V European Conference on Behavioural Biology

Ferrara, July 16th-18th, 2010

Local Organizing Committee:

Leonida Fusani	Università di Ferrara
Cristiano Bertolucci	Università di Ferrara
Augusto Foà	Università di Ferrara
Stefano Mazzotti	Museo Civico di Storia Naturale, Ferrara
Virginie Canoine	Università di Ferrara
Giulia Beltrami	Università di Ferrara
Elena Frigato	Università di Ferrara

Scientific Programme Committee:

Enrico Alleva	Istituto Superiore di Sanità, Roma
Cristiano Bertolucci	Università di Ferrara
Angelo Bisazza	Università di Padova
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Augusto Foà	Università di Ferrara
Leonida Fusani (Chair)	Università di Ferrara
Anna Gagliardo	Università di Pisa
Donato Antonio Grasso	Università di Parma
Giorgio Malacarne	Università del Piemonte Orientale

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GENERAL INFORMATION

Plenary sessions

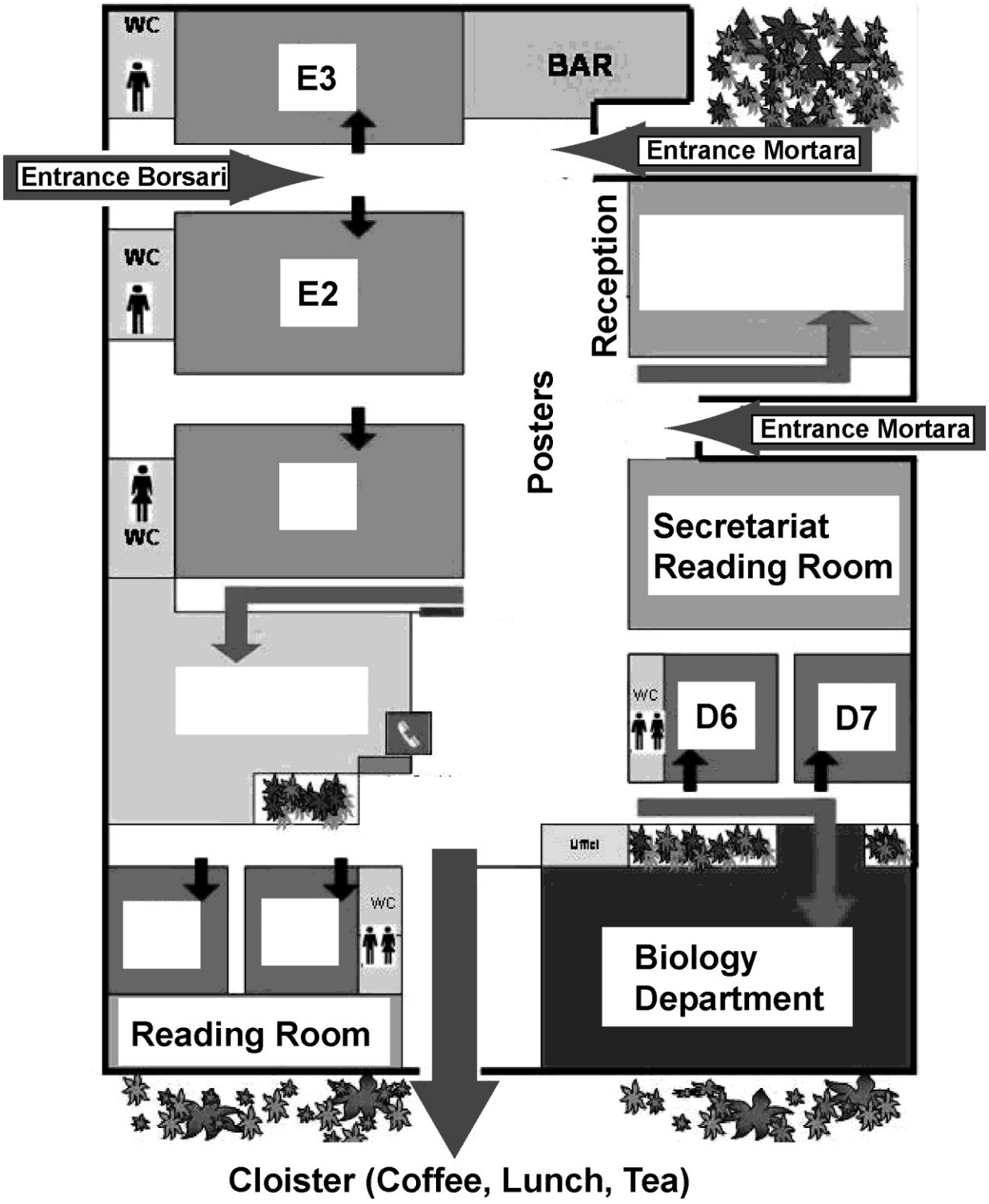
Plenary sessions will be held in Room E2. Additional seating will be available in Room E3, where the Plenary session will be shown in videoconferencing.

Internet Access

Wifi is available at the conference venue through the WIFE system. To obtain access codes, refer to the reception or Conference Secretariat. Please have a copy of your ID or Passport ready, by Italian laws access codes can be released only after registration of personal identification.

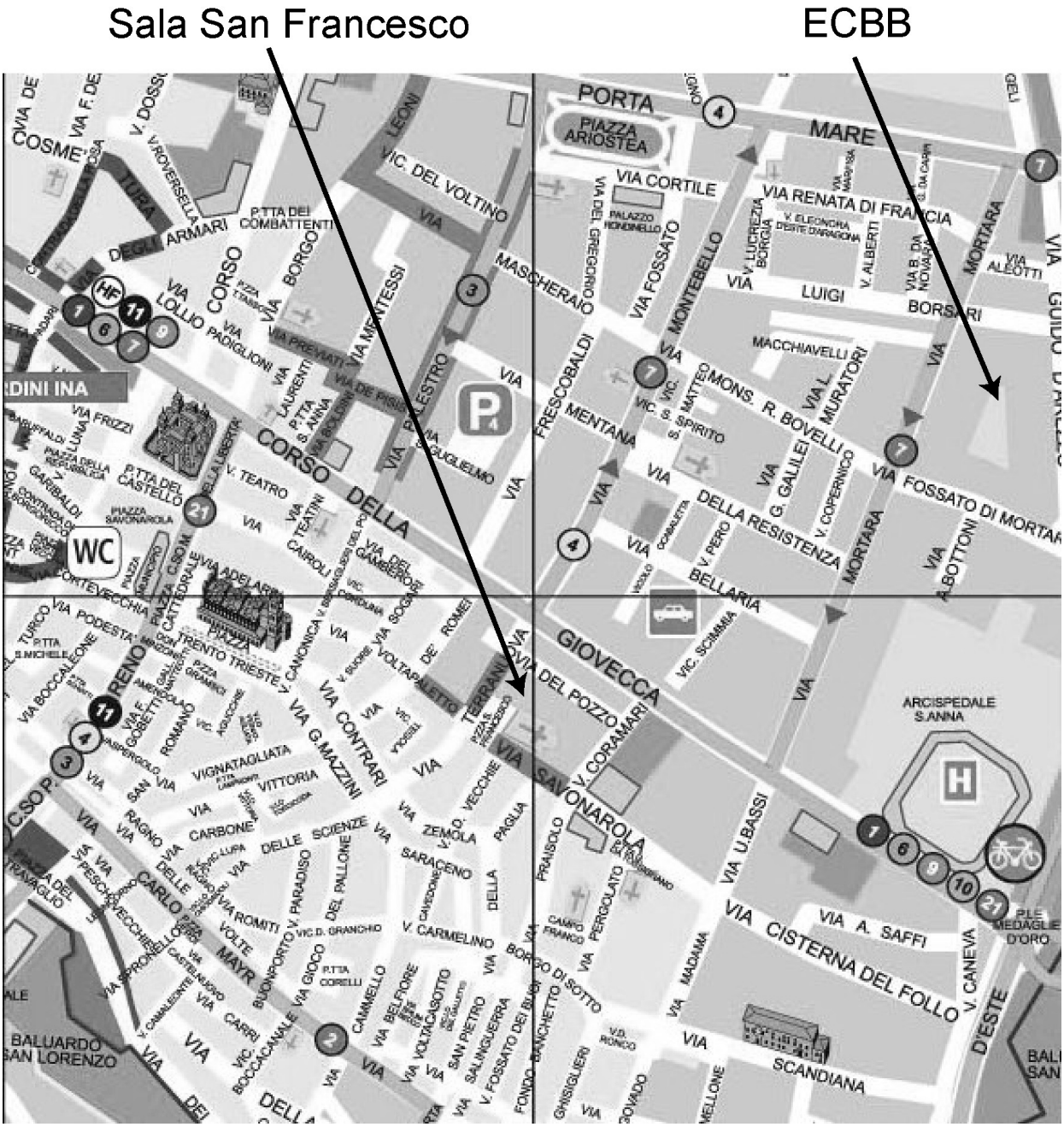
Map of the Conference Venue

(Mammouth, Via L. Borsari 46)



Dinner on Sunday 18th, 20:00

The social dinner will take place at the Sala San Francesco, Piazza San Francesco 7. The place is in the historical center and is 15 min walking from the Conference Venue.



V European Conference on Behavioural Biology

Ferrara, July 16th-18th, 2010

Programme

PROGRAMME OUTLINE

Thursday, July 15th 2010

17:30	- 19:30	Registration	Hall	
		Welcome Reception	Cloister	

Friday, July 16th 2010

8:00	- 9:00	Registration	Hall	
		Setup Posters	Hall	
9:00	- 9:15	Opening of ECBB 2010	E2+E3	
9:15	- 10:15	Plenary lecture	E2+E3	Elisabetta Visalberghi: Wild bearded capuchin monkeys use stone tools. A challenge to our ideas about tool use in human evolution
10:15	- 10:45	Coffee break	Cloister	
10:45	- 12:45	Symposium	E2	Trends in cognitive primatology
		Symposium	E3	Sex differences in hormones, brain and behaviour
		Oral session	D6	Communication I
		Oral session	D7	Parent-offspring
12:45	- 14:00	Lunch	Cloister	
14:00	- 16:00	Symposium	E2	Cognitive abilities of invertebrates: questions and perspectives
		Symposium	E3	Lateralised Behaviour
		Symposium	D6	Audience effect
		Oral session	D7	Sociality I
16:00	- 16:30	Tea break	Cloister	
16:30	- 17:30	Oral session	E2	Models
		Oral session	E3	Space
		Oral session	D6	Sociality II
17:30	- 19:00	Posters	Hall	

Saturday, July 17th 2010

9:00	- 9:30	Tinbergen Award	E2+E3	Katherina Hirschenauer: Hormones as coordinators and facilitators of social behaviour, excitement and success
9:30	- 10:30	Plenary lecture	E2+E3	Joan Strassmann: A behavioral perspective on organismality in a microbe
10:30	- 11:00	Coffee break	Cloister	
11:00	- 13:00	Symposium	E2	Where, when, and how many? The representation of space, time and number in animals
		Symposium	E3	Recognition systems and their overcoming at multiple levels of social organization
		Symposium	D6	Variation in fitness consequences of mammalian sociality
		Oral session	D7	Personality
13:00	- 14:30	Lunch	Cloister	
13:30	- *14:30*	*CESBB Meeting*	*E2*	

14:30	- 16:30	Symposium	E2	Long-term consequences of early environment on behaviour
		Symposium	E3	Behavioural ecology of keystone species as early bioindicator of anthropogenic impact on ecosystems
		Oral session	D6	Communication II
		Oral session	D7	Cooperation
16:30	- 17:00	Tea break	Cloister	
17:00	- 19:00	Posters	Hall	
18:00	-	*ASAB Council Meeting*	-	*Hotel Europa, Corso Giovecca 49*

Sunday, July 18th 2010

9:00	- 9:10	ASAB Medal	E2+E3	Michael Dockery
9:10	- 10:10	Plenary lecture	E2+E3	Martin Wikelski: Going wild, going global: rethinking behavioral biology in a new technological era
10:10	- 10:40	Coffee break	Cloister	
10:40	- 12:40	Symposium	E2	Consequences of an Urbanizing World: from Physiology to Behaviour
		Symposium	E3	Endocrinology of cooperative behavior
		Oral session	D6	Cognition
		Oral session	D7	Sociality III
12:40	- 14:10	Lunch	Cloister	
13:10	- *14:10*	*ASAB AGM*	*E2*	
14:10	- 16:10	Symposium	E2	Cooperation across species: cognitive processes, tolerance and efficiency
		Symposium	E3	Effects of immunity and oxidative stress on behavioural ecology, conceptual and technical relationships
		Oral session	D6	Time + Foraging
		Oral session	D7	Sexual selection
16:10	- 16:40	Tea break	Cloister	
16:40	- 18:00	Special Symposium	E2	The tradition of research in behavioral biology in Italy
18:00	- 19:00	Posters	Hall	
18:00	- *19:00*	*SIE Assemblea dei Soci*	*E2*	
20:00	- 23:00	Buffet dinner	-	Sala San Francesco, Piazza San Francesco 7

FULL PROGRAMME

Thursday, July 15th 2010

17:30 - 19:30 Registration Hall
Welcome Reception Cloister

Friday, July 16th 2010

8:00 - 9:00 Registration Hall
Setup Posters Hall

9:00 - 9:15 Opening of ECBB 2010 E2+E3

9:15 - 10:15 Plenary lecture E2+E3
ELISABETTA VISALBERGHI
Wild bearded capuchin monkeys use stone tools. A challenge to our ideas about tool use in human evolution
Chairman: Leonida Fusani

10:15 - 10:45 Coffee break Cloister

10:45 - 12:45 Parallel sessions

	Symposium	Symposium	Oral session	Oral session
Room	E2	E3	D6	D7
Title	**Trends in cognitive primatology**	**Sex differences in hormones, brain and behaviour**	**Communication I**	**Parent-offspring**
Chair	Elsa Addessi, Valerie Dufour & Valentina Truppa	Cornelia Voigt & Stefan Leitner	Marc Thery	Virginie Canoine
10:45	Are chimpanzees empathic? A proposal of the cognitive and emotional processing in chimpanzee empathy Sonja Koski	Sex differences in lateralization of behaviour and the potential role of androgens Ton G G Groothuis	Effect of bee alarm pheromone on the behaviour of conespecifics towards risky flowers Ana L Llandres	Relationship between embryos and carrying mothers in amphibious crabs: the case of *Armases miersii* Riccardo Simoni
11:05	Visual illusions in great apes Daniel Hanus	Hormone-dependent differentiation of sexually attractive songs of canaries Manfred Gahr	Male topi antelopes alarm snort deceptively to retain females for mating Jakob Brojorgensen	Divergent selection for egg testosterone content differentially influences growth rate and immune response in japanese quail Michal Zeman
11:25	How and what to learn from individual differences in social learning Judith Burkart	Mate choice copying in zebra finches: sexes differ Klaudia Witte	Role of the temporal pattern of males' aggressive sounds in a cichlid fish Frederic Bertucci	Who cares? Distribution of social care and alloparenting behaviours in the colonial rodent *Meriones unguiculatus* Andrew Fulmer

11:45	What mediates personality variation in grey mouse lemurs (*Microcebus murinus*)? Melanie Dammhahn	Sex differences in vocal behaviour and the song control system of a duetting songbird Cornelia Voigt	Why do shrews twitter – communication or simple echo-based orientation? Sophie Von Merten	Who determines fledging in the zebra finch? Fritz Trillmich
12:05	Does learning influence the acoustic structure and meaning of alarm calls in a malagasy primate (*Propithecus* spp.)? Claudia Fichtel	Evolution of behavioural traits: sex-specific mortality selection on activity Outi Vesakoski	Distinct howling in free-ranging packs of wolves (*Canis lupus*) Marco Zaccaroni	Variance in parenting tendency? Fostering behavior in galapagos sea lions Birte Mueller
12:25	Can the unsuspected anticipatory abilities of *Cebus apella* and *Macaca tonkeana* be future planning? Marie Bourjade	Discussion	Sternal marking in mandrills: a chemical and ethological investigation Stefano Vaglio	'La mamma' makes a difference – silver spoon effects in spotted hyenas Oliver Honer

12:45 - 14:00 Lunch Cloister

14:00 - 16:00 Parallel sessions

	Symposium	Symposium	Symposium	Oral session
Room	E2	E3	D6	D7
Title	**Cognitive abilities of invertebrates: questions and perspectives**	**Lateralised Behaviour**	**Audience effect**	**Sociality I**
Chair	Francesca Gherardi & Robert Elwood	Davide Csermely & Richard Andrew	Francesco Dessì-Fulgheri & Peter McGregor	Donato Grasso
14:00	The question of "individual recognition" in invertebrates Francesca Gherardi	Forms of lateralisation in common wall lizards Davide Csermely	Audiences, eavesdropping and communication in networks Peter Mcgregor	A comparative perspective on delay discounting: from capuchin monkeys to other primate species Elsa Addessi
14:20	Information gathering by contestants during fights reveals cognitive abilities Robert Elwood	Logical reasoning is best with a lateralised (and social) brain. The case of transitive inference in the domestic chick (*Gallus gallus*) Lucia Regolin	Cooperation in communication networks Redouan Bshary	Pattern and social dynamics of vigilance in redfronted lemurs (*Eulemur fulvus*) Peter Kappeler
14:40	Do decision-making ants compare alternatives? Elva Robinson	Olfactory lateralization in homing pigeons: GPS-recorded tracks of birds navigating with unilateral olfactory inputs Anna Gagliardo	Audience effect on alarm calls in the red-legged partridge Rosaria Binazzi	Learning to play nice: the emergence of prosocial behavior in pairbonded tamarins Katherine Cronin
15:00	Social recognition, memory and learning in ants Patrizia D'Ettorre	Maternal testosterone affects sibling competition but not lateralization in the domestic chicken Kristina Pfannkuche	Postconflict affiliative interactions among bystanders in a tolerant species of macaque (*Macaca tonkeana*) Arianna De Marco	Exceeding the pair bond: social structure of jackdaw networks Christine Schwab

15:20	Does lack of discrimination equal lack of cognition? Barry Magee	Development and evolution of cerebral lateralization using fishes as model organisms Anne Laurence Bibost	Effects of mate/familiar audience on intra/inter-sexual interactions in male domestic canaries (*Serinus canaria*) Davy Ung	Once a friend always a friend? Common ravens recognize affiliative partners over a long time period Markus Boeckle
15:40	Stomatopod crustaceans: what is the connection between raptorial appendage type and the evolution of sensory systems and cognitive ability? Roy Caldwell	The influence of aging on the visual side-bias in pigeons Christiane Wilzeck	Does familiar audience facilitate novel object exploration? A study in great tits (*Parus major*) Mareike Stowe	Patterns of agonistic intervention in the process of maternal rank inheritance among infant japanese macaques Rizaldi

16:00 - 16:30 Tea break Cloister

16:30 - 17:30 Parallel sessions

	Oral session	Oral session	Oral session
Room	E2	E3	D6
Title Chair	**Models** Wolfgang Goymann	**Space** Jesko Partecke	**Sociality II** Cristiano Bertolucci
16:30	Relating mathematical models of pattern development to the habitats and behaviour of cats William Allen	Asymmetry in brains of homing pigeons with and without navigational experience Julia Mehlhorn	Behavioural consequences of cold exposure on males and females of a parasitic wasp Joan Van Baaren
16:50	The influence of cognitive complexity, behavioral novelty and group density on social information cascades Bertrand Lemasson	How perceived threat increases synchronization in collectively moving animal groups Nikolai Bode	Status signalling in a european population of the paper wasp *Polistes dominulus* Jonathan Green
17:10	Learning in a game context: strategy choice by some keeps learning from evolving in others Frederique Dubois	Less is more: rearing density influences the development of behavioural life skills and survival of hatchery-released trout Bart Adriaenssens	Cuticular hydrocarbons or peptides: which one is responsibile for nestmate recognition in the paper wasp *Polistes dominulus*? Claudia Bruschini

17:30 - 19:00 Posters Hall

Saturday, July 17th 2010

9:00 - 9:30 Tinbergen Award E2+E3

KATHERINA HIRSCHENAUER: Hormones as coordinators and facilitators of social behaviour, excitement and success

Presented by Redouan Bshary, President of the Ethologische Gesellschaft

9:30 - 10:30 Plenary lecture E2+E3

JOAN STRASSMANN: A behavioral perspective on organismality in a microbe

Chairman: Augusto Foà

10:30 - 11:00 Coffee break Cloister

11:00 - 13:00 Parallel sessions

	Symposium	Symposium	Symposium	Oral session
Room	E2	E3	D6	D7
Title	**Where, when, and how many? The representation of space, time and number in animals**	**Recognition systems and their overcoming at multiple levels of social organization**	**Variation in fitness consequences of mammalian sociality**	**Personality**
Chair	Christian Agrillo & Jeffrey R Stevens	Rita Cervo & Patrizia d'Ettorre	Luis A Ebensperger & Patrick Gouat	Claudio Carere
11:00	Spatial discounting in fish: the convergence of space, time, and number Jeffrey Stevens	Crozier's paradox and genetic kin recognition in a social amoeba David Queller	Fitness consequences of sociality across mammals: a meta-analysis Luis Ebensperger	Effects of personality on territorial signalling in the greats tits (*Parus major*) Mathieu Amy
11:20	Ontogeny of numerical competence in the teleost fish *Poecilia reticulata* Christian Agrillo	Variations in cheater's strategies for evading discrimination: mimicry, insignificance, repulsion or their bizarre combination Maria Cristina Lorenzi	The social modulation of behavioural profiles and reproductive strategies during early phases of life and adolescence Norbert Sachser	Personality types and environmental enrichment affect aggression at weaning in pigs Luca Melotti
11:40	How domestic chicks do geometry in enclosed spaces Cinzia Chiandetti	Acoustic communication between mother and offspring in crocodiles Nicolas Mathevon	Testosterone and intrasexual competition among females in a cooperative mammal Heike Lutermann	Personality in a partial migrant – the blue tit Claudia Mettke Hofmann
12:00	Carrion crows choose higher quantities in a preference but not exchange task Claudia Wascher	Darcin: a male pheromone that stimulates female memory and sexual attraction in the house mouse Sarah Roberts	Are polygynous mound-building female mice in a social trap? Christophe Feron	Biology of fear in birds: multidisciplinary analysis of a genetic model Christine Leterrier
12:20	Effect of geometric information on orientation behavior in the domestic homing pigeon Mareike Fellmin	Fight or fool? How a cuckoo wasp conquer its host colony Alessandro Cini	Discussion	The social dimension of animal personalities in cooperative breeders Markus Zöttl
12:40	Sensory basis of habitat recognition in echolocating bats Stefan Greif	Discriminative predation: sequential and simultaneous encounter experiments Daniel Franks	Discussion	Discussion

13:00 - 14:30 Lunch Cloister
13:30 - 14:30 CESBB Meeting E2

14:30 - 16:30 Parallel sessions

	Symposium	Symposium	Oral session	Oral session
Room	E2	E3	D6	D7
Title	**Long-term consequences of early environment on behaviour**	**Behavioural ecology of keystone species as early bioindicator of anthropogenic impact on ecosystems**	**Communication II**	**Cooperation**
Chair	Eva Millesi & Barbara Taborsky	Stefano Cannicci & Gil Penha-Lopes	Giorgio Malacarne	Gianni Laviola
14:30	Experience in the egg influences precocial birds later ability to cope with their environment Aline Bertin	Behavioural ecology as early indicator of anthropogenic impact: a case study on East Africa mangrove benthic macrofauna Fabrizio Bartolini	Long-term nest and mate fidelity in the european eagle owl: an assessment using individual vocal signature Charlotte Cure	Individual specialisation in cooperative breeding alpine marmot (*Marmota marmota*) Francois Dumont
14:50	Social competence acquired by early social experience Barbara Taborsky	Behaviour as a driver of ecosystem functioning Gil Penha Lopes	Complexity and individuality in the contact calls of jackdaws Georgine Szipl	Direct and indirect fitness benefits of philopatry and cooperative care in ambrosia beetles Michael Taborsky
15:10	Social environment affects juvenile development in male european ground squirrels Eva Millesi	The use of ant functional groups to monitor human impact on European terrestrial ecosystems: what can Italian ant fauna tell us about it? Cristina Castracani	Dual-dialect song playback, and its effect on post-release dispersal following translocation of endangered North Island kokako (*Callaeas cinerea wilsoni*) David Bradley	Habitat saturation, benefits of philopatry, relatedness and cooperative breeding in a cichlid Dik Heg
15:30	Are woodpecker finches from an unpredictabel environment more flexible? Sabine Tebbich	Assessing the ecotoxicological effects of complex contaminant mixtures in Po river delta using burrowing responses in *Tapes philippinarum* Angela Sacchi	Monitoring territory dynamics of Mexican antthrush (*Formicarius moniliger*) using song recordings and a wireless sensor network Alexander Kirschel	Experimental evidence of kin recognition, cooperation and inbreeding in a cooperative breeder Kathryn Arnold
15:50	Mouse communal nesting: mother and peer interactions independently shape adult brain function and social behavior Igor Branchi	Battle between two piscivorous fishes – who will win as the aquatic optical properties change Lynn Ranaker	Seasonal patterns of singing in relation to breeding in the common nightingale luscinia megarhynchos Kim G Mortega	Contributions to a public good are maintained because the common enemy selects against free-riding Andrea Bshary
16:10	Stressful dieting during the nestling and fledgling phase: implications on biometry, physiology and male song learning Mariam Honarmand	Discussion	Female calling? Differentiated song responses to male and female call playbacks in common nightingales (*Luscinia megarhynchos*) Silke Kipper	Discussion

16:30 - 17:00 Tea break Cloister

17:00 - 19:00 Posters Hall
18:00 - 22:00 ASAB Council Meeting Hotel Europa, Corso Giovecca 49

Sunday, July 18th 2010

9:00 - 9:10 ASAB Medal E2+E3
Michael Dockery
Presented by Jane Hurst, President of ASAB

9:10 - 10:10 Plenary lecture E2+E3
MARTIN WIKELSKI
Going wild, going global: rethinking behavioral biology in a new technological era
Chairman: Cristiano Bertolucci

10:10 - 10:40 Coffee break Cloister

10:40 - 12:40 Parallel sessions

	Symposium	Symposium	Oral session	Oral session
Room	E2	E3	D6	D7
Title	**Consequences of an Urbanizing World: from Physiology to Behaviour**	**Endocrinology of cooperative behavior**	**Cognition**	**Sociality III**
Chair	Henrik Brumm & Diego Gil	Redouan Bshary & Katharina Hirschenhauser	Igor Branchi	Jutta Schneider
10:40	From patterns to emerging processes in urban behavioural ecology Paige Warren	Hormones as mechanisms for cooperative behaviour? Wolfgang Goymann	Memory consolidation in great apes Gema Martin Ordas	Fickle feathered friends: do hens form lasting dyadic bonds? Lisa Collins
11:00	Evolutionary consequences of an urbanizing world Jesko Partecke	An introduction to the evolutionary approach to altruism and cooperation: the basic concepts Redouan Bshary	The expression of oro-facial movements reflects right hemisphere dominance for emotions in baboons Catherine Wallez	Resource distribution and individual personality combine to induce social (and anti-social) behaviour in shore crabs Colby Tanner
11:20	Dealing with urban noise: a comparison between oscine and sub-oscine birds Diego Gil	Oxytocin triggers reciprocity in Norway rats Melanie Dietz	It is hard to see food gone: do grey parrots and jackdaws rely on causal or social information to find hidden food? Sandra Mikolasch	Does the winner always take all? Social context can change existing dominance hierarchies in shore crabs Gul Deniz Salali
11:40	Urban bird songs: vocal adaptations and unsolved questions Henrik Brumm	Does the use of tactile stimulation by cleanerfish has a role on its client fish stress response? Marta Soares	The parrot and the string: attention, motivation, and efficiency in a string-pulling task Christian Schloegl	Group navigation leads to increased path efficiency in the wood ant *Formica rufa* Mike Clease

12:00	Stress response across a rural-urban gradient is linked to melanin-based coloration in feral pigeons *Columba livia* Helene Corbel	Does testosterone facilitate territorial behavior and song of male black redstarts (*Phoenicurus ochruros*)? Beate Apfelbeck	Relational learning by capuchin monkeys (*Cebus apella*) Valentina Truppa	Alarm, defence and coevolution: a case study in ants Donato Grasso
12:20	Urbanization affects density, spacing pattern and mating system of free-ranging domestic cats Eugenia Natoli	Individual behavioral profile and specialization on building material transportation in mound-building mice Maria Jose Hurtado Herrera	Simplicity versus complexity: behavioral plasticity and its adaptive roles in the cephalopod mollusc, *Octopus vulgaris* Graziano Fiorito	Collective departure and individual decision-making in sheep Marie Helene Pillot

12:40 - 14:10 Lunch Cloister
13:10 - 14:10 ASAB AGM E2

14:10 - 16:10 Parallel sessions

	Symposium	Symposium	Oral session	Oral session
Room	E2	E3	D6	D7
Title	**Cooperation across species: cognitive processes, tolerance and efficiency**	**Effects of immunity and oxidative stress on behavioural ecology, conceptual and technical relationships**	**Time + Foraging**	**Sexual selection**
Chair	Franck Peron & Helene Möslinger	Albert Ros & George A Lozano	Augusto Foa'	Laura Beani
14:10	Cooperative string pulling in wolves (*Canis lupus*) Helene Moeslinger	Conceptual links between immune function and oxidative stress research in behavioural ecology: examples form vertebrate field studies Jonathan Blount	*Cerithidea decollata*, a snail foreseeing the future? Marco Vannini	Mate choice in free-ranging domestic dogs (*Canis lupus familiaris*) Simona Cafazzo
14:30	Coordination and negociation during a cooperative task in african grey parrots Franck Peron	The impact of impaired antioxidant defences on scent signalling in mice Michael Garratt	Does urbanization affect selective pressures and life-history strategies in common blackbirds? Juan Diego Ibanez Alamo	Heart rate as an index of increased metabolic output in a bird with a complex courtship display Julia Barske
14:50	Increase in social differentiation in wild vervet monkeys cooperating experimentally Riccardo Pansini	Immunity and oxidative stress in behavioral ecology: results and insights from species with alternative reproductive tactics/strategies Albert Ros	Stable individual differences in behavioural plasticity and sampling when playing social foraging games Julie Morand Ferron	Agreement of mate choice between females does not require social copying Emilie Beigneux
15:10	Cooperation enhancing effects of dynamical social networks in humans Dirk Semmann	Male parental effort, offspring quality and oxidative stress Fabrice Helfenstein	Foraging behaviour and hibernation patterns in male and female common hamsters Carina Siutz	Do sailfin molly males adjust sperm transfer to mate-choice copying? Sabine Noebel

15:30	Affiliative relationships promote cooperation in free-ranging dogs Roberto Bonanni	Are carotenoids really that important? Sandra Trigo	Detailed knowledge of the feeding ecology and spatial distribution of cheetahs reduces the farmer-cheetah conflict in namibia Bettina Wachter	Preference for human male body hair changes across the menstrual cycle and menopause Markus Rantala
15:50	The choice of neighbour: cooperation or conflict between nesting lesser kestrels (*Falco naumanni*) and jackdaws (*Corvus monedula*)? Daniela Campobello	Facial attractiveness signals the strength of immune function in men Indrikis Krams	Chronobiology of urban life: activity patterns of european blackbirds (*Turdus merula*) along an urban/rural gradient Davide M Dominoni	Are female mate choice preferences affected by developmental stress? Katherine Buchanan

16:10 - 16:40 Tea break Cloister

16:40 - 18:00 Special Symposium E2

Title	**The tradition of research in behavioral biology in Italy**
Chair	Leonida Fusani & Enrico Alleva
16:40	Presentation Augusto Foà
16:45	A brief history of Italian ethological and biobehavioural studies Enrico Alleva
17:00	Discovering that pigeons home by smell: forty years of research in Pisa Anna Gagliardo
17:15	Ethology in Parma: from ants to men Paola Palanza
17:30	The University of Florence Group for the Study of Social Insects Stefano Turillazzi
17:45	The legacy of comparative psychology in North-East of Italy: between Gestalt theory and classical ethology Giorgio Vallortigara

18:00 - 19:00 Posters Hall
18:00 - 19:00 SIE Assemblea dei Soci E2

20:00 - 23:00 Buffet dinner Sala San Francesco, Piazza San Francesco 7

Abstracts of Symposia and Oral Sessions

Alphabetical Order

Elsa Addessi Sociality I

A COMPARATIVE PERSPECTIVE ON DELAY DISCOUNTING: FROM CAPUCHIN MONKEYS TO OTHER PRIMATE SPECIES

E. Addessi1, F. Paglieri1, V. Focaroli1
1CNR, Istituto di Scienze e Tecnologie della Cognizione, Rome, Italy 2Sapienza Università di Roma, Rome, Italy

The evolution of sophisticated skills such as reciprocal altruism, planning, and cooperative interactions requires the inhibition of prepotent responses. Self-control is considered one of the features distinguishing humans from other animals. When choosing between a small immediate reward and a large delayed reward, humans apparently tolerate delays of weeks or even months, whereas animals tolerate delays of just a few seconds. However, discounting levels can vary across species and individuals and it is unclear if phylogenetic relatedness, feeding ecology, social structure, or metabolic rate account for these differences. To disentangle these hypotheses we evaluated temporal preferences in capuchin monkeys (Cebus apella), a South-American primate species that shares striking analogies with hominids in terms of encephalization index, ontogeny, manipulative skills and tool use. Then, we compared their performance with that of the other primate species tested so far with the same procedure. Capuchins showed a considerable tolerance for delay, with females being more "patient" than males, possibly because of females' less opportunistic foraging style or particular pattern of courtship. Furthermore, capuchins performed significantly better than closely related species as tamarins and marmosets, and their performance was not significantly different from that of apes. Our findings challenge the existing views on the evolution of self-control since none of the hypotheses proposed so far to account for differences in tolerance for delay across species could satisfactorily explain this pattern of results. In contrast, capuchins' high tolerance to delay adds to the many intriguing behavioural and cognitive convergences with chimpanzees.

Bart Adriaenssens Space

LESS IS MORE: REARING DENSITY INFLUENCES THE DEVELOPMENT OF BEHAVIOURAL LIFE SKILLS AND SURVIVAL OF HATCHERY-RELEASED TROUT

Bart Adriaenssens, Sofia Brockmark, and Jörgen I Johnsson
Animal Ecology, Department of Zoology, University of Gothenburg, Box 463, S-405 30 Gothenburg, Sweden. email: bart.adriaenssens@zool.gu.se

Theory suggests that habitat structure and population density during development have a profound impact on behaviour in animals. In this study we predict that reduced rearing density and increased structural complexity promote spatial orientation, anti-predator response and the ability to forage on novel prey, all ecologically important behaviours. We reared brown trout, Salmo trutta, at three densities (conventional hatchery density, a fourth of conventional hatchery density and natural density) in tanks with or without structure. Treatment effects on behaviour were studied on trout fry and parr, whereupon 20 trout from each of the six treatment groups were released in an enclosed natural stream and recaptured after 36 days. Fry reared at natural density were faster to find prey in a maze. Moreover, parr reared at natural density were faster to eat novel prey, and showed more efficient anti-predator behaviour than fish reared at higher densities. In addition, parr reared at reduced densities were twice as likely to survive in the stream as trout reared at high density. In contrast, we found no clear treatment effects of structure. These novel results suggest that reduced rearing densities can facilitate the development of behavioural life skills in captive animals, thereby increasing their contribution to natural production.

Christian Agrillo The representation of space, time and number in animals

ONTOGENY OF NUMERICAL COMPETENCE IN THE TELEOST FISH POECILIA RETICULATA
Christian Agrillo, Laura Piffer, Giovanna Serena, Roberta Casati & Angelo Bisazza
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Adult humans, infants and non human primates are thought to share two non-verbal systems for counting objects, one for representing precisely small quantities (up to 3-4 items) and one for estimating approximately larger quantities. Recent studies exploiting fish's spontaneous tendency to join the larger group showed that their ability in numerical discrimination closely resembles that of primates. We investigated the ontogeny of this capacity by measuring the numerical discrimination of newborn and juvenile guppies. One-day-old fish chose the larger shoal when the choice was between numbers in the small quantity range, 2 vs. 3 or 3 vs. 4 fish, but not when they had to choose between large numbers, 4 vs. 8 or 4 vs. 12, even though the ratio was even more favorable in the latter case. To investigate the relative role of maturation and experience in large number discrimination, fish were raised in pairs (with no counting experience) or in large social groups and tested at three ages. Forty-day-old guppies from both treatments were able to discriminate 4 vs. 8 fish while at 20 days this was only observed in fish grown in groups. Control experiments showed that these capacities were maintained after guppies were prevented from using non numerical continuous information that co-vary with number. Overall, our results suggest the existence of two separate numerical systems. One system, for small numbers, is innate and displayed immediately at birth; the other, the large number system, emerges later as a result of both maturation and social experience.

William Allen Models

RELATING MATHEMATICAL MODELS OF PATTERN DEVELOPMENT TO THE HABITATS AND BEHAVIOUR OF CATS.
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We present a novel method for mapping the complex patterns of 36 species of Felidae into a quantitative 'camouflage space' based on a biologically plausible reaction-diffusion pattern generation model. We then examined whether habitat type and behavioral attributes predicted species' positions in this space to test classic hypotheses of adaptive camouflage. We found: 1) a significant association between being patterned, in particular being irregularly and complexly patterned, and a preference for closed habitats, especially tropical rainforest; 2) cats living in mountainous regions were likely to be plain, and if they were patterned, this was likely to be a regular pattern; 3) patterned cats, in particular irregularly and complexly patterned cats, are associated with arboreal locomotion; 4) as the irregularity of patterns increases so does cats' preference for nocturnality; and 5) cats in closed environments and arboreal hunters have larger pattern elements relative to their body size. Despite these significant associations, there is also a large minority of cats who present as intriguing camouflage outliers. These results indicate that camouflage patterns can adapt over relatively short time-scales to specific niches, and that habitat type does not necessarily predict a single optimal camouflage solution. The study links the development, appearance and adaptive function of cat camouflage using a new method of parametric analysis of camouflage patterns. The method could be extended to analysis of diverse taxa, as long as their colour patterns can reasonably be matched to those of reaction diffusion models.

Enrico Alleva The tradition of research in behavioral biology in Italy

A BRIEF HISTORY OF ITALIAN ETHOLOGICAL AND BIOBEHAVIOURAL STUDIES

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Italian "ethology" had distinguished ancestors from Roman-time fish farmers to much more recent social clusters (dedicated and talented amateurs jointly with XXVII- XX century academic milieu) of entomologists, bird and mammal hunters. Scientists such as eg Jacques Loeb regularly visiting the Naples Stazione Zoologica, a marine station whose staff had strong and regular cultural links with Charles Darwin himself. We recently recognised the first modern-time ethologist (Alleva, 2009) in Leo Pardi, a crustacean and wasp expert with sound cultural exchange with Karl von Frish and mostly active at Florence University. One of his early pupils, Floriano Papi (University of Pisa), presently Honorary President of the Italian Association for the Study of Animal Behaviour (SIE), diverted from invertebrate to homing pigeon and much more recently sea turtle as study subjects. The late Nobel laureate Daniel Bovet (rodent expert) was the first SIE President, and initiated a fertile cross-exchange in the SIE with psychobiologists and neuroendocrinologists at the national and international level. A third main ethological centre started at the end of the mythical sixties thanks to Danilo Mainardi at Parma University: Florence, Pisa and Parma clustered experts of both vertebrate and invertebrate species, disseminating nationwide animal behaviour labs, such as the Rome primatological group led by Elisabetta Visalberghi at National Research Council since the mid-eighties. Ethology is presently taught at most Italian Universities (Science Faculties), while psychobiology and comparative psychology entered thanks to Bovet himself steadily in the Psychology curricula.

Alleva E. Storia dell'etologia italiana. In: La cultura Italiana, L.L. Cavalli Sforza (Ed), Vol VII Scienze e Tecnologie UTET, 2009 pp 445-467.

Mathieu Amy Personality

EFFECTS OF PERSONALITY ON TERRITORIAL SIGNALLING IN THE GREATS TITS (PARUS MAJOR)

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In animals, individuals often differ consistently in behavior across time and contexts and such consistent behavioral differences are commonly described as behavioural syndrome or personality. So far, relationship between avian personality and territorial signalling are poorly understood. We investigated whether personality of territorial male great tits (Parus major) influences their own and their neighbors' territorial responses towards simulated intruders. As a proxy of personality, we tested the exploratory behaviour of males in a standard context several weeks before the experiment. Using interactive playback, we engaged birds in a vocal interaction with a simulated intruder in their territory. The playback intruder either overlapped or alternated the subjects' songs. Before, during and after the playback we radio-tracked the subject and a neighbour. We will discuss how the behaviour of subjects and their neighbours vary according to male personality.

Beate Apfelbeck Endocrinology of cooperative behaviour

DOES TESTOSTERONE FACILITATE TERRITORIAL BEHAVIOR AND SONG OF MALE BLACK REDSTARTS (PHOENICURUS OCHRUROS)?

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It is thought that territorial behavior of temperate zone songbirds is regulated by testosterone, because seasonal testosterone profiles closely match the occurrence of territorial behavior in males. However, male black redstarts defend territories and sing during the breeding season and also in autumn, before they migrate south. But their testosterone levels are only elevated during the breeding season. Furthermore, plasma testosterone levels of black redstarts do not increase during territorial conflicts neither in spring nor in autumn. We therefore tested, if territorial behavior and song in male black redstarts is facilitated by testosterone both during the breeding season and during autumn. Male black redstarts were implanted either with control pellets or with Flutamide (an androgen receptor blocker) and Letrozole (an aromatase inhibitor) to block the action of androgens and estrogens. Three and ten days after the implantation, an intrusion into their territories was simulated by placing a stuffed black redstart into the centre of their territories and playing back black redstart song. The treatment decreased territorial behaviour in males after ten days but not after three days in spring. In autumn, however, experimental birds tended to spend less time close to the dummy and were less agitated than control males already after three days. Thus, territoriality in male black redstarts is facilitated by testosterone both in spring and in autumn. If the same mechanism applies is, however, still unclear.

Kathryn Arnold Cooperation

EXPERIMENTAL EVIDENCE OF KIN RECOGNITION, COOPERATION AND INBREEDING IN A COOPERATIVE BREEDER

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Kin recognition is core to the theories of the evolution of sociality and cooperative breeding, but has rarely been established experimentally. Benefits of kin recognition are predicted to change throughout life: Here we tested whether i) juveniles can recognise kin and accrue indirect fitness benefits through assisting kin, and ii) adults benefit from avoiding kin and the risk of inbreeding. Neolamprologus pulcher is a cooperatively breeding cichlid, in which a breeding pair is aided by helpers varying in relatedness. Clutches of eggs from known pairs were halved and reared in isolation. Thus, each fry had a group of familiar and unfamiliar siblings. In standard two-way choice trials, juvenile N. pulcher recognised unfamiliar kin over unfamiliar non-kin using phenotype matching. Also, chemical cues appeared more important than visual cues in recognising unfamiliar kin. However, individuals did not discriminate between familiar and unfamiliar kin. Thus, relatedness rather than familiarity influences association choices among juveniles. Perhaps advantageous in complex social groups in which familiar individuals are not necessarily relatives. Interestingly, relatedness did not predict helping effort by juveniles in cooperatively breeding groups. Among adults, female N. pulcher preferred to associate with unfamiliar male kin over male non-kin, contrary to predictions. Males, however, showed no overall preference for females based on kinship. Finally, we investigated the role of kin recognition for inbreeding avoidance. In a cross-over design, individuals were paired with an opposite sex sib or non-sib. Individuals were equally likely to breed with a sib over a non-sib. Moreover, both male and females paired with sibs commenced breeding faster and had higher hatching success rates than with non-sibs. Therefore in N. pulcher, inbreeding may be advantageous. Our results have intriguing implications for the evolution of sociality in cooperatively breeding groups.

Julia Barske Sexual selection

HEART RATE AS AN INDEX OF INCREASED METABOLIC OUTPUT IN A BIRD WITH A COMPLEX COURTSHIP DISPLAY

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The golden-collared manakin (Manacus vitellinus) of Panamanian rainforests has a polygamous (lek) breeding system in which individual males perform a complex and physically intensive courtship display. Using a small arena created on the forest floor, male displays consist of rapid, precise and acrobatic jumps between saplings accompanied by mechanical sounds produced by their wings. Males differ in the rate at which components of the display are performed and females prefer males that perform faster and more frequently. We hypothesize that these properties of the display reflect male condition, hence they are an indicator of genetic quality and serve as the basis for female mate choice. We further hypothesize that males express a higher heart rate while courting, reflecting the higher metabolic rate associated with elevated displaying activity. If heart and metabolic rate are increased during displaying, then courtship activity would represent a good proxy of condition for females. We monitored heart rate of wild breeding males over the course of one or more days. Birds were collected and miniature transmitters were attached that transmitted heart rate as amplitude modulation of the carrier frequency. After release, most males returned to their courtship arenas and appeared to behave normally. Overall, we have collected data from 26 males. From 20 of these, we determined a daily distribution of the heart rate and estimated maximum heart rate. In general, heart rate was lowest at night and during mid-day periods of inactivity. Courtship activity peaked in the early morning and early afternoon and heart rate was elevated at these times. We are currently analyzing data from 6 individuals for whom we have collected both heart rate data and detailed behavioral observations enabling us to analyze the metabolic costs of mechanical sound production and other features of the male's display.

Fabrizio Bartolini Behavioural ecology of keystone species

BEHAVIOURAL ECOLOGY AS EARLY INDICATOR OF ANTHROPOGENIC IMPACT: A CASE STUDY ON EAST AFRICA MANGROVE BENTHIC MACROFAUNA

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Ecosystem damages determined by anthropogenic activities can sometimes be difficult to detect. Increasing of taxonomic diversity or total biomass in a specific area, for example, can mask the ongoing degradation of an ecosystem, in terms of the loss of functionality of certain important faunal elements. Some authors have recently described such a phenomenon as “cryptic ecological degradation” of natural systems. Ecosystem engineers are known to play a crucial role with respect to other species of fauna and flora since they are able to control and modulate the availability of biologically important resources such as spatial and trophic ones. Once the connections and the role of these species within their own ecosystems are proved, the quantification of their activity can be a useful indicator of environmental health to support studies on anthropogenic environmental impact. Here we present the case study of the effect of sewage contamination on behavioural ecology of macrobenthic intertidal fauna of East African mangroves. We studied the activity of two important mangrove benthic groups, fiddler crabs (gen. Uca) and mud whelks (gen. Terebralia), whose bottom activity is known, or reasonably supposed to heavily influence the biogeochemistry of mangrove sediment. The studies were carried out in natural and experimental conditions, in order to quantify the time budget and the resultant amount of processed sediment (bioturbation) between impacted and pristine sites or along a sewage contamination gradient, respectively. It is shown how the eco-ethological information is crucial to support the detection of a hidden ecosystem degradation, not displayed using canonical ecological indicators, like biodiversity or biomass quantifications.

Emilie Beigneux Sexual selection

AGREEMENT OF MATE CHOICE BETWEEN FEMALES DOES NOT REQUIRE SOCIAL COPYING

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Stimulating studies based on the optimal outbreeding theory have emphasized the role of assortative mating mechanisms. As a result, variation in mate choice is the rule between females. Amazingly, agreement between females remains poorly documented in the recent literature. Studies related to public information theory have shown that shared preferences for particular males may occur as a result of mate choice copying, where females base their choice on the mate choice performed by other females. Nevertheless, females can also exert their own evaluation of intrinsic qualities of the male. When these criteria are of paramount importance for their breeding success, females should share their preferences for a given type of male. Since these different mechanisms act together, it is generally difficult to untangle them. The mound-building mouse Mus spicilegus gives the opportunity to lessen this constraint. In this monogamous species, female dispersion is the rule before mating and female-female intolerance prevents social copying. Moreover males disperse more than females and as a consequence females are already settled when they are courted by males coming from surrounding populations. This schedule weakens the role of assortative mating criteria during mate choice. We then predicted that females will share their criteria to select their mate. To test this hypothesis, we presented to females four pairs of male body odours. To rule out genetic criteria, we used males and females originating from two different populations. Our study revealed an important agreement between females and suggested that odorous productions are relevant for females to assess male quality and perform their choice.

Aline Bertin Long-term consequences of early environment on behaviour

EXPERIENCE IN THE EGG INFLUENCES PRECOCIAL BIRDS LATER ABILITY TO COPE WITH THEIR ENVIRONMENT

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In birds, the qualities of eggs as well as the sensory stimulation surrounding the embryos can influence the ontogeny of behaviour. In quail, we found that the quality of the human-animal relationship and the housing conditions of mothers influenced the quantity of yolk androgens available for embryos. In turn, emotional reactivity, social motivation and courtship behaviour of offspring were affected. Divergent selection based on emotional or social traits also lead to divergent levels of yolk hormones. These traits thus appear to be determined, at least in part, by the prehatch endocrine environment, itself resulting from the experience and genotype of mothers. Prehatch exposure to testosterone facilitated auditory learning of a maternal call, indicating that the endocrine environment can also modify prenatal perceptual development. Finally, we found that that the prenatal experience of domestic chicken embryos with olfactory stimuli guides their later feeding behaviour. Taken together, these findings indicate that the experience of embryos in the egg guides their later post-hatching ability to cope with their environment.

Frédéric Bertucci Communication I

ROLE OF THE TEMPORAL PATTERN OF MALES' AGGRESSIVE SOUNDS IN A CICHLID FISH.

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Many fish are known to produce sounds in different contexts such as courtship interactions or aggressive encounters. In the Lake Malawi cichlid fish Metriaclima zebra, sounds consist of bursts of pulses which might convey information about individuals' status or motivation. We intended to test the biological function of sounds produced during agonistic interactions in male M. zebra using underwater playback experiments in which the temporal pattern of sounds were modified as to obtain slower or faster sounds (modification of the inter-pulse interval), and shorter or longer sounds (modification of the number of pulses). First results show that the subjects respond behaviourally to aggressive playback by modifying their behavioural sequences with an increase of their territorial maintenance activity. The differential behavioural response to the modified sounds playback may allow us to emphasize the importance of temporal acoustic cues in sounds produced during aggressive interactions in M. zebra.

Anne Laurence Bibost Lateralised Behaviour

DEVELOPMENT AND EVOLUTION OF CEREBRAL LATERALIZATION USING FISHES AS MODEL ORGANISMS

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Cerebral lateralization refers to the functional partitioning of cognitive processing between the two hemispheres of the brain. Early studies suggested that cerebral lateralization is expressed in some animals such as fishes by the preference of left or right eye viewing of certain objects. It has been suggested that lateralized animals are better at processing two tasks simultaneously, such as anti-predator and foraging behaviour. However, it is not known whether cerebral lateralization influences fitness variables in fishes. Interestingly, the level of laterality varies between species, populations and even individuals, which suggests that the costs and benefits of expressing the trait may be context specific. We used the rainbowfish (Melanotaenia spp.) as a model organism to examine the potential benefits of lateralization. First, we identified that the complexity of the rearing environment can influence the strength of cerebral lateralization but the effect varies between sexes. Males from impoverished habitats were more strongly lateralized than males from enriched habitats and the reverse was true for females. Secondly, we examined the relationship between laterality and classical conditioning using captive-reared and wild populations. We found that the strength of laterality can influence learning speed depending on species. Finally, we determined the relationship between laterality, conspecific recognition and position of fish within a school. Our data demonstrate that individuals with a preference to orientate to the left side of the school also used the right eye for recognition of conspecifics.

Rosaria Binazzi Audience effect

AUDIENCE EFFECT ON ALARM CALLS IN THE RED-LEGGED PARTRIDGE

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The presence of conspecifics can affect the anti-predator response and the signaller's behaviour in particular. This study investigated anti-predator response in monogamous Red-legged partridge (Alectoris rufa) males in relation to their audience. Alarm calls and non vocal behaviour variations were analyzed, in order to assess whether they were affected by the presence of an audience, and, more particularly, by the audience's composition: unfamiliar males, unfamiliar females, signaller's mate. Frequency and sonographic characteristics of the alarm calls, as well as behavioural responses to a dummy avian raptor were analyzed in a sample of 18 males. Our findings point out that the presence of conspecifics is able to alter the number and structure of male anti-predator vocalizations. In contrast, the number of alarm calls drastically decreases when no audience is present: when the male is alone, it might even not vocalize. The audience composition is also important, the presence of the mate eliciting significantly more calls than that of an unfamiliar male. The structure of vocalizations is affected by the audience in terms of duration and frequency. As far as non vocal behaviours are concerned, no significant audience-related difference was found. This study shows that the alarm calls of monogamous Red-legged males are influenced by the audience, and, in particular, by the presence of the signaler's mate.

Jonathan Blount Effects of immunity and oxidative stress on behavioural ecology

CONCEPTUAL LINKS BETWEEN IMMUNE FUNCTION AND OXIDATIVE STRESS RESEARCH IN BEHAVIOURAL ECOLOGY: EXAMPLES FORM VERTEBRATE FIELD STUDIES

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Life history theory provides the conceptual framework for our understanding of the ecology of both immune and antioxidant defences. It is clear that both traits can be subject to resource allocation trade-offs, and are themselves mechanistically linked. Indeed, it has recently been suggested that oxidative stress is a potentially unifying mechanism that underpins life-history trade-offs. Most studies to date have focussed on measurements of variation in endogenous resources that contribute to antioxidant defence, but it is becoming increasingly clear that ultimate biomarkers (e.g. oxidative damage) in addition to upstream processes are required to build a complete picture of the ecological significance of oxidative stress. I review evidence from studies of various taxa (sheep, birds, turtles), where we have found associations between environmental and ecological factors, and variation in antioxidant defences and oxidative stress. However, whether variation in susceptibility to oxidative stress has fitness consequences has been relatively little studied by ecologists, and some studies have found no such associations. I argue that oxidative stress seems unlikely to be a unifying mechanism that underpins life-history trade-offs across all taxa. Ecological factors that vary amongst species, e.g. variation in extrinsic mortality risk, may ultimately determine the importance of oxidative stress in shaping life history evolution.

Nikolai Bode Space

HOW PERCEIVED THREAT INCREASES SYNCHRONIZATION IN COLLECTIVELY MOVING ANIMAL GROUPS

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Nature is rich with many different examples of the cohesive motion of animals. Previous attempts to model collective motion have primarily focused on group behaviours of identical individuals In contrast we put our emphasis on modelling the contributions of different individual-level characteristics within such groups by using stochastic asynchronous updating of individual positions and orientations. Our model predicts that higher updating frequency, which we relate to perceived threat, leads to more synchronised group movement with speed and nearest neighbour distributions becoming more uniform. Experiments with three-spined sticklebacks (Gasterosteus aculeatus), that were exposed to different threat levels, provide strong empirical support for our predictions. Our results suggest that the behaviour of fish (at different states of agitation) can be explained by a single parameter in our model – the updating frequency. We postulate a mechanism for collective behavioural changes in different environment-induced contexts and explain our findings with reference to confusion and oddity effects.

Markus Boeckle Sociality I

ONCE A FRIEND ALWAYS A FRIEND? COMMON RAVENS RECOGNIZE AFFILIATIVE PARTNERS OVER A LONG TIME PERIOD

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It is known that humans are able to visually recognize, remember and think about hundreds of different faces and sheep may also remember and differentiate conspecific faces for over two years. Ravens deal with a complex social environment and may profit from differentiating and remembering different individuals over long time spans. As ravens may hear other individuals without seeing them, auditory stimuli may play a critical role in individual recognition. Here, we investigate whether ravens are able to acoustically differentiate calls of individuals they haven't encountered for up to three years. We conducted a playback-study presenting five captive raven pairs each with calls from one raven, with whom they previously shared an affiliative relationship, one raven with whom they shared an agonistic relationship and calls from an unknown raven. As a control three raven pairs were presented with calls from the same individuals but were unfamiliar with all the birds. Each pair was presented with one counterbalanced playback session in the morning and one in the afternoon. All sessions consisted of only same-sex stimuli. Results suggest that ravens are able to differentiate between the different stimulus types.

Roberto Bonanni Cooperation across species: cognitive processes, tolerance and efficiency

AFFILIATIVE RELATIONSHIPS PROMOTE COOPERATION IN FREE-RANGING DOGS

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Recent studies suggest that cooperation and altruism are promoted, and proximately motivated, by positive social relationships with partners. These are expressed through mutual tolerance, close proximity and affiliative behavioural patterns. In this study we investigated the influence of social relationships on cooperation in conflicts against conspecifics in a population of free-ranging dogs (Canis lupus familiaris), living in a suburban environment. The research focused on three packs (ranging in size between 3 and 27 individuals) during the period April 2005-September 2008. We recorded ad libitum both intergroup conflicts (n = 198) and instances of coalitionary support (n = 54) in conflicts among members of the same pack. We found that the individual frequency of active participation in intergroup conflicts increased with an increasing number of affiliative partners within the pack ($F_{1,19} = 9.27$, $P < 0.007$). Variables such as age and dominance rank explained a smaller portion of the total individual variation in active participation. The analysis of dyadic association indexes, measured during resting times, showed that dogs developed closer associations with their coalition partners than they did with the targets of intragroup coalitionary attacks ($z = 3.54$, $P < 0.0004$). Moreover, on average, coalition partners were lower in dominance rank than targets ($z = 2.21$, $P < 0.03$). These results suggest that, in free-ranging dogs, support given in conflicts is conditional on positive social relationships with partners, a pattern consistent with emotionally mediated cooperation.

Marie Bourjade Trends in cognitive primatology

CAN THE UNSUSPECTED ANTICIPATORY ABILITIES OF CEBUS APELLA AND MACACA TONKEANA BE FUTURE PLANNING?

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Future planning is central in humans' life but animals are paradoxically considered as "stuck in time"; because they may not be able to travel mentally in time and anticipate future needs dissociated from current ones. Alternatively, it is still unclear whether animal limits lie in the cognitive mechanisms per se or rather in the extent and flexibility to which they plan for the future. We tested monkeys' planning abilities in a cooperative context to delineate experimentally their capacity to plan for future reciprocal interactions. We involved six subjects in planning tasks based on a token-exchange procedure designed to mimic intra-specific reciprocal interactions. Three types of tokens were used to control for the potential of biased attraction towards one object over another. Cueing by the experimenter was controlled for to avoid any prompting effect on token-related behaviours. Subjects who successfully planned for the exchange task were expected to collect the suitable tokens during a collection period (5/10min), save them during a fixed delay and transport them into an adjacent compartment to exchange them against food rewards with a human experimenter. Initially, the delay was set at 40min. Because subjects did not succeed in this task, further testing was conducted with a 25-min delay. Two subjects were able to save and transport tokens suitably and succeeded several times. These results indicate that monkeys are able to act in the present to secure future benefits, bridging temporal gaps of several minutes between key actions. Their performances resembled future planning.

David Bradley Communication II

DUAL-DIALECT SONG PLAYBACK, AND ITS EFFECT ON POST-RELEASE DISPERSAL FOLLOWING TRANSLOCATION OF ENDANGERED NORTH ISLAND KOKAKO (CALLAEAS CINEREA WILSONI)

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Vocal variation between geographically or behaviourally isolated populations ("dialects") may function as an isolating mechanism upon secondary contact, eventually leading to speciation. Studies in wide range of territorial birds have shown stronger responses to playback of local dialects than foreign dialects, although this has not been widely tested in duetting birds or in non-territorial contexts. Using radio telemetry, we examined post-release dispersal patterns following the translocation of endangered North Island Kokako (Callaeas cinerea wilsoni), a duetting songbird endemic to New Zealand, from two adjoining dialect groups. At the release location we broadcast duet song from six speakers simulating two dialect 'neighbourhoods' for a period of seven days after four separate releases involving 19 birds. Our results show that although dispersal distances significantly increased over time, birds remained closer to the release location than predicted by a random walk model. Although the birds remained nearest to a speaker broadcasting their own song dialect significantly more often than speakers broadcasting the unfamiliar foreign dialect, suggesting an attraction effect, no pattern was found in actual distance to each of the speaker types. These findings suggest support for the `recognition' hypothesis for differential responses to local and foreign dialects in kokako. This study reveals clues as to the possible function of song dialects in kokako, as well as the efficacy of acoustic techniques in preventing excess dispersal following translocation of endangered species.

Igor Branchi Long-term consequences of early environment on behaviour

MOUSE COMMUNAL NESTING: MOTHER AND PEER INTERACTIONS INDEPENDENTLY SHAPE ADULT BRAIN FUNCTION AND SOCIAL BEHAVIOR

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The early social environment produces persistent changes in behavior and brain function. In order to investigate the relative contribution of the different features of the nest environment we exploited the Communal Nest (CN) paradigm. CN, which consists of a single nest where three mothers keep their pups together and share care-giving behavior from birth to weaning, characterizes the natural ecological niche of the mouse species. In the CN, both mother-offspring and peer-to-peer interactions are markedly increased. At adulthood, CN mice show higher propensity to interact socially with conspecifics and more elaborate social competencies compared to mice reared in standard laboratory conditions (SN). In particular, CN mice play the role of either the dominant or the subordinate starting from the first agonistic encounter, while SN mice need five social encounters to fully show a social role. With regard to the coping response to social challenges, CN mice show reduced anhedonia following social stress and display a lower activation of the hypothalamic-pituitary-adrenal axis after acute or prolonged exposure to agonistic encounters. Both components of the early social environment i.e. mother-offspring and peer-to-peer interactions, affect adult social behavior, exerting relevant and independent effects on the developmental trajectories. For instance, only individuals that have been exposed to both components are able to face more effectively and more promptly a social challenge. Overall, the present findings confirm the crucial role played by the early social experiences and further illustrate the complexity of the developmental trajectories shaping the individual.

Jakob Bro-Jørgensen Communication I

MALE TOPI ANTELOPES ALARM SNORT DECEPTIVELY TO RETAIN FEMALES FOR MATING
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Despite intense interest in the role of deception in animal communication, empirical evidence is wanting that non-human animals are capable of actively falsifying signals to manipulate mates for reproductive benefits. Thus tactical use of falsely positive signals has so far been documented mainly where interests are consistently opposed, such as between predator and prey and between competitors for food and for mates. Here we report that male topi antelopes alarm snort deceptively to retain receptive females on their territories and thereby secure mating opportunities. The finding reveals that sexual conflict over mating, which is known to promote various forms of coercion and sensory bias exploitation, can also lead to active signal falsification. However, because honesty in sexual signals is generally assured by physical or cost-enforced constraints on signal production, sexually selected mate deception is likely to mainly target signals, such as alarm calls, which were originally not under sexual selection."

Henrik Brumm Consequences of an Urbanizing World

URBAN BIRD SONGS: VOCAL ADAPTATIONS AND UNSOLVED QUESTIONS
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One aspect of the urban environment we all complain about is the increase in noise. But the din of modern cities is not only an annoyance to us humans (not to mention being damaging to our health), it also affects the life of wild animals that find themselves in an increasingly urban world. High levels of ambient noise are particularly problematic for animals that use sound to communicate, as it masks their signals and thus impairs the exchange of vital information. This is the case, for instance, in many birds, where males use their songs to attract mates and to defend their territories against rivals. This close relationship between bird song and sexual selection means that variation in signalling efficiency is likely to have major fitness consequences for the singing male. Recent research has shown, however, that birds are equipped with means to deal with some interference from environmental noise, for example by increasing their vocal amplitude. On the other hand, not all characteristics of urban bird songs are necessarily an adaptation to reduce acoustic masking but could also be epiphenomena of sound production mechanisms or the urban ecology of birds. Overall, I advocate that future research on urban behaviour and ecology needs to go beyond correlational data, as we need experimental studies to recognize the causal role of human activities in altering ecological and evolutionary processes.

Claudia Bruschini Sociality II

CUTICULAR HYDROCARBONS OR PEPTIDES: WHICH ONE IS RESPONSIBILE FOR NESTMATE RECOGNITION IN THE PAPER WASP POLISTES DOMINULUS?

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A colony of social insects is like a fortress. Access is allowed only by members of the colony. The mixture of hydrocarbons of the cuticle, whose primary function is to prevent dehydration, was widely reported to be involved in nestmate recognition in all social insects. Recent studies have shown the occurrence of a peptidic fraction on the cuticle of the paper wasp of the genus Polistes that may be involved in the communication system. Present work is aimed at separating the two cuticular fractions, peptides/polar versus hydrocarbons/apolar, to verify whether only the latter component is responsible for nestmate recognition as reported in the literature. Several colonies of Polistes dominulus were collected in the field and brought to the laboratory. Conspecific wasps, not belonging to the same colonies, were also collected to be used as non-nestmates in discriminatory tests. These spare individuals were killed by freezing and washed through several steps in a mixture of polar and apolar solvents in order to obtain two distinct cuticular fractions: hydrocarbons and peptides. These fractions were checked for purity through Gas Chromatography coupled with Mass Spectrometry and MALDI-TOF mass spectrometry, respectively. Binary choice tests were performed on each colony by presenting the two isolated fractions, previously extracted from a non-nestmate conspecific in order to evaluate the behavioural response. Our results confirmed that it is the hydrocarbon fraction, and not the peptidic one, the chemical mediator prompting nestmate recognition in paper wasps.

Redouan Bshary Endocrinology of cooperative behaviour

AN INTRODUCTION TO THE EVOLUTIONARY APPROACH TO ALTRUISM AND COOPERATION: THE BASIC CONCEPTS

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Nature is full of struggle, as predicted by the theory of evolution through natural selection, yet there are also paramount examples where individuals help each other. Many instances of helping have at first been difficult to reconcile with Darwin's theory because it is not always obvious how such behaviours increase the fitness of actors. Consequently, initial publications that offered solutions to subsets of the observed cases of helping, such as kin selection are among the most influential and most cited papers in evolution / behavioural ecology. While there is plenty of confusion in the literature, often because of terminology, the basic concepts are relatively simple. At the very least, they are simple compared to the variety of mechanisms that may cause helping behaviour. As an introduction to the workshop on the endocrinology of helping behaviour, I will briefly review the major classes of evolutionary concepts.

Redouan Bshary Audience effect

COOPERATION IN COMMUNICATION NETWORKS

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Communication theory has greatly benefited from the integration of the fact that interactions are often observed by third parties who may extract valuable information about the interaction partners. Such eavesdropping by bystanders may affect the behaviour of interaction partners, causing so-called 'audience effects'. This is because optimal behaviour changes due to the effects of current behaviour on the future interactions with bystanders. Here, I will present basic concepts and empirical evidence concerning the importance of communication networks for the evolution of cooperation. Examples include humans and marine cleaning mutualism involving the cleaner wrasse Labroides dimidiatus and its client reef fish. Cleaners remove ectoparasites but prefer the clients' mucus layer, which creates a conflict of interest. As cleaners have about 2000 interactions per day, many interactions are observed by potential clients. Experiments demonstrate that bystanders pay attention to a cleaner's current service quality and that cleaners fine-tune current service quality not only to being observed but also to the identity of bystanders.

Andrea Bshary Cooperation

CONTRIBUTIONS TO A PUBLIC GOOD ARE MAINTAINED BECAUSE THE COMMON ENEMY SELECTS AGAINST FREE-RIDING

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Cooperation in groups is difficult to explain as individual contributions are shared among group members, a condition that is often vulnerable to free-riding. A key challenge for evolutionary biologists is to determine conditions under which individuals benefit from a contribution to public goods. One possibility is that individuals gain social prestige from their contributions. Here, I present empirical evidence for an alternative solution where public goods are created as a by-product of self-serving punishment. Sabre-tooth blennies attack other reef fish species to take a bite of mucus, scales or tissue. Victims of these attacks often react with chasing the parasite. In a laboratory study I could show that chasing the blenny functions as punishment as it decreases the probability of future attacks. Many victim species live in shoals, raising the question whether conspecifics may as well benefit from the punishment of a group member. Indeed, field observations suggest that punishment increases the probability that the parasite switches to another species for the next attack. As a consequence, chasing the parasite not only benefits the chasing individual but creates a pubic good. A second laboratory experiment indicates that it is the parasitic blenny that selects against free-riding in the system. Blennies were presented with choices between various plates that varied in their probability of chasing in response to blennies feeding. Under these conditions, the blennies developed a preference to attack non-punishing plates even if these had an always chasing look-alike. Free-riders appear to risk to be identified as easy targets for future attacks. Conclusion: 1. Punishment of blennies is entirely self-serving and 2. Creation of a public good is a consequence of blenny foraging decisions.

Katherine Buchanan Sexual selection

ARE FEMALE MATE CHOICE PREFERENCES AFFECTED BY DEVELOPMENTAL STRESS?
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Developmental stress has been shown to have detrimental effects on the expression of various secondary sexual traits in male birds. These effects include reductions in song output and song complexity, with the latter thought to be associated with neural changes in the song control system. Female birds use the same brain nuclei for assessing song as are used for song production in males. Despite this, the effects of developmental stress on female preferences remain largely unaddressed. We tested whether developmental stress affects the visual and acoustic mate choice preferences. Female zebra finches were raised under control conditions or nutritional stress. In adulthood, female mate choice preferences were assessed for i) visual preferences using an Amsterdam apparatus and ii) acoustic song preferences using song playback. The influence of nutritional stress on mate choice preferences was tested. In the visual choice experiment stressed females showed no agreement in preference ranking of males, either with each other or with controls. Interestingly, stressed females were found to be significantly less active than controls. In the acoustic choice experiment, overall females preferred song from unstressed males, but stressed and control females did not differ in their degree of preference. Our findings suggest that developmental stress may have long term fundamental effects on adult behaviour. However, we did not find a clear change in in mate choice preferences or discrimination, as a result of our experimental stress treatment.

Judith Burkart Trends in cognitive primatology

HOW AND WHAT TO LEARN FROM INDIVIDUAL DIFFERENCES IN SOCIAL LEARNING
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While much progress has been made in identifying various social-learning mechanisms across nonhuman primate species, less information is available about intraspecific variation in their deployment. Examining individual variation can provide valuable insight into a broad range of topics, such as the dynamics of social transmission, cultural evolution and intelligence, or task specialization within social groups. Under naturalistic social-learning situations, however, where a conspecific demonstrates a solution to a naïve observer, investigators face the problem that it is almost impossible to achieve uniformity of the demonstration, thus making it near-impossible to compare individual propensities for social learning. One solution to this problem consists in using videotaped demonstrators. Based on experiments with common marmosets, we will first address some factors that revealed to be relevant for successfully using videotaped instead of live demonstrators. We will then report results from such video experiments which suggest that a deeper understanding of the action goal is required to support not only imitative learning mechanisms, but also low-level mechanisms such as social facilitation (sensu Zajonc). This suggests a much greater role of observation in non-imitative social learning than hitherto realized, at least in common marmosets. We discuss the implications of this finding for the classification of social learning mechanisms, in particular emulation learning and the use of ghost control studies.

Simona Cafazzo Sexual selection

MATE CHOICE IN FREE-RANGING DOMESTIC DOGS (CANIS LUPUS FAMILIARIS)

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Although mate choice has received considerable theoretical and empirical attention in recent decades, there are few studies on sexual behaviour and mating system in domestic dogs (Canis lupus familiaris). Moreover, no studies have attempted to examine systematically the sexual preferences of males and females in relation to the social dynamics of the group. The aim of our study was to detect whether mate selection occurs and what factors might influence such a choice. We analysed mating behaviour in two packs of free-ranging dogs (ranging in size from 9 to 27 individuals) living in a suburban environment between April 2005 and September 2008. All animals were free in their movements and breeding activity. During the study 13 oestrous period were observed in detail. Data were collected by 'focal animal and subgroup sampling' (512.42 hours) and ad libitum methods. We found that male mating success was positively correlated with dominance rank; adult females accepted to copulate with high-ranking males and refused more frequently low ranking males ($P<0.04$); young females accepted to copulate with males with whom they had developed affiliative relationships, with the exception of their littermates that were always refused ($P<0.04$). Adult high-ranking females were courted by a higher number of males than young low-ranking females ($P<0.05$). These results are consistent with the existence of sexual preferences in domestic dogs. Both males and females seem to prefer high-ranking partners, although this preference is less pronounced in young females. It is suggested that this strategy may be functional in order to avoid inbreeding.

Roy Caldwell Cognitive abilities of invertebrates

STOMATOPOD CRUSTACEANS: WHAT IS THE CONNECTION BETWEEN RAPTORIAL APPENDAGE TYPE AND THE EVOLUTION OF SENSORY SYSTEMS AND COGNITIVE ABILITY?

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Stomatopods are an old group of marine predators that split from other crustacean lineages around 400 million years ago. About 75 million years later they evolved a key innovation, a modified pair of raptorial appendages (second thoracopods) used to reach out and seize prey. The size, morphology, speed and power of these appendages have been subject to repeated evolutionary experiments in design that fall into two general categories – spearers and smashers. In spearers, the terminal segment of the raptorial appendage is armed with three or more barbs used to impale and hold soft bodied prey. Most spearers are sit and wait predators. In smashers, the terminal segment is modified into a blunt hammer used to bludgeon and break apart armored prey such as crabs and snails. They are more likely to hunt for and pursue prey. For their size, smashers possess some of the most potent mechanical weapons found in any animal. Stomatopod raptorial appendages are used not only in prey capture and processing, but also as offensive and defense weapons employed both intra- and interspecifically when competing for food, space and mates. With the evolution of such lethal weapons comes the need to assess how and when to use them. This is reflected in the evolution of complex visual and chemosensory systems, but what about cognitive ability? This paper will explore whether behavioral plasticity and complexity is related to raptorial appendage type?

Daniela Campobello Cooperation across species: cognitive processes, tolerance and efficiency

THE CHOICE OF NEIGHBOUR: COOPERATION OR CONFLICT BETWEEN NESTING LESSER KESTRELS (FALCO NAUMANNI) AND JACKDAWS (CORVUS MONEDULA)?

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Group living enhances foraging success and provides a plethora of antipredator benefits that become more pronounced with increasing group size. Such benefits, however, can be offset by increasing costs of competition for food, mates and/or nest sites in large, monospecific groups. Where groups are comprised of multiple species with limited niche overlap, the benefits of a large group can be realized with lower commensurate costs associated with competition. Where multiple avian species nest in the same site, positive, negative and neutral effects have been recorded on their reproductive success. Whether these reproductive costs and benefits depend on the simple presence of the other nesting species or result from a modified time budget of one or both species remains uninvestigated. We studied the time budget of Lesser Kestrels (Falco naumanni) and Jackdaws (Corvus monedula) nesting both in mono- and poly-specific colonies inside rural buildings in the Gela Plain (Sicily, Italy). When nesting with Lesser Kestrels, Jackdaws adjusted their nest and colony attendance to conform with that displayed by Lesser Kestrels. The opposite did not hold, with Lesser Kestrels nesting in mixed colonies attending their nests and colonies in an indistinguishable manner from conspecifics nesting without Jackdaws. That said, the presence of Jackdaws did affect the time budget of the Lesser Kestrels where these nested in small colonies composed of less than 10 breeding pairs. Changes in the time budget of colony attendance recorded between single and mixed colonies suggest elements of both cooperation and conflict in nesting associations between Lesser Kestrels and Jackdaws, which have both theoretical and conservation implications.

Cristina Castracani Behavioural ecology of keystone species

THE USE OF ANT FUNCTIONAL GROUPS TO MONITOR HUMAN IMPACT ON EUROPEAN TERRESTRIAL ECOSYSTEMS: WHAT CAN ITALIAN ANT FAUNA TELL US ABOUT IT?

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Among the taxa proposed so far as bioindicators for the state of terrestrial ecosystems, ants may have a central role. Several features make this group an ideal tool: for exemple, their worldwide distribution and abundance, ease of collection, key role in ecosystem and a generally well-known ecology and taxonomy. A promising framework for monitoring and understanding changes in ant assemblages is represented by the Functional Group approach (FG), where taxa can be classified on the basis of ecological/behavioural rather than purely taxonomic criteria. This approach may permit the identification of general patterns in community structure that are independent of the identity of the observed species and transcend biogeographical boundaries. Functional groups have been successfully used to monitor disturbance gradients in several different contexts (eg. mining activity, forest management, revegetation) throughout the World. Surprisingly, little has been done to test the reliability of the functional group approach in Europe. This study reports the results of an integrated study for the application of FG to different ecosystems in Italy, which include a preserved area, different types of agro-ecosystems and urban parks. The results showed how functional group composition changed in response to type and strength of human impact. They also suggested possible improvement to FG definition and highlighted missing information.

Cinzia Chiandetti The representation of space, time and number in animals

HOW DOMESTIC CHICKS DO GEOMETRY IN ENCLOSED SPACES

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Non-human animals can make use of the geometric shape of an environment for spatial reorientation and in some circumstances reliance on purely geometric information (metric properties of surfaces and left-right directional sense) can overcome use of local featural information. What sort of features are considered for reorientation, when and whether encoding of geometric information for navigational purposes crucially depends on environmental experience or is innately predisposed in the brain was systematically investigated in the domestic chick. Our results show that chicks can reorient relying immediately to the environmental features even when displacement with respect to the outer layout is not expected; chicks do prefer metric in small environments and salient visual features in large spaces; chicks are able to use available geometry for successful reorientation even when not exposed to metric characteristics after birth and before the task, suggesting that the ability of doing geometry using metric-related basic tools is somehow endowed in the brain, shared across species and possibly maintained throughout during evolution.

Alessandro Cini Recognition systems and social organization

FIGHT OR FOOL? HOW A CUCKOO WASP CONQUER ITS HOST COLONY

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Social insect colonies are highly defended fortresses and their vast array of defense mechanisms has imposed strong selection on species which need to exploit them. Obligate social insect parasites, for example, have engaged with their social insect hosts an evolutionary arm race which resulted in the development of a series of physiological and behavioural adaptations. This study examines the factors that can potentially influence and that actually affect the host colony usurpation process in the host-social parasite system Polistes dominulus-Polistes sulcifer. We try to understand how the parasite can succeed in the host colony takeover, especially focusing on the ways in which the host comunication system can be exploited and fooled by the parasites. Host aggression toward intruders, for example, depends on chemical cues and parasites would benefit from approaching host colonies bearing reduced quantity of these cues. Our chemical analysis however revealed that usurping parasites do not show reduced chemicals amounts. Host aggressive behaviour is also affected by the opponents visual facial patterns. P. sulcifer has a peculiar facial pattern and our behavioural experiments gave evidence that it reduces host aggressive reaction. We performed laboratory usurpation trials to assess the importance of this visual trait together with other parameters (e.g. body size) in determining parasites success. We show that facial pattern does not influence contest outcome, which is indeed strongly affected by relative body size of the opponents. We conclude that the violent usurpation strategy adopted by P. Sulcifer could explain why chemical or visual tricks do not play a role in the host colony takeover despite their potential usefulness.

Mike Clease Sociality III

GROUP NAVIGATION LEADS TO INCREASED PATH EFFICIENCY IN THE WOOD ANT FORMICA RUFA

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In social insects the mechanisms by which individuals are able to accurately navigate through their environment are relatively well understood. However, many species do not forage alone and individuals therefore have the opportunity to obtain information about the presence and location of food sources from their conspecifics. This is exemplified by the recruitment and orienting properties of the pheromone trails employed by many ant species. Here we present data demonstrating how visual navigation in the wood ant, F. rufa, is affected by the presence of other navigating nestmates. Ants were trained to search for a sucrose food source at the base of a black cardboard landmark. In tests where ants searched for the learnt food location in a group their routes were shorter and straighter than the routes they showed when foraging individually. This was the case both when ants were trained individually and tested as a group and the converse; ants were trained in groups and tested as individuals. Interestingly the increase in performance due to being in a group appeared to decline as an individual's level of experience increased.

Lisa Collins Sociality III

FICKLE FEATHERED FRIENDS: DO HENS FORM LASTING DYADIC BONDS?

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Recent emphasis in positive welfare has generated interest in the capacity of farmed species to form socio-positive bonds. The social behaviour of 8 groups of 15 Hyline Brown hens was recorded over 8 weeks. We used a combination of social network analysis and mathematical modelling to investigate the occurrence of dyadic relationships, characterised by consistent, context-independent associations. Social network analysis was performed on adjacency matrices for both existence and number of individual proximities within discrete pen areas, generated from four 5 minute scan-samples conducted immediately twice daily each week. No evidence was found for general stability in association networks over time, suggesting that hens did not preferentially locate with others. Of the 120 hens in the study, only 3 pairs formed a stable dyadic bond. However, significant correlations were seen in binary data across adjacent pairs of weeks for some pens, suggesting that dyadic associations may be short lasting, with hens changing 'friends' regularly. Although few hens made lasting 'friends', they also did not make 'enemies': there was only one pair that actively avoided each other throughout the study. Final roosting positions at dusk were recorded 3 nights per week for 8 weeks. Paired roostings occurred less than expected, when observed data was compared with a hypergeometric placement model. Although this may suggest that birds actually try to avoid each other, results of the SNA suggest otherwise and it is likely that this result reflects that not all birds were on the perches at every dusk period when recordings were made. In conclusion, no evidence was found for consistent dyadic associations or avoidances in pairs of hens.

Hélène Corbel Consequences of an Urbanizing World

STRESS RESPONSE ACROSS A RURAL-URBAN GRADIENT IS LINKED TO MELANIN-BASED COLORATION IN FERAL PIGEONS COLUMBA LIVIA

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In response to stressors, birds release corticosterone (Cort) which is highly adaptive on the short-term level. By contrast, prolonged high Cort levels due to frequent exposure to stressors, as is the case in cities, may have deleterious effects notably immunosuppression. We tested whether Cort stress response i. was modulated across a rural-urban gradient, and ii. was related to immunocompetence. Because melanocortin system regulates melanogenesis as well as stress responses, we also investigated whether melanin-based coloration interfere with Cort stress response and urbanization. Adult feral pigeons were caught from three locations along a rural-urban gradient. Birds were submitted to a 30-min capture-handling stress and Cort levels were measured. Then, pigeons were immunized with a non-pathogenic antigen (Keyhole Lympet Hemocyanin, KLH) and anti-KLH antibodies (Ab) levels were measured to assess immunocompetence. Stress-induced Cort levels tended (dark and light pigeons considered) and were (dark pigeons considered) lower in urban pigeons relative to rural ones. Ab levels were two-fold higher in rural pigeons relative to urban ones. Urban pigeons being considered, Ab levels were negatively related to stress-induced Cort levels. Results suggest that in pigeons that live under frequently stressful situations, high Cort stress response entails a cost in terms of immunocompetence. In turn, the down-regulation of stress response in urban pigeons, as shown in dark ones, should be highly advantageous. Taken together, our results suggest that some pleiotropic effects of the melanocortin system i. are context dependent and ii. would play a critical role in bird adaptation to urbanization.

Katherine Cronin Sociality I

LEARNING TO PLAY NICE: THE EMERGENCE OF PROSOCIAL BEHAVIOR IN PAIRBONDED TAMARINS

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Previously, cooperatively breeding cottontop tamarins (Saguinus oedipus) coordinated with partners to solve cooperative tasks when rewards were reciprocally distributed. However, tamarins failed to demonstrate prosocial preferences in recent investigations that measured the amount of rewards tamarins allocated to their partners compared to an empty cage. Here we investigated whether reciprocity would facilitate prosocial behavior among pairbonded tamarins by comparing the number of pulls tamarins made to transfer food rewards to partners who had either immediately previously provided or denied them rewards (Reciprocity and No Reciprocity conditions, respectively). Subjects were also tested in a NonSocial Control condition. Overall, tamarins transferred more rewards in the Reciprocity condition, compared to both the No Reciprocity and NonSocial Control conditions. However, analysis of behavioral changes within sessions suggests that reciprocity was not the primary mechanism contributing to the prosocial response. Initially, tamarins exhibited a depression in reward transfers to partners who recently denied them rewards. Late in sessions, the amount of rewards transferred in the Reciprocity and No Reciprocity conditions were near equal and greater than the amount of rewards transferred in the NonSocial Control. Thus, pulling was maintained when it resulted in food transfer to mates and was extinguished when it did not, suggesting that tamarins found it rewarding to provide benefits to mates. These results indicate that prosocial effects will be dependent upon experimental conditions and emphasize the importance of investigating proximate mechanisms that underlie prosocial expression.

Davide Csermely Lateralised Behaviour

FORMS OF LATERALISATION IN COMMON WALL LIZARDS

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Lateralisation, i.e. left/right differences in behaviour associated with CNS asymmetries, is widely distributed in vertebrates and shows striking correspondences in different taxa: the right eye is usually used in response to food targets, whilst left eye use is associated with complex layouts and objects. Lateral eyes species, as fishes and very often sauropsids, are good models for investigating the occurrence of lateralisation, because of minimal binocular view and the frequent minimal connections between the two cerebral hemispheres. We aimed at ascertaining the possible existence of visual lateralisation forms in the Common wall lizard (_Podarcis muralis_), belonging to a family (Lacertidae) neglected from that point of view. We report results obtained in several experiments carried out in different contexts: the predatory context, the anti-predatory context, and the exploratory one. When the lizards faced mealworm larvae as prey they preferred watching them with the right eye. This occurred when the lizards detected the prey at the end of either arm of a T-maze or behind a transparent barrier to detour, as well as when at the centre of a circular arena. Conversely, when the lizards escaped from a refuge after visual and sound stimulation feigning a predator, they chose to use the left eye to monitor the threatening stimulus during the escape run. The escape direction was slightly and very frequently to the right. Escaping to the right direction allowed lizards to turn the head back to the left in order to have a wider visual field with the left eye to monitor the supposed predator. Left eye use preference was ascertained even when the lizards explored a new environment, such as a maze, an open field, and an empty circular arena. We can then confirm that even in Lacertidae different tasks are monitored by different eyes and, therefore, processed by different cerebral hemispheres, maybe for the need of short- or long term memory processing.

Charlotte Curé Communication II

LONG-TERM NEST AND MATE FIDELITY IN THE EUROPEAN EAGLE OWL: AN ASSESSMENT USING INDIVIDUAL VOCAL SIGNATURE

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The Eagle Owl Bubo bubo is a nocturnal bird of prey species breeding in rock cavities along cliffs. Recent concerns focused on individual monitoring of this endangered species. More data on reproductive strategies is needed to follow population dynamics and to develop efficient conservation programs. For vocalizing species like the Eagle Owl, acoustic monitoring can represent an accurate technique for individual identification. Advantages of this method are its simplicity and non-invasiveness which are particularly interesting for a human-sensitive and threatened species. The most characteristic call of these birds is emitted by both sexes. This call is sexually dimorphic and is used for sex-advertising and territoriality. Our team (1) previously showed that wild-recorded calls of both sexes were highly individually distinctive. Moreover, we validated the feasibility of individual acoustic monitoring by comparing calls recorded on the same sites during 2 consecutive years. In the present study our aim was to investigate whether long-term nest and/or mate fidelity occur in such long-lived species. We had the rare opportunity to compare 7 consecutive years of call recordings from males and females of 9 sites localized in the Loire Department (France). We developed an automatic analysis of vocal individual signatures. Advantages of this technique are operator-independent measurements of acoustic features, and high rate of correct classification of individual calls even the heterogeneity of recordings quality. Our results support that the Eagle Owl shows long-term nest and mate fidelity. (1) Grava T. et al. 2008. Individual acoustic monitoring of the European Eagle Owl Bubo bubo. Ibis 150:279-287.

Melanie Dammhahn Trends in cognitive primatology

WHAT MEDIATES PERSONALITY VARIATION IN GREY MOUSE LEMURS (MICROCEBUS MURINUS)?

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Individuals of the same species, sex and age often differ consistently in behaviour. These intrinsic individual differences in behaviour, i.e. personality, are moderately heritable, affect several components of fitness and might constrain or favour individual cognitive performance. Elucidating the potential relationships between personality and cognition, however, necessitates an understanding of the processes responsible for the maintenance of personality variation within populations. The aim of this study was to test the hypothesis that a trade-off resulting from a correlation between risk-taking and other personality traits mediates personality variation in a natural population of small nocturnal primates under high predation risk. This study was performed in Kirindy Forest (Madagascar), where grey mouse lemurs (Microcebus murinus) have been regularly (re-)captured and individually marked since 2002. Using open field and novel object tests performed with captured individuals inside their home-ranges, I quantified variation in activity, exploration and boldness in 53 individuals in 2008 and 63 individuals in 2009, including 23 re-tested individuals. Additionally, I exposed 12 individuals to low- and high-risk situations, while controlling for resource value, at artificial feeding sites and tested for differences and cross-context consistency in individual risk-taking behaviour. These tests revealed (1) consistent individual differences in exploration, boldness and activity and (2) a correlation between risk-taking behaviour and other personality traits. These results indicate that survival costs might mediate personality variation in grey mouse lemurs. Further, the strong positive relationship between boldness and exploration suggests profound individual variation in learning opportunities and, thus, ultimately cognitive performance.

Arianna De Marco Audience effect

POSTCONFLICT AFFILIATIVE INTERACTIONS AMONG BYSTANDERS IN A TOLERANT SPECIES OF MACAQUE (MACACA TONKEANA)

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Aggression is potentially disruptive for social groups. Although individuals witnessing a conflict are not directly damaged by conflicts, the aftermath of aggression appears as a period of social instability. If bystanders contribute to conflict management, they should react by affiliating with other group members. We tested such expectations in two captive groups of Tonkean macaques (Macaca tonkeana). After the end of an agonistic interaction, the behaviours of individuals not involved in the conflict were recorded during 5-min post-conflict periods to be compared with baseline periods. We found that bystanders were more likely to engage in affiliation during post-conflict periods than in baselines. Serious aggression prompted them to affiliate, and rates of displacement activities tended to decrease after occurrence of the first affiliative contact. Nonetheless, signs of anxiety remained limited in bystanders, and their social relationships had little influence on the timing of affiliation. Such results should be related to the high propensity of Tonkean macaques to appease others and stop aggression. Our study demonstrates that post-conflict affiliation occurs between bystanders in a species characterized by tolerant social relationships. It could be a pervasive mean of conflict management among primates.

Patrizia d'Ettorre Cognitive abilities of invertebrates

SOCIAL RECOGNITION, MEMORY AND LEARNING IN ANTS

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The complex cognitive architecture of a mini-brain, such as that of an insect, has been intensively studied in the honey bee, which has become a model organism for invertebrate cognition during the last couple of decades. Ants are all highly social (eusocial) and show a variety of life histories and behavioural adaptations, however they have been neglected in cognitive studies despite their advanced cognitive abilities. Ants, for instance, are capable of individual recognition based on long-term memory of individual identity and they show multiple levels of recognition, from individual to caste, social status and colony. We have recently developed a conditioning procedure that allows testing learning and generalization of chemical cues involved in ant recognition, namely cuticular hydrocarbons. Results show that ants can learn different classes of hydrocarbons and suggest that chain length and functional group might be coded independently by the ant olfactory system. We have also tested whether the significance of recognition cues varies according to the context in which they are perceived. Ants that learned to associate the chemical profile of a foreign colony to food were still very aggressive towards ants from this colony in dyadic encounters. Ants show perceptual interaction between different modalities (e.g. olfactory and visual) and can treat complex chemical cues differently, according to the context. This ensures that learning stimuli in an appetitive context does not interfere with the critical task of colony defence.

Melanie Dietz Endocrinology of cooperative behaviour

OXYTOCIN TRIGGERS RECIPROCITY IN NORWAY RATS

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The neuropeptide oxytocin increases „trustfulness" in humans. In this study we asked whether oxytocin might regulate the propensity to show reciprocal cooperation in mammals, using wild type Norway rats, Rattus norvegicus, as an experimental model. Previous studies revealed that female rats help others in response to experienced help in both direct and generalized reciprocity paradigms employing a two-player sequential food-exchange task. In our experiment focal animals received either an intranasal treatment with oxytocin or a placebo, and a positive or negative social experience with a conspecific, in a full factorial experimental design. Rats that experienced help (delivered food supply) from a partner were subsequently more likely to cooperate with either the same individual or a stranger. Application of oxytocin increased this experience-mediated helping propensity by showing a significant interaction effect with the experimental treatment: the propensity to cooperate after received help increased in both the amount of help given and the reduction of the time interval before the first and between subsequent helping acts. Remarkably, after a negative social experience the application of oxytocin decreased the propensity to cooperate. Similar risk-averse strategies have been found also in recent studies with humans playing economic games. Hence our results suggest that oxytocin might be part of a general physiological mechanism of reciprocal cooperation and altruism in mammals.

Davide M Dominioni Time & foraging

CHRONOBIOLOGY OF URBAN LIFE: ACTIVITY PATTERNS OF EUROPEAN BLACKBIRDS (TURDUS MERULA) ALONG AN URBAN/RURAL GRADIENT

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Across much of the world, urban areas are growing faster than any other land cover type. Animals which have successfully settled in these man-made ecosystems have to cope with novel environmental conditions compared to their forest conspecifics. One of the most apparent urban-specific environmental factors is artificial light at night. While there is no doubt that photoperiod i.e. the light fraction of a 24 h day is one of the driving forces regulating life cycles of plants and animals, nothing is known about the effects of this so called 'light pollution' in urban environments on the behaviour, physiology, and brain functions of animals. Previous studies, however, support the idea of a stimulatory effect by artificial night light. Urban birds exposed to higher light irradiance initiated their morning chorus earlier than birds living in rural areas. Even changes in the seasonal organization of annual events such as reproduction in urban populations have been tried to explain by increased night light irradiance. To elucidate the biological significance of artificial night light we quantified daily activity pattern of urban and rural individuals along an urban/rural gradient in Munich, Germany, with the use of an automated telemetry system. Simultaneously we tagged the same individuals with micro light loggers to measure light irradiance to which the individuals are exposed. In our contribution we will report on the effects of light irradiance and noise levels on the daily activity profiles of urban and rural European blackbirds and finally will discuss the ecological and evolutionary consequences.

Frédérique Dubois Models

LEARNING IN A GAME CONTEXT: STRATEGY CHOICE BY SOME KEEPS LEARNING FROM EVOLVING IN OTHERS

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Behavioral decisions in a social context commonly have frequency-dependent outcomes and so require analysis using evolutionary game theory. Learning provides a mechanism for tracking changing conditions and it has frequently been predicted to supplant fixed behavior in shifting environments. Yet few studies have examined the evolution of learning specifically in a game theoretic context. We present a model that examines the evolution of learning in a frequency-dependent context created by a producer-scrounger game where producers search for their own resources and scroungers usurp the discoveries of producers. We ask whether a learning mutant that can optimize its use of producer and scrounger to local conditions can invade a population of non-learning individuals that play producer and scrounger with fixed probabilities. We find that learning provides an initial advantage but never evolves to fixation. Once a stable equilibrium is attained, the population is always made up of a majority of fixed players and a minority of learning individuals. This result is robust to variation in the initial proportion of fixed individuals, the rate of within- and between-generation environmental change and population size. Such learning polymorphisms will manifest themselves in a wide range of contexts providing an important element leading to behavioral syndromes.

François Dumont Cooperation

INDIVIDUAL SPECIALISATION IN COOPERATIVE BREEDING ALPINE MARMOT (MARMOTA MARMOTA)

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In cooperative breeding species, helpers assist in rearing young that are not their own offspring. Helpers may not perform all the helping tasks but may specialize in some particular activities such as offspring provisioning or nest defence. Some individuals' characteristics may increase performance in particular tasks, thus promoting specialisation and division of labour between group members. In this study, we investigated specialisation among two social behaviours (play-fight with youngsters and territorial defence against neighbours) in cooperative breeding Alpine marmot (Marmota marmota). In summer 2008 and 2009, we performed observation scans of social behaviour on 40 marked adults and two-year-old individuals in 17 distinct groups in Gran Paradiso National Park. The number of yearlings in the group was increasing play-fighting between youngsters and adults. Territorial defence increased with the number of neighbours a group have and the number of adults in the group. A K-mean partitioning of individuals in four specialisation classes (play-fight, territory defence, generalist or individualist) allocates a higher number of individual in the individualist class. Specialisation classes were not influenced by the social status (dominant or helper) of the individuals. Group composition in specialisation classes was not dependent on specialisation classes of the dominants . A positive relationship between the number of individualist and the number of adults in the group is consistent with the load-lightening hypothesis; helping behaviour may lighten the workload of breeders. Our results show that individual may specialized in specific social tasks, but this may depend on the age-structure of the group.

Luis Ebensperger Variation in fitness consequences of mammalian sociality

FITNESS CONSEQUENCES OF SOCIALITY ACROSS MAMMALS: A META-ANALYSIS

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A major theme regarding the functional value of sociality (or group living) is the fitness consequences linked to sociality. Studies have revealed a variety of fitness patterns, with some studies supporting that group members attain net fitness benefits, and others not supporting such benefits. This variation could be linked to ecological factors, but also to aspects of the structure and breeding strategy of individuals within social groups. Our talk first highlights conceptual links between sociality, ecological causes, fitness consequences, and traits evolved after the rise of social living. We then discuss the results of a quantitative meta-analysis to examine variation in size of effects linked to reported correlations between fitness and sociality measures. In particular, we examined how variation linked to ecological conditions of studies (i.e., causes of sociality), and breeding strategy (i.e., secondarily evolved social traits) within social groups predict effect size variation. Preliminary, univariate examination of these variables showed that effect size did vary with breeding strategy and habitat, but not with overall climate, sociality or fitness measures examined. Overall then, attributes that are extrinsic (ecological) and intrinsic (breeding strategy, fitness measure) to social groups influence covariation in fitness-sociality measures.

Robert Elwood Cognitive abilities of invertebrates

INFORMATION GATHERING BY CONTESTANTS DURING FIGHTS REVEALS COGNITIVE ABILITIES.

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Animals are thought to gather and use information about themselves, their opponents, and about the value of resources in making decisions during contests. However, some species are better able to gain information and thus make better informed decisions than are other species. The information used gives an insight into the cognitive abilities of animals. I examine two species of crustaceans that show differing degrees of complexity in information use in fights. First, in the amphipod, Gammarus pulex, males fight for ownership of females and are adept in assessing the value of the female in terms of her size (and hence fecundity) and nearness to moult (and hence how long the precopulatory guarding period will be). Males, however, do not appear to be able to assess each other and each simply fights to a threshold of cost. Second, in the hermit crab, Pagurus bernhardus, individuals assess the quality of their own shell and compare that with the quality of their opponent's shell and base fight decisions on the potential gain that may be gained. How they gather information about the opponent's shell appears to differ between fight roles. There appears to be some opponent assessment prior to escalation, and during escalation the defender gathers information about the opponent from the vigour of the attack. However, the attacker monitors only its own physical state during escalation, particularly levels of lactate, and that influences the vigour of attack and persistence. Overall, however, the information used in these contests comes from multiple sources and the complexity suggests a higher cognitive ability than hitherto thought.

Mareike Fellmin The representation of space, time and number in animals

EFFECT OF GEOMETRIC INFORMATION ON ORIENTATION BEHAVIOR IN THE DOMESTIC HOMING PIGEON

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Spatial abilities are important for a wide range of species. The homing pigeon, a domestic pigeon breed, is one model species used to examine spatial ability. We examined the ability of pigeons to encode geometric and featural properties within a rectangular environment. Whether geometric information is represented in an orientation-free manner, and whether these abilities change across the lifespan was examined. Young pigeons (30 day-old fledglings), adult pigeons (3-5 years) and aged pigeons (9 years and older) were trained to find food located at one corner of a rectangular arena that contained distinctive features in each corner. After successful training, the pigeons were tested as to whether they could locate the correct corner in the same arena but with all distinctive features removed. Thus, the pigeons had to use geometric information exclusively. During one testing condition, the birds entered into the arena using the same entrances as for training (Geometry Only test), whereas in second testing condition, the birds entered into the arena using novel entrance points (Geometry Novel Entry test). The birds' search behavior was strongly influenced by entrance point. The age of the individuals did not affect orientation performance.

Christophe Féron Variation in fitness consequences of mammalian sociality

ARE POLYGYNOUS MOUND-BUILDING FEMALE MICE IN A SOCIAL TRAP?

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Monogamy is one of the main characteristics of the mound building mouse, Mus spicilegus, an outdoor species living in agricultural fields of Central and Eastern Europe. Facultative polygyny occurred nevertheless and was observed in the field notably when sex-ratio was highly biased. In response to male shortage, females tended to remain grouped sharing a common male. Laboratory experiments revealed that the cost of polygyny was high for females whereas males did not obtain any substantial gain in reproductive success. Males display an efficient paternal care and as a result represent a critical resource to be monopolized by females. Moreover variability of reproductive success in females appears to be a consequence of the quality of paternal care expressed by their mate, at least under laboratory conditions. From these data one may conclude that polygynous females were making the best of a bad job when males were scarce. But this did not explain why the two strategies, i.e. monogamy and polygyny, were observed in the field at the same time. We hypothesized that some females were less affected and tolerated polygyny better. Variability in social tolerance between females and differences in reaction to forced polygyny may explain this heterogeneity. The consequence of this heterogeneity on female reproductive success was evaluated from laboratory and field data.

Claudia Fichtel Trends in cognitive primatology

DOES LEARNING INFLUENCE THE ACOUSTIC STRUCTURE AND MEANING OF ALARM CALLS IN A MALAGASY PRIMATE (PROPITHECUS SPP.)?

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Much recent research in animal communication has focused on intra- and interpopulation comparisons to investigate whether signals are subject to modification and social transmission. Although gestural signals in nonhuman primate communication seem to be more flexible than vocal signals and subject to cultural transmission, social learning can principally influence the production, usage or comprehension of vocalizations as well. In order to study this flexibility, I compared variation in production and comprehension of alarm calls in two lemur species, Verreaux's (Propithecus verreauxi) and Coquerels sifakas (P. coquereli). Three different wild populations of Verreaux's sifakas clearly differ in the acoustic structure of the 'Tchi-fak' alarm call, indicating that social learning rather than genetic differences explain this variation. I studied Coquerel's sifakas' usage and comprehension of alarm calls in a wild and a semi-captive population, which were characterized by different settings of predators. Although observations revealed that both populations used alarm calls in similar contexts, playback experiments showed that Coquerel's sifakas exhibited striking differences in comprehension of one type of alarm call. This differential comprehension of alarm calls may reflect the operation of social learning processes that caused changes in signal content due to changes in the set of predators to which these populations have been exposed. These interpopulation comparisons clearly indicate that non-human vocal signals are also subject to modification and social transmission.

Graziano Fiorito Cognition

SIMPLICITY VERSUS COMPLEXITY: BEHAVIORAL PLASTICITY AND ITS ADAPTIVE ROLES IN THE CEPHALOPOD MOLLUSC, OCTOPUS VULGARIS

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Our understanding of the nature and limits of animal cognition has largely been defined by studies that focused on the nervous systems and behaviors of vertebrates, in particular, birds and mammals. Only recent efforts to characterize behavioral plasticity in invertebrates, have promoted the search of a conserved path. Recent findings in the octopus and other cephalopod molluscs, revealed in this taxon a behavioral flexibility that is exceptional among invertebrates and comparable in many ways to that of the higher vertebrates. Here, we will review available knowledge of the behavioral capabilities of the common octopus (Octopus vulgaris). The richness of this invertebrate's behavioral repertoire is achieved through a neural architecture comprising fused ganglia that, though markedly less complex than the vertebrate central nervous system, is nevertheless sophisticated in its own right. Major focus will be given to: i. marked inter-individual differences in behavioral responses; ii. behavioral plasticity and factors that may influence it; iii. degree of complexity of the behavioral repertoire and its neural correlates; and iv. the apparent lack of sensory integration of visual and chemo-tactile systems. The behavioral diversity represented across many cephs' species may arise from possible differences in neural properties that have been driven by selection pressures over the course of evolution. Evidence suggests that cephalopod mollusks have evolved a variety of sensory and computational strategies to cope with the multifarious niches they have come to occupy in the world's oceans.

Daniel Franks Recognition systems and social organization

DISCRIMINATIVE PREDATION: SEQUENTIAL AND SIMULTANEOUS ENCOUNTER EXPERIMENTS

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Discrimination learning is an essential component of successful predation, as predators strive to distinguish between a good meal and a bad experience. Profitable prey benefit from predator inability to distinguish them from unprofitable prey. Many profitable species have taken advantage of this in evolving Batesian mimicry – where they resemble the appearance of an unprofitable species. Mimics exhibit different degrees of mimetic resemblance to their models. Perfect mimetic fidelity is not essential for them to benefit, although the degree of protection for profitable prey is generally thought to increase with improved resemblance because it is more difficult for predators to discriminate between good mimics from their models. It is therefore reasonable to assume selection pressure for prey to achieve a good resemblance. Most mimicry, however, is either imperfect or crude. Theories exist to explain the evolution of poor mimetic resemblance. Models have been presented, for example, to demonstrate the role of countering selective pressures, kin selection, or physiological costs in its evolution. We hypothesise that when predators observe model and mimic simultaneously, discriminatory ability is high and good mimicry is beneficial. We also hypothesise that when predators observe model and mimic sequentially, discriminatory ability is low and poor mimicry is sufficient. Dittrich et al. (1993) showed that pigeons and humans generally showed a broad agreement in categorising the extent of mimicry when discriminating a range of hoverflies from wasps. This general agreement between pigeons and humans is suggests that we can use humans as discriminators when empirically studying general concepts, such as the one we study here. Beatty et al. (2005) also demonstrated that humans behave similarly to great tits, Parus major, in a foraging task. We therefore use a human-computer interactive to experimentally test our hypotheses, and task predators with discriminating between variation of two prey types for simultaneous and sequential encounters. We show that discrimination is more difficult when prey are encountered sequentially. We discuss the relevance of our results for predator behaviour, prey behaviour, and the evolution of anti-predatory defences.

Andrew Fulmer Parent-offspring

WHO CARES? DISTRIBUTION OF SOCIAL CARE AND ALLOPARENTING BEHAVIOURS IN THE COLONIAL RODENT MERIONES UNGUICULATUS

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In species with complex social systems, altricial young may receive necessary care from individuals other than their parents. These care interactions may influence later life affiliation behavior and social preferences. The Mongolian gerbil, Meriones unguiculatus, lives in large family colonies dominated by a monogamous male-female pair. Most young remain with the parents well into sexual maturity. This behavior may be adaptive to facilitate the rearing of later litters, but these relationships have not been examined in detail. This study addresses the distribution of social care behaviors within colonies of M. unguiculatus along dimensions of sex, litter-rank and kin-relationship, as well as tracking the care provided for and by individuals before and after weaning. Observation of seven colonies (avg. 9 individuals) over an eight month period provided revealed a number of significant social-role effects on care distribution: parents provide significantly more care than siblings, even after weaning; female siblings are significantly more likely to be recipients of care (a possible mechanism for encouraging female offspring to stay with the colony into adulthood); and first litters provided more care than second litters. Care received by an individual before being weaned positively correlated with the care that individual gave throughout observed adulthood, and total care given by an individual also correlated with the care that individual received throughout observed adulthood, suggesting transmission of high prosocial participation: an adaptation which may make colonies more cohesive and better the fitness of subsequent litters.

Anna Gagliardo The tradition of research in behavioral biology in Italy

DISCOVERING THAT PIGEONS HOME BY SMELL: FORTY YEARS OF RESEARCH IN PISA

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At the time Floriano Papi and co-workers discovered that homing pigeons deprived of the sense of smell were unable to home, other researchers in the field were speculating only at a theoretical level about the possible mechanisms that enable birds to navigate. Not surprisingly, the community of navigation researchers reacted with considerable scepticism to Papi's discovery. This attitude led the research group in Pisa to replicate the experiments themselves and to invite contrarians to carry out collaborative research in order to openly demonstrate that the effect of anosmia on pigeon homing was real. The proponents of the olfactory navigation hypothesis were then challenged to carry out numerous control procedures and to plan elegant experimental designs in order to exclude possible side effect of manipulating the olfactory system. My interest in the neural basis of avian spatial behaviour led me to continue the work started by Papi and co-workers in facing the challenges to the olfactory navigation hypothesis, as well as extend my research interests to the sensory basis of navigation in migratory birds.

Anna Gagliardo Lateralised Behaviour

OLFACTORY LATERALIZATION IN HOMING PIGEONS: GPS-RECORDED TRACKS OF BIRDS NAVIGATING WITH UNILATERAL OLFACTORY INPUTS

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The ability of homing pigeons to navigate by relying on environmental odours makes them a unique animal model for investigating possible functional asymmetries in the olfactory system in a naturalistic setting. Previous studies have highlighted a functional asymmetry in favour of the right nostril, as regards the initial orientation of inexperienced pigeons. In fact, only the occlusion of the right nostril produces a clear scattering of the birds after release. However this phenomenon was documented only by observing the initial orientation of the pigeons, that is by recording vanishing bearings, and did not occur in birds with previous extensive homing experience. In the present work we report GPS recorded flight tracks of experienced pigeons released from an unfamiliar location with monolateral olfactory input. The analysis of the tracks revealed that the birds with the right nostril occluded interrupted their journey more frequently than both the control birds and the pigeons with the left occlusion. During the interruption all the pigeons both sat and circled over the same location. An inspection of the birds' movement over the stop site showed that the right plugged pigeons flew for significantly longer tracts over the same area with respect to controls. Moreover, the homing flight path of the birds with the right nostril occluded was more tortuous than both controls and left plugged pigeons. We suggest that the behaviour of the pigeons smelling with the left nostril might be due to a greater difficulty in processing the olfactory navigational cues.

Manfred Gahr Sex differences in hormones, brain and behaviour

HORMONE-DEPENDENT DIFFERENTIATION OF SEXUALLY ATTRACTIVE SONGS OF CANARIES

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In songbirds, testosterone and its estrogenic metabolites are involved in both the developmental and seasonal acquisition of song. In a well-studied model system, male canaries (Serinus canaria) sing seasonally in a testosterone-dependent manner, in order to attract females. Female canaries do not sing at all during the breeding season, but may produce a relatively primitive song, known as subsong outside of the breeding season. When treated with testosterone, female canaries can develop highly structured songs that resemble those of reproductively active males. Such testosterone-induced song is associated with gross anatomic changes to the neural circuits controlling song, an interconnected set of testosterone-responsive central nuclei known as the vocal control system. Among the principal relay nuclei of the vocal control system is HVC, which is involved in the generation of higher-order song patterns such as syllable sequences. Testosterone-dependent singing of female canaries involves not only anatomical changes, but testosterone-dependent angiogenesis and neuronal recruitment into the HVC. The differentiation of singing precedes, however, the recruitment of new neurons into HVC and testosterone-induced masculinization of the song system anatomy is not sufficient to produce sexy songs. Next to anatomical changes, testosterone induces a number of changes in gene expression in HVC. Among those genes, testosterone induces the production of vascular endothelial growth factor (VEGF) and its receptor (VEGFR2 tyrosine-kinase), which in turn leads to an up-regulation of BDNF (brain derived neurotrophic factor) production in HVC endothelial cells. The expression of BDNF locally in HVC in turn appears necessary for the development of elaborate male-typical song features such as syllable repertoires and high repetition rates of song syllables, features known to attract females.

Michael Garratt Effects of immunity and oxidative stress on behavioural ecology

THE IMPACT OF IMPAIRED ANTIOXIDANT DEFENCES ON SCENT SIGNALLING IN MICE

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Sexually selected traits may reveal information to prospective mates regarding resistance to oxidative stress. This has been tested widely for visual carotenoid based signals but is largely unexplored for other signalling modalities. In house mice (Mus musculus domesticus), and the majority of mammals, olfaction is the dominant sense and sexual signals are chemicals excreted in scent. Male mice use urine scent marking to defend their territories and attract mates. Females can determine a number of aspects of male quality from these signals, such as social status, level of parasitism and genetic heterozygosity. The main involatile signalling components in urine, Major Urinary Proteins (MUPs), are highly polymorphic and made up of a number of different isoforms; at least one MUP expressed by all males is known to signal specific information influencing female attraction. By using mice genetically engineered to be deficient in a key enzyme that combats oxidative stress, Copper-Zinc Superoxide Dismutase (SOD1), we demonstrate that MUP concentration in urine decreases with oxidative stress. Notably, the SOD1 knockout only influences expression of certain MUPs, suggesting these may have a role in signalling oxidative stress or related health status. These results highlight a direct link between oxidative stress and the expression of scent signals, in a system that that does not involve carotenoids. The use of molecular-genetic techniques could provide a powerful tool to establish the causal relationships between oxidative stress and sexual signalling.

Francesca Gherardi Cognitive abilities of invertebrates

THE QUESTION OF "INDIVIDUAL RECOGNITION" IN INVERTEBRATES

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Individual recognition (IR) in invertebrates is often regarded as the expression of their relatively "higher mental faculty". In principle, IR involves (i) cue production by the signaler, (ii) cue perception and template matching by the receiver, and (iii) a behavioral response by the receiver. Starting from this scheme, however, a gradient of increasing complexity has been proposed. In "class-level" or "binary" IR, the receiver associates the characteristics of the signaler with inferred class-specific information or it matches the signaler's phenotype to an internal template proper of a given class (dominant or subordinate, familiar or non-familiar). "True" individual recognition is a more complex ability. It occurs when cue, template and response are all individual specific. For example, the receiver learns the unique facial feature of a wasp or the individual scent of a hermit crab, associates these cues with social dominance (for the wasp) and with the quality of the shell house (for the crab) and behaves accordingly in an appropriate and distinctive manner. Here, we will discuss examples of IR in crayfish, hermit crabs, lobsters, and octopuses. We will show that, independently of its various complexity, IR discloses the ability of invertebrates to develop sophisticated, multifaceted internal models of their conspecifics.

Diego Gil Consequences of an Urbanizing World

DEALING WITH URBAN NOISE: A COMPARISON BETWEEN OSCINE AND SUB-OSCINE BIRDS

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Bird acoustic communication can be impaired by urban noise. A number of strategies that birds use to deal with this problem have been reported in several oscine species. These include increasing the song minimum frequency, which would make songs more salient in the presence of noise. Song development in oscines involves vocal learning, and this process has been related to their generally remarkable song variability. In contrast, sub-oscines do not learn their songs, and it could be hypothesized that these species may lack the capacity of using some of the adaptive strategies described for oscines. In this study, we recorded the songs of a wide sample of oscine and sub-oscine species living in urban habitats in South American cities, and analyzed their song frequency with respect to the level of ambient noise. We hypothesized that oscines, but not sub-oscines, would show a positive relationship between noise level and minimum song frequency. Our preliminary analyses confirm that most oscines were found to increase their song pitch with increasing levels of noise, whereas sub-oscines did not. These preliminary data suggest that sub-oscines may be less acoustically adaptable compared to oscines, or that they must resort to other strategies to make their acoustic message detectable in urban environments.

Wolfgang Goymann Endocrinology of cooperative behaviour

HORMONES AS MECHANISMS FOR COOPERATIVE BEHAVIOUR?

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The topic of cooperation has long captured the attention and interest of biologists and, it has encouraged the discussion of scientists in multiple disciplines. Cooperation is defined as any interaction between individuals where one actor's costs (i.e., any investment into the partnership) should be outweighed by its benefits for all individuals involved. We are thus referring to individuals supporting or actively helping others. This, of course, poses a challenge to the very concept of natural selection, which favours individuals that try to promote their own evolutionary success, by selfishly considering their own benefits at the expense of their competitors. During the last decades evolutionary models have explained under which conditions cooperation between selfish individuals can evolve. Very little, though, is known about the mechanistic basis of cooperation. In this talk, we would like to ask if and under which conditions hormones may influence the decision to cooperate. Our aim here is to focus on the potential role of neuroendocrine mechanisms on the regulation of the expression of cooperative behaviour in vertebrates. We will provide a brief introduction into the neuroendocrine basis of social behaviour and evaluate how hormones may influence known cognitive modules that are involved in decision making processes that may lead to cooperative behaviour. Based on this evaluation, we will discuss some specific examples how hormones may contribute to the variation of cooperative behaviour.

Donato Grasso Sociality III

ALARM, DEFENCE AND COEVOLUTION: A CASE STUDY IN ANTS

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The integrity of insect societies against enemies is mainly due to two synergic processes: 1) an efficient recognition system (allowing discrimination of aliens from nest-mates); 2) an adequate reaction to sources of danger. The cooperative defence in ant societies is a suitable system to keep the integrity of the colonies against competitors, predators and parasites. This is due to alarm communication that mediates collective defence once a threat is perceived. Here we compare the alarm behaviour and collective reactions of two ant species (Formica cunicularia and Formica rufibarbis) against possible sources of danger to the colony. These species are very suitable models since they are prone to react to enemies and are both potential hosts of the slave-maker ant Polyergus rufescens, although F. cunicularia is by far more vulnerable to the parasite attacks. Alarm and defensive reactions of F. cunicularia and F. rufibarbis were investigated presenting different threatening stimuli (ants from alien colonies, homospecific and heterospecific) to colony fragments. Results show that both species react to a potential threat to the colony with a prompt exit of workers from the nest, attraction towards the stimulus and aggressive behaviours. Moreover they seem to feature the phenomenon of 'Enemy Specification' by which a species has evolved the capacity to recognize and take specific defensive measures against especially dangerous enemies, in this case the parasite Polyergus rufescens. However, F. rufibarbis resulted more aggressive than F. cunicularia towards it. Results further clarify the preference of the parasite towards F. cunicularia as host species, providing information on the possible coevolutionary pathways involving the parasite and its potential hosts.

Jonathan Green Sociality II

STATUS SIGNALLING IN A EUROPEAN POPULATION OF THE PAPER WASP POLISTES DOMINULUS

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The use of status signals, or 'status badges', is thought to be important in the establishment of dominance hierarchies across a range of species. In the paper wasp Polistes dominulus, there is considerable variation in the number, shape and size of black patterns on the clypeus. Work on recently established populations of P. dominulus in the USA has argued that these patterns are used to signal status to conspecific rivals in contexts such as foraging and nest usurpation. However, within species, there is often variation in signal value between populations. Here I present the results of the first test of status signalling in a second population of P. dominulus in its native European range.

Stefan Greif The representation of space, time and number in animals

SENSORY BASIS OF HABITAT RECOGNITION IN ECHOLOCATING BATS

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The correct identification of suitable habitats is critically important for animals. This is especially true for bats, as their use of echolocation restricts them to fill specific niches. However, how bats distinguish between various habitat types is not yet understood. Bodies of water represent a special case of habitat; they are not only used for drinking, but also for foraging and as landmarks for orientation. We investigated the hypothesis that bats recognize water surfaces echo-acoustically by relying on their mirror-like acoustic reflection properties. We mimicked the surface of water using smooth plates and presented them to bats simultaneously with textured ones of the same material. Our experimental data suggest that (1) bats recognize water surfaces echo-acoustically as an acoustically smooth, extended surface, (2) this recognition pattern is stereotypic and innate and (3) it is phylogenetically widespread across European bat species and families and thus likely an universal feature of bat echolocation. Furthermore (4) the minimum area for a smooth surface to be taken for water depends on the maneuverability and sonar 'foot print' of each tested species. (5) Bats integrate the available sensory stimuli with variable weighting to assess the presented multisensory situation and decide whether or not to drink.

Ton G G Groothuis Sex differences in hormones, brain and behaviour

SEX DIFFERENCES IN LATERALIZATION OF BEHAVIOUR AND THE POTENTIAL ROLE OF ANDROGENS

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There is a long ongoing debate about the potential role of sex hormones in the development of lateralization of brain and behaviour. This lateralization refers to the fact that both hemispheres differentially affect perception, behaviour, emotion and cognition. It is now accepted that this lateralization occurs throughout animal kingdom, representing a fundamental aspect of the organization of brain and behaviour. Inspired by sex differences in some aspects of lateralization in humans, several hypotheses have been put forward about the potential role of androgens in the development of lateralization, explaining both its between and within sex differences. We will first briefly present data of meta analyses about sex differences and the effect of androgens on lateralization in humans and other animals. Next we will present data of recent and ongoing studies in humans, birds and fish on the effect of organizing or activational effects of androgens on behavioural lateralization. The results will be used to evaluate the different hypotheses and suggest that testosterone may affect lateralization by more than one pathway, inducing larger phenotypic plasticity than sometimes assumed.

Daniel Hanus Trends in cognitive primatology

VISUAL ILLUSIONS IN GREAT APES

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It has been argued that humans' susceptibility to visual illusions does not simply reflect cognitive flaws but rather specific functional adaptations of our perceptual system. It would not be surprising, therefore, if human societies of distinct cultural and physical environments differed in their cognitive analyses of a visual scene. Data from cross-cultural studies confirm exactly this assumption by showing different degrees of susceptibility to geometric illusions in different human societies. Some illusion research has also focused on non-human species, mainly by using a matching-to-sample-paradigm in a computerized setting. We presented chimpanzees, bonobos and orangutans with a battery of different visual illusions, thereby using a new and more naturalistic approach. Two identical food items were presented on separate trays with the crucial difference being only the appearance of the surrounding area. Subjects always received the content of the tray they selected and were therefore never differentially reinforced. Our results did not reveal a uniform and straightforward picture of apes' general susceptibility to visual illusion, however they provide empirical descriptions of different optical phenomena that might help to better understand both human and non-human spatial cognition.

Dik Heg Cooperation

HABITAT SATURATION, BENEFITS OF PHILOPATRY, RELATEDNESS AND COOPERATIVE BREEDING IN A CICHLID

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Cooperative breeding in vertebrates may emerge due to subordinates delaying dispersal when free breeding habitat is not available ('habitat saturation' hypothesis, HS). However, delayed dispersal might also be due to younger individuals postponing dispersal to when they are more competitively able or have more to gain from breeding independently ('benefits-of-philopatry' hypothesis, BP), or to when inclusive fitness benefits no longer outweigh the benefits from independent breeding ('kin selection' hypothesis, KS). Here we show in three experiments that both HS and BP determine the extent of cooperative breeding in the cichlid Neolamprologus pulcher. Contrary to the KS, individuals significantly avoided settlement with related individuals, and an additional settlement experiment confirmed this result. Our results suggest that kin structure in these cichlids emerges from limits on dispersal, but if such barriers are absent, cichlids prefer to settle with unrelated individuals to maximise the benefits of direct reproductive participation.

Fabrice Helfenstein Effects of immunity and oxidative stress on behavioural ecology

MALE PARENTAL EFFORT, OFFSPRING QUALITY AND OXIDATIVE STRESS

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Oxidative stress is likely a major constraint in the evolution of life history traits. For example, oxidative stress has been shown to be a proximate cost of reproduction. Additionally, in birds, high sibling competition may subject nestlings to oxidative stress due to intense begging activity and associated high metabolic rate. Yet, no studies have so far tested if oxidative stress is a cost of reproduction and sibling competition in a natural, free-ranging population of vertebrates. We performed a full factorial design experiment on great tits Parus major. We manipulated brood size, aimed at increasing male reproductive effort and sibling competition, and supplemented males with physiological doses of carotenoids. We then assessed male and nestling condition and antioxidant capacity. Enlarging broods size impaired male antioxidant capacity after 5 days of hard work. Carotenoid-supplementation enhanced body condition, but did not affect male antioxidant capacity, suggesting a secondary role for carotenoids as antioxidants. Males with brighter carotenoid-based yellow breast plumage showed greater antioxidant capacity 15 days post-hatch. The body condition of 15-day old nestlings was both reduced by the brood enlargement and enhanced by the carotenoid supplementation of their fathers. Nestling antioxidant capacity was however not influenced by the treatments but positively correlated with brood size, which was also negatively related to nestling condition. This study on a natural population supports the hypotheses that 1) oxidative stress is a proximate cost of reproduction, 2) carotenoid-based plumage traits reflect resistance to oxidative stress, and 3) carotenoid availability mediates reproductive effort.

Mariam Honarmand Long-term consequences of early environment on behaviour

STRESSFUL DIETING DURING THE NESTLING AND FLEDGLING PHASE: IMPLICATIONS ON BIOMETRY, PHYSIOLOGY AND MALE SONG LEARNING

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The Netherlands Numerous influences an organism experiences throughout life determine its phenotype. Unfavorable conditions throughout the period of parental care can severely affect growth, reproductive performance and survival. Yet, the question remains whether stress experienced during distinct early developmental phases contributes differently to variation in the expression of phenotypic traits. Here we tested whether the nestling phase compared to the fledgling phase is more susceptible to nutritional stress by considering biometry, physiology and sexually selected traits using zebra finches (Taeniopygia guttata) as a model species. As nestlings (day 0 - 17) or fledglings (day 17 – 35), subjects were raised either on low or high quality food (LQ, HQ). The results show that substantial phenotypic plasticity appeared as subjects compensated for a temporal decline in environmental conditions. However, compensation was not complete and our results show to what extent individuals reflect nutritional history and whether this is dependent on the trait and the timing of the constraint. Constraints on male song learning provide a unique opportunity to understand epigenetic influences on phenotypic plasticity and their implications on mate choice as important evolutionary force.

Oliver Höner Parent-offspring

'LA MAMMA' MAKES A DIFFERENCE – SILVER SPOON EFFECTS IN SPOTTED HYENAS

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Life history theory predicts that mothers should provide their offspring with a privileged upbringing if this enhances their offspring's and their own fitness. In many mammals, mothers of high social status provide their young with a privileged upbringing, but whether sons obtain fitness benefits during adult life from these privileges, that is, whether they benefit from a 'silver spoon' effect, is unknown for mammals living in large social groups. This is because most male mammals disperse and it is difficult to assess the effect of maternal social status on the fitness of sons after dispersal. Here we show that in the spotted hyena, a highly social, female-dominated carnivore, dispersing sons of high-ranking mothers obtain fitness benefits in adult life from their privileged upbringing. High-born sons grew at higher rates, were more likely to disperse to groups offering the best fitness prospects, started to reproduce at a younger age and were of higher reproductive value than low-born sons. These results are based on long-term demographic data from eight hyena clans, life-history data from 114 dispersing males and microsatellite-based paternity analysis of 679 offspring. The study is the first to our knowledge to document that the maternal environment has profound life history consequences for dispersing males in a mammal in which male fitness strongly depends on social relationships. It therefore provides strong support to life history theory and illustrates the evolutionary importance of maternal effects.

Maria Jose Hurtado Herrera Endocrinology of cooperative behaviour

INDIVIDUAL BEHAVIORAL PROFILE AND SPECIALIZATION ON BUILDING MATERIAL TRANSPORTATION IN MOUND-BUILDING MICE

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A social group may be perceived as a mosaic of interacting individuals with different behavioural profiles. These differences might lead to specialization, some individuals being more fitted to perform certain tasks. We tested whether specialists for a given task can be characterized by their behavioural profile in mound building-mice. This wild species is capable of collectively building impressive mounds to overwinter. Previous work has shown that within a group of six mice, two individuals were specialized in the transportation of the material items. This specialization remained stable over time and was linked neither with the gender nor with the parental origin of the mice. In order to highlight the origin of this specialization, the mice were characterized by their individual behavioral profiles (i.e. level of anxiety, neophilia, level of activity) and their affinity with the building material. The performance of transportation was then evaluated for each individual inside a group of six mice from the same litter. The global behavioral profile of specialists did not differ from those of other mice. Only the level of affinity with the building material was higher in specialists. In a second phase, we removed two animals to test the effect of social composition of the group. When two mice were removed from the group, whatever the two specialists or two of the non-carriers, difference between individuals disappeared and contribution to transport tended to be equally distributed. Our results failed to establish a typology of specialist but suggested that the difference of behavioural profiles better acted at a group than at a population level.

Juan Diego Ibáñez-Álamo Time & foraging

DOES URBANIZATION AFFECT SELECTIVE PRESSURES AND LIFE-HISTORY STRATEGIES IN COMMON BLACKBIRDS?

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Nest predation and food limitation are the two main factors proposed to explain life-history theory. However, contradictory results of previous studies impede a clear interpretation of which of these two selective pressures, if any, is more important in urban habitats compared with natural situations, and whether birds can confront them by adjusting their life-history strategies. We investigated life-history syndromes of three common blackbird (Turdus merula) populations differing in their human influence (urban, rural and woodland). We analyzed daily nest predation and nestling starvation rates to assess the relative importance of these selection pressures in each habitat. Simultaneously, we investigated several life-history traits to determine if blackbirds seem adapted to their main source of selection. Food limitation was more important in the city, while nest predation was the most important selective force in the forest. The rural habitat was characterized by an intermediate influence of these two factors. Life-history syndromes, as the covariation of a suit of traits, confirmed these results as blackbirds seem well adapted to the main cause of selection in each habitat. Our results are consistent with urbanization imposing new challenges on birds, and that they adaptively respond to them. In addition, there were no differences in fledging rate among habitats. However, given that only 17% of nests were successful in woodland, but this increased to 46% and 53% in the rural and urban populations, respectively, showed a significantly higher fitness with increasing human impact. This suggests that blackbirds benefit from human activities, which could be the ultimate explanation why this species has been expanding into urban areas.

Peter Kappeler Sociality I

PATTERN AND SOCIAL DYNAMICS OF VIGILANCE IN REDFRONTED LEMURS (EULEMUR FULVUS)

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Vigilance represents an important anti-predator strategy, but the factors shaping this behaviour remain poorly understood. Here, we explore two aspects of the temporal organisation of vigilance behaviour in a group-living primate. Specifically, we tested the prediction that individual bouts of vigilance should be separated by randomly distributed, and hence unpredictable, latencies. Moreover, we wanted to know whether members of a subgroup coordinate their vigilance bouts with each other. Using focal animal observations and video recordings, we studied vigilance behaviour in four groups of redfronted lemurs (Eulemur fulvus) in Kirindy, Madagascar. Redfronted lemurs live in small groups of 5-12 males and females. These 1.5kg animals face a constant predation risk from carnivores (Cryptoprocta ferox) and hawks (Polyboroides radiatus). Because these lemurs are cathemeral, they rest for extended periods of the day; typically in small subgroups. With respect to our first question, spectral analysis of temporal sequences of bouts of vigilance revealed significant deviation from a random pattern, indicating regular oscillation between longer and shorter bouts of vigilance. Moreover, vigilance in sleeping subgroups was not coordinated among the members of a subgroup, and subgroup size had no effect on individual vigilance rates. Thus, individual patterns of vigilance in this species appear to be primarily driven by an independent internal pacemaker that generates a pattern not predicted by theoretical models. We will discuss our findings in the context of similar studies on other mammals and the actual predation rates experienced by this population.

Silke Kipper Communication II

FEMALE CALLING? DIFFERENTIATED SONG RESPONSES TO MALE AND FEMALE CALL PLAYBACKS IN COMMON NIGHTINGALES (LUSCINIA MEGARHYNCHOS)

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Acoustic playbacks have been proven to be a powerful tool to investigate functions of vocal communication systems. In birdsong research, usually the song of a male is played to simulate a territorial intrusion by a conspecific male. Song responses to the presence of a female are much harder to test this way, because females of many bird species don't sing. They do call, however. In a playback experiment, I investigated whether male nightingales can discriminate the presence of a male or female conspecific solely by means of their call characteristics. Calls used in playbacks were recorded from nightingales kept in the laboratory and were most likely contact calls. 24 free-ranging male nightingales that engaged in nocturnal singing (indicating an unpaired or pre-breeding mating status) were tested in one of three playbacks treatments: calls of male nightingales, female nightingales, or a control (chaffinch calls). Changes in singing of males were much more pronounced in response to both male and female call playbacks in comparison to the control. More interestingly, female calls elicited different vocal responses from male calls. For example, males made fewer song interruptions and produced many more 'soft wheeps' after hearing female calls. I conclude that male nightingales can tell females apart from males based on their call characteristics. An acoustic analysis of male and female call characteristics will reveal which call characteristics are different between males and females and thus may account for differentiated responses. In future studies, call playbacks may be used to disentangle song characteristics that serve the multiple functions of bird song: territory tenure and female attraction.

Alexander Kirschel Communication II

MONITORING TERRITORY DYNAMICS OF MEXICAN ANTTHRUSH (FORMICARIUS MONILIGER) USING SONG RECORDINGS AND A WIRELESS SENSOR NETWORK

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Birds sing as they move through their territories to signal to rivals that their territory is occupied. Typically it is males that sing to defend their territory, but female birds in some species also sing, particularly in the tropics. Researchers have traditionally followed spatiotemporal territory dynamics by tagging birds and mapping their territories using sight records. Such methods require substantial field effort and may not be suitable for species that are difficult to observe. We tested whether individual Mexican antthrush (Formicarius moniliger) could be monitored over time using their songs. We used Canonical Discriminant Analysis to identify over 30 individual male and female birds by their songs over a 5-year period. We found that songs varied little from year to year and that individuals' songs could be recognised with accuracies over 80%. We then determined territory locations by mapping where identified birds were recorded singing, including where possible, with the use of a wireless sensor network. We found that shapes and sizes of territories can vary over time when individuals are replaced and territory dynamics varied between males and females.

Sonja Koski Trends in cognitive primatology

ARE CHIMPANZEES EMPATHIC? A PROPOSAL OF THE COGNITIVE AND EMOTIONAL PROCESSING IN CHIMPANZEE EMPATHY

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Empathic concern leading to pro-social behaviour is considered a crucial feature in the evolution of human cooperation, altruism and morality. Empathy in adult humans employs a capacity to cognitively represent other's mental states, i.e, Theory of Mind. The representational skills of our closest relatives have been intensively studied in recent years and the evidence suggests that chimpanzees are capable of some mental state representations. However, whether and how chimpanzees represent other's emotions has not been addressed in detail. Consequently, the level of cognitive and emotional processing in chimpanzee empathy is unknown. We propose a model for chimpanzee empathic processing, using the development of empathy in humans as a comparative viewpoint. Human empathy develops gradually with increasing cognitive complexity. In the first developmental stages the following levels can be distinguished: emotional contagion in neonates, transition from egocentric to veridical empathy during the second year of life, and finally cognitive empathy at three to four years of age. The current evidence suggests that chimpanzees are capable of emotional contagion, may be capable of veridical empathy, but probably do not achieve cognitive empathy. Thus, we propose that chimpanzee empathy may operate on a continuum from egocentric, to quasi-egocentric, to veridical empathy. We evaluate evidence for this hypothesis and discuss further the possible links between empathy and pro-social behaviour in chimpanzees and other nonhuman primates.

Indrikis Krams Effects of immunity and oxidative stress on behavioural ecology

FACIAL ATTRACTIVENESS SIGNALS THE STRENGTH OF IMMUNE FUNCTION IN MEN

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Facial attractiveness is important for human mating behavior and associated with reproductive success. Symmetry, averageness and masculinity have been shown to influence the attractiveness of men's faces and it has been expected that these traits signal a male's immunological competence and that women's preferences on these traits may be adaptations for identifying healthy mates with good genes. To date, tests of this hypothesis have been only indirect and results have been equivocal. Here we show experimentally that the attractiveness of male faces is associated with the strength of their immune defence. We photographed and vaccinated 74 men with hepatitis B vaccine and measured the amount of specific antibodies produced and their plasma testosterone levels. We found a very significant relationship between attractiveness ratings of these faces and amount of antibodies produced, suggesting that the most attractive men have superior immune defence compared to less attractive men. Symmetry and masculinity increased the attractiveness in men's faces. Facial masculinity and symmetry correlated positively with the amount of antibodies produced. However, facial averageness was not associated with strength of the immune defence. Plasma testosterone levels correlated very strongly and positively with the strength of immune defence and moderately with facial masculinity. This study supports the hypothesis that perception of facial attractiveness is an adaptation for identifying higher-quality mates.

Ana L Llandres Communication I

EFFECT OF BEE ALARM PHEROMONE ON THE BEHAVIOUR OF CONESPECIFICS TOWARDS RISKY FLOWERS

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Recent discoveries demonstrate that, following an attack at a food source, honeybees can incorporate negative feedback signals in the waggle dance of their nest-mates to prevent the recruitment of new foragers to the sources where they have been attacked. However, although the waggle dance indicates the direction and distance to resource patches, it is unlikely that it has sufficient spatial resolution to specify in which particular flowers predators lie at ambush. Is there another mechanism allowing bees to indicate the exact location of a potential predator? In this study we tested whether olfactory cues released by alarmed bees during attacks are the proximate mechanism allowing honeybees to detect hidden predators. To do so we counted the number of Apis mellifera bees approaching and visiting three types of flowers: flowers with an Australian Thomisus spectabilis crab spider, flowers where we simulated a predator attack by pinching a bee with forceps and control flowers. Our results show that while there were no significant differences in the number of approaches to the three flower types, there was a strong significant difference in the number of visits they received: bees landed as often on control and spider-harbouring flowers but hardly ever on flowers where we simulated the predator attack. Our results show that alarm pheromones released by recently attacked bees are used as warning cues by potential visitors, helping them to detect ambushing predators at the flowers where they intend to forage.

Bertrand Lemasson Models

THE INFLUENCE OF COGNITIVE COMPLEXITY, BEHAVIORAL NOVELTY AND GROUP DENSITY ON SOCIAL INFORMATION CASCADES

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Our understanding of the mechanisms underpinning collective animal behavior is predominantly rooted in the social insect societies, where kinship is the rule rather than the exception and selfish motivations are rare. In many vertebrates the social groups are composed of selfish individuals with competing interests, yet collectively these groups can display an amazing ability to rapidly recognize pertinent social cues (e.g., the coordination observed in bird flocks and fish schools). How can such apparent collegiality arise from predominantly selfish motivations under varying ecological contexts? Specifically, how do group communications remain resilient to fluctuations in group structure (e.g., density) or any behavioral heterogeneity among neighbors? Recent evidence suggests the need for complex cognitive abilities. If so, how then do individual decision mechanisms impact the accuracy of information propagation through a social network? We address these questions by integrating basic components of animal cognition into a model of self-organization. We measure how accurately social foragers may pursue a novel behavioral cue based on the initial group density and the individual decision mechanism employed. Results using a primitive signal-noise decision threshold demonstrate that: 1) the average number of social interactions are negatively correlated with the strength of a behavioral cue; 2) individual social networks show little variability in size over moderate density ranges, suggesting that field evidence for stable topological interactions in animal groups may not require individuals to possess complex decision thresholds.

Christine Leterrier Personality

BIOLOGY OF FEAR IN BIRDS: MULTIDISCIPLINARY ANALYSIS OF A GENETIC MODEL

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This presentation summarizes results obtained in genetic lines of quail divergently selected on a fear behaviour trait, namely tonic immobility duration (Mills and Faure 1991). These lines exhibit different behavioural responses in numerous fear tests and are thus considered to differ in their propensity to experience fear in frightening situations. Apart from behavioural studies, they have been used to study the physiological, genetic and cognitive correlates of fear behaviour. Lines were compared for the autonomic nervous activity measured through heart rate variability, HPA activity and neuroanatomy of various brain structures. These studies have shown that the differences in behavioural responses between lines are linked to differences in physiological mechanisms that occur not only during fear responses, but also in basal conditions. Moreover, the use of these lines allowed the detection of Quantitative Trait Loci for tonic immobility duration and egg production. These lines of quail constitute a powerful tool to further investigate the biology of fear behaviour in birds.

Maria Cristina Lorenzi Recognition systems and social organization

VARIATIONS IN CHEATER'S STRATEGIES FOR EVADING DISCRIMINATION: MIMICRY, INSIGNIFICANCE, REPULSION OR THEIR BIZARRE COMBINATION

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Many organisms parasitize or exploit other organisms' resources and may avoid recognition by their targets organisms (hosts) by cheating on their identity or by concealing it. The mechanisms that parasites and exploiters use to avoid recognition, escape detection or trick hosts about their identity are the results of coevolutionary processes between interacting species. Exploiters or parasites that avoid detection by hosts are favorably selected on one side, whereas hosts that detect parasites are selected on the other, resulting in an arms race of adaptations and counteradaptations. Although some mechanisms used by cheaters are common, e.g., visual or chemical mimicry, it is not surprising that coevolution produced variation among species in the strategy used to avoid detection and in the degree of matching of recognition cues. Among insects, social parasite species often perfectly mimic the chemical signature of their hosts and acquire dominant positions into the host social structures. Other parasites or exploiters of social insect colonies barely mimic the host signature and their integration into the social structure of the hosts is poor or lacking. Here I analyze how variation in cheater's strategies depends on the specific life history traits of the species involved and on the kind of biological relationship between interacting species.

Heike Lutermann Variation in fitness consequences of mammalian sociality

TESTOSTERONE AND INTRASEXUAL COMPETITION AMONG FEMALES IN A COOPERATIVE MAMMAL

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Sexual selection acts on individuals to increase their reproductive success. Variation in reproductive success is often higher among males than females. Consequently sexual selection is frequently considered to affect only males while its role in females is largely neglected. However, in some species females compete intensely for reproductive opportunities and may exhibit 'male-like' traits such as increased intrasexual aggression and secondary sexual traits. In male vertebrates their expression tends to be testosterone-dependent and this is likely to be similar in females. Here, we compare two cooperatively breeding mole-rat species (Natal, Cryptomys hottentotus natalensis, and Damaraland mole-rats, Fukomys damarensis) with different mechanisms of reproductive skew (i.e. behavioral vs. physiological) to evaluate the effect of intrasexual competition on female testosterone (T). We found a strong effect of breeding status on T-levels in females and T tended to increase with increasing body mass in both species. T-values measured were significantly higher in the absence of physiological mechanisms of suppression and showed a larger range of values in accordance with the more frequent challenges to the reproductive monopoly in Natal mole-rats. In addition, T-levels rose in non-breeding females seasonally with increases in opportunities for breeding dispersal. A concomitant rise in cortisol-levels in both species suggests higher frequencies of agonistic interactions between females during wet periods. Our results suggest a role for T in female intrasexual competition in species with high reproductive skew and a possible modulatory role for the mode of reproductive suppression as well as environmental factors on female T-levels

Barry Magee Cognitive abilities of invertebrates

DOES LACK OF DISCRIMINATION EQUAL LACK OF COGNITION?

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The question of whether crustaceans experience pain is an unresolved one as there is no conclusive body of evidence to support the theory that their abilities extend beyond nociception. Various criteria would need to be satisfied in order for crustaceans to be deemed capable of this experience. This investigation looks at one possible criteria using the shore crab, Carcinus maenas, as a model species. Discrimination learning was examined using a tank with a removable central divide splitting the tank in half with a shelter in each section. In one section the subject received an electric shock after it entered the shelter but was not shocked when tested with the other shelter. After five trials with each shelter the subject was simultaneously exposed to both and it could select either. It was predicted that the subject would choose to enter the safe shelter in which it had previously not received an electric shock. No preference for the safe shelter was found and there was no evidence of discrimination learning in this task. However, during the initial phase of five trials there was an increased use of an escape response to get away from the noxious stimulus. Thus there is evidence to suggest that the animals became increasingly sensitive to the electric shock or had learned that leaving the shelter terminated the shock. The lack of discrimination between the shelters might be interpreted as a lack of perception of the shock or lack of motivation due to it being unimportant to the animal. However, leaving the shelter in response to the shock makes this explanation unlikely. Alternatively, the lack of discrimination might be due to insufficient visual differences for them to be perceived as being different or to a lack of cognitive ability.

Gema Martin Ordas Cognition

MEMORY CONSOLIDATION IN GREAT APES

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Following its encoding, a memory undergoes consolidation. Consolidation refers to processes that continue after learning and stabilize, transform, or enhance the newly encoded memory trace, which is initially fragile and temporary. Here we investigate the role of memory consolidation in a spatial memory task in great apes. We tested 5 orangutans, 5 bonobos and 12 chimpanzees in an object-choice paradigm. We presented the subjects with a platform in which three baiting places were available. Subjects had to remember the location of a reward placed under one of three containers on the platform after 2-minutes, 1-, 2- and 24-hour RIs. Half of the subjects stayed inside the testing room during the 2 min, 1- and 2 hours RIs ("stay in" group) and the other half of the subjects left the testing room and were involved in other activities during those RIs ("leave" group). Subjects in both groups left the testing room during the 24 hours trial and came back into it only to sleep. Our results show that subjects in the "stay in" group remembered the location of the food significantly above chance in all RIs. The performance of the subjects in the "leave" group was significantly above chance in the 2-minutes RI. This performance degraded in the 1- and 2-hours RIs, but significantly recovered after 24 hours. We are currently exploring the effects that "sleep" and "rehearsing" during the RIs has over the apes' performance in the same task.

Nicolas Mathevon Recognition systems and social organization

ACOUSTIC COMMUNICATION BETWEEN MOTHER AND OFFSPRING IN CROCODILES
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The use of acoustic signals has been documented in most vertebrates groups: numerous mammals, birds, amphibians and fishes emit sounds that support information transfer between individuals. Conversely, within the reptiles polyphyletic group and apart a few exceptions, only crocodilians are known to produce vocalizations. However, in spite of its importance for the understanding of the evolution of sound communication, information concerning their vocal world is limited. Using playback experiments, we experimentally show that hatching Nile crocodiles Crocodylus niloticus communicate acoustically with each other and their mother, synchronizing hatching and inducing parental care. By analyzing the structure of the calls emitted before, during, and just after hatching, we find that the female crocodile may gather information about her brood maturity by just hearing to her nest. By studying young black caimans Melanosuchus niger during their first weeks of life in their natural habitat, we bring the experimental evidence that juvenile crocodilians use a graded sound system in order to elicit behavioral responses from their mother and siblings. Under stressful conditions, siblings stay motionless and elicit maternal protection with a chorus of 'distress' vocalizations. Conversely, in a quiet situation, 'contact' calls are mostly directed towards other juveniles, gathering the group. Acoustic communication appears as an important component mediating relationships within crocodilian family groups. References 1. Vergne A, Pritz MB, Mathevon N, 2009. Acoustic communication in crocodilians: from behaviour to brain. Biological Reviews, 84:391-411. 2. Vergne A, Mathevon N, 2008. Crocodile egg sounds signal hatching time. Current Biology, 18:R513-R514. 3. http://www.cb.u-psud.fr/index.html

Peter McGregor Audience effect

AUDIENCES, EAVESDROPPING AND COMMUNICATION IN NETWORKS
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Most signals travel farther than the average spacing between individuals; therefore, communication is best thought of as evolving in a communication network and as now being used in such a network. This network approach expands the individuals considered to be involved in communication beyond the usual signaller-receiver signalling interaction. Audiences are a key group of such extra individuals. This talk will consider their influences on communication over evolutionary and ecological timescales. Such influences include eavesdropping. Evidence from fiddler crabs, fish and birds in the social contexts of aggressive and sexual interactions in both the lab and the field will be discussed. Recent work on how signallers and receivers respond to audiences will also be discussed.

Julia Mehlhorn Space

ASYMMETRY IN BRAINS OF HOMING PIGEONS WITH AND WITHOUT NAVIGATIONAL EXPERIENCE

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Homing pigeons are well-known for their homing abilities, and their brains seem to be functionally adapted to homing with e.g. larger hippocampi and olfactory bulbs. At least hippocampus size is influenced by navigational experience and functional specialization of the two hemispheres ('lateralization') occurs as well in homing pigeons. To show in what way lateralization is reflected in brain structure volume and whether some lateralization is caused by experience, 14 homing pigeons were raised under identical constraints. After fledging, 7 of them were allowed to fly around the loft and participated successfully in races. The other 7 stayed permanently in the loft and thus did not share the navigational experiences of the first group. After reaching sexual maturity, all individuals were sacrificed and morphometric analyses were carried out to measure the volumes of 12 brain parts (separately for both hemispheres). The comparison of left/right quotients of both groups reveal that pigeons with navigational experience show a smaller left mesopallium in comparison to the right one and pigeons without navigational experience a larger left mesopallium in comparison to the right one. Additionally, there are significant differences between left and right brain subdivisions within the two pigeon groups namely a larger left hyperpallium apicale in both pigeon groups and a larger right nidopallium, left hippocampus and right optic tectum in pigeons with navigational experience. The results of our study confirms that the brain of homing pigeons is an example for mosaic evolution and indicates that lateralization is correlated with individual life history and not exclusively based on heritable traits.

Luca Melotti Personality

PERSONALITY TYPES AND ENVIRONMENTAL ENRICHMENT AFFECT AGGRESSION AT WEANING IN PIGS

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We investigated the effects of different environmental treatments and personality types on aggression at mixing of newly weaned domestic piglets. From birth to weaning, 16 litters were housed with their dams in either substrate-impoverished (I) or larger, substrate-enriched (E) environments. At 14 days old, piglets were classified as 'high' (HR) or 'low resistant' (LR) in a manual restraint test (back-test, after Bolhuis et al., 2003, Physiology & Behavior, 79), which is thought to identify proactive (HR) and reactive (LR) stress coping strategies as part of different personality types. At 30 days old, 128 piglets were weaned and mixed into 32 pens of 2 HR and 2 LR unfamiliar pigs. 8 I and 8 E groups changed environment whereas the others remained in the same environment. Fighting was scored for 5 h post-mixing and for 6 h the following day. Data were analyzed using generalized linear mixed models with pre- and post-weaning housing, back-test classification and interactions as fixed effects and pen as random effect. Pre-weaning E pigs fought for longer after mixing and on the next day than I pigs. Post-weaning E did not affect fighting at mixing but reduced the time spent fighting the next day. Subtle and environment-dependent effects of personality on fighting were found. In E groups, for instance, HR pigs won more fights than LR pigs. Also, HR pigs bullied (i.e. chased surrendering pigs) more often and their fighting behaviour was less affected by body weight than that of LR pigs. Overall, pre-weaning E increased aggression after weaning whereas post-weaning E reduced it, and coping strategy related to some aspects of fighting behaviour.

Claudia Mettke Hofmann Personality

PERSONALITY IN A PARTIAL MIGRANT – THE BLUE TIT

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Individuals differ consistently in their strategy to cope with environmental challenges (termed personality). In facultative migrants this may include the decision whether to migrate at all, when to leave and may also influence behaviours on route. We investigated the influence of age, timing of migration (early, mid, late autumn) and morphological traits on a range of traits that can be related to personality, i.e. time to first feed in captivity, latency to touch a novel object on a perch (neophilia) and latency to feed at the feeding dish when a novel object was placed next to it (neophobia) in migrant female blue tits (Cyanistes caeruleus) captured at Falsterbo, southern Sweden. Neophilia and neophobia were tested after four days of habituation and experiments repeated after one week. Timing of migration had no effect on any of the measured traits. However, old and fat birds started to feed late. Also, on the 1st trial older birds were less explorative than younger birds. However, this relationship was reversed on the 2nd trial. Neophobia and neophilia were repeatable over time. The results suggest that young birds may be prepared to settle down in the first suitable habitat they encounter (hence their higher exploration), whereas older birds may have a particular destination and at least initially ignore sites on route.

Sandra Mikolasch Cognition

IT IS HARD TO SEE FOOD GONE: DO GREY PARROTS AND JACKDAWS RELY ON CAUSAL OR SOCIAL INFORMATION TO FIND HIDDEN FOOD?

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In a typical choice-by-exclusion task, subjects identify the location of hidden food after having seen the absence of food in an alternative hiding place. This ability may involve causal knowledge, if the location of the food is inferred. Only few non-human animals possess this ability. Recently, we found strong evidence for exclusion in grey parrots, but only limited evidence in jackdaws. Interestingly jackdaws and dogs may be prevented from relying on exclusion by their susceptibility to local enhancement, i.e. the manipulation of a hiding place by the experimenter may be a stronger cue than the causal information about the absence of the food. Due to the superior performance of grey parrots in the exclusion task, we would expect a stronger susceptibility to local enhancement in jackdaws than in grey parrots. Here, two pieces of food were visibly hidden under two cups. Then we either lifted one cup, showed the food to the bird and then put it back or we removed the food. Alternatively, we first showed one reward to the bird and then removed the other reward or vice versa. Surprisingly, both species had a preference for the last cup the experimenter manipulated, irrespective of whether it contained food or not. However, this effect was weaker if the birds had to wait for ten seconds after the presentation before they could make their choice. Taken together, the results suggest that jackdaws and grey parrots are both highly susceptible to local enhancement effects, and seeing an empty hiding location or the removal of a food reward influence the choice behaviour of grey parrots differently.

Eva Millesi Long-term consequences of early environment on behaviour

SOCIAL ENVIRONMENT AFFECTS JUVENILE DEVELOPMENT IN MALE EUROPEAN GROUND SQUIRRELS

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Effects of social factors on developmental processes in European ground squirrels (Spermophilus citellus) were investigated both in free-living and captive individuals. The latter were kept in outdoor enclosures, either with or without contact to older males. Stress load as indicated by fecal glucocorticoid levels was higher in the presence of older conspecifics and cortisol excretion was positively correlated with the number of aggressive interactions initiated by adult males. Furthermore, daily mass gain and structural growth rates during summer were lower in juveniles that grew up with contact to older males. In the field we were able to compare juvenile males living in different social environments. In the study area, population density changes led to different levels of intrasexual competition and female availability over a 7-year period. Adult sex ratio was highly female biased in low-density years. Body mass in juvenile males shortly before hibernation onset did not differ significantly between the two periods but at low density the males started to hibernate earlier in the season, indicating faster rates of growth and prehibernation fattening. Fecal glucocorticoid levels were significantly elevated in the high compared to the low-density situation. Overwinter survival rates were similar in both periods but at high density most yearling males remained sexually immature until the following year. In contrast, at low density almost all yearlings reproduced successfully. The results indicate potential effects of social factors that could act via resource competition and/or stress load caused by social conflicts.

Helene Möslinger Cooperation across species: cognitive processes, tolerance and efficiency

COOPERATIVE STRING PULLING IN WOLVES (CANIS LUPUS)

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Cooperation (i.e. two or more individuals acting together voluntarily to the benefit of at least one participant) depends on social relationships and may require certain cognitive abilities. In the wild, lions and wolves hunt together by taking complementary roles. To find out whether they understand the need and the role of a partner, experiments under controlled conditions are needed. Two wolves of the Zoo Schönbrunn, Vienna learned individually to pull a rope connected to one of two baited platforms in order to move them forward to reach a food. In the cooperative condition, two platforms were connected and both wolves had to pull, each on a rope in synchrony. In the control condition the wolves moved the platforms separately, so no synchrony was necessary. In both conditions either both or one platform was baited. The wolves solved the task irrespectively of one or two baited platforms. They synchronized their behaviour and both wolves started pulling later when the partner was not at the apparatus than when they were there together, indicating that they may recognize when a partner was needed. In the condition with only one food reward presented and the platforms not connected, the subordinate wolf did not pull on the unbaited side, but did so when cooperation was necessary to solve the task. The successful performance of the wolves in this pilot study was based on their behavioural flexibility. Because of our low sample size not all of our results are conclusive and alternative explanations are discussed.

Julie Morand Ferron Time & foraging

STABLE INDIVIDUAL DIFFERENCES IN BEHAVIOURAL PLASTICITY AND SAMPLING WHEN PLAYING SOCIAL FORAGING GAMES

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The ability to adjust behaviour to current conditions is a form of reversible phenotypic plasticity that has been studied under the optimality framework, and more recently by researchers exploring the idea of animal personalities. Recent studies reveal that individuals of a same population can differ not only in the value of a behavioural trait under specific conditions, but also in the extent to which they can adjust their behaviour over an environmental gradient (i.e. behavioural plasticity, or responsiveness). Why such individual differences in behavioural plasticity should arise and persist is not yet well understood; theoretical advances suggest negative frequency-dependence of payoffs to behavioural alternatives as an adaptive explanation. Evolutionary models of behavioural games predict that individuals should differ consistently in their plasticity within and across game contexts. These predictions have yet to be tested empirically and so we examine the behavioural adjustment of individual nutmeg mannikins (Lonchura punctulata), gregarious ground-feeding passerines, when playing two different social foraging games: producer-scrounger (PS) and ideal free distribution (IFD). We found significant individual differences in plasticity and sampling behaviour in each of the two games; these differences were consistent over different test conditions within a game (IFD) and persisted over 6 months (PS), but were not correlated from one social foraging game to another. The rate at which birds sampled alternative tactics was positively associated with seed intake in the PS game but negatively associated in the IFD. These results suggest that games with frequency-dependence of payoffs can maintain persistent differences in behavioural plasticity but that an important component of this plasticity is game- and/or group-specific.

Kim G Mortega Communication II

SEASONAL PATTERNS OF SINGING IN RELATION TO BREEDING IN THE COMMON NIGHTINGALE LUSCINIA MEGARHYNCHOS

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It has been shown that singing plays a crucial role for the establishment and maintenance of territories and in mate attraction. Seasonal patterns of song characteristics have been extensively studied, but little is known about how these patterns vary with mating status and phases of the breeding season. To address aspects of evolutionary adaptations in communication, I investigated whether and how seasonal patterns of different song characteristics were related to mating status and to the breeding stage in the Common nightingale, Luscinia megarhynchos. In this study, I examined several measures of song output based on data which I collected on 23 males of a Berlin population in 2008. In addition, I investigated variation in males' behavior during simulated vocal interactions in the course of the breeding season and whether this variation is influenced by the prospective mating status. The results of my playback experiments imply that mating status is a key factor affecting singing behavior in vocal interactions and that singing patterns like song overlapping and matching are used flexibly during vocal interactions. Furthermore, individual differences in response suggest that the motivational state and quality of a territorial male are important predictors of vocal response. Specific song characteristics of mated males do indeed change during the breeding season. Hence, differences between paired and unpaired males shed further light on the dual function of song and might help to identify song characteristics that might be crucial in territory defense from those that mainly serve to attract females.

Birte Mueller Parent-offspring

VARIANCE IN PARENTING TENDENCY? FOSTERING BEHAVIOR IN GALAPAGOS SEA LIONS

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Allosuckling is often considered misdirected, supposedly maladaptive care behaviour. Nevertheless, in pinnipeds fostering behaviour is frequently observed and attributed to 1) milk stealing where females make a recognition error or are unaware of the sucking event or 2) active acceptance of alien offspring. Whereas milk stealing may easily occur in dense population, it is challenging to explain why females should willingly foster alien offspring. The kin selection hypothesis (H1) predicts that females prefer to nurse close kin over unrelated offspring, the milk evacuation hypothesis (H2) proposes that females willingly evacuate surplus milk to alien offspring and under the parenting hypothesis (H3) inexperienced females nurse alien offspring to improve maternal skills. Here, we examined the fostering behavior of Galapagos sea lion (Zalophus wollebaeki) females during the pupping period of 2008. Females showed high site fidelity and clustered in kin groups. For reproduction, they aggregate on land in relatively low density and suckle their pup for up to 3 years. We observed several cases of milk stealing. One juvenile milk thief succeeded in obtaining milk from numerous females, and one female suckled up to 3 alien juveniles (H1+H2). We observed females suckling alien juveniles until parturition, but not thereafter (H1+H2), and females suckling alien newborns after death of own pup (H1+H2). These suckling pairs were still observed when offspring was aged 1 year and one female unknown to have given birth adopted a foreign pup for a minimum of 5 months (H3). Genetic data of 17 females (10% of all reproducing females) revealed that fostering is not primarily related to kinship. This study provides a prime example of intraspecific variation in female predisposition to nurse alien offspring.

Eugenia Natoli Consequences of an Urbanizing World

URBANIZATION AFFECTS DENSITY, SPACING PATTERN AND MATING SYSTEM OF FREE-RANGING DOMESTIC CATS

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Domestic cats differ for dispersal patterns, social organisation and mating systems according to resource distribution in different ecological contexts. The original pattern shown by the ancestor of the domestic cat, the wild cat, has been found in some extreme non-inhabited habitats where feral cats live solitarily at densities of fewer than 5 cats/km2, hunting on natural prey. They seem to be polygynous and no case of multiple paternity has been found. In rural areas, cats live at low density (100–300 cats/km2) on food distributed by human beings in low quantity and hunting on natural prey. A small number of territorial polygynous males defend access to females. However, sometimes females copulate with strange males which result in a low rate (20%) of multiple paternity. In remarkable contrast, in the urban environment free-ranging cats live up to 3000 cats/km2 and can form large multimale–female social groups sharing food and shelters provided by humans. A dominance hierarchy exists, but the alpha male is unable to monopolize the receptive females when they reproduce synchronously. A promiscuous mating system is observed with a high rate (80%) of multiple paternity. During the last 20 years, working on the differences found at the intraspecific level, we have produced evidence both in behavioural and genetical terms, that the inconsistency between tomcat investment in high dominance rank and the low reproductive success is due to the quick change of the environment, due to human influence: it has brought about that males still show competitive mechanisms that were functional in the original environment of adaptation, but not in the new context.

Sabine Nöbel Sexual selection

DO SAILFIN MOLLY MALES ADJUST SPERM TRANSFER TO MATE-CHOICE COPYING?

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Although there is good evidence that mate-choice copying exists in Poeciliids the fitness advantages of the copier and the individual which is copied are still unknown. Within the Poeciliids males produce sperm bundles containing 4000-5000 sperms. After a copulation males need at least two days to refill their sperm reserves. Poeciliid males are able to control sperm production and sperm transfer. Males can therefore decide how many sperm they transfer into which female. The two facts that sailfin molly males (Poecilia latipinna) are able to modulate and control sperm transfer during copulations and the fact that sailfin molly females copy each others mate choice of?fer males special options to maximize their reproductive success. In a typical mate-choice copying situation a male co?pulates with a female and some fertile females which are potential copulation part?ners observes this sexual interaction from nearby. We investigated whether males are able to adapt their sperm transfer to such a copying situation. If so, males should trans?fer less sperm to the copulating female partner when other females are present and save sperm for those fertile females. In the experiment males could physically interact with one female in a small tank when three fertile audience females were presented in a separate tank next to the couple. In a control the male could physically interact with one female without audience females. Sperm transfer was similar in both situations. This suggests that male sailfin mollies might not able to adjust sperm transfer to a mate-choice copying situation.

Paola Palanza The tradition of research in behavioral biology in Italy

ETHOLOGY IN PARMA: FROM ANTS TO MEN

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In 1975 Parma hosted the XV International Conference of Ethology, which followed the Nobel prize to Lorenz, Tinbergen and von Frisch and thus received high scientific and mass-media attention. This resulted in a general acknowledgment of ethology as a scientific discipline also in Italy and of Parma as a focal scientific centre for Italian ethology. At the foundation of the culturally rich and scientifically productive school of ethology in Parma was the collaboration between Luigi Luca Cavalli Sforza and Marisa and Danilo Mainardi in the '60s: an integration of population genetics, evolutionary theory and passionate interest for animal behaviour which profoundly influenced the flourishing of behavioural biology in Italy. The characteristic of the Parma ethology school was then the diversity of species under study either in laboratory or in the field, the comparative analysis and integrative approaches; the adaptiveness of behavior as well as how behavior developed, is controlled and evolved. I will try to give here an overview of the ethological studies conducted in Parma from the initial works on behavioural genetics in Drosophila, sexual preference and social learning in the House mouse, chemical and acoustic communication in fish, imprinting-like phenomena and social parasitism in ants, territorial behaviour in ungulates and orientation in birds, to the more recent researches on aggression, sex differences, endocrine disrupters and neurobehavioral development, social stress models, behavioural phenotyping of transgenic mice, ants as bioindicators of environmental quality, lateralization in lizards, social and cognitive behaviour of dogs, bioacustics, cognitive functions in monkeys, agonistic behaviour and social role in humans. Together with Pisa and Firenze, Parma founded the first Italian graduate program in behavioural biology and has since actively contributed to the education of many researchers in this field.

Riccardo Pansini Cooperation across species: cognitive processes, tolerance and efficiency

INCREASE IN SOCIAL DIFFERENTIATION IN WILD VERVET MONKEYS COOPERATING EXPERIMENTALLY

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To test how cooperation emerges when experimentally triggered, we studied the social dynamics of wild vervet monkeys (Chlorocebus aethiops) in South Africa. The cooperation experiment, which we ran repeatedly over three years, involved two or more individuals operating automated feeders. To test whether cooperation was attained according to market theory models, each group member was allocated to one of two classes. In turn, the feeders had to be handled simultaneously by a member of each class to return a shareable reward. Before the experiment, three groups of vervets were found to have a social network with a social differentiation relatively homogeneous, without clearly distinguishable social units. The stable partner associations observed before the experiment only partly predicted the outcome of forming cooperative partnerships. The relatively homogenous networks we observed before the experiment started differentiated under influence of the presence of the feeders. Most individuals preferred to cooperate with other specific monkey partners. Monkeys of opposite sex and age class tended to share food, whereas higher ranking individuals cooperated with other higher ranking ones, and the lower ranking did it among themselves. This study shows the key role that the dominance status holds when patchy food resources are available to a social primate group under the condition of cooperation. From relatively homogenous societies, the social networks of these observed vervet groups became more heterogeneous increasing the despotic access to food according to what generally predicted by socioecological models of primate societies.

Jesko Partecke Consequences of an Urbanizing World

EVOLUTIONARY CONSEQUENCES OF AN URBANIZING WORLD

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The human impact in the global biosphere now controls many major facets of ecosystem function. One of the most striking man-made environmental changes is the existence and rapidly ongoing spread of urban areas. Although ecologists used to dismiss urban areas as unworthy of study, they have recently begun to realize that cities provide an ideal theatre in which to see animals adjusting to novel environments at a pace rarely seen in the wild. Whereas ecological consequences of human-induced habitat alteration are receiving increasing attention, studies on evolutionary consequences of urbanization have only recently begun attracting significant interest. This is insofar remarkable because there is increasing evidence that human ecological impact has enormous evolutionary consequences and can greatly accelerate evolutionary change in species around us. In this talk I will focus on the European blackbird (Turdus merula) which is now one of the most common urban species throughout Europe. I will review what we know about changes in life history, morphology, physiology, and behavior following the colonization of urban areas. In addition I will elucidate to what extend the invasion of urban areas leads to micro-evolutionary changes due to altered and novel selection regimes in urban settings or whether these changes result from other mechanisms, e.g. phenotypic plasticity of individuals experiencing different environmental conditions. Finally I will address what we still need to do in order to better understand the proximate (mechanistic) and ultimate (evolutionary) processes of urbanization.

Gil Penha Lopes Behavioural ecology of keystone species

BEHAVIOUR AS A DRIVER OF ECOSYSTEM FUNCTIONING

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Wetland associated fauna species present diverse survival strategies and consequently behaviors, being able to colonize sediment surface but also the subsurface ecosystem. Usually they present one of three types of bioengineering modes (bioturbation). One of these groups are the epifauna bioturbators, which are organisms whose activities occur predominantly at the top sediment surface redistributing fine particles randomly over very short distances along the surface. The second group is called biodiffusive bioturbators, which are organisms that transport particles over short distance during their activity and gallery construction and maintenance. The last group is called regenerators, which are organisms that excavate holes, transferring sediment at depth to the surface. The excavated sediment is replaced by surficial sediments from both of the infilling of surface sediment and the collapse of burrow walls. Epibenthos and burrowing fauna will expose new surfaces to oxygen, increasing old and refractory organic matter degradation by efficient aerobic bacteria. They may also stimulate benthic bacterial biomass and activity through faecal pellet production and mucus secretion. Furthermore, the continuous mixing of the top layer by these organisms, will enhance carbon mineralization and nutrient cycling by improving sediment aeration and drainage (shifting carbon degradation pathways from anoxic/hipoxic to oxic) as well as by increasing surface areas for microbial activity.

Franck Péron Cooperation across species: cognitive processes, tolerance and efficiency

COORDINATION AND NEGOCIATION DURING A COOPERATIVE TASK IN AFRICAN GREY PARROTS

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African grey parrots (Psittacus erithacus) were tested on the four levels of cooperation defined by Boesch & Boesch (1989): Similarity, Synchrony, Coordination & Collaboration. We also carry out an experiment base on a negotiation game (Melis et al. 2009). We found that birds had the same goal, were able to wait for a partner and also to coordinate with him. Indeed, birds behaved according the social environment (partner availability) and the spatial disposition of the apparatus. Grey parrots also collaborate doing complementary actions but were not able to exchange their role. We observed that bird's personality and the social relationships between them influenced their performances. In the negotiation game birds behaved differently: Cooperation appears to be very flexible going from selfishness to altruism.

Kristina Pfannkuche Lateralised Behaviour

MATERNAL TESTOSTERONE AFFECTS SIBLING COMPETITION BUT NOT LATERALIZATION IN THE DOMESTIC CHICKEN

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In many animal taxa embryos are exposed to maternal androgens that may profoundly influence their development. Birds are excellent models to study this, because embryonic development takes place outside the mother's body, facilitating descriptive and experimental studies. Bird eggs contain substantial amounts of hormones and these amounts vary within and between clutches, depending on the environment during egg laying. Maternal androgens affect several behaviours of avian offspring, both in social and non-social domains. In a separated research field, that of lateralization of brain and behaviour, several hypotheses and findings suggest an effect of prenatal testosterone on lateralization. This opens the possibility that maternal androgens affect lateralization too, explaining perhaps its wide array of effects on behaviour. To test this we elevated maternal testosterone within the natural range before the onset of incubation in eggs of the domestic chicken (Gallus gallus domesticus). To validate the treatment we tested its effect on sibling competition. For testing the effects on brain lateralization, we measured the direction and strength of lateralization in a mealworm and social detour test, and a tonic immobility test. Males hatched from testosterone treated eggs showed more competitive behaviour than control males; no such effect was seen in females. This is the first evidence that maternal androgens may affect sibling competition in a precocial species. Lateralization in the detour and tonic immobility tests was not affected by our treatment, although chicks showed a significant right hemispheric population bias in all tests. Analyses of the lateralization of the sibling competition test are still in progress.

Marie Helene Pillot Sociality III

COLLECTIVE DEPARTURE AND INDIVIDUAL DECISION-MAKING IN SHEEP

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In gregarious species, where group composition is unstable, it is a challenge to understand which individuals take the decision to initiate movement and how a collective decision to follow emerges. Our experimental procedure is useful to control which individual initiate a movement allowing to quantify the following response of group members, according to the social context. We performed a series of experiments with Merino sheep (Ovis aries), a highly gregarious vertebrate. We show that trained sheep when stimulated initiate systematically a movement, and triggered a collective movement of 1, 3, 5 and 7 naïve group members. Each potential follower was thus exposed to various stimulating combinations of already moving and still unmoving individuals, depending on its rank of departure. Trained ewes when departing simply raised their head and move readily toward a visual target. Our results suggest that, provided they exhibit this social cue, any individual in a group could trigger a collective movement, turning itself an incidental leader. We also found that sheep individual decision to move is based on a balance between the number of moving and unmoving individuals. Sheep follow a law based on a double mimetic effect: attraction to committed and attraction to uncommitted individual.

David Queller Recognition systems and social organization

CROZIER'S PARADOX AND GENETIC KIN RECOGNITION IN A SOCIAL AMOEBA

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The evolutionary stability of genetic kin recognition systems is not well understood. Highly variable cue loci are required, but using them for altruism selects against cue variability, a problem known as Crozier's paradox. Our model of kin recognition includes alleles at a perception locus can accept or reject specific cue alleles. The model shows how multiple cues can be maintained in populations, though it does not appear to explain how rare cue alleles are initially favored. We have studying kin recognition in a system that is genetically tractable, the social amoeba Dictyostelium discoideum. These amoebas, when starved, join together to make a fruiting body in which 20% die in order to produce a stalk that aids the dispersal of the others. This altruistic sacrifice is vulnerable to exploitation by cheaters, but cheating can be limited by high relatedness. Relatedness is very high in natural fruiting bodies, and laboratory tests show that this is partially due to segregation of different clones into separate fruiting bodies. Subsequent work identified two genes, tgrB and tgrC, that are involved in this kin recognition. They are adjacent to each other on the chromosome and co-expressed early during the development of fruiting bodies. Their proteins are both anchored in the cell membrane and have extracellular portions have immunoglobulin-like domains consistent with functions like recognition and adhesion. Replacement of native alleles at the two genes with alleles from another strain alters the segregation behavior. Both genes are extremely variable genetically, as expected under balancing selection. Evidently, D. discoideum has solved Crozier's paradox, maintaining variation at kin recognition loci.

Lynn Ranaker Behavioural ecology of keystone species

BATTLE BETWEEN TWO PISCIVOROUS FISHES – WHO WILL WIN AS THE AQUATIC OPTICAL PROPERTIES CHANGE

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Visually oriented predators rely on environmental optical properties for foraging success. During the last three decades, northern temperate-region lakes are increasing in humic contents, and this brown colouration of the water deteriorates the optical prerequisites for visually foraging piscivores. Interestingly, the increased brown colouration seems to be a relative benefit to piscivores that rely on multiple senses when foraging, at the expense of strict visual predators. Such comparisons of relative abundances of predator types have hitherto not been accompanied by evaluation of the effects of brown colouration at the mechanistic, predation-event level. Our results show that the mainly visually foraging pike's ability to detect and predate prey decreases with deteriorated visual range in brown water, while this is not the case for pikeperch that forage using multiple senses. This difference is tightly linked to the relative reaction and strike distances of the predator species, as degraded optical qualities impose negative effects on foraging through the longer distances generally displayed by pike. Short reaction and strike distances also benefit pikeperch via altered prey activity and escape tactics in brown water. Hence, piscivore assemblages and relative foraging efficiencies are expected to change with increased brown colouration, with consequences for trophic interactions.

Markus Rantala Sexual selection

PREFERENCE FOR HUMAN MALE BODY HAIR CHANGES ACROSS THE MENSTRUAL CYCLE AND MENOPAUSE

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It has commonly been considered that women's preference with regard to male body hair changes over the years according to fashion, and is influenced by the media. Experimental evidence, however, is currently lacking. We examined the effect of male torso hairiness on Finnish women's attractiveness ratings by presenting pictures of male torsos before and after the removal of body hair. We found that the women's preferences correlated strongly with the hairiness of their current partners, suggesting that body hair may play a role in actual mate choice. We also found that when the women's fertility was at its highest they preferred males with less body hair, and that post-menopausal women demonstrated stronger preferences relating to male body hair than did pre-menopausal women. Previous studies have found that when fertile in their cycles, women are particularly sexually attracted to masculine features in men, which are suggested to be indicators of genetic quality. Our study suggest that in the fertile period of their cycle Finnish women prefer more the trait that is current Western ideal of male beauty (hairlessness) than the trait that is traditionally (but incorrectly) seen as a symbol of masculinity. Interestingly, the hairiness of the women's fathers correlated positively with that of their current mates. This suggests that women's preferences as to male hairiness may be partly the result of sexual imprinting on paternal body hair, and/or that this preference is heritable.

Lucia Regolin Lateralised Behaviour

LOGICAL REASONING IS BEST WITH A LATERALISED (AND SOCIAL) BRAIN. THE CASE OF TRANSITIVE INFERENCE IN THE DOMESTIC CHICK (GALLUS GALLUS)

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Social animals which establish stable hierarchies require sophisticated cognitive abilities. They need to recognize other individuals and to have the capacity to deduce their own status (or their conspecifics') on the basis of observed interactions between other individuals using a form of logical reasoning. Brain lateralization is also linked to the selective pressures associated with social life. We investigated transitive inference learning in a bird species which forms social hierarchies, the domestic chick, in order to determine if this may be related to the possession of a lateralized brain, and if this ability is performed differently in the two hemispheres. Lateralization was manipulated by exposing eggs to light before hatching, which leads to the development of lateralization of some visual functions. Chicks with strong (Light-incubated, Li-chicks) or weak (Dark-incubated, Di-chicks) lateralization were trained to discriminate stimulus pairs, in order to build a hierarchy (A>B>C>D>E), and were subsequently tested on stimulus-pairs never seen before (AE & BD). Li-chicks performed the discrimination BD better than did Di-chicks. Moreover, lateralized chicks using their left eye only (right hemisphere) during test showed a better performance than did right eye-only (left hemisphere) chicks on the BD task. Females also tended to perform better than males. Results demonstrate that chicks with lateralized brain hemispheres show greater inference and this is under right hemisphere control, the brain hemisphere that is dominant in social interactions.

Rizaldi Sociality I

PATTERNS OF AGONISTIC INTERVENTION IN THE PROCESS OF MATERNAL RANK INHERITANCE AMONG INFANT JAPANESE MACAQUES

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Previous studies have assumed that aggressive interventions by mothers and other individuals are the main factor determining which of their peers infants can outrank. However, this assumption has been questioned because of the rarity of interventions and that they usually occur after dominant infants had received a submissive signal from opponents. In fact, infants of higher-ranking mothers have been reported to acquire maternal rank from the onset of their own aggressive interactions. Here I analyzed patterns of intervention during the process of rank inheritance in a captive group of Japanese macaques (Macaca fuscata) consisting of 36 individuals, including 10 infants born in 2008. I differentiated between aggressive intervention (intervener threatens or attacks the infant's opponent) and submissive intervention (intervener retrieves or gives a submissive signal to the infant's opponent). Mothers and other individuals interfered in 20.8% out of 1451 conflicts involving infants. Aggressive interventions on behalf of infants did not significantly correlate with their attainment of dominance, but lower-ranking mothers performed submissive interventions on behalf of their infants significantly more often than higher-ranking mothers. Thus, submissive interventions could be an important source of observation learning for infants of both low and high ranking mothers. These results suggest that infant monkeys are able to 'recognize opportunities' through observation learning, and that they can respond appropriately to signals provided by their mothers during the rank acquisition process.

Sarah Roberts Recognition systems and social organization

DARCIN: A MALE PHEROMONE THAT STIMULATES FEMALE MEMORY AND SEXUAL ATTRACTION IN THE HOUSE MOUSE

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Pheromones in scent play a critical role in mediating reproductive interactions and sexual attraction in many mammals. In mice, males deposit numerous urine scent marks around their territories, continually refreshing their scent and countermarking any scent marks from competitor males. These urine scents contain both sex- and individual-specific volatile and involatile components. Females spend more time near male than near female urine when able to contact the scents. However, they are only attracted to airborne urinary volatiles from individual males whose urine they have previously contacted. Even females with natural exposure to many males and females fail to develop generalised attraction to airborne male scents. This implies that information gained through contact with a specific male's urinary scent is essential to stimulate attraction. We separated male urine into different fractions using anion exchange chromatography, and analysed each fraction using mass spectrometry and bioassay of response. Female sexual attraction to male scent was due to a single fraction containing a male-specific protein pheromone that we named darcin. Heterologous expression of recombinant darcin and other major urinary proteins confirmed that darcin elicits attraction even when presented alone. Importantly, nasal contact with darcin also elicits the learned attraction of females to airborne volatiles from individual males. Darcin is thus a mammalian male sex pheromone that stimulates an adaptable response to individual-specific odours through associative learning and memory, allowing female sexual attraction to be inherent but selective towards particular males.

Elva Robinson Cognitive abilities of invertebrates

DO DECISION-MAKING ANTS COMPARE ALTERNATIVES?

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Many vertebrates can perform the cognitively complex task of comparing multiple alternatives when making a decision. This ability is less well-known in invertebrates. Until recently, one invertebrate example was thought to be the rock ant, Temnothorax albipennis, which was thought to make direct comparisons between available nest sites, and choose the best site. However, by using radio-frequency identification (RFID) technology to identify individual ants during the nest choice process, we found that behaviour previously described as 'comparison' could be more parsimoniously explained using a sequential search process, in which ants simply accept or reject a nest based on an internal threshold. This threshold hypothesis forms a simple yet sophisticated mechanism for collective decisions, without requiring the ants to remember nest quality. We used a Monte-Carlo model of threshold-based decision-making to demonstrate that this mechanism can account for the previously described apparent comparison behaviour. We empirically tested the predictions of our model using a nest-choice scenario specifically set up to distinguish between the comparison method and the threshold method. The observed ant behaviour matched the predictions of the threshold model, and did not show any support for the comparison hypothesis. Our results strongly suggest that ants do not use the cognitively complex process of comparing alternatives, however by combining simple threshold-based behaviour of individuals, the ant colony can nevertheless choose the best nest from a range of alternatives.

Albert Ros Effects of immunity and oxidative stress on behavioural ecology

IMMUNITY AND OXIDATIVE STRESS IN BEHAVIORAL ECOLOGY: RESULTS AND INSIGHTS FROM SPECIES WITH ALTERNATIVE REPRODUCTIVE TACTICS/STRATEGIES

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In the last two decades, much work has been done on detecting physiological mechanisms linking parasite resistance with sexual selection. The impetus for this work was Folstad and Karter's immunocompetence handicap hypothesis of 1992, which postulated that secondary sexual traits are honest signals of parasite resistance because testosterone, which is necessary for the development of these traits, also suppresses the immune system. Whereas most tests have consisted of comparisons between males and females, the same ideas should apply, and perhaps be more appropriately tested in species with alternative reproductive tactics/strategies. However, work in species with alternative tactics, in the ruff and in blennies, has not provided strong support for the hypothesis. We propose that androgen variation might not result in a pleiotropic effect on immunity and sexual traits because of the plasticity in steroid metabolic pathways, which would result in a flexible regulation of the immunocompetence trade-off. Alternatively, the causality of the trade-off might be very different: 1) variation in androgen levels might be a consequence rather than a cause of life history stage related variation in activation of the immune system; and/or 2) both are unrelated but co-vary with a factor that is related to life history. A similar framework could be used to examine oxidative stress, which is linked to energy metabolism, immune function and traits that play a role in sexual selection.

Angela Sacchi Behavioural ecology of keystone species

ASSESSING THE ECOTOXICOLOGICAL EFFECTS OF COMPLEX CONTAMINANT MIXTURES IN DELTA PO RIVER USING BURROWING RESPONSES IN TAPES PHILIPPINARUM

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The Po river flows through one of the most densely populated and productive agricultural and industrial regions of the country, by influencing the inputs of freshwater quality flowing to aquatic systems of deltaic costal lagoons. Their ecological status is affected by the quality of inland waters, a complex mixture of environmental contaminants. In costal lagoons a wide range of compounds are present in complex mixtures, stimulating a variety of toxicity mechanism; currently numbers of bioindicators allow assessment of the status of organisms under stress caused by anthropogenic or natural contaminants. Clams Tapes philippinarum have been widely used as bioindicator organisms, tool for indirect description of their habitat quality within the costal-marine environment. This study aimed to evaluate the impact on clams from three farming sites, with different environmental conditions, in Sacca di Goro Lagoon, Delta Po river. Take into consideration the non-specific responses to general stress, evaluated physiologically (condition index) and in the burrowing behaviour, which have been aimed to be indicators of chronic stressful environmental conditions. Individuals of T. philippinarum were exposed to reference sediment, and their rate of reburrowing measured and used as ecotoxicological effects response. Surface sediment sample were collected using Van Veen Grab from sample site in Goro harbour, Po Volano inflow (Po river plume) and a control site. Sediment characterization and chemical analysis for selected contaminant classes (metals, ? PAHs, ? PCBs) were performed, since is well established that sediment act as sink for a variety of contaminants.

Norbert Sachser Variation in fitness consequences of mammalian sociality

THE SOCIAL MODULATION OF BEHAVIOURAL PROFILES AND REPRODUCTIVE STRATEGIES DURING EARLY PHASES OF LIFE AND ADOLESCENCE

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Members of the same species can live under different social conditions and, over the lifetime individuals may find themselves in varying situations. The adjustment to a specific social environment can not only be achieved by genetically inherited programs, but in addition, epigenetic mechanisms for rapid adaptation exist. The stability of the social environment can vary considerably and, in particular during pregnancy and lactation, is of major importance for the behavioural profile of the offspring in later life. Social instability during these critical periods of development generally brings about a behavioural and neuroendocrine masculinisation in daughters and a less pronounced expression of male-typical traits in sons. These effects of the social environment are likely to be mediated by maternal hormones and/or maternal behaviour and may help to adjust the offspring to the conditions under which the mother lives. Adolescence is another period in which behavioural profiles and reproductive strategies can be shaped by social influences. For example, the involvement in many agonistic interactions during this time can predispose for a “queuing strategy” at high population densities, whereas few social interactions at low densities facilitate a “resource defence” strategy. Concerning underlying mechanisms, a central role of gonadal and adrenocortical steroids has been suggested. During adolescence, earlier influences on behaviour may not only be confirmed and/or complemented but also readjusted to meet current environmental conditions. Hence, the social modulation of behavioural profiles and reproductive strategies from the prenatal phase through adolescence appears to represent an effective epigenetic mechanism for repeated and rapid adaptation.

Gul Deniz Salali Sociality III

DOES THE WINNER ALWAYS TAKE ALL? SOCIAL CONTEXT CAN CHANGE EXISTING DOMINANCE HIERARCHIES IN SHORE CRABS

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Dominance relationships often are formed as a result of competitive interactions among individuals living in a group. Formation of a stable dominance hierarchy has significant consequences on group members' fitness values, as high-ranking individuals often pay an initial price to gain subsequent access to resources not available to low-ranking members. Dominance relationships can be affected by individual attributes such as size, age, and gender, as well as by complex social interactions among individuals. Understanding how social context affects dominance relationships plays a vital role in understanding the nature of how groups are formed and maintained. These complex social interactions often limit the ability of typical analysis methods to explain behavioural interactions between members while considering the larger context of the group itself. Social network analysis (SNA) has emerged as a promising tool to analyse just such relationships. Here we report the effects of social context on the establishment and maintenance of dominance hierarchies in the European shore crab, Carcinus maenas, using SNA for detailed behavioural observations. We used a fusion:fission protocol, merging two stable groups into one large assemblage, allowing a new hierarchy to form, and then separating individuals back into their respective pre-fusion groups. We then compared how social context and recent experience affected the individual's dominance rank within the group, and described the change in the dominance relationships as a function of interaction patterns among individuals, as well as the overall network structure.

Christian Schloegl Cognition

THE PARROT AND THE STRING: ATTENTION, MOTIVATION, AND EFFICIENCY IN A STRING-PULLING TASK

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The string-pulling paradigm is a well-known experimental procedure. In birds, corvids and parrots are particularly skilled in this task, as a variety of species of both taxa instantaneously pull up strings to obtain a reward attached to the string; they even do so if repeated sequences of pulling and stepping on the string are required. So far, this paradigm has been used mainly to investigate means-end-understanding and "insight", but little is known about motivational aspects and if the subjects are attentive to their efficiency in solving this task. We here investigated the selectivity of several species of parrots in variations of the string-choice paradigm. In three conditions, the subjects had the choice between a string holding a preferred food type and another string being either i) empty or ii) holding non-food or iii) holding a non-preferred food type. In two further conditions, both strings hold the preferred food type; here, the birds either had the choice between one string to which the food was attached at the end and one string to which the food was attached in the middle of the string; or, the birds could choose between two strings of different length. In all conditions, the birds preferred the string holding the preferred food type and they preferentially selected those strings at which the food was easier to obtain. If they corrected their initial choices, the birds switched to the preferred strings. In summary, this suggests that parrots are clearly motivated to select the most rewarding string and to choose the food which can be obtained most efficiently.

Christine Schwab Sociality I

EXCEEDING THE PAIR BOND: SOCIAL STRUCTURE OF JACKDAW NETWORKS

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Long-term monogamous pair bonds are often considered the core of social structure in flocking avian species and jackdaws, Corvus monedula, are no exception. However, little is known about social relations in juvenile and subadult birds as well as the social structure of colonies beyond the pair bond. Here we address these questions and also ask whether the widespread assumption that spatial association is a proxy for social preference is valid for jackdaws. We apply social network analysis to examine the social structure of a captive colony of jackdaws in 3 interaction contexts: 1-agonistic, 2-sociopositive, and 3-spatial association. Observational data were taken for 10 months and divided into 3 periods: juvenile, subadult, and adult. Results show that individuals in network 1 are densely connected in all three periods. Colony members interact with virtually all other conspecifics, but interactions are unidirectional with males initiating more interactions than females. In constrast, network 2 is only sparsely connected and individuals have considerably less interaction partners. Interactions are highly reciprocal and occur preferentially between pair partners in adult birds and between nestmates in juveniles and subadults. Both sexes initiate interactions to a comparable extent. Finally, network 3 displays a similar social structure as network 2 (reciprocal interactions between pair partners and nestmates) but shows a density as high as network 1. Hence, spatial assocation reflects social preference in jackdaws and our results demonstrate that juvenile and subadult jackdaws show as complex social relations within their colony as do adult birds.

Dirk Semmann Cooperation across species: cognitive processes, tolerance and efficiency

COOPERATION ENHANCING EFFECTS OF DYNAMICAL SOCIAL NETWORKS IN HUMANS

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Human cooperative behavior is still in many aspects an evolutionary puzzle since defectors often benefit from cooperative interaction without bearing the costs of cooperators. Well-known mechanisms that promote cooperation between unrelated humans are for example punishment, direct and indirect reciprocity. In addition, spatial structure has in theory been shown to have a positive effect on cooperative behavior. However, spatially structured social networks are static. Lately theoretical research has focused on dynamical social networks which are predicted to enhance cooperation even further. We present an experimental study where humans played prisoner's dilemmas with multiple partners simultaneously. We compare groups playing on a static network to groups playing on a dynamical network. In the dynamic network groups the players had the option to actively end their social links to their partners after each prisoner's dilemma interaction. We show that cooperation is higher in the dynamic network setting and that the theoretical prediction of cooperative links being long-lived in comparison to links that include defectors holds. Additionally, we show that cooperative clusters are forming in dynamical networks through which defectors can be held at bay.

Riccardo Simoni Parent-offspring

RELATIONSHIP BETWEEN EMBRYOS AND CARRYING MOTHERS IN AMPHIBIOUS CRABS: THE CASE OF ARMASES MIERSII

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The correct development of embryos included into a mass of eggs depends upon peculiar micro-environmental conditions. In masses held under water, the main problem seems to be the oxygenation of the internal parts of the mass itself, which is known to cause delays in the growth of embryos in fish, snails and frogs. Brachyuran crab females carry an adherent mass of eggs on their abdomen for many days, till the hatching of swimming larvae. In aquatic species, the problem of anoxia within the masses is overcome by means of parental-care behaviours such as the flapping the abdomen, that allows oxygenated water to reach the internal embryos. In semi- and terrestrial crabs, however, the challenges due to the aerial environment, namely desiccation, changes in salinity, UV radiation, large temperature variability and reduction of mechanical support, are mainly coped by berried females, who control the micro-environment and give mechanical support of embryos. Nevertheless the 30-fold abundance and 10.000 times higher diffusiveness of oxygen in air with respect to water could give the opportunity to adopt aerial respiration and reduce the problems described for marine species and consequently of the carrying mothers. To highlight the relationship between the physiology of embryos and the behaviour of the carrying mothers, we performed a series of experiment on the influence of microenvironment on the development of the embryos of the semiterrestrial Jamaican crab Armases miersii. The reproductive success of ovigerous females kept away from water for l8 hours per day proved to be significantly lower than the one of control females, who could choose their microhabitat. The lower respiration rate in air than in water recorded for A. meirsii embryos confirmed that these embryos are still water dependent. These results were discussed in terms of ontogenetic adaptations to terrestrial life, in the light of recent results obtained with embryos of other terrestrial/arboreal species.

Carina Siutz Time & foraging

FORAGING BEHAVIOUR AND HIBERNATION PATTERNS IN MALE AND FEMALE COMMON HAMSTERS

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Common hamsters are hibernators that can use both body fat reserves and food caches during winter. Male hamsters have larger home ranges than females, frequently switching between several burrows during the reproductive period when searching for mates. Female hamsters are more philopatric and can raise up to three litters per season. We investigated relationships between foraging behaviour and hibernation patterns in free-living Common hamsters (Cricetus cricetus) in Vienna. We applied capture-mark-recapture and focal-animal-sampling techniques. Body temperature during winter was recorded by subcutaneously implanted data loggers (iButtons). Males were regularly observed feeding above-ground but rarely showed food-hoarding behaviour. In contrast to males, females almost exclusively cached food in their burrows. Hibernation patterns also differed between the sexes. Preliminary results demonstrated regular hibernation patterns with alternating torpor bouts and euthermic phases in males. In females, hibernation patterns varied between individuals and appeared to be related to previous reproductive output. Females with more litters per season remained euthermic for extended periods and spent less time torpid during winter than individuals with lower reproductive success. The results indicate trade-offs between acquiring mates and building up food stores in males and between maternal effort and the allocation of body fat reserves in females.

Marta Soares Endocrinology of cooperative behaviour

DOES THE USE OF TACTILE STIMULATION BY CLEANERFISH HAS A ROLE ON ITS CLIENT FISH STRESS RESPONSE?

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The use of tactile stimulation by cleaner fish species has so far only been described in the genus Labroides. This highly adapted behaviour occurs when clients visit cleaners' territories; however, instead of solely removing clients' parasites, these cleaners may also choose to touch clients with their pectoral and pelvic fins in an oscillating "dancing" routine (e.g. usually referred as massages). Cleaners are known to manipulate client decisions with this behaviour (as they gain access to a food source) serving as: 1) a pre-conflict management strategy, 2) a reconciliation mechanism and 3) to make clients that are unwilling to interact, stop for inspection. However, for clients, direct benefit seems more elusive and controversial. In this study, we aimed at linking tactile stimulation given by the Indo-Pacific bluestreak cleaner wrasse Labroides dimidiatus to their customers, to a physiological correlate, namely to the reduction of client stress response. We found that clients with access to tactile stimulation had generally lower cortisol baseline levels than those without access to massages. Moreover, when submitted to a confinement test, clients with massage access exhibited lower cortisol responses. Our study provides the first evidence of direct fitness benefit for clients derived from cleaners' application of tactile stimulation.

Jeffrey Stevens The representation of space, time and number in animals

SPATIAL DISCOUNTING IN FISH: THE CONVERGENCE OF SPACE, TIME, AND NUMBER

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In temporal discounting, animals subjectively trade off time and number by choosing between a smaller reward available sooner and a larger reward available later. A parallel choice can apply over space when animals choose between smaller, closer and larger, more distant rewards. Most studies of temporal and spatial discounting use food as their reward, and we do not know if animals trade off other rewards in similar ways. Here, we offered guppies (Poecilia reticulata) a spatial discounting task in which we measured their preferences for the larger reward as the distance to this reward increased relative to a close, smaller reward. We varied whether the reward type was food or social partners to test whether the fish discounted reward types differently. We found that the fish switched their preferences from the larger to the smaller reward as the distance to the larger reward increased, but this did not differ across the two reward types, even after equating their values. Therefore, our initial results suggest that the fish had a similar spatial discount rate for food rewards and social partners. More reward types and reward amounts should be tested to investigate the domain specificity of discounting.

Mareike Stowe Audience effect

DOES FAMILIAR AUDIENCE FACILITATE NOVEL OBJECT EXPLORATION? A STUDY IN GREAT TITS (PARUS MAJOR)

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The Netherlands Social context can enhance exploration of novel objects/food, but may also delay approach to novel objects and the intake of novel food. Audience effects and social relationships may contribute to explain this ambiguity. We conducted novel object tests with juvenile great tits of lines selected for fast and slow exploration under different social conditions: alone or in dyadic combination with a familiar/unfamiliar audience. The audience varied in sex (same/opposite) and personality type (same/opposite line). Birds were put in adjacent housing cages separated by wire mash. After 6min to inspect the audience a novel object was fixed inside the cage, opposite the side of the audience. We videotaped the behaviour of both birds for 5min. When alone, slow birds approached novel objects significantly later than fast birds. When with a familiar bird as audience this difference vanished. Hence, in slow birds the audience of a familiar bird enhanced approach to and exploration of novel objects. In contrast, fast birds tended to spend more time close to novel objects with an unfamiliar audience than with a familiar companion. Males tended to spend less time close to the novel object when together with an opposite sex audience. While familiarity and sex of the audience affected the exploratory behaviour, line did not. Results illustrate that fast and slow explorers differ in their response to social context. We discuss these results with regard to sub-group composition in foraging flocks and producer-scrounger relations.

Georgine Szipl Communication II

COMPLEXITY AND INDIVIDUALITY IN THE CONTACT CALLS OF JACKDAWS

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Recent research suggests that social complexity can be reflected in communicative complexity in birds. Variable flock composition may require more variation of calls to communicate more information and to facilitate acoustic individual recognition of all members. Jackdaws (Corvus monedula) live in complex social societies, form lifelong monogamous pair bonds, and establish a linear dominance hierarchy. They forage and breed in flocks and utter contact and separation calls to maintain group cohesion. We recorded these calls of foraging and perching juvenile and adult jackdaws and measured several parameters (e.g. call duration, mean pitch). Discriminant function analyses (DFA) were applied to test whether contact and separation calls show sufficient individual variation in acoustic characteristics to enable vocal individual recognition. We further compared call repertoires of juveniles and adults to see whether repertoire sizes changed with age. The results showed that one and two-year-old adults used in total four contact call types and one separation call. Each adult had one to three contact call types in its repertoire. Juveniles only uttered two different contact calls. DFA further revealed that individuals could be clearly distinguished by these calls via temporal and structural parameters. Our results indicate that the acoustic structure of different calls could be used by jackdaws to recognize members of their flock individually. Also, the higher number of contact calls in the adults' repertoire indicates increasing vocal variation with age and supports the assumption that vocal complexity may be associated with a complex social organization.

Michael Taborsky Cooperation

DIRECT AND INDIRECT FITNESS BENEFITS OF PHILOPATRY AND COOPERATIVE CARE IN AMBROSIA BEETLES

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Reproduction of ambrosia beetles is characterized by extended parental care and colonial breeding. The social behaviour has not yet been studied in this group, despite its outstanding suitability to serve as model system for the study of the significance of genetic and environmental factors in the evolution of cooperation and advanced sociality. We studied the parental and alloparental behaviour of two species of the haplodiploid Xyleborina (Curculionidae: Scolytinae) and estimated fitness effects to distinguish between the potential importance of individual and kin selection. We show experimentally that philopatric females bear direct fitness costs from alloparental care in their natal gallery, which leads to a reduced reproductive output after dispersal and foundation of an own nest. However, philopatric females may sometimes breed within their natal gallery, thereby gaining direct fitness benefits. Indirect fitness benefits of alloparental care seem to be important as well: all colony members cooperate in gallery maintenance, brood care and fungus farming, with various task specializations among individuals of different status and age. This polyethism is reminiscent of the behaviour of the socially most highly-developed hymenoptera and represents an advanced level of sociality in Coleoptera.

Barbara Taborsky Long-term consequences of early environment on behaviour

SOCIAL COMPETENCE ACQUIRED BY EARLY SOCIAL EXPERIENCE

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Social competence describes the ability to respond appropriately to a social challenge. It is favoured by natural selection if it helps to obtain or maintain resources successfully and is hence especially important in species with complex social organization. In humans, children growing up in more complex social structures acquire better adult social competence, which may reflect a general pattern in animals. An experiment in the highly social, cooperatively breeding cichlid fish Neolamprologus pulcher revealed that young raised in the presence of guarding parents performed more social behaviour than groups of siblings raised without parents. After being transferred to a neutral environment lacking adult conspecifics the fish were socially challenged at different life stages both in a known context (sib-sib competition) and in a context never encountered before (integration in a new family). Fish raised with parents showed more adequate social behaviour in the different situations and/or used social behaviour more economically. Most remarkably, they differentiated between opponents with different raising history, which was not the case for young raised in the absence of parents. The suite of improved social skills in N. pulcher raised with older fish is in accordance with the four major factors defining human social competence. Under natural conditions social complexity during ontogeny is often determined by the natal group size. Here I compare the behaviour between N. pulcher that grew up in small or large families. Moreover I discuss the underlying mechanisms, possible involved trade-offs and the functional importance of an enhanced acquisition of social skills in highly social species.

Colby Tanner Sociality III

RESOURCE DISTRIBUTION AND INDIVIDUAL PERSONALITY COMBINE TO INDUCE SOCIAL (AND ANTI-SOCIAL) BEHAVIOUR IN SHORE CRABS

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Living in groups provides members with many benefits as well as costs. In social species, population structure often accentuates the benefits or reduces the costs, allowing individuals to operate in ways that would otherwise be sub-optimal. Non-social species, however, often lack such population structure, and costs outweigh the benefits of group living. Insight into how population structure develops, therefore, plays a vital role in understanding how social behaviour evolved in some species but not others. Here we provide evidence that social behaviour and complex population structure can be induced in non-social animals in response to a combination of individual character traits and resource distribution. Using the European shore crab, Carcinus maenas, we show that: 1) individual crabs differ in their exploratory behaviour, 2) if food is difficult to find, individuals with low exploratory behavior will persist in stable sub-groups, despite persistent aggression between members, 3) high-exploratory individuals do not join groups, but rather connect sub-groups of otherwise disconnected individuals within the population, and 4) grouping by low-exploratory individuals enhances their ability to find food relative to high-exploratory individuals in the population. These results show that shore crab behaviour is flexible enough to produce a shift in population structure, according to differences among individuals within the population, that allows less effective foragers to compensate by modifying their behaviour. Furthermore, these results provide a simple and robust scenario in which social behaviour could evolve.

Sabine Tebbich Long-term consequences of early environment on behaviour

ARE WOODPECKER FINCHES FROM AN UNPREDICTABEL ENVIRONMENT MORE FLEXIBLE?

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Behavioural flexibility enables animals to react to changes in the environment and is thought to be a major factor in evolution. It may facilitate the discovery of new recourses and the subsequent acquisition of new behavioural patterns to exploit them. This in turn may expose populations to novel selective forces and facilitate adaptive radiation. Darwin's finches are a textbook example for adaptive radiation. They are fast learners and show a whole range of unusual foraging techniques, very likely as a result of their behavioural flexibility. In this study we aimed to test whether unpredictability of the environment could be driving flexibility. We compared behavioural flexibility of woodpecker finches (one of 15 Darwin's finch species) from a dry area, where food is limited and seasonal, with individuals from a cloud forest where food is abundant year-round. As parameters for flexibility, we used reaction to novelty, the ability to reverse a previously rewarded behaviour (reversal learning) and performance in a novel operant task. The results on different tests for reaction no novelty were ambiguous: woodpecker finches from the arid zone were slower to feed from their feeding dish when a novel object was nearby but were more likely to touch a novel object in their environment. We found no differences between the two populations in their performance in the operant task but individuals from the dry habitat were significantly faster in reversal learning than their conspecifics from the cloud forest. This supports notions from a previous study that the unpredictability of the dry costal areas of the Galapagos played an important role in the evolution of unusual feeding techniques.

Sandra Trigo Effects of immunity and oxidative stress on behavioural ecology

ARE CAROTENOIDS REALLY THAT IMPORTANT?

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In birds, carotenoid-based coloration is one of the most important sexual signals. An imunostimulatory and antioxidant function has been attributed to carotenoids. However, in recent years these functions have been questioned. Here, we experimentally manipulated carotenoid intake and measure the effects on the carotenoid-based plumage coloration, immune system, blood carotenoid levels, physical condition and female mate choice. Males with carotenoid supplement had higher levels of blood carotenoids, higher immune response (PHA-P and SRBC immune challenges) and are brighter than males with no supplement. These results confirm the hypothesis that plumage coloration can function as quality signals.

Fritz Trillmich Parent-offspring

WHO DETERMINES FLEDGING IN THE ZEBRA FINCH?

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Theory predicts parent offspring conflict about parental care. Often such conflict may become particularly evident with changes in parental care pattern, such as weaning or fledging. We studied in Zebra finches (Taeniopygia guttata) who decides about the timing of fledging: parents or offspring. By cross fostering young of different ages we created a situation where parents could shorten or had to increase the time feeding young in the nest. Parents were found to care for young as long as they were in the nest whereas young fledged independent of conditions always around day 19-20. Our data prove that young decide about the timing of fledging independent of the duration that parents had cared. Earlier fledging of older cross-fostered chicks did not lead to a change in the duration of post-fledging care. We conclude that chicks are selected to leave the dangerous nest as early as developmentally possible to avoid prolonged exposure to predators that may present a greater danger inside than outside the nest. Apparently parents can rely on this decision to the extent that they do not need a mechanism to enforce timely fledging of young.

Valentina Truppa Cognition

RELATIONAL LEARNING BY CAPUCHIN MONKEYS (CEBUS APELLA)

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Relational learning, i.e. the ability to compare objects to one another and to judge the relationship between them according to rules, has been scarcely investigated in New World monkeys. Typically, relational learning has been assessed by requiring monkeys to judge whether two items are physically the same or different. In this study, we used tasks involving relations of increasing level of abstraction to assess the extent to which tufted capuchin monkeys (Cebus apella) use same/different concept. Six capuchins had to choose which stimulus between two comparison ones matched the stimulus presented as sample. The capuchins' ability to discriminate between individual items on the basis of the physical features of the stimuli has been evaluated in Identity Matching-to-Sample (Id-MTS) tasks. The capuchins' ability to judge the relation between items and to select the comparison stimulus having the same relation as the sample stimulus has been assessed in Relational Matching-to-Sample (RMTS) tasks. Both in Id-MTS and RMTS, the ability to transfer to novel stimuli was considered evidence of relational learning. Results demonstrated that capuchins' ability to judge physical equivalence and to transfer to novel stimuli is significantly increased by the number of stimuli used during training. Moreover, relational similarity is affected by the size of the stimulus-set and by the number of items featuring the stimuli. These findings clarify the critical role of specific factors affecting relational learning in monkeys and suggest strong similarities in relational learning abilities by New World and Old World monkeys. Funds: ANALOGY Project (EC-NEST #29088).

Stefano Turillazzi The tradition of research in behavioral biology in Italy

THE UNIVERSITY OF FLORENCE GROUP FOR THE STUDY OF SOCIAL INSECTS

Stefano Turillazzi
University of Florence

The Group for the Study of Social Insects of the University of Florence is a direct derivation of the school established in the sixties by Leo Pardi in Florence for researches on the social behaviour of wasps. The undisputed founder of Italian Ethology started again the studies of polistine wasps after a break of almost twenty years and sowed the seeds for future researches on proximate and ultimate factors of social behaviour. The group grew in the years with the contribution of various researchers and international interactions and is now interested in many aspects of insect social life including evolution of sociality, chemical communication, nest defence, social parasitism, sexual selection and systematics of social species.

Davy Ung Audience effect

EFFECTS OF MATE/FAMILIAR AUDIENCE ON INTRA/INTER-SEXUAL INTERACTIONS IN MALE DOMESTIC CANARIES (SERINUS CANARIA)

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Animals often live in a social environment where several receivers are within signalling range of several signallers, creating communication networks. A consequence of such networks is that individuals gather information from conspecific interactions on the relative status, motivation or quality of the interactants (i.e. they eavesdrop). Previous studies have shown that animals use this information to assess rivals, potential mates or extra-pair partners. Therefore, eavesdropping affects the fitness of both eavesdroppers and interactants. Under these conditions, natural selection should favour individuals who adjust their signalling behaviour during an interaction because of the presence of an audience. These audience effects seem to be widespread among species and interactants have been shown to be sensitive to the nature (the species, gender, mating status...) of the audience. However, the influence of the type of interaction (e.g. intra/inter-sexual interaction) during which audience effects are expressed is still poorly understood. To address this question, we tested the audience effects on behaviour (number of songs and attacks initiated) of twenty male domestic canaries Serinus canaria during two types of interactions: (i) with a sexually receptive female and (ii) with another male during a competition for food. Males were observed under three conditions: (i) the absence of audience, (ii) the presence of a mate or (iii) a familiar female. Males modified their behaviour according to both the audience and the type of interaction. These results are discussed in the light of the trade-offs interactants make between extra-pair opportunities, mate guarding and monogamy maintenance.

Stefano Vaglio Communication I

STERNAL MARKING IN MANDRILLS: A CHEMICAL AND ETHOLOGICAL INVESTIGATION

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Mandrills are one of the few Old World monkeys to show scent-marking. We studied the function of sternal marking in the olfactory communication of this species using both chemical and behavioural methods. The research was carried out on the groups of mandrills housed at Rome Zoo (Italy), Ostrava Zoo (Czech Republic), The Tisch Family Zoological Gardens in Jerusalem (Israel) and Colchester Zoological Gardens (UK). Using all occurrence and ad libitum sampling, we observed all olfactory behaviours for approximately 775 h from October 2006 to July 2008. We collected olfactory secretions on filter paper placed on special supports. Adult males marked them spontaneously. We also sampled directly the modified hairs of adult, adolescent and infant males and females. The volatile compounds present in the samples were extracted by SPME and DHS, afterwards analysed by GC-MS. Behavioural observations show that sternal marking was almost always performed by alpha males in specific places of the enclosure boundary when visitors attended, while just in specific contexts by dominant females. GC-MS analyses showed the presence, in male secretions, of some volatile compounds which have a pheromonal function in other species. These results support the hypothesis that scent-marking signals the status of the dominant male and repels rivals. We also suggest that this male scent-marking behaviour is probably involved in sexual pheromone communication, and that the female sternal marking imitates this behaviour as a visual signal rather than a true scent-marking behaviour.

Giorgio Vallortigara The tradition of research in behavioral biology in Italy

THE LEGACY OF COMPARATIVE PSYCHOLOGY IN NORTH-EAST OF ITALY: BETWEEN GESTALT THEORY AND CLASSICAL ETHOLOGY

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In Europe, particularly within the tradition of Gestalt Psychology or in the work of zoologists somewhat influenced by the Gestalt tradition, studies on intelligence of birds and fish (and even non-vertebrates species such as insects) have been quite common though little known. The kind of cognitive problems investigated within this tradition was quite different from that of the psychology of learning, including for instance detour behaviour, perceptual organization, problem solving, number concepts. After the Second World War this research tradition largely dissipated and the remaining followers of Gestalt psychology (concentrated in few universities in Germany, Japan and North-East of Italy) concerned themselves mainly with studies of human visual perception. Comparative psychology in North-East of Italy was shaped in such a tradition but also influenced by classical ethology, particularly in the version provided by the second generation of British ethologists. In the talk I shall try to describe some of the work carried within these traditions in Italy, using non-mammalian species (mainly the domestic chick) as system models, and addressing issues that were largely inspired by the European Gestalt tradition.

Joan van Baaren Sociality II

BEHAVIOURAL CONSEQUENCES OF COLD EXPOSURE ON MALES AND FEMALES OF A PARASITIC WASP.

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Cold storage of insect parasitoids is currently used before mass release in the field in biological control programs. Physiological consequences of constant cold storage are known in various species of parasitic wasps but few reports exist on behavioural consequences and even less where both sexes are tested. In this study we observed consequences of a long storage of an aphid parasitoid to low temperatures on some key behavioural decisions that both sexes will make when they were released in the field. We found that males are less tolerant than females and that both sexes suffer for a long exposure (28 days and more) to 4°C during their pupal stage: alterations on their olfactory responses, their mating capacities and the female patch exploitation.

Marco Vannini Time & foraging

CERITHIDEA DECOLLATA, A SNAIL FORESEEING THE FUTURE ?

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Cerithidea decollata is a mangrove snail creeping on the ground during the low tide and resting on mangrove trunks the whole high tide, migrating thus twice a day along the trees and keeping themselves permanently out of the water. The snails start climbing and firmly cluster on the trunks about two hors before the actual water arrival, i.e. when the sea front is about 1 km away, with a 300 m thick forest between. Along the Kenyan coast the tide pattern is anyway so varying and complicated (two waves a day with both diurnal and synodic strong variation) that a simple tidal biological clock can hardy explain the snail refined synchronization. For instance, the average delay between to analogous tidal waves is 24hr 48' but such delay can vary from 24hr 20', during some Spring Tide to nearly 27 hrs during certain Neap Tides. In addition, most of the snails appear to cluster always between 20 and 40 cm above the level that water will reach, a level that on our study site may vary from 0 to over 100 cm. No simple explanation seem to exist other than admitting that animals may rely on direct "subtle" signals. If animals could directly perceive gravity and/or electric and/or magnetic variation, all phenomena known to be related to the tide and to the water mass movements, their whole behaviour could be easily explained: direct information would tell the snails both when at how far to climb on the trunk. Unfortunately those kind of direct signals are supposed to be well below the noise and no living organism is supposed to be able to react to them (MV & SF) I only can add that Cerithidea decollata is still daring us and complain that to reach Ferrara and tell you the whole story I had to pay an exaggerated registration fee, well above to SIE tradition (MV).

Outi Vesakoski Sex differences in hormones, brain and behaviour

EVOLUTION OF BEHAVIOURAL TRAITS: SEX-SPECIFIC MORTALITY SELECTION ON ACTIVITY

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Evolution of behavioural traits is likely to be a trade-off between benefits and costs of the behaviour. For example, activity of an individual may increase its mating success by increasing the number of encounters of possible partners but simultaneously, it also exposes the animal to predators. Inter-individual differences in resolving the the trade-off may further complicate the evolution in species level. For example males and females maximize their fitness differently and survival may be of greater importance for females whereas the fitness of males may depend on their chances to find mates. We studied the sex-specific trade-off in evolution of behavioural traits in the marine crustacean grazer Idotea baltica by first measuring their activity and then the mortality of individuals in presence of a predatory fish (Perca fluviatilis). Most active males had higher mortality than less active males, whereas most active females had higher survival than less active females. This shows that mortality selection should result to lower activity in males than in females. As far as we know this is the first experimental set-up for studying the relative mortality of the individual with known behaviour.

Cornelia Voigt Sex differences in hormones, brain and behaviour

SEX DIFFERENCES IN VOCAL BEHAVIOUR AND THE SONG CONTROL SYSTEM OF A DUETTING SONGBIRD

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Sex differences in behaviour are widespread among vertebrates. Prominent examples represent songbirds, where in many species males sing more than females. These behavioural differences are often accompanied by differences in the responsible brain areas, the so-called song control system. It is thought that the sex differences in song system size are more pronounced in species with large sex differences in song behaviour such as the zebra finch, then in those with more similar song output such as duetting songbirds. Here, we aim to test this hypothesis by using the white-browed sparrow weaver, a tropical songbird with two types of song, duet and solo, whose production is dependent on sex and social status. We find male- as well as female-biased sex differences within the song control nuclei depending on whether a histological or a cytochemical approach is used. Further, actual song nucleus size in males and females is not related to the overt song repertoire. Moreover, under the influence of testosterone, both sexes can produce both types of song. These data show that the structure-function relationship is much more complex than previously thought.

Sophie von Merten Communication I

WHY DO SHREWS TWITTER – COMMUNICATION OR SIMPLE ECHO-BASED ORIENTATION?

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Shrews are very vocal animals. While some vocalisations serve interspecific communication, it is not yet clear why they produce twittering calls during solitary exploration. One hypothesis is the use of a simple echolocation-like system for orientation. Shrews mainly forage in cluttered substrate. Thus, they could use echoes of their calls to assess the habitat structure at close range, but beyond the range of their vibrissae. A series of classical studies provide equivocal evidence for echolocation in shrews. To complement these data, we used a novel behavioural and acoustic approach on two shrew species, representative for the two large shrew subfamilies. In both species, experimental manipulation of substrate density and habitat novelty affected the number of twittering calls uttered during exploration. The adaptation of call rate to habitat clutteredness parallels bat echolocation and suggests that shrews use reverberations of their calls for probing habitat routing or type. The shrew signals were tonal, larynx produced calls in the sonic range and not 'echolocation clicks', as had been suggested by other studies. To test the utility of those calls for orientation, we ensonified different natural shrew habitats with an

Bettina Wachter Time & foraging

DETAILED KNOWLEDGE OF THE FEEDING ECOLOGY AND SPATIAL DISTRIBUTION OF CHEETAHS REDUCES THE FARMER-CHEETAH CONFLICT IN NAMIBIA

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Cheetahs living on Namibian farmland occasionally hunt livestock and game trophy species. This decreases the economic revenue of farmers and generates substantial conflict between farmers and cheetahs. As a consequence, large numbers of cheetahs are eliminated by farmers. To assess the livestock and game losses and develop more effective management strategies we determined the cheetahs' diet and studied their spatial movement. Using cheetah scats we showed that livestock and valuable trophy species consist of a lower percentage of the cheetah diet than previously thought. Cheetah density on farmland was also lower than perceived by farmers, because most cheetahs ranged over 1200 - 3000 km2 encompassing up to 60 farms. Although home range overlap was high, there were always only a few cheetahs on the land of any one farm. Some cheetahs held territories of approximately 250 km2 that were scattered on the farmland and only around these areas there was increased cheetah activity. Eliminated cheetahs were quickly replaced by others, thus elimination of cheetahs does not reduce livestock and game losses. We presented these results during regular meetings of farmer associations and during daily contact between researchers and farmers. As a result, farmers realised that improvement of protection of livestock and valuable game against cheetahs is more effective than elimination of cheetahs.

Catherine Wallez Cognition

THE EXPRESSION OF ORO-FACIAL MOVEMENTS REFLECTS RIGHT HEMISPHERE DOMINANCE FOR EMOTIONS IN BABOONS

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Since it is commonly accepted that animals and humans share basic emotions, the study of laterality of animal emotional behavior can help to elucidate the evolution of human hemispheric specialization for emotions. Asymmetries of emotional facial expressions offer reliable indexes to infer brain laterality and mostly reveal right hemisphere dominance in humans. Few studies have investigated oro-facial asymmetries in nonhuman primates. In chimpanzees and in rhesus monkeys, a significant left bias (i.e. right hemisphere) was found for emotional expressions, whereas a left bias for positive emotions and a right bias for the negative ones were reported in marmosets. Because of the discrepancies between results, we conducted a research in baboons in order to assess the presence of asymmetrical oro-facial productions and their related emotional cortical processes. We collected 288 still pictures on a sample of 69 baboons (Papio anubis) concerning affiliative (lipsmack, copulation call) and agonistic behaviors (screeching, eyebrow-raising). For screeching, a significant left hemimouth bias was found, but no significant bias was observed for the three other behaviors. These results will be discussed in the light of the available literature concerning asymmetrical oro-facial productions in nonhuman primates. However, we can already conclude that hemispheric specialization of emotions in humans may have precursors in our primate ancestors. This research was supported by a French National Research Agency (ANR) grant reference ANR-08-BLAN-0011_01.

Paige Warren Consequences of an Urbanizing World

FROM PATTERNS TO EMERGING PROCESSES IN URBAN BEHAVIOURAL ECOLOGY

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As the pattern of reduced species diversity and increased densities for animals associated with urbanization has crystallized in recent years, competing explanations for the patterns have emerged. Application of island biogeography theory finds, in general, that species-area relationships are preserved in urban patches. In addition, some studies have directly quantified the extinction and colonization processes that the theory proposes as underlying patterns of diversity. According to this view, the species present in a patch are the combination of the species colonizing the novel habitats formed with urbanization and those remaining after local extinctions are caused by isolation or habitat alteration from urbanization. An alternative, though not mutually exclusive view, is that species interactions, such as competition, play a key role in shaping community composition in urban habitats. For example, altered habitat structure and resource availability may favor colonizing species over native ones in competition for resources, leading to local extinctions of native species and elevated densities of a few strong competitors. Behavioral ecologists have a key role to play in distinguishing among competing theories. In addition, there is a pressing need to address the evolutionary implications of urbanization, from effects on trait evolution to speciation. I argue that using interdisciplinary approaches that incorporate the social sciences will yield greater insights into all these questions than solely disciplinary approaches.

Claudia Wascher The representation of space, time and number in animals

CARRION CROWS CHOOSE HIGHER QUANTITIES IN A PREFERENCE BUT NOT EXCHANGE TASK

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The ability to discriminate between different quantities has been shown in a wide range of animals (mammals, birds, fish, amphibians) and has been suggested to be an essential cognitive skill in many ecological as well as social contexts (e.g. foraging, cooperation, aggressive interactions). In order to investigate if crows can discriminate between quantities we used two different experimental approaches. (A) preference test: individuals had two choose between two options: 1 vs. 2, 1 vs. 4, 1 vs. 8 pieces of a food reward (cheese); (B) exchange task: individuals were given the opportunity to exchange one piece of cheese against two, four or eight pieces of cheese. We successfully tested six captive crows and all of them choose the higher quantities significantly more often in the preference test. In contrast to this, in the exchange task, three individuals never exchanged one piece of cheese against a higher quantity. Three individuals did exchange at very low frequencies (6.3±6.1 successful trials out of 48). This is surprising, as crows successfully exchanged non-preferred food against preferred food in another experiment and even dealt with increasing delay. Overall our results suggest, that crows are capable of discriminating quantities, but when they have to "work" for the reward, a motivational aspect overshadows this cognitive skill.

Christiane Wilzeck Lateralised Behaviour

THE INFLUENCE OF AGING ON THE VISUAL SIDE-BIAS IN PIGEONS

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Humans, pigeons (Columba livia) and chicks (Gallus gallus) primarily attend to objects in the left side of space. This pseudo-neglect likely reflects a right hemispheric specialization for spatial attention. For humans this is typically tested using cancellation tasks in which the participants cross-out visual characters on a sheet of paper centered in front of them. In an adapted version, birds sample grains arranged in a regular pattern. Typically, a preference for the left side of visual space is found in these tasks The neural organization underlying this phenomenon may be similar in both humans and birds; the right hemisphere processes a more bilateral representation of space, whereas the left hemisphere processes more right-sided visuo-spatial information. However, little is known about the hemispheric distribution of attention across the life-span. In humans, spatial attention is known to be especially vulnerable to aging effects, and important models predict a reduction of hemispheric specialization and an increase in individual variability with age. To test the impact of aging on spatial attention we used young, adult and aged homing pigeons in an adapted version of the cancellation task. The birds could freely choose grain spread evenly over an area in front of them. The body was restrained and aligned centrally in front of the choice area, but the head could move freely. Adult pigeons showed a strong leftward bias, preferring to choose grain on the left side of space, hereby confirming former findings in this species. However, young and aged birds showed a different pattern with more individual variation; indeed some individuals over-selected grains on their right side. Maturation processes of the young brain as well as compensatory mechanisms during aging will be discussed.

Klaudia Witte Sex differences in hormones, brain and behaviour

MATE CHOICE COPYING IN ZEBRA FINCHES: SEXES DIFFER

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The social environment can have an enormous influence on mate choice decisions in individuals. Socially driven mate choice can even overwrite genetically fixed mate preferences. The fact that individuals use public information in the context of mate choice amplifies the dynamic processes in sexual selection. Mate-choice copying occurs when an individual observes a sexual interaction between two heterosexual conspecifics and chooses or rejects the individual as a mate as the observed individual did before. We investigated whether male and female zebra finches copy each others mate choice. In a binary choice situation zebra finch females chose between two males of two different phenotypes: one male of the natural phenotype, the other male was adorned with a red feather on the forehead. In this situation females did not discriminate between males of both phenotypes and spent a similar amount of time in front of both male types. After this preference test females could observe a single male of the natural phenotype and a pair of zebra finches, i.e. a female and her mate adorned with the red feather, for 2 hours. After this observation period females could choose between other males of both phenotypes in two consecutive preference tests. After the observation period females spent significantly more time in front of the adorned male phenotype in both preference tests. This shows that females copied the mate choice of other females which they have seen together with an adorned mate. We performed the same experiment with male zebra finches and used adorned females. In contrast to females males did not copy the mate choice of other males. Thus, it seems that sexes differ in the ability to use public information in mate choice decisions.

Marco Zaccaroni Communication I

DISTINCT HOWLING IN FREE-RANGING PACKS OF WOLVES (CANIS LUPUS)

Marco Zaccaroni[1], Antonella Buccianti[2], Francesco Dessì-Fulgheri[1], Claudia Facchini[o], Andrea Gazzola[3], Isabella Maggini[1], Daniela Passilongo[3] and Marco Apollonio[3]
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During the summer of 2007, 2008 and 2009 we recorded the vocalizations of 5 free ranging packs of wolves in the province of Arezzo, Italy. Sound spectrograms were used to measure 6 pitch and 6 tone variables, and the differences among pack howls were tested by means of non-parametric MANOVA analysis. Results showed that howling varied significantly according to the pack and such differences suggest that, as already reported for individual wolves, also the pack can be recognized as a "unit" with a specific vocal print. In fact, the territoriality of packs in this species is also maintained by means of howling that needs to be recognized and referred to a specific pack. Moreover, we recorded vocalizations in two locations for two consecutive years. Statistically significant differences between years were found only in one of these locations. Further studies are needed to better understand if and how wolf packs are able to maintain a vocal print throughout the years.

Michal Zeman Parent-offspring

DIVERGENT SELECTION FOR EGG TESTOSTERONE CONTENT DIFFERENTIALLY INFLUENCES GROWTH RATE AND IMMUNE RESPONSE IN JAPANESE QUAIL

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Maternal hormones deposited in the egg yolk can modify various behavioral and physiological processes and adjust development of progeny to prevailing environmental conditions. We used a genetic approach and performed divergent selection of Japanese quail for egg testosterone (T) content. We determined effects of selection on growth rate (body weight and tarsus length) and activity of the immune system. Activity of the immune system was assessed as a response of the heterophil/lymphocyte (He/Ly) ratio, antibody production and corticosterone (C) levels to lipopolysaccharide (LPS) administration. All parameters were measured in both sexes in Low (LET) and High (HET) Egg Testosterone lines that differed distinctly in egg T content. Quail from HET line were heavier than those from LET line from age of two weeks until sexual maturity. The similar pattern was seen in tarsus length illustrating that growth of long bones was increased by selection, giving the HET line a competitive advantage. Differences were more pronounced in males than females. Exposure to LPS increased plasma C levels and He/Ly ratio and decreased levels of antibodies. C response to LPS and He/Ly ratio was higher in the HET than LET line. Immunoglobulins were higher in HET than LET lines both before and after LPS administration. Obtained results suggest that selection of quail for low and high T content can influence growth and immune competence of progeny. Changes in maternal hormone content can contribute to surviving and shape fitness of young in different environmental conditions. Supported by VEGA 1/0365/10

Markus Zöttl Personality

THE SOCIAL DIMENSION OF ANIMAL PERSONALITIES IN COOPERATIVE BREEDERS

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To date, most studies of animal personalities have been concerned with non-social behaviours, and nearly all studies have used model species disposing of rather simple social organizations. We predict that the expression of consistent individual differences between conspecifics is of particular importance in highly social animals, where the existence of social niches might select for specialization in social roles, dominance positions and task performance. We have studied personality traits of the cooperatively breeding cichlid Neolamprologus pulcher in an observational and experimental paradigm in the natural habitat of these fish at Lake Tanganyika. We tested 100 individuals in a novel environment (a cage with various shelters) for their exploration behaviour and found that exploration propensity was independent of sex, social status and home group size of test individuals, but it correlated with body size/age of the fish: smaller (younger) individuals showed significantly more exploration behaviour. Interestingly, exploration propensity was positively correlated with territory defence in females but not in males. Furthermore, we show how personality influences social interactions between group members and stress the evolutionary implications of the coexistence of divergent behavioral types in highly social animals.

Poster Abstracts

Alphabetical Order

(= Poster Number Order)

Yuri Albores-Barajas Poster N. 1

VOCAL REPERTOIRE OF THE MEDITERRANEAN STORM PETREL, HYDROBATES PELAGICUS MELITENSIS

Albores-Barajas, Y.V.1, Malavasi S.1, Georgalas V.1, Soldatini, C.1, Torricelli P.1 and Massa, B.2
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Since 2007 we studied the Mediterranean storm petrel in the island of Marettimo. During the chick rearing period and in absence of human disturbance, we used infrared cameras to register birds activities in the colony. This allowed us to register normal activity patterns and to analyse adults and chicks vocal repertoire in relation to their activities. Registrations were made using a digital video camera and then digitalised and analysed using the software Avisoft sas lab pro. The vocal repertoire was analysed by identifying structurally distinct sounds emitted during social interactions by individuals of both sexes. Different behavioural contexts were considered as associated to call emission: agonistic context, partner recognition display, aggressive interactions. Calls were analysed for syntactic, temporal and spectral properties. At least three basic acoustical units were recognised: non-harmonic units lasting from 10 to about 400 ms, and composed of damped pulses with energy concentrated around 1.5-2 kHz, harmonic segments lasting few hundred milliseconds with a fundamental frequency of 4 kHz, and multi-harmonic segments with multiple frequencies of the 4 kHz fundamental. The basic units were temporally organised in bouts of variable duration, from 2 to more than 5 seconds, where harmonic and non-harmonic components were often combined, repeated at regular intervals, and yielding stereotyped patterns of temporal organisation. Differences in calls properties were tested between behavioural contexts, sex and individuals, to assess intra-specific variation.

Mhairi Alexander Poster N. 2

HABITAT COMPLEXITY MEDIATES THE PREDATORY FUNCTIONAL RESPONSE OF THE INTER-TIDAL AMPHIPOD ECHINOGAMMARUS MARINUS

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Predation is a key factor that structures natural ecosystems and may be mediated by habitat complexity. The ability of a predator to regulate the abundance of a prey population can be assessed by its functional response, defined as the relationship between predator consumption rate and prey density. Habitat structure may influence foraging ability causing predator intake rate to vary, resulting in changes to the functional response. We investigated the functional response of a marine inter-tidal amphipod Echinogammarus marinus preying on the isopod Jaera nordmanni in the presence and absence of habitat complexity in laboratory microcosms. E. marinus preyed on J. nordmanni in both simple and structurally complex microcosms, but the prey were significantly less vulnerable in the complex habitat with no differences recorded between male and female amphipods. At low initial prey densities in complex habitat, E. marinus consumed significantly fewer prey compared to when complexity was absent, however, the difference declined at high initial prey densities. E. marinus displayed type II (hyperbolic) functional responses in simple habitats, with a shift towards type III (sigmoid) responses in complex habitats, These results indicate that differences in habitat structure can mediate the predatory ability and impact of E. marinus. However, since prey at low densities were consumed even in complex habitats, this amphipod predator may have significant impacts on the distribution and abundance of prey in marine inter-tidal communities.

Enrico Alleva Poster N. 3

EARLY SOCIAL ENRICHMENT PROVIDED BY COMMUNAL NEST, INCREASES FLOATING IN THE FORCED SWIM TEST AT ADULTHOOD: ARE THESE MICE MORE OR LESS VULNERABLE TO "DEPRESSION"?

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Early postnatal environment exerts profound and persistent influences in determining the developmental trajectories of the organism. In order to study the effects of the early experiences on adult brain and behavior, we exposed mouse pups to an early social enrichment: the Communal Nest (CN). CN, which consists in a single nest where three mothers keep their pups together and share care-giving behavior from birth to weaning, mimics the natural ecological niche of the mouse species. In the CN, maternal behavior and peer interactions are markedly increased. At adulthood, mice reared in CN display a number of phenotypic traits having face validity with a reduced vulnerability to depression. In particular, when compared to mice reared in standard laboratory conditions (SN), CN mice show more elaborate social skills, reduced anhedonia following social stress and a reduced activation of the hypothalamic-pituitary-adrenal axis after acute or prolonged exposure to social challenge. These behavioral and neuroendocrine modifications are accompanied by higher brain BDNF levels. By contrast, in the forced swim test, a test developed to assess the effects of antidepressants, CN mice display longer floating time. These apparently discordant results may be put coherently together when an evolutionary perspective is taken into account. Overall, the present findings confirm the crucial role played by the early social experiences in shaping adult brain and behavior in the mouse and indicate the communal nest as a valuable model to evaluate the relevance of epigenetic factors in both physiological and pathological conditions.

Lucia Maria Almeida Poster N. 4

REPRODUCTIVE BEHAVIOUR OF ANASTREPHA ZENILDAE ZUCCHI (DIPTERA: TEPHRITIDAE) IN LABORATORY

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The knowledge of Anastrepha zenildae behavioural aspects combined with the biology of Tephritidae may contribute to monitoring and control programs of this fruit fly that is considered as economically important. In order to characterize the reproductive profile of the Anastrepha zenildae, we studied the behaviours of courtship, copulation and oviposition of animals submitted to an artificial 12:12h light-dark cycle (750:-1lux) with controlled temperature (26±2 °C). The observations were made with groups of 16 males and 16 females during 3 consecutive days each generation from parental to F5. Courtship, copulation and oviposition were recorded as frequency, time of occurrence and duration by all occurrences technique. During the courtship, males were grouped in lek formations showing wings vibration and pheromone liberation. Courtship occurred more frequently 4 to 7 h after lights on (81.9%) with copulations being more frequent 6 h after lights on with a mean duration of 58.1±40.4 min. Copulation attempts were observed in males inside and outside the lek with aggressive behaviour being observed only between males in the lek. Oviposition behaviour was similar to that described for other species of the genus with a peak of this activity 2-3 h after the lights on, mean duration of 0.7±0.6 min and 2 to 5 eggs by event. According to the results, sexual behaviour of A. zenildae is temporally different of other sympatric species of the genus, being favourable to the reproductive isolation as well as the use of resources as oviposition substrate.

Arrilton Araújo Poster N. 5

TRAVELING ROUTES ARE INFLUENCED BY FRUIT AVAILABILITY IN CALLITHRIX JACCHUS (PRIMATES, CALLITRICHIDAE)?

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Variations on the environmental conditions influence decision-making process. Thus, a group has to adequately choose how much time and energy should be invested in activities, in order to optimizing them. Callithrix jacchus are primates that live in family groups. They exploit their territory in search of food (fruits, exudates and animal prey) and resting places. In the present study we investigated the occurrence of travelling routes and its relation to time and spatial availability of resources in the environment. A group of wild Callithrix jacchus (11 individuals) was followed through a period of 3 months during the dry season and 3 months during the wet season, consecutively, in a secondary Atlantic Forest area, in a FLONA Nísia Floresta - ICMbio, Northeastern Brazil. Two observers, in alternate days, collected the group's location using a GPS device, registering the location in 5 minutes intervals. Analysis showed that the exploration of the environment is related to the location of fruits, exudates and sleeping sites, varying the intensity of use through the months. The majority of sleeping sites and exudates trees were found in nuclear areas, therefore most behavioural activities were concentrated in those areas. Seasonal fruits led the animals to exploit areas with high concentration of that resource in short periods of abundance, using different routes to reach those places. Animal preys, a rich protein source, were hunted in all area. The pattern suggests that group members were capable of balancing the costs and benefits of travelling in the area of activity. Environmental cues and acquisition of new information is vital to survival in a constant changing environment.

Maria de Fatima Arruda Poster N. 6

BEHAVIOURAL AND HORMONAL PROFILE ALONG CALLITHRIX JACCHUS DEVELOPMENT

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Primate Order stands among mammals as presenting very slow ontogenetic growth. In Neotropical Primates, in particular the marmoset Callithrix jacchus, most data are related to infant care in the first months; only few data about older infants and juveniles are found. Also, there is no information on long-term monitoring of youngsters in the natural environment, from infant stage, including the periods of dependence and independence of carrying (0-5 months) to the entire juvenile stage (5-10 months), when hormonal and behavioral changes are expected, associated with sexual maturation. This study approached modifications of the activity profile and social interactions along infant and juvenile stages of 2 twin sets in order to better understand how development and survival of Callithrix jacchus youngsters are accomplished in natural environment, taking into account the characteristics of their environment, once the species adjusts to different seasonal conditions. The growth of both sets was characterized by infant carrying to 3 months, supervision and food sharing between 2 and 4 months; activities closer to the general profile of the group, including foraging and social interactions were presented from the 5th month on. Testosterone levels increased in the late juvenile phase, between the 7th and 8th month, when there was also increased scent-marking, an activity related to competition inside and between groups. Despite presenting a similar activity profile, the set born during the rainy season reached its independence earlier than the one born in the dry season. We suggest that a decisive factor for youngsters' independence must be the characteristics of the environment in which they grow up.

Majid Askari Hesni Poster N. 6 bis

THE STUDY OF ACUTE TOXICITY OF TPH (TOTAL PETROLEUM HYDROCARBONS) AND BEHAVIORAL CHANGES OF MILKFISH (CHANOS CHANOS)

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Increasing demand and utilization of petrochemicals has resulted in an increase in levels of petroleum hydrocarbons in marine, coastal and estuarine environments. These compounds affect on biochemical, physiological and behavioral of aquatic organisms. In this study the 96-h LC50 values of diesel oil and it effects on behavioral changes of Milkfish (Chanos chanos) determined. Young juvenile milkfish (W: 64±1.2gr, SL: 16.7±0.4Cm) were exposed to diesel oil at concentrations of 3.4, 3.9, 4.4, 5.5, and 7 ml/l. The experiments were performed as three replicates, and behavioral changes in the all specimens were determined for each concentration. Water quality parameters of the test seawater were: hardness, 193.4 mg/l as CaCO3; pH, 7.6 to 8.1; dissolved oxygen concentration, 6.7 to 7.8 mg/l; temperature, 23ºC and salinity, 38.3 psu. The data obtained were statistically evaluated by the use of EPA computer program based on Finney's Probit Analysis Method. The 96-h LC50 value was found to be 5.12 ml/l in a static bioassay test system. The behavioral changes observed in fish were, hyperactivity, loss of balance, vertical and downward swimming patterns, convulsions, attaching to the surface, increased mucus secretion especial on gills, and some of them in high concentration were schooling, motionless, difficulty in breathing gathering around the ventilation filter and body surface was bloody. There were no behavioral changes and deaths observed in the control group throughout the experiment. The result showed that acute oil toxicity severely affects the mortality and normal behavior which may be deleterious for milkfish populations. Key words: TPH, LC50, Behavior, Chanos chanos

Dina Azevedo Poster N. 7

DINOPONERA QUADRICEPS FORAGING PROFILE: THE CHALLENGE OF SURPASSING OBSTACLES

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Animals must make use of strategies that allow to an executable benefit/cost relationship. Dinoponera quadriceps workers perform solitary foraging. They leave the nest with slow speed and initiate the foraging as soon as they exit; when finding food, the return is almost straight-line. Thus, our objective was to verify if there was variation in foraging profile of D. quadriceps after introducing an obstacle ahead of the colony exit. Two colonies of this species were observed in an area of secondary Atlantic Forest, FLONA-ICMBio of Nísia Floresta, Northeastern, Brazil. Observations occurred at least once a week, 10h/dia. Each worker was followed from exit to return to the nest through continuous focal method. We recorded searching times and returning, of the latency of exit for a new search, and the capture of the food. We estimated the distance covered by each worker placing numbered signal-flags, every five minutes. In the first phase, there was no interference in the foraging of the ants. In the second phase, we put a opaque black acrylic plate (100x30x0,8 cm), 2 m away from the exit of the nest, in each day in a different angle. The comparison between the two phases demonstrated that the time spent to return with the food, the speed to return and the latency to leave the nest again increased when the obstacle was placed. That result was expected once returning to the nest was always almost straight-line, but, after placing the obstacle, surpassing it was necessary. That must have influenced the workers' permanence inside the nest longer, before a new foraging bout. We suggest that a new environmental information apparently is soon incorporated by the workers, resulting in little alteration of their activities.

David Baracchi Poster N. 8

SPATIAL ORGANIZATION OF WORKERS OF POLISTES DOMINULUS ON THE NEST IS NOT REGULATED BY THE AGE

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By using an ecological analytical approach (home range analysis), we demonstrated that the positions of wasps on Polistes dominulus combs are spatially structured. Each active wasp has its own small fidelity area on the comb which varied in shape and size, with no relation to wasp density and position of immature brood. However, this analysis is limited to a single day of activity on the nest and with no information about the workers' age. We could expect that each individual is able to change its own spatial pattern during its lifespan and over the colony cycle. Here, we assessed the existence of a "temporal spatial polyethism" among workers by evaluating whether at workers age, changes in their spatial preference occur, and, whether workers of different ages belonging to the same colony patrol different areas. After marking all the workers, each colony was video-recorded four times, every 15 days, from May to July. Each recording session consisted in 7 hours in a single day with a time laps of 1sec/min. The area occupied by each wasp was obtained using 95% (home range) and 50% (core area) kernel density isopleth estimates, calculated according to its occurrences in all the frames. Statistical analyses show that workers' age do not regulate nor influence their use of space (size, shape and position of core area and home range) on the nest and the grade of superimposition with other workers. In contrast with our expectations, we did not find any temporal spatial polyethism among workers of P. dominulus. Our data shows that workers fidelity area changes during the colony cycle. Thus, the results suggest that, among workers, the mutual influence in the use of space may be based on a daily self-organization process not affected by workers' age.

Laura Beani Poster N. 9

WHEN A PARASITE AFFECTS THE SPATIAL BEHAVIOUR OF POLISTES DOMINULUS: FIRST DATA ON MUSHROOM BODIES BY MALDI-TOF MS

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Xenos vesparum (Stylopidae, Strepsiptera), a parasitic castrator, affects both behavioural and physical traits of its host, the social paper wasp Polistes dominulus. Parasitized ("stylopized") females desert the colony early in the season to aggregate in summer aberrant extra-nest groups on prominent hedges, usually patrolled by lekking males and foraging workers, if resources occur at landmarks. Although the aggregation rules of stylopized wasps are unclear, their peculiar spatial behaviour (site attachment, stable grouping points but turn-over among clusters) may facilitate the parasite's mating. In order to assess whether the aggregations of stylopized workers may be induced by a parasite manipulation of the host, we combined behavioural and molecular data. During the first 2 weeks of July, when usually the lek settlement occurs, we censused clusters of stylopized wasps, by means of mark recapture techniques, in only one flowering hedge intensively patrolled by wasps (26 healthy males, 40 healthy and 89 stylopized females). The result has shown 30% of re-sightings for males, 20% for stylopized females, whereas healthy workers were seldom captured more than once. In a sample of both healthy and parasitized wasps from this hedge, we performed MALDI-TOF MS analysis of mushroom bodies (centres involved in olfactory memory and spatial behaviour). The reference spectra of healthy and stylopized females appeared very similar apart from 3 peaks (m/z 1099, 2806 and 3009) out of 24 detected. These 3 compounds, although not exclusive of the parasitized wasps, may play a role in their aberrant spatial behaviour. Further studies are required to confirm this hypothesis and to determine the nature of the compounds.

Ahmed Belguermi Poster N. 10

FORAGING BEHAVIOUR OF FERAL PIGEONS (COLUMBA LIVIA) IN AN UNCERTAIN ENVIRONMENT: RESPONSES TO DIFFERENT SIGNALS

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We studied the response of pigeons to different predation situations in the 'Jardin des Plantes' in Paris. The aim of our study was to investigate the foraging behaviour of pigeons in this area, in particular their responses to different types of signals of danger, in order to evaluate a potential method of scaring pigeons away and to compare social vs. non social alarm cues. A single population was studied during 30 days. Observations lasted 30 minutes following distribution of seeds. We confronted the foraging pigeons to three different situations: - During the first experiment, we played back the sound of pigeons flying away in presence or absence of 4 stuffed conspecifics. - During the second experiment we played back four types of alarm signals; two calls of pigeons predators: carrion crow (Corvus corone), herring gull (Larus argentatus), pigeons flight sound alone or combined with crow calls. These signals were randomly played. - During the last experiment we randomly played back alarm call or song of blackbird (Turdus merula). In each experiment we noted the number of pigeons leaving the spot and the latency of the return to the patch. - We found no difference in the number of pigeons' departures in presence or absence of stuffed individuals but pigeons returned in the experimental patch faster in the presence of stuffed pigeons. - Crow calls appear to be more efficient than gull calls to elicit pigeons' flight. The flight sound alone or in combination with the crow call elicited more departures from foraging sites than did the crow and gull calls. - The blackbird alarm call causes more departures than the blackbird song. These results are discussed in relation to the use of information (personal: predators calls and alarm call or social: flight noises) in pigeons.

Veronica Bellisario Poster N. 11

DISSOCIATION BETWEEN ANHEDONIA, EMOTIONALITY AND BRAIN LEVELS OF NEUROTROPHINS IN A MOUSE MODEL OF SOCIAL STRESS

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Animal models of chronic social stress (CSS) have long been used to model depression and anxiety and may represent useful tools to investigate the pathophysiological mechanisms underlying these mood disorders. Neurobiological changes underlying physiological and pathological reactions to stressful events include variations in the secretion of neurotrophic factors, such as Nerve Growth Factor (NGF) and Brain-Derived Neurotrophic Factor (BDNF), that may lead to increased vulnerability to mood disorders. In this study we investigated the effects of CSS on behavioural measures of depression, including anhedonia and levels of NGF and BDNF. Experimental subjects were 44 adult male C57/BL6N mice divided into 3 experimental groups: ? individual housing (n=12); ? stable social group housing (n=16); ? unstable social group housing in which the social hierarchy was disrupted twice a week (social stress, n=16). At the end of the stress procedure, during 3 weeks, animals were subjected to the open field and the elevated plus-maze tests. Finally, all subjects were sacrificed and NGF and BDNF protein levels assessed in different brain areas and in the adrenals. Results indicate that living in a social group increases anhedonia while making the animals less emotional. NGF and BDNF were higher in the social groups, compared to IC, SG showing the greatest levels of BDNF. These results lead us to consider that social isolation might represent a more detrimental condition than social stress. Studies are being performed to analyze the neuroendocrine response (corticosterone levels) in the different groups. Supported by IMH, Ricerca Finalizzata ex art. 12 –2006 (Q77).

Giulia Beltrami Poster N. 12

A SKY POLARIZATION COMPASS IN LIZARDS: ONLY SOME WAVELENGTHS ARE INVOLVED

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The present study first examined whether ruin lizards Podarcis sicula are able to orientate using a preferential region of the light spectrum to perceive the e-vector direction of polarized light. Ruin lizards were trained and tested indoors, inside an hexagonal Morris water maze, positioned under an LCD screen producing by itself plane polarized light with a single e-vector, which provided an axial cue. Lizards (N= 86) were subjected to axial training. Lizards meeting learning criteria (N= 43), were subjected to 90° rotation of the e-vector directions. Lizards directional choices rotated correspondingly, producing a bimodal distribution which was perpendicular to the training axis. Lizards were then tested under 4 different monochromatic lights (blue: 435nm; red: 611nm; green: 544nm; turquoise). Under both blue light and turquoise light lizards were able to orientate in both e-vector's conditions, otherwise under red light lizards resulted completely disorientated; under green light lizards were able to orientated themselves only when the direction of the e-vector was the same as in training, whereas after 90° rotation of the e-vector lizards were disorientated. Present data showed that both the blue wavelength and the turquoise wavelength are crucial for perceiving e-vector, whereas the red wavelength doesn't mediate the perception of the e-vector. The green wavelength's results are borderline. Furthermore, the present experiment confirmed that the UV is not necessary to perceive polarized light.

Alessandra Berry Poster N. 13

EXTENDED LONGEVITY HAS A COST: REDUCED REPRODUCTIVE SUCCESS AND IMPAIRED MATERNAL CARE IN LONG-LIVED P66SHC-/- MICE

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P66Shc-/- mice are characterised by a delayed aging, reduced oxidative stress and increased metabolic rate. The antagonistic pleiotropy theory of aging states that for each benefit there is a cost to pay in life. Main aim of this study was to investigate whether the longevity of p66Shc-/- mice has a cost in terms of reproductive success. To this purpose we looked at repeated breeding cycles, breeding under stressful conditions, mean number of pups per nest and time of the onset of puberty. Since p66Shc-/- mice are characterized by a decreased emotionality we also investigated whether this characteristic may be mediated by maternal care. P66Shc-/- mice showed an overall earlier onset of puberty in addition to a reduced fertility both over repeated breeding cycles and under stressful situations; mean number of pups did not differ between the two genotypes. A redirection of maternal behaviour was observed in the mutants as a function of feeding pattern, which might account for the anticipated onset puberty observed in the offspring. Our results show that p66Shc is important for optimal reproductive success. The lack of the gene is able to affect sexual maturation, an effect possibly mediated by changes in maternal care. Funded by Italian Ministry of Health - ex art. 56 - to F.C., L.M. and E.A. and Marie Curie fellowship ("The Genetic Basis of Disease; Stress-Responsive Genes in Brain during Health and Disease" to A.B.).

Bezawork Afework Bogale Poster N. 14

CATEGORIZATION OF 'MALE' AND 'FEMALE' PHOTOGRAPHIC HUMAN FACES IN JUNGLE CROWS (CORVUS MACRORHYNCHOS)

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Categorization of items of once environment accordingly has an enormous biological relevance such as identification of conspecifics as potential prey or threat. Jungle crows (Corvus macrorhynchos) live widely spread in cities of Japan due to readily availability of food in garbage sites and such cohabitation with inter-specifics such as humans that may ignore, persecute or assist them may require individual recognition. Here, we studied categorical learning ability of wild caught jungle crows (N=4) using photograph of human face, according to sex in a simultaneous two choice discrimination task. Our result showed that jungle crows learn discrimination task and reach to the criterion (80% or more correct choice in two consecutive sessions) in relatively few trials showing successful generalization to novel face photographs. Their discriminative behavior was predominantly controlled by color cue while facial contour information was also sufficient enough for discrimination in half of crows. However, partial occlusion of internal features of the face (eyes, nose, mouth or a combination of either) did not affect discriminative behavior of most of the crows. We suggest that Jungle crows categorize human face photographs according to their sex on the basis of perceptual similarity as in other non human animals and show no evidence of understanding 'maleness' or 'femaleness'. In addition, the variation in the utilization of different cue for discrimination between individual crows suggests multiple visual feature utilization and also individual difference in visual information processing in jungle crows.

Vera Brust Poster N. 15

THE CORVIDS' WAY OF CHOOSING IN AN AUDITIVE INFERENCE TASK

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Carrion crows and ravens, but not jackdaws, seem to be able to reason by exclusion in the visual domain, i.e. they infer the location of hidden food after having seen that food is absent in an alternative location. Chimpanzees can also use acoustical information in these tasks and we asked whether ravens, crows and jackdaws may use their ears to find hidden food. We tested also jackdaws, because they regularly feed on living insects and may therefore use acoustical information like humming sounds to locate food. In our task, the birds had to make a choice between two cups in four different conditions, in which either the baited (rattling noise), the empty (no noise), both cups (rattling noise vs. no noise) or no cup (control) was shaken. A correct choice in the first two conditions would suggest that the birds associated the food with the noise cue or, potentially, made a causal connection between the two. A correct choice in the empty condition would furthermore suggest that they could use the absence of noise to infer the location of the hidden food. In general, the birds were not able to infer the location of the hidden food, but one jackdaw and two ravens connected the rattling noise with the presence of food; a further playback experiment suggests that two of these birds even may have developed a weak causal understanding of the task. The other individuals based their choices mainly on the visual information, i.e. the movement of the cups. In consequence, corvids might be able to use acoustic cues correctly, but it seems to be easily overlapped by visual cues.

Nicole Cadieu Poster N. 16

INNOVATION AND SPREAD OF A NEW FEEDING HABIT IN CANARIES

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Feeding innovation occurs when individuals choose a novel, unknown type of food and/or acquire new feeding skills. Here studied innovation and social transmission of a new feeding habit in canaries. Adult canaries eat a wide variety of seeds but avoid larger ones, such as those of sunflowers. We determined whether adult individuals of both sexes are equally prone to innovate when confronted with sunflower seeds and whether free-interactions facilitate transmission of the new feeding habit in a sex-dependent manner. Our results show that innovative sunflower-seed consumption only occurred in males after a familiarization period with the unknown seeds. In contrast, females rarely innovated, thus showing a clear sex dependency of innovative feeding habit acquisition. Social transmission between individuals depended both on experimental conditions and on the sex of the naive animals. Naive females learned more easily from experienced males than naive males because the latter were usually attacked by the demonstrative male. Naive males, therefore, learned better when they could observe the demonstrator through a transparent wall. In contrast, naive birds of both sexes learned efficiently the new feeding habit from demonstrative females, which were more tolerant towards observers of both sexes. Thus, although males are more prone to innovation, females play a more crucial role in social transmission. Our results thus show that individuals who innovate are not necessarily the best demonstrators, a fundamental conclusion in studies on social behaviour in animals.

Elisabetta Cancellieri Poster N. 17

FEEDING BEHAVIOUR OF SIX BOTTLENOSE DOLPHIN NEWBORNS IN CONTROLLED ENVIRONMENT

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In Tursiops truncatus mothers provide the bulk of parental care by virtue of the nursing relationship. The problematic access to lactating females has complicated studies of suckling behaviour so that early developmental profiles of feeding are almost completely lacking. The birth in different periods of six bottlenose dolphin calves in Aquatic World Delphinarium (Cattolica, RN, Italy) and in Rimini Delfinario (Italy) provided an opportunity for identifying suckling trends useful for calves' healthiness diagnosis. Data were collected from birth to 52 weeks of age of calves (1745 hours total) by means of focal animal sampling and Observer software. The highest frequency of unsuccessful suckling was observed in the first neonatal week (2.70 ± 1.24 events/h). The average time of first real suckling was 7.48 ± 8.95 hours after the birth. The successful suckling trend revealed to shift from about 3 events/h in the first weeks to about 2 suckles/h in the rest of the period. The mean suckling time per feed remained between 3-5 seconds, with no significant variations depending on calves' age. During the first month of life, the feeding appeared often associated to a 90-degree rotation of the mother from the dorsal position, a behaviour facilitating the nipple exposure but fated to desappear with time. In conclusion, while feeding behaviour confirmed its cruciality especially in the very early stages of calves' life, quantitative evidences could represent a first assumption to a better comprehension of conservation biology issues.

Sara Capoccia Poster N. 18

EFFECTS OF CHRONIC STRESS ON NEUROENDOCRINE IMMUNE FUNCTION AND DEPRESSION-LIKE BEHAVIOURS

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Abundant evidence in animal models suggests that the sustained activation of the hypothalamic-pituitary-adrenal (HPA) axis, and the consequent suppressed activity of the immune system, mediated by glucocorticoid hormones, may increase the susceptibility to diseases including neoplastic processes. Main aim of this study was to compare the effects of physical (mild - 7 days - or severe - 21 days - restraint stress - RS) and social stress - SS - (chronic disruption of social hierarchy) on behavioural items indicative of a depressive state and the associated variations in neuroendocrine (corticosterone) and immune parameters (cytokines and splenocyte apoptosis) in 4-month-old C57 male mice. RS resulted in an increase (mild condition) followed by a decrease (severe condition) in cytokines levels. By contrast splenocytic apoptosis was increased only under severe stress. As for the HPA axis activity, corticosterone levels showed a blunted response under mild stress, followed by an increase under severe stress condition. This result is in agreement with the observed suppression of the immune response during the same experimental condition. Data on corticosterone levels following SS are currently being investigated and will be presented. At the end of the SS procedure subjects underwent a forced swim test to assess behavioural despair and a social interaction test with a conspecific to assess social anxiety. Results of these tests will also be presented. This study will contribute to develop suitable animal models linking together exposure to stress, depression-like behaviour and tumor progression. ISS-NIH Collaborative Project (530F/51) to E.A. and F.C.

Federico Cappa Poster N. 19

PRELIMINARY STUDY ON THE HOST PREFERENCES OF VARROA DESTRUCTOR UNDER CRITICAL HONEYBEE COLONY CONDITIONS

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Varroa destructor is a parasitic mite commonly associated with several honeybee species. The parasite is responsible for the varroosis, the most destructive disease of honeybees worldwide. A number of studies carried out in the last decades have highlighted a series of adaptations of the parasite aimed at maximizing its fitness. The mite seems to be able to discriminate between different host types and choose the more suitable host based on its physiological state, showing a significant preference for nurse bees. The latter will most likely bring the mites in contact with brood susceptible to infestation, favouring the reproduction of the parasite. However, under critical colony conditions we would expect the mites to adopt a dispersal strategy to leave the compromised situation in search of a more favourable environment. Thus, the mites should move onto foragers, better yet foragers from a different colony. To test our hypothesis, mites from a honeybee colony next to collapse were individually introduced in Petri dish arenas together with a pair of honeybees, Apis mellifera, of different hive function or colony. Movements of the mites were monitored at 5-min intervals for 90 min. When the mites were placed into a Petri dish with a nurse bee and a pollen forager from the same colony of the parasite, they showed no preference for either host. On the other hand, mites presented with a forager from the same colony and a forager from a different colony showed a significant preference for the foreign bee. The results seem to support our hypothesis of a change in host preference of the parasite according to different colony conditions. Further studies are required to confirm our findings.

Sonia Cardoso Poster N. 20

THE IMPACT OF PARROTFISH ON THE BENTHIC COMMUNITY COMPOSITION OF CARIBBEAN CORAL REEFS

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Herbivorous fish have become a more important source of grazing pressure on Caribbean reefs since the near-disappearance of the sea urchin Diadema antillarum. These fish can be classified into three major functional groups: bioeroders, scrapers and grazers,based on their foraging method and targets. This study was carried out on 11 Barbadian reefs with the main objective of determining the influence of herbivores, in particularly parrotfish functional groups, on benthic community characteristics. Herbivore density composition, as well as benthic community, were significantly different among reefs. However, we found that the relationship between parrotfish functional group composition and benthic community was weak. In fact, benthic characteristics were best explained by the presence of D. antillarum and the ubiquitous damselfish Microspathodon chrysurus. It appears that factors other than parrotfish herbivory seem to determine benthic community characteristics on Barbadian coral reefs. Such factors may include the removal of macroalgae by severe storms, spatial variability in recruitment and settlement of benthic species and D. antillarum recovery. For a better management of reefs it is crucial to identify and protect species or groups of species that affect ecosystem resilience and recovery.

Claudio Carere Poster N. 21

BIG BROTHER APPROACH TO INVESTIGATE THE REPRODUCTIVE DECISIONS AND BREEDING SUCCESS OF PEREGRINE FALCONS

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The recent development of webcam technology and the worldwide proliferation of web sites allow to follow in real time the behaviour at nest of many bird species. We studied the reproductive phenology of the peregrine falcon (Falco peregrinus) for assessing the effect of geographical factors and female age on reproductive decisions and breeding success. We monitored webcams from Europe and North America and analysed retrospectively laying date, clutch size, and breeding success on 102 reproductive events. Geographical effects emerged for laying date, which was delayed at northern latitudes. At similar latitude laying date in Europe occurred two weeks earlier than in North America. Clutch size was larger in US, where clutches with five and six eggs occurred, whereas in Europe clutch size never exceeded four eggs. Age had no significant effect on the variables, though younger females tended to breed later and lay smaller clutches, particularly on their first breeding. Overall, the species showed a good productivity, compared with the dramatic decrease suffered in the 70's. As most of the webcams are installed on buildings, the results are representative of the urban populations of peregrine falcons, which showed a marked increase in the last decade. The use of webcams proved to be a good avenue for monitoring the reproductive health of peregrine falcon populations at a global scale.

Elena Carloni Poster N. 22

SPONTANEOUS QUANTITY DISCRIMINATION IN THE DOMESTIC CAT (FELIS SILVESTRIS CATUS)

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This pilot study investigated domestic cat's spontaneous ability to discriminate food quantity based on acoustic rather than visual cues, and on representational memory. The discrimination threshold was set at 4 versus 2 pieces of dry food pellets. Cats were rewarded whatever choice they made, but they could not access food used as stimulus. Food pellets were not patently showed to subjects during stimulus phase, but cats could hear single pellets falling into two steel cans, thus they received clear acoustic cues. Visual hints consisted merely in the hands of the researcher held above cans. Olfactory cues were neutralised by compensatory food odour diffusers. Since cats could not see food pellets, acoustic short-term representational memory was involved in the choice process. Approach, orientation towards and investigation of one of the two cans were interpreted as choice for its content. Twelve cats were tested in absence of previous training in their home environment. Each subject received 12 trials. Relative position and order of presentation of large and small food amounts were counterbalanced. The results provide evidence of quantity discrimination since choice for the larger amount of food clearly prevailed. Keywords: Cat, Spontaneous quantity discrimination, Animal cognition.

Chiranjibi Pokheral Poster N. 23

POPULATION STATUS OF TIGER AND COMMON LEOPARD IN SUKLAPHANTA WILDLIFE RESERVE, NEPAL

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We assessed the population status of two sympatric carnivores, tiger and common leopard, in Suklaphanta Wildlife Reserve, Nepal, during Nov 2009- January 2010. Digital remote sense cameras were set up in 109 stations within an approximate 250 sq km area of the reserve, for consecutive 10 days/nights in each station. With an effort of 1090 days/ nights, 5 tigers (3 females and 2 males) and 6 leopards (2 females, 2 males & 2 individuals of unknown sex) were photographed during this period. Tigers were captured from 21 stations and leopards from only 11 stations. Photos of both tigers and leopards were taken from 4 stations only. The comparison with a previous camera trapping study, in 2000, reveals that the number of tigers is declining rapidly in the area. Tigers were distributed throughout the sampling area, whereas leopards mostly concentrated at the Northern edge of the reserve. We are studying the diet of these large cats to identify their ecological relationships and niche overlap.

Douglas Chivers Poster N. 24

LINKING PREDATOR RISK AND UNCERTAINTY TO ADAPTIVE FORGETTING IN PREY: A THEORETICAL FRAMEWORK AND EMPIRICAL TEST USING TADPOLES

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Hundreds of studies have examined how prey animals assess their risk of predation. These studies work from the basic tenet that prey need to continually balance the conflicting demands of predator avoidance with activities such as foraging and reproduction. The information that animals gain regarding local predation risk is most often learned. Yet, the concept of 'memory' in the context of predation remains virtually unexplored. Here, our goal was (i) to determine if the memory window associated with predator recognition is fixed or flexible and, if it is flexible, (ii) to identify which factors affect the length of this window and in which ways. We performed an experiment on larval wood frogs, Rana sylvatica, to test whether the risk posed by, and the uncertainty associated with, the predator would affect the length of the tadpoles' memory window. We found that as the risk associated with the predator increases, tadpoles retained predator-related information for longer. Moreover, if the uncertainty about predator-related information increases, then prey use this information for a shorter period. We also present a theoretical framework aiming at highlighting both intrinsic and extrinsic factors that could affect the memory window of information use by prey individuals.

Francesca Coccon Poster N. 25

BEHAVIOURAL RESPONSE OF MANACUS VITELLINUS TO AN ALTERATION OF THE COURTSHIP ARENA

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During a seven-month long breeding season, males of the Golden-collared manakin spend several hours per day in their leks performing complex and elaborate courtship displays. These include acrobatic jumps between the saplings delimiting the nuptial arena and loud mechanical sounds produced with the wings. In this study we altered the spatial conformation of the arenas of six adult males to investigate if changes in the arena spatial structure affect courtship activity, display execution and courtship success. The courtship behaviour of the males was first observed for several days in normal conditions. Then, we placed an obstacle, i.e. a shaped piece of branch, on the mating sapling, which is consistently used by males during displays and is the place where copulations occur. Our hypothesis was that the obstacle would have altered the capacity of males to display normally and, as a consequence, would have reduced the number of female visits to their arenas. Our results showed that, despite the evident disturbance caused by the branch, males continued to perform their displays at the same frequency recorded before the alteration. However, they tried actively to remove the obstacle and modified their routine to avoid it during the display. In addition, we cannot exclude that the alteration affected the speed or the choreography of the display, which were not studied. Although the sample size was limited, we found some indications for a reduction of the attractive value of the altered display. Further studies on additional males will be necessary to confirm these preliminary data.

Emilie Cros Poster N. 26

AUDITORY STEERING IN THE CRICKET TELEOGRYLLUS OCEANICUS

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The recognition and the localization of a potential mating partner are difficult at low population densities and in cluttered environments. To overcome these problems, many animals use acoustic signals for communication between the sexes as sound signals propagate well even in complex environments. In crickets males produce a calling song to attract females, which fly or walk toward singing males. Teleogryllus oceanicus generate one of the most complex calling songs known among cricket acoustic signals. Their calling song consists of three different interpulse intervals and two types of pulse durations. Songs are organised in phrases which consist of a chirp and a trill section composed of five single pulses and nine repetitions of double pulses, respectively. Using a sensitive trackball system we investigated the phonotactic response in this species. With a synthesized calling song, which allowed us to control the temporal pattern of the song as well as its carrier frequency we tested the relative response of phonotactically steering females. We investigated the steering behaviour towards different split-song paradigms and inserted unnatural sound pulses into the calling song, to analyse the interplay between pattern recognition and phonotactic steering.

Giulia Cutuli Poster N. 27

PRELIMINARY RESULTS OF A LONG-TERM STUDY ON FEMALE SEXUAL CHOICE IN TORTOISES (TESTUDO SPP.)

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The female reproductive tract of many chelonians is physiologically capable of storing viable sperm for a variable time span, from few days to years, after copulation. Since the female tortoises of the genus Testudo have this ability, coupled with multiple matings in a single reproductive season, theoretically a process of cryptic female choice may arise. Till now very few studies have been performed on Testudo sexual behaviour: thus it is still unclear whether a female choice effectively exists, and whether random, such as the mating order, or qualitative factors, related for instance to male health, may affect the male success. Since, as in all chelonians, Testudo do not form social groups neither provide parental care beyond nesting, it is unlikely to hypothesise that females receive direct benefits from multiple matings; otherwise, indirect benefits may play an important role in mate choice and paternity distribution. Our research aims at investigating such processes and it is performed on captive and semi-captive specimens of T. hermanni subject to multiple experimental matings. Behavioural observations coupled with parental genetic analysis will allow us to identify in which order females use the stored sperm, and thus to understand whether they actively choose the father/s of their clutch. Herein we will show some results on the reproductive behaviour of T. hermanni as obtained from the first series of planned matings.

Ivana D'Andrea Poster N. 28

MATERNAL CARE AND EARLY PEER-TO-PEER INTERACTIONS SHAPE ADULT SOCIAL BEHAVIOR IN MICE

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The critical role of the early experiences in shaping adult behavior has been widely investigated in animal models exploiting paradigms affecting mother-offspring interaction. However, these paradigms overlook a key factor profoundly affecting infant development: peer interactions. In order to investigate the contribution of both factors we developed a new paradigm: the Communal Nest (CN). CN mimics the natural ecological niche of the mouse species and consists in a single nest where three mouse mothers keep their pups together and share care-giving behavior from birth to weaning. In the CN nest, maternal care and peer interactions are markedly increased compared to mice reared in standard laboratory rearing conditions (SN). Here, with the purpose of having several rearing conditions characterized by different levels of maternal care and peer interactions, the three CN mothers gave birth with an interval between two consecutive deliveries of 3 days. Thus, each CN nest was formed by 3 different groups of mice: oldest, intermediate and youngest. We assessed, during the first 2 weeks of life, maternal behavior and peer interactions and, at adulthood, social behavior in the all experimental groups. CN-intermediate mice received less care compared to CN-old, CN-young and SN mice. By contrast, SN showed lower levels of peer interactions compared to all CN groups. At adulthood, in a social interaction test, CN-oldest and CN-youngest mice appear to have more elaborate social competencies, displaying the behavioural profile of either the dominant or the subordinate after significantly shorter time compared to CN-intermediate and SN mice. These findings suggest that both maternal care and peer interactions are critical for shaping adult social competences.

Marco Dadda Poster N. 29

BRAIN LATERALISATION AND MATING SUCCESS IN MALE GOLDBELLY TOPMINNOW

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Cerebral lateralization refers to sensory, motor, and cognitive abilities that are specialized to either the left or right cerebral hemisphere. During the last years we did laboratory tests to compare cognitive performance of goldbelly topminnows from lines that have been selected for high or low degree of laterality in turning direction when encountering a predator. Strongly lateralized fish showed higher performance when foraging was concurrent with another task suggesting that hemispheric specialization favours multitasking. Strongly lateralized fish also showed more efficient shoaling and were faster at learning a spatial task. On the other hand, fish with strong hemispheric specialization were severely handicapped when they had to take a quick decision between two options (e.g. a large vs. a. small shoal) each seen by a different eye, since they tended to choose the option processed by the hemisphere dominant for analyzing social stimuli, irrespective of its quality. Here we measured a component of fitness, male mating success, comparing the rate of successful sneak mating attempts in males from high and low laterality lines. Fish selected for right eye preference to monitor a predator were more successful when the female was on their left side and the reversed occurred for fish selected for left eye preference. Males from line selected for low degree of laterality had no side-preference for mating too and on the whole they were less successful than lateralized fish.

Harold Dadomo Poster N. 30

TRAIT ANXIETY MODULATES STRESS-INDUCED DEPRESSION-LIKE DISORDERS IN MALE MICE

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Clinical and pre-clinical evidences prove that among many individuals experiencing stress, only a sub-population will progress to disease. Human studies suggest that a high trait anxiety may represent a vulnerability factor for psychiatric disease. Inbred strain of mouse characterized by high genetic and phenotypic homogeneity may be a valuable tool to investigate the mechanisms linking trait variables with disease susceptibility. 129SvEv and C57BL/6J strains are often used in behavioural neuroscience and are characterized by marked difference in trait anxiety, with C57 representing the less anxious strain. In this study, adult 129 (high anxiety trait) and C57 (low anxiety trait) male mice were subordinate in a model of chronic psychosocial stress-induced depression. To investigate stress-induced depression-like disorders, validated and novel behavioural tests relevant to anhedonia (sucrose preference test, novel-palatable food presentation test, sexual behaviour) were performed before and along the stress procedure. Stress-induced body weight gain was evaluated as well. Results showed a strain-independent stress-induced body weight gain. On the contrary, and in agreement with our hypothesis, 129 males showed higher vulnerability to stress-induced anhedonia as demonstrated by a lower preferences to eat a palatable food (a peanuts), low sexual motivation and no sucrose preference. At variance, the low anxiety strain C57, was resilient to stress-induced anhedonia as demonstrated by unaltered sexual motivation and hedonic response in the sucrose preference test. These results demonstrate that an elevated level of trait anxiety, represent a vulnerability factor to stress-induced anhedonia, a key diagnostic marker for major depression in humans. In addition, our data suggest that low trait anxiety might represent a resilient factor for stress-induced depression.

Philip Dammann Poster N. 31

REVERSAL OF A FUNDAMENTAL LIFE HISTORY TRADE-OFF IN A COOPERATIVELY BREEDING MAMMAL

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Cooperative breeding has traditionally attracted a great deal of attention from scholars of animal life histories, but the issue of potentially role-dependent aging rates in cooperatively breeding vertebrates is surprisingly under-studied despite the long-standing knowledge that sexual reproduction dramatically prolongs lifespan in many eusocial insect species. Here, we demonstrate that in the cooperatively breeding Giant mole-rat Fukomys mechowii, reproductive individuals live significantly longer than helpers who forego reproduction, irrespective of potentially confounding factors such as gender, social rank, or overall activity. These data corroborate earlier results obtained in the closely related Ansell´s mole-rat F. anselli (Dammann and Burda 2006) and indicate that a reversal of the classic trade-off between somatic maintenance and sexual reproduction is probably characteristic of the whole genus. Given the striking convergence with aging patterns in eusocial insects, and bearing in mind that most components of the mole-rats' social and mating system are – to varying degrees - shared by other cooperative breeders, we argue that status-specific aging in cooperatively breeding vertebrates should receive more attention, as it may refine our understanding of how social and mating systems, reproductive effort, longevity and aging are intertwined.

Lara Delgado Garcia Poster N. 32

BEHAVIOURAL DEVELOPMENT OF A HARBOUR PORPOISE (PHOCOENA PHOCOENA) MOTHER-CALF PAIR IN CAPTIVITY

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In this study the social and spatial interactions between cow and calf are described in harbour porpoises. The study started 3 months after the birth and presents the development of their behaviour during 10 months in a captive situation. Being this the first time a porpoise calf is documented to have been born and survived in captivity and this study being the only description of a mother-calf pair bond along time in either captivity or the wild. Spatial relative positions between mother and calf, the apparition or extinction of behaviours, and the variation in their occurrence along time were quantified. The study was done using focal sampling and observations were always conducted by the same observer. Avoidance and aggression from the mother towards the calf tended to increase when the calf was 8 months old, while potential fishing in the calf increased around that time. The total time they spent in close proximity decrease around the 10th month of the calf. The longest interval of time calf and mother spent separated increased from 4 minutes when the calf was 3 months old, to up to 40 minutes when it was 10 months old. Additionally, differences in mother and calf time budgets, and durations of behaviours showed age-related differences. The importance of studying the development of harbour porpoises calves during its first year has capital importance for its survival in the age class with the highest mortality in the species. Even though, the study is based in one mother-calf pair, and generalizations at species level would need the study of more individuals, it sets a basis for mother and infant interactions and calf development.

Alessandro Devigili Poster N. 33

SEXUAL SELECTION IN THE GUPPY: A COMPARISON BETWEEN PRE- AND POST-COPULATORY TRAITS

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In polyandrous species male fitness is determined by traits that come into play before and after mating. To identify the components of male reproductive success it is necessary to test the effect of each component by controlling, at the same time, for the influence of the others. This approach, although effective to identify the various mechanisms of sexual selection, does not allow to define their relative importance in determining a male's fitness. In the guppy (Poecilia reticulata), males are exposed to both pre-copulatory (female mate choice) and post-copulatory sexual selection (sperm competition and cryptic female choice). These components of sexual selection, have been shown to act in the same direction, as females prefer to mate with colourful males, colourful males produce more competitive sperm and females allow colourful males to inseminate more sperms. However, the relative importance of pre- and post-copulatory traits and the role of genetic similarity between partners have not been investigated in detail so far. To do so we related the variance in male reproductive success to the variation in behavioural and morphological pre-copulatory traits, ejaculate quality measures (sperm number and swimming velocity), and genetic similarity of mates. We set up 10 experimental replicates in which 6 males and 8 females could freely interact for one month. We collected one brood from each female and related the paternity of 532 offspring to the characteristics of their father. This is the first attempt, to our knowledge, to determine the relative importance of pre- and post-copulatory traits on the one hand, and genetic similarity between mates on the other hand.

Priscila Fernandes Silva Poster N. 34

BEHAVIOR OF THE MARINE SHRIMP FARFANTEPENAEUS SUBTILIS IN DIFFERENT STAGES OF GROWTH

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Farfantepenaeus subtilis, a native species from brazilian coast presents potential to being cultivated. Behavioral and physiological changes in the species along growth can be related to ecological pressures on different life stages. Ethological research has been pointed out as an important tool to improve the knowledge of cultivated species resulting in an efficient management, in other words, allowing better welfare conditions to the animals. This study characterized the behavior of F. subtilis on two different life stages: precocious juvenile stage (4 g) and late juvenile/beginning of adult stage (6 to 13 g). Both groups were observed in laboratory conditions during light and dark phase of the 24 h cycle. The recorded behaviors were: moving, exploration, burying, swimming, inactivity and feeding. For older stage animals, behaviors were more frequent in dark phase, but burying predominated in light phase. Precocious juvenile shrimps showed high records of exploration and burying in light phase, although the remaining activities were relevant in that phase too. Moving and swimming were more frequent in dark phase. Feeding and inactivity didn't show differences between light and dark phases. The observed differences demonstrate the importance of information related to behavioral activities along development as a tool to permit adjustments in order to optimize management. That way, healthy growing of the specimens will be met throughout the culture, preventing natural resources exploitation.

Caterina Ferrari Poster N. 35

PERSONALITY IN ALPINE MARMOT (MARMOTA MARMOTA)

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Several studies provided evidence that individuals of the same species differ consistently in their behaviours and that behaviour in one context is correlated with behaviour in other contexts; these suites of consistent individual differences in behavioural traits have been referred to as personality or coping style. The study of the ecological role of personality allow researchers to estimate the action of natural selection upon different personality types. By studying in the wild 11 different families of Alpine marmot (Marmota marmota), a social burrow-dwelling rodent, we aimed to evaluate whether individuals of this species show consistent differences in their personality. We captured and tested 122 marmots during the summers of 2007 to 2009 in the Gran Paradiso National Park, Italy. We collected repeated measures of individual physiological responses during handling and of individual level of activity during open-field tests. We analysed the data using Linear Mixed Models to account for individual and environmental differences, and to estimate the repeatability of individual measurements. We found that Alpine marmots differ in their behavioural responses during handling and during the open field tests, marmot identity explaining 45% and 33% of the phenotypic variance in behaviour, respectively. These two measures were also highly positively correlated, suggesting that one can use just one of the methods (i.e. measures of heart rate or measures of the activity level during the open-field test) to obtain a reliable measure of coping style in this species. Further studies should consider if and how personality affect individual strategies in this species.

Maud Ferrari Poster N. 36

OCEAN ACIDIFICATION MAKES LITTLE FISH FEARLESS

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Atmospheric carbon dioxide (CO2) concentrations are increasing at an unprecedented rate and could approach 1000 ppm by 2100 unless greenhouse gas emissions are substantially reduced. The corresponding increase in dissolved CO2 at the sea surface is expected to have serious consequences for marine species, although the CO2 concentrations at which impacts will manifest and the capacity for species' adaptation to this threat remain largely unknown. Here, we show that CO2 levels as low as 750 ppm CO2 result in an impairment of the antipredator response of larval damselfish both in the lab and in the field. Additionally, field observations revealed that larvae exposed to elevated CO2 were bolder and exhibited riskier behaviour than control fish and had 5-8 times higher rates of mortality within 30h of settlement to the reef. These results show that elevated CO2 could have far-reaching consequences for the replenishment of fish populations. Adaptation of behavioural responses might be possible at 750 ppm CO2, but atmospheric CO2 needs to remain below this level to avoid serious impacts on marine biodiversity.

Laura Fontanari Poster N. 37

USE OF PROPERTY AND SPATIOTEMPORAL INFORMATION FOR OBJECT INDIVIDUATION IN AN ANIMAL MODEL

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Object individuation is defined as the process by which organisms establish the number of distinct objects present in an event. Chicks' spontaneous tendency to approach the larger group of imprinting objects was exploited for investigating object individuation in this species. The first experiment assessed the role of property information provided by color, shape or size in object individuation. Newborn chicks were reared for three days with objects differing for one property (either color, shape or size). At test each chick was presented with two groups of events: one group comprised two objects differing for one property, while the other group comprised two presentations of one same object. In both cases all objects involved in a same group of events were sequentially presented and eventually concealed in a different spatial location and the number of events taking place at each location was equalized. Chicks spontaneously approached the two different objects rather than the single object seen twice. Chicks did not just prefer the more varied set as they did not choose when the two elements of each group of events were simultaneously presented (Exp 2). In Exp 3 chicks' use of spatiotemporal information in object individuation was assessed by presenting simultaneously three identical objects vs two different objects. Chicks proved able to use property information provided by color shape or size and spatiotemporal information in object individuation.

Serena Fregonese Poster N. 38

EFFECTS OF TWO FOOD DISPENSERS ON SEA LIONS' BEHAVIOR

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This preliminary study aimed to investigate the interactions of captive Sea lions with two food dispensers of a different shape: food dispenser A (tube-shaped) and food dispenser B (with a globular shape). Seven sea lions (3 Zalophus californianus, 3 Arctocephalus pusillus, 1 Otaria flavescens; 5 males 2 females) were observed each in one session interacting with food dispenser A and one with food dispenser B, using instantaneous focal animal sampling every 15 seconds for 20 minutes. The sea lions interacted with both food dispensers using their nose significantly more ($Z=2.2$; $p=0.03$) than using any other body part, whereas no significant difference in behaviour was found between sessions with food dispenser A or B. The time spent interacting with the food dispenser was about 50%, with no significant difference between dispensers. However, food dispenser B was contacted significantly more ($Z=1.2$; $p=0.046$) with the mouth than with fins, whereas the same was not true for food dispenser A. These results are encouraging, because all animals spent a discrete amount of time playing with food dispensers.

Nina Furnari Poster N. 39

BEHAVIOR OF A VERY RARE WILD GUINEA PIG CAVIA INTERMEDIA: PRELIMINARY RESULTS

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The wild guinea pig Cavia intermedia (Rodentia: Caviidae), which have one of the smallest known natural populations of mammals (less than 100 individuals) and are considered a critically endangered species by IUCN, exclusively inhabits an island of the Moleques do Sul achipelago, Santa Catarina, Brazil. Study of C. intermedia´s ecology and behavior is relevant from a comparative point of view and should contribute to the species' preservation. Data were collected during 25, 8-day monthly trips to the cavies´ island. On each visit, we captured, tagged and set free animals in order to recognize them individually. Behavior was recorded in three of the areas where the animals foraged, using a previously defined ethogram of 43 categories. Scans were performed at one minute intervals, during two-hour periods (between 9h and 22h), where we've also registered inter-individual distances. Preliminary results indicate that Cavia intermedia feeds mainly on grass, bushes or fallen leaves of the Guapira opposita tree. They usually forrage in groups (2 to 17 individuals) in which stable sub-units could be observed, mostly male-female pairs and male-female-pup association. There is a hierarchy between males and females, the former being more aggressive in food and space disputes. On the island, we've observed distinct sub-groups within the three analyzed areas, with cases of dispersion in young males. Predation is limited and life expectancy can exceed four years (vastly superior to the expectancy of wild guinea pigs on the mainland). The ecological and behavioral characteristics of this population are related to the island environment and the long term isolation they experience.

Marco Fusi Poster N. 40

PHYTOTHELMIC BEHAVIOR: NEW OBSERVATIONS ON THE SESARMID CRAB CHIROMANTES BUETTIKOFERI FROM CAMEROONIAN MANGROVE FORESTS

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Container habitats are relatively poorly studied in mangrove forest, even if they represent an important collector of biodiversity due to the complexity of their food webs. Moreover, brachyuran crabs, mostly biodiverse in mangroves, are among the many taxa well adapted in terms of feeding ecology, reproductive strategies, morphological adaptation and behavior to cope with this particular microhabitat. It is thus not surprising that, during a macrobenthos survey in a the mangrove forests of the estuary of Wouri river, close to Douala, Cameroon, we observed Chiromantes buettikoferi a sesarmid crab inhabiting this container habitat. These mangrove forests have been exploited for wood and timber since long time ago by the rapid development economics and massive growth of the population of Douala, determining a patchwork structured forest where mangrove associate species like Pandanus parvicentralis, P. satabiei and P. candelabrum have been able to grow, forming huge complexes. Pandanus leaves morphology coupled with the massive rainfall characterizing the zone (the second most rainy place of the world) allow the harvest of water in their axils and, consequently, the establishment of phytotelmic habitats, where C. buettikoferi was found. Two transects were selected for sampling and observations, located northward and southward of Douala city, respectively. We analyzed every cluster of leaves along the transect recording its height above ground, axils water pH and conductivity, number of crabs present and their sex, age and ovigerous female ratio. Moreover, we described the morphology of C. buettikoferi in terms of adaptation toward a phytotelmic habit, highlighting its climbing behavior, and the particular shape of the claws, unique among sesarmid species. We thus strongly suggest that C. buettikoferi could be considered a fully phytotelmic species and urge for further studies on its reproductive biology and feeding ecology.

Clelia Gasparini Poster N. 41

POST-COPULATORY MECHANISM OF INBREEDING AVOIDANCE IS MEDIATED BY THE OVARIAN FLUID IN THE GUPPY

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Since inbreeding is costly, mechanisms to avoid fertilization by close relatives are expected to evolve, especially in females. In species that lack effective pre-copulatory mechanisms of inbreeding avoidance, it has been suggested that females should mate promiscuously to exert a post-copulatory selection against sperm from closely related males. Although evidence of purely post-copulatory inbreeding avoidance is limited, it has been recently shown that ovarian fluids can have non-transitive effects on sperm swimming speed, suggesting a possible role in mediating sperm competition success in relation to male-female genetic similarity/compatibility. We studied post-copulatory mechanisms of inbreeding avoidance in the guppy (Poecilia reticulata), a species in which inbreeding has severe fitness consequences and females have limited pre-copulatory control over mating with relatives. We first investigated whether sperm number and swimming velocity affect sperm competition outcome. We found that males that contributed to sperm competition with more and faster sperm sired more offspring. Secondly, we investigated whether ovarian fluid differently affects sperm swimming velocity according to female-male relatedness. We found that ovarian fluid enhanced in vitro sperm swimming velocity, with sperm from unrelated males swimming faster than sperm from related males. Our results suggest that ovarian fluid mediates sperm competition success in favour of unrelated males in guppies, supporting the hypothesis that polyandry may be favoured in this species as a means to reduce the costs of mating with close relatives.

Patrick Gouat Poster N. 42

THE MOTHER'S DIET INFLUENCES FOOD CHOICE MADE BY NEWBORN AND EIGHT-WEEK-OLD KITTENS

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An effective food choice is a key for survival. In young animals, learning to select appropriate food by trial and error is a costly and even dangerous process. Lactation provides young mammals with an appropriate food during their early life but it could also give the opportunity to pups to collect information on suitable solid food through their mother's diet. We have investigated the effects of early olfacto-gustatory exposure via maternal ingestion on the later food preferences in cats. In a first experiment, we tested whether a prenatal exposure (25 days pre-partum) to a cheese flavor via the mother's diet could influence olfactory preferences of neonatal kittens. During two-choice tests, two-day-old kittens oriented firstly toward the cheese odor experienced in utero than toward a usual pet food odor whereas kittens born to mothers fed with a control diet did not. In a second experiment, the role of pre and postnatal exposure (from 25th day before to 23rd day after birth) to the cheese flavor on food preferences in weaned kittens was evaluated. Forty-five-day-old kittens exposed to cheese flavor during uterine and postnatal life via their mothers' diet ate higher amounts of food supplemented with cheese flavor than food supplemented with usual pet food flavor whereas kittens from the control group did not. These results demonstrated that information collected by kittens during their early life influenced their food choice after weaning.

Tomasz Hetmanski Poster N. 43

THE EFFECT OF THE SEASON ON THE ALLOCATION OF PARENTAL CARE BY MALE AND FEMALE FERAL PIGEONS COLUMBA LIVIA

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Feral pigeons breed throughout the year. Under favorable conditions, they can care for two broods at the same time. They exhibit so called clutch overlap. Both parents provide parental care. The patterns of incubation and feeding of the young by male and female were examined in two seasons, summer and winter. Males incubate in the afternoon, and females in the evening, at night, and in the morning. No differences were found in the duration of incubation by males and females between summer and winter. Females incubated for about 80% and males for about 20% of the 24-h cycle. But longer daytime period in summer conferred advantage to males as they had much more time for foraging in summer than in winter. The period of nestling development can be divided into three phases. The first one from hatching to 7-8 days of age, when they become normothermic. During this period the young are incubated by both parents. In the second period, extending from the time of developing normothermy to the time of laying new eggs by the female, the parents stop incubating. The third period covers parental care from laying new eggs to fledging of the young. It has been found that in the first and the second periods nestlings are fed by both parents, but in the third period only male cares for the young. Females feed them significantly less frequently than do males. In the third period, males feed the young alone, but significantly more often than in the first two periods when both parents feed the young. Because of the shortened daytime in winter, the males have too little time for foraging to satisfy food requirements of the young , and this is reflected in their poor growth and development.

Elise Huchard Poster N. 44

POLYANDRY: A CONDITION-DEPENDENT BEHAVIOUR?

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In contrast to traditional views of choosy females carefully selecting mates, recent observations often report on polyandrous females soliciting matings from multiple mates. The potential benefits of polyandry have attracted much attention so far, suggesting that females could secure good genes for future offspring through post-copulatory mechanisms. Much less empirical work has focussed on characterizing potential costs associated with such behaviour. At least some of these costs may be condition-dependent. Here we investigate the influence of female physical condition on sexual behaviour of small nocturnal primates where females are dominant over males. In gray mouse lemurs (Microcebus murinus), females mate polyandrously during a single night per year, providing the opportunity to estimate their degree of polyandry, even in the wild. We first tested whether females in better condition are more promiscuous using field observations from a natural population living in Kirindy forest, Western Madagascar. We then conducted an experiment in a captive population (Brunoy, France) where we directly manipulated female physical condition through food restriction and immune challenges prior to their oestrous night. The results of these two recent studies will be combined and contrasted focusing on sexual conflict and the potential energetic costs of countering male attempts to monopolize reproduction.

Jana Jeglinski Poster N. 45

INTO UNKNOWN DEPTH: THE ONTOGENY OF FORAGING BEHAVIOUR OF GALAPAGOS SEA LIONS

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One of the first major challenges and critical periods during an animal's ontogeny is the transition from maternally provided nutrition to independent foraging: Requiring increased amounts of energy for growth and maturation of morphological structures, immune system and physiological functions, juvenile animals operate with limited physiological capacity and behavioural skills in comparison to adults and are especially vulnerable to competition, predation and disturbance by environmental change or anthropogenic impact on their habitat. The study of the development of juvenile foraging skills, foraging habitat and nutrition is therefore of special importance for understanding demography and in the conservation of endangered species. Most pinniped species are distributed in nutrient rich habitats providing rather stable food conditions and the development to independent foraging is a rapid process induced and forced by weaning from maternal milk supply. The Galapagos sea lion is an endangered, marine top predator distributed in a confined, highly variable environment characterized by seasonal fluctuations between a cold, productive and a warm, less productive season. Juveniles are small and exhibit the lowest growth rate of all sea lion species. They may be nursed up to three years. We studied the development of diving behaviour with Time-depths recorders (TDRs) and performed stable isotope analysis to determine the onset of independent foraging. How, when and where do foraging skills develop under these difficult, variable marine conditions?.

Naoki Kamata Poster N. 46

PICK FORCES AND PRESSURES EXERTED BY JUNGLE AND CARRION CROWS

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Picking infrastructures and scavenging by jungle (Corvus macrorhynchos) and carrion (C. corone) crows result in noticeable mess for lifelines and causes conflict between humans and the crows in the highly urbanized environment like central Tokyo in Japan. Here, we investigated the pick forces and pressures exerted by wild caught adult jungle (n=32) and carrion (n=28) crows for establishing long term damage control techniques. A picking action consists of three actions; pecking, biting and pulling. The forces and pressures were measured by using pressure measurement film (Prescale HSseet; Fujifilm, Tokyo, Japan), analyzation equipment (FPD-100 / FPD-100S; Fujifilm) and spring scales (Mita instrument and gauge, Tokyo, Japan). The mean of maximum peck, bite and pull forces and pressures were 20.4 N (30.9-3.5; Maximum-Minimum) and 67.2 MPa (91.0-52.0), 427.4 N (779.9-165.0) and 107.2 MPa (141.8-74.2), and 9.13 N (15.7-0.6) (pull pressure was not measured), for jungle and carrion crows respectively. Therefore, our study revealed that jungle and carrion crows can break items which are made of soft plastics (e.g. polypropylene, polyethylene and vinyl chloride). Thus, we suggest that the infrastructures should be made by the materials which can endure against the three types of forces (at least 780 N) and pressures (at least 150 MPa) exerted by crows.

Inese Kivleniece Poster N. 47

TERMINAL INVESTMENT IN SEXUAL SIGNALING IN MALE MEALWORM BEETLES, TENEBRIO MOLITOR

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Theory suggests that secondary sexual traits should honestly reflect males' immunocompetence. We tested whether the activation of a male's immune system has an effect on the female's choice in Tenebrio molitor. We found that males did not suffer from increased mortality but their ability to attract a mate was reduced after a single parasite-like activation of their immune system by a nylon monofilament. However, after a repeated immune challenge the females more often chose the treatment males although these males later suffered a high mortality rate, suggesting terminal investment on sexual signaling. The reduced encapsulation response against the nylon implant and reduced survival of these males suggest they did not invest in recovery of their immune system. Our results suggest that under terminal investment males preferred by females communicated their condition dishonestly.

Nina Kniel Poster N. 48

DO BIRDS OF A FEATHER FLOCK TOGETHER? ARTIFICIAL ORNAMENTATION AND SOCIAL ATTRACTION IN THE ZEBRA FINCH (TAENIOPYGIA GUTTATA CASTANOTIS)

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It is known that artificial ornamentation, such as the leg band colour, can influence mate choice decisions in male and female zebra finches (Taeniopygia guttata castanotis). This results in a wide range of consequences, as it can affect the reproductive success, parental investment, mortality rate and offspring sex ratio in this species. But up to now, nothing is known about consequences of leg band colour in a social context in this highly social bird. We investigated whether male and female zebra finches use self-referent phenotype-matching in a social context and prefer to associate with a same-sex conspecific of the same phenotype (same leg band colour). We conducted a simultaneous choice experiment in cages where test birds wore a red leg band on each leg. Each test bird could choose to associate with a same-sex conspecific bearing red leg bands or a same-sex conspecific bearing blue leg bands. We measured the time they spent with the respective birds. Neither males nor females preferred to associate with same-sex conspecifics of the same artificial phenotype. The motivation to associate with same-sex conspecifics was significantly higher in females than in males. Our findings suggest that leg band colour does not seem to matter in a social preference context in the zebra finch. At least, they do not seem to discriminate between red and blue leg bands in a social context.

Martina Komárková Poster N. 49

VISUAL LATERALISATION IN SUCKLING FOALS

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Different use of left/right (L/R) eye for exploring environment and evaluation of different stimuli was described in domestic horses. They use left eye predominantly for watching novel object or frightening stimulus which indicates specialization of right hemisphere (RH) for appraisal of these types of stimuli. We presumed such lateralisation also in foals during suckling when only monocular vision (L/R) can be employed for observing surroundings (foals suck mostly in antiparallel body position). If so, foals should suck more often from the mother's right side ('from right'), so as potential danger were detected by the better adapted RH (left eye). Within two seasons, suckling behaviour of 59 Oldkladruby mares giving birth to 79 foals was observed from deliveries to abrupt weaning (4-6 months of age). From 10357 recorded suckling, 50.1% were performed from right. One third of the foals, however, showed strong, either right (N=13) or left (15) side preference; probability of suckling from right ranged from 0.22-0.98 ($p<0.0001$, logistic regression, PROC GENMOD, SAS). In some foals, side preference strengthened with age. Foal's choice of suckling side was not affected by foal's sex, mother's age, dominance rank or whether mother or foal terminated a suckling bout. In conclusion, only 16 % of the foals revealed significant right side preference for suckling. Thus, general trait to suck with left eye open for better danger detection and recognition is unlikely to occur, at least in up to 6 months old foals. Such a young foal is probably fully focused on suckling and relies on mother's vigilance. Individual side preferences among foals indicate rather kind of motor lateralisation, which has been already described in adult horses. Further research is needed to clear up effects of age and individual experience of the foal.

Wiebke Konerding Poster N. 50

PAW PREFERENCE IN THE DOMESTIC CAT: EFFECTS OF POSTURAL DEMAND

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Previously, it has been suggested that handedness is unique to humans. Recently, it has been found that individual handedness/ paw preference is common among a variety of vertebrate species. The fact, that biases scarcely reach the human distribution with 90 % right-handers, lead to the hypothesis that only highly demanding tasks will reveal biases at a group level. Previous studies have shown that the body posture during performance of a task highly influences either direction or strength of handedness/ paw preference. The domestic cat (Felis silvestris catus) is a good model for paw preference, as cats frequently use the paws to catch and hold prey. We performed behavioural experiments to reveal whether differences in the difficulty of tasks influences paw preference in cats. We performed two tasks that differed only in postural demand. The animals had to extract food items from a plastic box that was attached at different heights: ground level (20 cm) and cling level (100 cm). Each experiment was performed three times and was videotaped for later computer based analyzes. We revealed paw preference at individual but not at group level (approx. 40 % left, 30 % right, 30 % ambiguous). The cling level task was significantly more difficult than the ground level task, with animals extracting less food items per time and taking more grasps per item. Still, the cling level task did neither lead to stronger individual preferences nor to a higher predominance of left or right pawed individuals. Thus, we revealed that postural demand had no systematic effect on direction or strength of paw preference in the domestic cats.

Julita Korczynska Poster N. 51

THE EFFECTS OF AGE AND PAST AND PRESENT BEHAVIOURAL SPECIALISATION ON BEHAVIOUR OF WORKERS OF THE RED WOOD ANT FORMICA POLYCTENA DURING NESTMATE REUNION TESTS

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As a rule, social insect workers act first as nurses and then switch to extranidal activities and become foragers. However, worker behavioural development can be accelerated, retarded, and reversed in response to modifications of the social context. Honeybee foragers may switch to brood care behaviour if they are exposed to brood in absence of younger workers. Some elements of behavioural reversion may be induced by absence of younger workers even if foragers are not exposed to brood. We compared the behaviour of 5 groups of workers of the red wood ant Formica polyctena: (1) callows (newly eclosed ants), (2) nurses, (3) foragers kept in laboratory nests housing ants and brood collected from the mound, (4) foragers collected from the trails and kept in absence of brood and younger ants, and (5) reverted nurses created by exposing foragers to brood in absence of younger ants. Dyads of ants from the same group were tested during 10 min nestmate reunion tests. The behaviour of the tested ants was influenced both by their age and by their past and present behavioural specialisation. Callows were the least active. The behaviour of nurses was intermediate in respect to the behaviour of callows and of the remaining ants. The behaviour of the reverted nurses was in most respects closely similar to that of foragers. The behaviour of two groups of foragers showed some differences, and in some cases workers taken from the groups composed solely of foragers were more alike to the reverted nurses than foragers kept together with brood and younger ants.

Yordan Koshev Poster N. 52

DAILY ACTIVITY PATTERN OF EUROPEAN GROUND SQUIRREL, SPERMOPHILUS CITELLUS IN HIGH ALTITUDE

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European ground squirrel (Spermophilus citellus) is an endangered species and typically inhabits steppes and open woodland at low altitude in Central Europe and the Balkans. There are only few populations living at high altitudes, and knowledge about their biology, ecology and behavior under these environmental conditions is scanty. This study described the daily activity pattern of Spermophilus citellus living in high mountain population (2000-2400 m a. s. l.) in Rila Mt., Bulgaria. In summer the daily activity began about 8.00 EET and ended about 19.00 EET. The activity pattern in summer was bimodal, while in autumn and spring only one clearly expressed peak was observed. The spring peak of ground squirrel activity is shifted in morning hours. The activity is higher in low cloudiness, weak winds and little rain.

Tatjana Krama Poster N. 53

A RAPID EFFECT OF HANDLING ON COUNTS OF WHITE BLOOD CELLS IN A WINTERING PASSERINE BIRD: A MORE PRACTICAL MEASURE OF STRESS?

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Measuring circulating glucocorticoids is a widely used method to assess stress in animals. However, hormones must be sampled within the first few minutes of capture, which makes it difficult to discriminate between hormone baseline levels and the levels caused by environmental stress. The use of white blood cell counts made from blood smears represents an alternate method for measuring physiological stress. Since the increase in glucocorticoid hormones causes characteristic long-lasting changes in the leukocyte numbers, we tested whether stress related handling of male great tits (Parus major) may cause rapid changes in their leukocyte profile. We found that handling stress significantly increased heterophil counts already between 30 and 60 min after capture, while lymphocyte and eosinophil counts significantly declined between 60 and 120 min after capture. The increase in heterophil counts and reduction in lymphocyte counts caused an increase of heterophil and lymphocyte ratio (H/L) between 60 and 120 min after capture. Overall these results indicate that leukocyte profiles in wintering male great tits may change more rapidly than previously thought, reflecting the condition of acute stress of individual birds.

Antonieta Labra Poster N. 54

DISENTANGLING THE SCREAM OF THE WEEPING LIZARD: FROM FORM TO FUNCTION

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Gekkota is a taxon that communicates using vocalizations, although these have been reported in many other species, which apparently vocalize under risky situations, particularly, predation. Unfortunately, most of these studies barely report the structure of those vocalizations, and fewer attempts had been made to understand their function. So far, the two main hypotheses proposed to explain vocalizations in a predatory context are: 1- they constitute an antipredatory mechanism, which may stop a predatory event. 2- They are alarm calls to conspecifics. Here, we explore the structure of the vocalizations, the factors that may modulate them, and test the two "predatory" hypotheses in the "weeping or shrill lizard", Liolaemus chiliensis. Liolaemus is a South American genus with more of 200 species, and so far, there are only anecdotic reports of vocalizations for two species (e.g. L. chiliensis), not closely related. Liolaemus chiliensis has more than 20 different patterns of vocalizations, and the two most common are around the 50%. Evidences suggest some sexual differences in vocalizations. Lizards confronted and attacked (unsuccessfully) by models of the two main predators (raptor and snake), did not screamed, but they did it when were "captured" by a simulated predator. These data suggest that the main function of these vocalizations would not be antipredatory. Finally, we tested the response of lizards to vocalizations of conspecifics that screamed in a "predatory event". Evidences do not support strongly that vocalizations have an alarm function. Funds: Fondecyt 1090251.

Giovanni Laviola Poster N. 55

EVALUATION OF IMPULSIVE BEHAVIOUR IN CALLITHRIX JACCHUS: A PILOT STUDY

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An important factor in impulsive behaviour is the inability to tolerate delay of gratification, which has been measured by a two-choice operant paradigm, in a number of animal species. Callithrix jacchus, a NW monkey (N=16), was confronted with a choice (session 10 min., timeout 1 sec.) between a smaller and immediate reward (SI: 1 flavoured banana pellet, 45mg) vs a larger and delayed reward (LD: 4 pellets. Delay before release of LD was progressively increased during sixteen days (0-60 sec). On the basis of median slope value, we identified two subpopulations within a "strategy" or "efficiency" factor, respectively. For the factor "strategy", subjects were classified as "shifting" or "non-shifting" based on progressive decrease (or not) in their preference for LD with increasing delay. As for "efficiency", subjects were classified as "progressive" or "regressive" in their capacity (or not) to maximize the payoff (pellet gain), as delay increased. Upon small (< 9 sec.) delays, "non-shifting" subjects show greater motor impulsivity than "shifting" individuals, which however never developed a clear preference for SI. With regard to larger (> 9 sec.) delays, "progressive" subjects show higher impulsivity than "regressive" subjects. In general, a profile of low motor impulsivity seems to predict elevated flexibility of choices, which also allowed a better payoff in terms of pellet gain. In conclusion, individual behavioural differences can be evidenced in marmosets in a delay-to-reward operant choice laboratory paradigm.

Lars Lewejohann Poster N. 56

SOCIAL STATUS, EMIGRATION, AND SPONTANEOUS BEHAVIOUR IN GROUPS OF MALE MICE DIFFERING IN SEROTONIN-TRANSPORTER GENOTYPE

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The serotonin transporter (5-HTT) is the key-regulator of the serotonergic system and is hypothesised to play a central role in the control of social behaviour. Genetically modified mice eliciting abrogated 5-HTT function display a number of phenotypic changes in behavioural tests corresponding to human neuropsychiatric disorders. However, a characterisation of the effects of serotonergic malfunction on the day-to-day life of these mice was still missing. 5-HTT knockout mice, heterozygous 5-HTT mice, and wild-type controls were housed in male groups of the same genotype in spacious and richly structured cages. This enriched environment allowed a trained experimenter to analyse a wide variety of behavioural patterns. Additionally the mice could emigrate from the cages through a tunnel and a water basin. The results revealed unaltered daily behaviour in heterozygous mice. In knockouts, however, reduced locomotion, increased socio-positive behaviour, and reduced aggressive behaviour were observed. Nevertheless, all groups showed a significant amount of aggressive behaviour and there were no differences regarding the establishment of dominance relationships, emigration, and the number of animals remaining in their groups. In a second step, pairs of heterozygous and wild-type males and pairs of knockout and wild-type males were brought together in order to assess their ability to obtain a dominant social position in a direct encounter. Heterozygous mice did not differ from wild-type mice but knockout mice were significantly inferior in obtaining the dominant position. In addition to confirming multiple effects of abolished 5-HTT function in a real life situation, this study supports the central role of the 5-HTT in the control of social interactions.

Lisa Locatello Poster N. 57

EXPERIMENTALLY INDUCED IMMUNE CHALLENGE AFFECTS MALE SEXUAL DISPLAYS IN THE PEACOCK BLENNY (SALARIA PAVO)

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The theory of parasite-mediated sexual selection posits that individuals (usually females) choose mates by assessing the expression of costly secondary sexual signals, which provide reliable indication of parasite resistance. If these traits warrant to females the honest advertisement of male health status, then immune-compromised males are expected to exhibit a reduced signals' expression. We addressed this prediction in the peacock blenny, Salaria pavo, by injecting males with lipopolysaccarides (LPS; dosage: 2mg/kg), eliciting the immune system activation and leading to a remarkable oxidative stress in animals by an increased production of reactive oxygen species. Peacock blenny males are larger than females and exhibit two sexually dimorphic traits, a pronounced head crest and a pair of anal glands, both implicated in female mate selection. We recorded changes in the expression of male secondary sexual traits, courtship behaviour and ejaculate quality (sperm number, velocity and viability) between groups of males respectively exposed to the immune challenge or sham-injected. The immune treatment had a significant negative effect only on the yellow colouration of the head crest, both in terms of colour extension and intensity. These results indicate that in the peacock blenny the head crest, a sexual signal whose colouring expression depends on antioxidants (i.e carotenoids), may represent an honest advertisement of male quality assessable by females during mate choice. Indeed, the immune system activation trough LPS may result in depletion of bodily antioxidants, mobilized to contrast the oxidative stress at the expense of a carotenoid mediated sexual signals.

Stephanie Luerzel Poster N. 58

BEHAVIORAL AND ENDOCRINE PROFILES IN GUINEA PIGS – AN ADAPTATION TO THE SOCIAL ENVIRONMENT?

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The social environment of small mammals may vary widely across time and, thus, requires appropriate adaptation. In guinea pigs, for instance, differential social housing of males leads to two distinct phenotypes that appear over the course of adolescence. These two phenotypes encompass differences on the behavioral as well as on the endocrine level. Males reared under pair-housing conditions with only one female since before puberty (PM) show much higher levels of aggression towards other males and of courtship and sexual behavior towards females compared with males reared in large mixed-sex colonies (CM). Furthermore, late adolescent CM show a reduction in cortisol responsiveness and a testosterone peak, both of which are absent in PM. In experimental studies, a defined period of social stimulation of PM caused an increase in testosterone levels; thus, this difference between PM and CM is likely caused by the constant social stimulation by adult conspecifics in the colonies. Furthermore, we hypothesize an organizational effect of testosterone on stress responsiveness that also may have implications for aggressive behavior. The two different phenotypes may represent adaptations to different population densities mimicked under laboratory conditions. For CM (living at a high population density), the most successful reproductive strategy appears to be peaceful integration and adoption of a 'queuing strategy' until they have an opportunity to monopolize females, contrary to investing in costly aggressive encounters. Contrarily, pair-housing represents a low-density situation, in which it may prove advantageous to be highly aggressive in order to defend a mating partner.

Luigi Macchitella Poster N. 59

SOCIAL COGNITION AND PYCHOPATHOLOGY IN DOGS: A BRIEF REVIEW WITHIN A COMPARATIVE PERSPECTIVE

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Studies in social cognition and psychopathology of dogs has greatly increased in recent years. Researchers have explored the behaviour, physical cognition, genetics and neurochemistry of dogs, whereas social cognition as been mainly investigated in humans, non-human primates and rodents. Studies concerning communication, social learning, theory of mind, attachment and abnormal behaviour in dogs show that dogs have complex inter-specific and intra-specific social cognitive skills. Recent findings show that some dogs' performances exceed those of apes and monkeys, are comparable with those of human infants, have a genetic basis prompted by domestication. Interestingly, dogs show psychopathologies similar to those of humans and other animals. We argue that the dog is a good model species for the study of social cognition and psychopathology in humans and non human animals.

Diego Magnani Poster N. 60

SEARCHING FOR DIFFERENCES IN BEHAVIOURAL RESPONSE OF PIGLET GROUPS SUBJECTED TO A NOVEL SITUATIONS

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Individual difference in animal behaviour could clarify the differences in stress coping style, which have consequences in production, health and welfare. If differences in behaviour reflect coping characteristics, then behaviour in one situation should predict behavioural reactions in other situations and at other times. The Backtest (BT), the Open Field (OP) and the Novel Object (NO) tests have been used to identify individual reaction patterns in pigs and to measure parameters that previous studies showed to be correlated to the coping strategies of animals. The BT allows classifying piglets in two different "coping styles": high-resisting (HR), which adopt a (pro) active coping style and low-resisting (LR), which seem to behave as passive (or reactive) coopers. In previous researches subjects were tested singularly, so the aim of this study was to investigate if differences between HR and LR could be detected when piglets are tested in group. A total of 132 piglets were subjected to BT and then they were housed in group of four individuals for a total of 12 HR's boxes, 12 LR's boxes and 9 mixed boxes (2 HR and 2 LR piglets). At the age of 44 days piglets housed in the same box were subjected all together to OP and NO. We found difference in exploration time ($p<0,03$) during OP and in aggressive behaviour frequency ($p<0,03$) during NO; both of them were higher in LR than in HR piglets. We did not find any other relation between results of Backtest and reactions in the open field and novel object tests. Our results suggest that differences between HR and LR piglets involves few behavioural occurrences when animals were subjected in group to novel situations.

Giorgio Malacarne Poster N. 61

DOES THE PARTNER'S SOCIAL RANK AFFECTS EGG TESTOSTERONE ALLOCATION OF THE FEMALE? COMPLEMENTARY STUDIES IN TWO BIRD SPECIES

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The differential allocation of resources in egg is considered as a strategic maternal effect. Hormones, vitamins and immunoglobulins deposited in yolk, and antibacterial molecules present in the albumen, are substances able to positively affect embryo growth and chick survival. In some bird species, the mating preference of the female can influence yolk testosterone (T) concentration: female canaries produce eggs with more T when exposed to an attractive male song. Little is known on the role of the male social status (dominant or subordinate males) in influencing female eggs allocation. In two different studies, we exposed females of grey partridge and of canary to choice tests where the real or perceived rank of the males was assessed. In the grey partridge, the females were paired with winners or with losers of male-male encounters. Preliminary results suggest that the females paired with winner males laid eggs with higher T concentrations. In the canary we exposed females to an overlapping interaction of two males songs. It has been shown that the covering song is a signal of dominance vs. the covered one. The egg analysis has shown that T concentration does not differ significantly in the two groups but, interestingly, the females exposed to overlapping songs laid eggs with greater yolk/total egg mass ratio than females exposed to overlapped songs. The results here reported for the two birds are discussed in the light of the complex and species-specific different strategies that the females of oviparous species put in act to enhance her reproductive fitness.

Arianna Manciocco Poster N. 62

LONGITUDINAL BEHAVIOURAL AND PHYSIOLOGICAL MONITORING OF INTENSIVE STOCK-FARMING PIGS ARISEN IN ENRICHED ENVIRONMENT

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A holistic monitoring approach aimed to determine level of welfare should include behavioral and physiological measures. Pigs prevented from possibility to exhibit proper investigative activities redirect their behavior by increasing frequency of biting inappropriate items, such as the bodies of penmates. This behavior can represent a condition of poor welfare for swine, also representing a locus of infective processes. Here we report a longitudinal monitoring of the effects of the physical enrichment of environment by evaluation of presence of specific abnormal behaviours and of physiological indicators. 28 (Large White x Landrace) x Pietrain pigs were exposed or not to four different types of objects over a period of two months and a half. The presence of skin injuries was also recorded. Frequency of abnormal behaviours was significantly reduced in the enriched subjects. Furthermore, a time-related profile appeared in the use of objects. Levels of complement system and lymphocytes were lower in pigs from the enriched group. The longitudinal monitoring of behavioural and physiological indicators appears to represent a useful approach for an accurate evaluation of the farm animals' welfare state as a function of refinement housing procedures.

Valeria Marasco Poster N. 63

STRESS RESPONSE ACTIVITY CHANGES AT DIFFERENT STAGES OF EARLY DEVELOPMENT IN JAPANESE QUAIL (COTURNIX COTURNIX JAPONICA)

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Vertebrates deal with unpredictable stimuli by activating a stress response under the control of the Hypothalamus-Pituitary-Adrenal (HPA) axis. The stress response in birds is mainly characterised by a short-term increase in the stress hormone corticosterone. Although, there has been great interest in the physiological and behavioural changes triggered by the stress response in adult birds, we know much less about the changes of the HPA axis activity and regulation during early postnatal development. In the present study we analysed the stress response in captive Japanese quail at different stages of early life by measuring baseline and stress-induced levels of corticosterone during a capture handling restraint protocol. We found a significant effect of chick age and time of sampling on corticosterone levels. Interestingly, our results showed that older quail chicks exhibited lower stress-induced corticosterone levels than those observed in younger chicks. We also measured in each chick the tonic immobility behaviour, an innate anti-predatory response, and tested whether potential behavioural differences were associated with stress response activity. Here, we found that tonic immobility response was related to chick age and the magnitude of the stress response. Our results suggest that an age-related decline in the physiological stress response may be related to the need to respond quickly to stressful stimuli in the early stages of development in this precocial species.

Kristine Meise Poster N. 64

HOW TO DEAL WITH THE PROXIMITY OF POTENTIAL RIVALS

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Living in groups provides animals with the opportunity to interact with several different individuals. Although often being advantageous, interactions can be costly when group members compete for specific resources. In polygynous mating systems males compete for females. The most competitive ones establish territories and monopolize the access to females. Inferior males avoid encounters with these stronger rivals and accumulate in non-territorial areas, often forming so-called bachelor groups. Members of these groups have to deal with the permanent presence of potential rivals. This raises the question whether males have strategies to cope with this potentially dangerous situation. Associations with related individuals or males that share specific characteristics might lessen the aggressive potential. We investigated the effect of intra-sexual competition on the spatial and social organization of non-territorial males in a colony of Galápagos sea lions (Zalophus wollebaeki). While territorial males occupy the preferred habitats along the water's edge, non-territorial males use the less attractive inland habitats. Analyses of resights conducted during the reproductive season revealed that these non-territorial males do not choose their resting spot randomly, but instead show fidelity to specific sites. As the number of males is high and space is limited, several males use the same areas. Thus, site fidelity is one factor sub-structuring interaction patterns as it sets limits to the number of an individual's social partners. Analyses combining spatial grouping with social network analysis demonstrate how individuals using the same sites group together in the social network and to what extent the members of a group share characteristics that might explain their grouping tendencies.

Michele Mignini Poster N. 65

COOPERATIVE LARVAE? UNDERSTANDING VIBRATIONAL COMMUNICATION IN THE SOCIAL WASP POLISTES BIGLUMIS

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Research on social insect communication allows investigations on the evolutive role that signals played in the origin and maintenance of social systems. Vibratory signals are widespread in insects. Females of the primitively eusocial wasps Polistes exhibit these behaviours, which consist in lateral or vertical movements of the abdomen or the entire body. The social meaning of these signals is poorly understood. This work aimed to analyze vibrational communication in the mountain species P. biglumis. We performed 380 hours of behavioural observations on females of 188 colonies at different development stages. Colonies belonged to two geographically distinct populations from western Alps and central Apennines, Italy. We analysed the pattern of the vibratory signals in P. biglumis, the behavioural contexts in which vibrations occur and the extent of signal variation between populations, in order to understand the function and social meaning of this behaviour. In P. biglumis, nest foundresses are the only individuals exhibiting vibratory signals. They are only performed during the founding phase of the colony and are associated with other brood-caring behaviours. Presence of late instar larvae on the nest seems fundamental for these signals to appear. Our findings suggest that vibratory signals in P. biglumis may stimulate larvae to secrete saliva, which represents an essential nutritive source for foundresses and acts as a chemical primer on foundress behaviour. We also found that populations differed in the amount of vibrational signalling. Such differences reflect differences in social structure and suggest that vibrations may also be a means of parental manipulation of caste differentiation in immature brood.

Paolo Mongillo Poster N. 66

ASSESSMENT OF SPATIAL LEARNING AND MEMORY IN COMPANION DOGS

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Spatial cognition entails basic skills, which animals require to navigate their environment. On the base of such skills, behavioral tests can be devised to assess a variety of cognitive functions without the need for extensive training. Here we present preliminary results obtained in a two-steps task based on a T-maze, for the assessment of spatial learning and memory abilities in companion dogs. Twenty-four privately owned dogs of various breeds and ages (X+SD=4.6+1.4 years of age) were included in the study. In the learning phase dogs were asked to solve the T-maze in a maximum of 15 trials. Subjects that achieved the learning criterion were re-tested after two weeks in three unrewarded trials to assess long-term spatial memory. Learning trials were completed in an average of 22.0+23.5 s. The proportion of success in this phase was above 50% chance level (N=19, P<0.001, Binomial test), with successful dogs committing 5.5+4.5 errors; unsuccessful dogs (N=5) committed 12.4+2.5 errors on average. In the memory task, trials were more quickly completed than in the learning task (X+SD=6.9+10 s; t18=2.571, P=0.020). Dogs accomplished the memory task without errors (N=9), or committing one (N=8), two (N=1) or three errors (N=1). These data suggest that most dogs can rapidly acquire a spatial learning task, whereas failure seems to be associated with individual side preference. Results of the memory task indicate that procedural memory was retained by most dogs after a two-weeks interval. Results were less consistent in terms of declarative spatial memory, with only half of the dogs providing evidence of long-term retention of the previously acquired task.

Abdolali Movahedinia Poster N. 67

FISH BRANCHIAL RESPONSES TO NATURAL CONDITIONS IN MARINE ENVIRONMENTS

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Abstract: A variety of factors, including environmental pollutants and many parasites can induce morphological anomalies in fish gills. Unfortunately, different irritants may cause almost identical lesion and gill structural damage may merely reflect a generalized stress response rather than toxicant or parasite-specific responses. The present study, considered histopathological changes in the two fish species, Persian sturgeon (Acipenser persicus) and Stellate sturgeon (A. stellatus), focusing on gill alterations. The aim was to describe the different gill tissue changes in this two species of sturgeons. Gills were sampled from sturgeons caught from fishing ground along the southern coasts of Caspian Sea. Samples fixed in buffered formalin and embedded in paraffin. Serial, longitudinal 5µm thick sections were routinely stained with Harris' haematoxylin and eosin. One hundred slides with 3 to 8 sections of gills were examined with light microscope. Hyperplasia of the lamellar epithelium was the most frequent gill lesion. In fact this anomaly is a general response to different irritants. Hyperplasia is an increase of cellular layers of the lamellar epithelium. Epithelial lifting of the lamellae because of an infiltration of fluid makes oedematous space between epithelium and basement membrane. This lesion inhibits respiratory gas exchange by increasing diffusion distance and decreasing interlamellar distance. In leukocyte infiltration there are blood cells (Leukocytes) in the oedematous space. Hypertrophy of the respiratory epithelium is probably a phenomenon related to volume regulatory processes break down and the cell swell. Fusion of adjacent secondary lamellae as a result of hyperplasia or epithelial lifting and in some cases hypertrophy was the second frequent gill lesion. Lamellar aneurysm happens by accumulation of blood cells in the secondary lamellae. Keywords: Acipenser persicus, Acipenser stellatus, Histopathology, Gill, Caspian Sea

Petr Musil Poster N. 68

EFFECT OF CATCHING AND MARKING BY NASAL SADDLES ON BEHAVIOUR AND BREEDING PERFORMANCE OF DIVING DUCKS

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In total, 174 females of European Pochard Aythya ferina and 135 females of Tufted Duck Aythya fuligula were marked during 1998 - 2009 in southern Bohemia (in the T?ebo? Biosphere Reserve and adjacent areas, 49°00´ N, 14°46´ E) in the Czech Republic. The project is based on catching, measuring, weighting and colour marking (nasal saddles or nasal discs) of females diving ducks. Moreover, regular monitoring of surrounding landscape, including about 180 fishponds is carried out from April to August. The main goal of the Czech diving duck catching and marking project is investigation movements and survival of individual diving duck broods and its relation to: female quality, weather and feeding conditions (i.e. fish stock density, density and composition of benthos and plankton, water transparency) on the nest site and in surroundings. Females were caught on the nest using drop-door trap or flushed into mist nets exposed close to the nest. Both catching methods are used only during the late phase of incubation to prevent nest abandonment. We compared data sampled marked and non marked females in aim to evaluate effect of catching and marking of diving duck females on various aspects of behaviour and breeding performance of investigated diving duck species. There was no significant effect of marking on breeding success, behaviour of brood rearing female as well as on number and survival of ducklings in broods. Although, incubation constancy (i.e. proportion of day-time spend by incubation) decreased in day of catching and marking. Nevertheless, incubation constancy in the day after hatching was the same as in the day before catching.

Zuzana Musilova Poster N. 69

TERRITORY SETTLEMENT AND SITE FIDELITY IN THE REED BUNTING EMBERIZA SCHOENICLUS IN A PATCHY ENVIRONMENT OF FISHPOND

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The highly fragmented fishpond landscape in South Bohemia provides an important breeding habitat for Reed Buntings Emberiza schoeniclus (early-arriving species, forming flocks in pre-breeding season). In total, 270 colour marked individuals were investigated on five fishponds in South Bohemia, the Czech Republic, in 2000-2009. We used model selection to test the effect of individual covariates (sex, age, weight and body measurements) on apparent survival and recapture probabilities of Reed Bunting adults. There is a correlation between territory settlement and site fidelity. Older males were more frequently re-sighted in the study area during the year of banding. Moreover, males were more frequently recovered in subsequent breeding seasons. The effect of breeding performance on site fidelity in previous breeding seasons was not confirmed. This study provides evidence that there is a connection between territory settlements and site fidelity in Reed Bunting. Moreover, territory settlement, and marginally, site fidelity is associated with the previous experience of the males. Forming pre-breeding flocks probably provides addition of nutrition reserves after spring arrival. High competition in males and lack of suitable breeding habitats, due to occupancy by older residents, indicated crucial importance of small fragmented wetlands to this study species in this particular area.

Simona Normando Poster N. 70

A FACE PREFERENCE STUDY IN LAMBS (OVIS ARIES)

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The presence at birth of preferences for attending to faces is a much debated issue. In human newborns face-preferences are well attested, though it is not clear if they are face-specific or rather elicited by some low-level properties of faces (e.g. the up-down asymmetry in the distribution of inner features). In spite of the extensive literature on face-processing in sheep, spontaneous face preferences in newborn lambs have not been systematically tested yet. On the contrary, it has been demonstrated that naive domestic chicks show a preference for face stimuli, regardless of the up-down distribution of inner elements. Chickens and sheep are both social species for which detection of conspecifics and individual recognition are important tasks. In both species, the performance in such tasks can be guided by the perception of visual features of the head region of other animals. In this study we tested the spontaneous preference of 8-day-old lambs (N=9) for three pairs of stimuli. In each pair, one stimulus was a face-like display, whereas the other presented the same inner features displaced in unnatural positions. One pair of stimuli was obtained from photographic images of ewes' faces, the other two pairs were schematic face-like stimuli. In one pair the face- and the non-face stimulus were controlled for the up-down asymmetry in the distribution of features. Results showed that lambs discriminated between the two stimuli obtained by photos of conspecifics (they preferred the non-face stimulus). Learning during the first week of life might be responsible for the results observed.

Monika Okuliarova Poster N. 71

FEAR-RELATED BEHAVIOUR IN OFFSPRING JAPANESE QUAIL DIVERGENTLY SELECTED FOR YOLK TESTOSTERONE CONCENTRATIONS

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Maternal hormones transferred in the egg yolk can substantially contribute to an early environment of developing embryo and mediate behavioural consequences in offspring. Genetic lines of Japanese quail selected for low (LET) and high (HET) yolk testosterone (T) concentrations may represent the model to study the effects of maternal variability in yolk T levels on behavioural and physiological phenotype of offspring. Therefore, the aim of our study was to compare the LET and HET line for fear-related behaviour in the open-field (OF) and tonic immobility (TI) test in quail of the F2 generation at the age of 9 – 10 days. In addition, basal plasma corticosterone (C) levels were measured. Mothers of offspring in the LET line laid eggs with lower mean yolk T levels compared with the HET line (4.0 ± 0.2 and 12.8 ± 0.9 pg/mg yolk in the LET and HET line, respectively). We found no differences between offspring of both lines in TI responses. In the OF test, HET males emitted higher number of distress calls compared with LET males, while females did not differ in their distress vocalisation. We did not record any line differences in other OF behaviours like locomotor activity, latency to vocalize, latency to explore and defecation. Plasma C concentrations were higher in quail of the HET than LET line under basal conditions. Our results show subtle effects of selection for yolk T concentrations on fear-related behaviour in quail offspring and further studies are needed to characterize behavioural phenotypes in the LET and HET line. The study was supported by VEGA 1/0365/10.

Milena Palumbo Poster N. 72

SHIFTS OF ATTENTION MODULATE GLOBAL/LOCAL PROCESSING IN CAPUCHIN MONKEYS

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A robust finding in human cognition is that the global level form of hierarchical patterns (i.e., patterns where a global shape is formed by the configuration of smaller local shapes) is processed faster and better than the local level forms. By contrast, most monkey species show a strong advantage in the processing of the local level of the stimuli. In humans, there is evidence that the allocation of attention to one level of hierarchical stimuli can affect the speed of processing of that particular level. In the present study we examined whether the allocation of attention to particular levels of stimulus structure affected global-local processing in capuchin monkeys, a species with a strong local bias. Attention shifts were induced by manipulating the relative frequency of trials requiring either the global or the local form processing within a testing session. Capuchins showed a global advantage in the global bias condition, in which shape identification was more likely to occur at global level, and a local advantage in the local bias condition, in which shape identification was more likely to occur at local level. Overall these findings demonstrate that selective attention can modulate the quality of processing of different levels of stimulus structure in a monkey species.

Riccardo Panelli Poster N. 73

SHORT AND LONG TERM EFFECTS ON BEHAVIOUR AFTER AROMATASE BLOCKAGE IN PREPUBERTAL MALE RATS

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In rodents, sex steroids are essential for the ontogenesis of sexually dimorphic behaviours. During the perinatal period, the masculinization of CNS depends of Testosterone aromatized to Estradiol. At puberty however, sexual hormones may still complete these functional and structural modifications of CNS. Here we analyze the short and long term effects of a prepubertal administration of aromatase blocker, anastrozole on plasma T levels, gonads weight, play and sexual behaviours. Three groups of male rats were treated as follows: anastrozole, anastrozole and 17ß estradiol, and placebo. First results showed that both central and peripheral activation may still influenced by the alteration of the endocrine milieu, well beyond the perinatal period. Short term modifications (PND 45) were observed on play behaviour after treatment, as on plasma T level and gonads weight, according to the hypothesis that T level is regulated by a feedback action mediated by Aromatase. Nevertheless, effet on T level was not peripherally maintained in a long-term period (PND 90), probably due by the previous SNC organization in the perinatal phase. Long-term effects on sexual behaviour need to be still analized.

Stefano Parmigiani Poster N. 74

SILDENAFIL COUNTERACTS THE INHIBITORY EFFECT OF SOCIAL SUBORDINATION ON COMPETITIVE AGGRESSION AND SEXUAL MOTIVATION IN MALE MICE

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Sildenafil citrate (known as Viagra) is used to treat human male erectile dysfunction (ED) and is a potent and selective inhibitor of the phosphodiesterase enzyme type 5, (PDE-5). Recent studies have localized PDE-5 in diverse areas of the brain and this suggest the possibility of central nervous system (CNS) effects of sildenafil on aggression and mood. Thus the effects of chronic intra-peritoneal administration of 10mg/kg (t.i.w., for 5 weeks) of sildenafil on competitive aggression, sexual behaviour was tested in CD1 subordinate male mice subjected to two social contexts: 1) “low levels of aggression ”, i.e. housing in dyads of siblings 2) “high levels of aggression”, i.e. exposure to a model of chronic psychosocial stress with an unfamiliar mice. Subordinate mice in both experimental context were injected with sildenafil or with saline. After 2 week of sildenafil administration subordinates exposed to “high levels of aggression” began to counterattack their dominant counterparts in a higher rate than subordinates injected with saline. This effect was essentially similar but faster (i.e. as soon as sildenafil treatment was initiated) in subordinates subjected to “low levels of aggression”. As far as sexual behaviour is concerned sildenafil injected subordinated mice in both experimental contexts showed a significant lower latency to mount a proceptive female when compared to saline injected subjects. Moreover, in both experimental contexts Sildenafil reduced body weight gain. In conclusion, chronic Sildenafil treatment counteracts the inhibitory effects of social subordination on male competitive aggression, sexual behaviour and body weight gain. Overall our data suggests that sildenafil could be acting in the central nervous system to modulate motivational systems involved in competitive aggression and sexual behaviour. These findings might open the perspective of a new pharmacological use of this drug.

Emilie Perez Poster N. 75

DOES CORTICOSTERONE MODIFY FINE ACOUSTIC STRUCTURE OF BEGGING CALLS IN WILD ZEBRA FINCH NESTLINGS?

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As their needs vary in time with metabolic rate, environmental conditions and development, young birds have to communicate their needs to their parents to receive the appropriate level of resources at any one time. Although the prediction that the rate of begging displays reflects nestlings' needs has received empirical supports, the specific components of the signal driving parents feeding is not well established. To the best of our knowledge, no study asked whether nestlings' condition affects begging calls acoustic structure. Whereas an increase in begging call rate enhances the risk of predation, fine variations in call structure could be less conspicuous. When nestlings are food deprived, the level of circulating corticosterone (the main stress hormone in birds) increases and may be the physiological pathway that modulates call structure. Recent studies demonstrated that corticosterone provokes fine call structure modulations in adult zebra finches (Taeniopygia guttata). Thus, we hypothesized that the acoustic structure of young begging calls could also vary according to stress level. We experimentally increased circulating level of corticosterone in wild zebra finch nestlings by performing oral administration at 8 and 11 days of age. Begging calls were recorded before and after oral administration and acoustic parameters were analysed. During the whole experiment, chicks' behaviour in the nest was videotaped and morphometric measurements were taken.

Nadia Pieretti Poster N. 76

ANALYZING THE SINGING BEHAVIOUR OF AN AVIAN COMMUNITY: THE BIRD ACOUSTIC COMPLEXITY INDEX (BACI)

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The animal soundscape continues to be a difficult subject to investigate, due to the huge amount of information which it contains. It becomes essential to formulate mathematical indices with which to interpret it in an appropriate way. In this contribution, the suitability of the Bird Acoustic Complexity Index (BACI) is examined. It is an algorithm created to produce a direct quantification of bird song by processing the intensities registered in audio-recordings, even in presence of human-generated-noise. Twenty audio-recordings were made at equally spaced locations in a beech mountain forest in the Tuscan-Emilian Apennine National Park (Italy) between June and July 2008. The study area is characterized by the absence of recent human disturbance to forest assets but the presence of airplane routes does bring engine noise which overlaps and mixes with the natural soundscape. The intensity values and frequency bin occurrences of soundscapes, the total number of bird vocalizations and the BACI were processed by using the Songscope v2.1 and Avisoft v4.40 software. The Spearman's rho calculation highlighted a significant correlation between the BACI values and the number of bird vocalizations, while the frequency bin occurrence and acoustic intensity were weaker correlated to bird singing activity because of the inclusion of all of the other geo and anthrophonies present in the soundscape. This result let us to conclude that this algorithm effectively tends to filter out anthrophonies and can synthetically and efficiently describe the complexity of bird song patterns across the landscape, offering new opportunities for the monitoring of songbird communities faced with the challenge of human-induced disturbances.

Laura Piffer Poster N. 77

QUANTITY DISCRIMINATION IN MOSQUITOFISH: NUMBER OR ELSE?

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The ability to discriminate between two groups of items has been demonstrated in human infants and in a wide range of animal species. However many studies have demonstrated that animals base their discrimination on continuous extent that co-vary with number, such as cumulative surface area or the overall space occupied by the items, rather than really represent number. According to this findings it has been suggested that animals use numerical information only as a "last resort" strategy since processing number would be more cognitively demanding than processing continuous extent. We tested this hypothesis by training adult mosquitofish (Gambusia holbrooki) to discriminate between 2 and 3 figures in three different conditions. In the first condition, continuous extent was controlled for and the numerical information was only available; in the second condition the number was kept constant and only continuous extent varied; in the third condition stimuli differed for both number and continuous extent. Comparing the number of trials necessary to learn a discrimination showed that fish learned faster when both number and continuous extent were available, while there was no difference in the capacity to learn the discrimination based on numerical or continuous information. This seems to support the idea that processing number is not more complex than processing non numerical information correlated with number. On the whole, the results here presented indicate that the availability of multiple information sources may facilitate discrimination learning and supported the idea that animals have evolved mechanisms involving multipe cues to estimate quantity.

Rianne Pinxten Poster N. 78

SHORT AND LONG TERM EFFECTS OF ELEVATED TESTOSTERONE LEVELS ON REPRODUCTIVE SUCCESS AND SURVIVAL IN CAPTIVE FEMALE EUROPEAN STARLINGS

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Testosterone (T) mediates the expression of many fitness-related behaviours in male vertebrates. Although most female vertebrates produce significant amounts of T, the role of T in female fitness is poorly known. To explore possible costs and benefits of high T in female songbirds, we examined short and long term effects of experimentally elevated T in female European starlings (sturnus vulgaris), housed in large outdoor aviaries. We measured effects on several reproductive variables (focusing on the egg-laying stage) both during the year of manipulation (MY) and the second year (SY), and on several physiological parameters during the non-breeding season in between. Both during the MY and SY, elevated T did not cause negative effects on reproductive performance: the proportion of females breeding, date of pair formation, nest building, interval between nest completion and appearance of the first egg, clutch size and the number of (experimentally induced) replacement clutches did not differ between T- and Control females. During the MY, T-females even laid larger and heavier eggs than C-females. Elevated T-levels did not affect weight during the following autumn and winter, but delayed the moult of contour wing feathers and disturbed the moult of the body and throat feathers. Our results obtained in a captive situation with ad libitum food availability seem to contrast to previous results in free-living European and spotless starlings, where elevated T did negatively affect breeding performance by delaying the onset of laying and decreasing clutch size.

Federica Pirrone Poster N. 79

OBJECT SOCIAL PLAY IN COUGAR KITTENS, PUMA CONCOLOR

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Most researches on object play have been focused on the interaction of an individual and an object, saving less attention for social interactions occurring during such activity. We studied object-oriented social play in two captive Puma concolor sibling kittens (male and female) while they were 10-25 weeks. Both the duration of interactions and levels of cooperation decreased over the 25-week period ($p=0.008$ and $p=0.018$). Competition increased ($p=0.03$) showing a positive linear relationship with age ($p=0.05$). In the 10/19-week interval, kittens spent a long time in social interactions, sharing rather than competing for the object. Cooperation included pawing at and chasing the object together, while passing it to one another. Occasionally, one or the other kept running faster with the object, stimulating a contest. However, contests were settled peacefully and object play sequences terminated because of waning of interest. At 22 weeks, object social play became more competitive and its termination was mostly due to aggression. At 25 weeks, the male maintained 100% object possession, through serious aggression, as threat, challenge and vocalizations while starring at the female, which in turn showed off defensive postures and tried to withdraw from the context, avoiding physical attacks. In conclusion, object social play was either cooperative or competitive, shifting to aggression as kittens aged. At 25 weeks, social object play was absent and male possessive aggression occurred, reflecting similar levels of motivation over food resources. As it was the larger sibling, sex and body size might be critical factors promoting the evolution of male behaviour in the oldest age observed.

Jernej Polajnar Poster N. 80

ACOUSTIC COMMUNICATION IN CHIROCEPHALUS CROATICUS (STEUER, 1899) (ANOSTRACA: CHIROCEPHALIDAE)

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We present evidence of acoustic signalling between adults of the fairy shrimp Chirocephalus croaticus. Using hydrophone recording of animals in a laboratory environment, we detected sound pulses produced by both males and females. The pulses were 120-1760 ms long (n= 428) and consisted of one to three amplitude peaks. Of those, 366 (86%) were single-peaked and 120-1100 ms long. The dominant frequency was 15.3 Hz ± 2.5 Hz (n= 103). Males produced shorter and stronger pulses than females. Up to 5 pulses per minute were recorded, depending on the number of individuals in the recording chamber. No sounds were detected in C. diaphanus, Artemia cf. salina, Branchinella thailandensis and Chaoborus sp. We argue that sound could be produced by modified hair-setae on the limbs of C. croaticus, since such setae are not present in the other species tested. The ecological significance of the sound production is unclear, but might be linked to the rapid disappearance of the intermittent karstic lake habitat of the fairy shrimp. The narrow time window during which the animals must complete their life cycle could require them to develop efficient means of localizing conspecifics. The small but consistent differences in the sound waves produced by the two sexes suggest that a sexual recognition process may indeed be involved. Another advantage of acoustic communication in C. croaticus over other fairy shrimp species is the absence of predators able to detect the signals.

Mari Pölkki Poster N. 81

INBREEDING REDUCES THE ATTRACTIVENESS OF PHEROMONES IN TENEBRIO MOLITOR

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According to Hamilton and Zuk's hypothesis of parasite-mediated sexual selection, males that have exaggerated secondary sexual ornaments have a better genetic immunity against parasites. Therefore females who choose males with more pronounced ornaments benefit more by having good genes for their offspring. Pheromones are produced to attract mates, but they probably also provide other information for potential mates. For example, parasitic infections affect the information content of the pheromone signals, and therefore it is possible that pheromones function as condition dependent signals of mate quality. Here we tested if inbreeding reduces the attractiveness of pheromones in Tenebrio molitor. In the study, we made inbred and outbred (control) families and collected pheromones from males and females. We found that females were more interested in pheromones produced by outbred (control) males than pheromones produced by inbred males. Females spent more time and visited more often on those pheromone discs that were collected from outbred males. However, there were no differences between times that males spent on inbred and outbred female pheromone discs. Likewise, there were no differences between visited times. In our study inbreeding reduced the attractiveness of pheromones in males. However, our results suggest that pheromones are an honest signal of male quality for females. After all, mate quality is more crucial for females than it is for males.

Pamela Priori Poster N. 82

TO CLOSE OR NOT TO CLOSE? STARTING TIME FOR HIBERNATION IN A POPULATION OF ALPINE MARMOT

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Hibernation is a characteristic behavior of mammals that during the cold season reduces their vital functions remaining in a state of quiescence. In the Alpine Marmot (Marmota marmota) during this period body temperature drops from 35 to less than 5 degrees, the heartbeat slows from 130 to less than 15 beats for minute and breathing stands at 2-3 acts for minute. During this period marmots survive on fat reserves stored during the warm months. The period of hibernation is usually from early October to April depending on the severity of the climate. The winter dens are deep and at lower altitudes than the summer dens, less deep and with many exits. The winter den is closed with a "cap" of hay and ground and can accommodate from 3 to 10-15 marmots. It was shown that the presence of several individuals within the burrow increases the probability of survival of young, with a behavior called social thermoregulation. This study refers to a population of Marmota marmot of Lessinia Regional Park where it was necessary to analyze the areas colonized by sciurids to check environmental choices and behaviors. In addition to measure the topography and vegetation of the areas chosen by rodent and the abundance and composition of households, in the first week of October were recorded dates of closure of several major holes. We detected three groups of closure time corresponding to three areas of the park where families were withdrawn at different moments. We compared the effects of size of families, altitude, and location of holes on the closing date by multivariate analysis. The number of individuals of the family did not affect the time of closing, suggesting that family thermoregulation is not related to the temperature of the start of hibernation but is an additional parameter of fitness.

Olga Prokudina Poster N. 83

EARLY MATERNAL ENVIROMENT AFFECTING THE PREDISPOSITION TO AUDIOGENIC EPILEPSY ON RATS

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Numerous data suggest that changes in maternal environment during early postnatal period can specifically influence some genetically determined behavioral characteristics and even correct certain inherited abnormalities. We were interested in investigating the role of maternal influences on the development of anomalies such as audiogenic epilepsy. This study was carried out on PM+ and PM- laboratory rat strains. PM+ rat strain was bred from white Wistar rats on predisposition to pendulum movements (stereotypic hyperkinesis in the form of lateral rocking of the head and body). Control strain PM- was bred for the absence of pendulum movements. Breeding rats for increased pendulum movements (strain PM+) resulted in a heightened frequency of audiogenic epilepsy (about 80%), whereas in the strain PM- this frequency was about 30%. The goal of the present work was to study maternal behavior of PM+ and control females and to investigate the possible influences of changes in maternal environment on the audiogenic epilepsy of the offspring. Reciprocal cross-fostering of offspring in the epileptic rat strain PM+ and the control PM- strain was performed. Some differences in maternal care between control and epileptic females were shown. Cross-fostering in PM+ and control PM- resulted in decrease frequency of epileptic seizure in both cross-fostered groups. Also sex differences in the frequency of epileptic seizure were found. The work was supported by the Russian Foundation for Basic Research (grant No. 10-04-00616-?).

Caterina Quaresmini Poster N. 84

ANIMATE AND INANIMATE TARGET: INFLUENCE ON GORILLAS AND CHIMPANZEES' HANDEDNESS

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The preferential use of the right hand for tool-use and tool-making skills, common in hominids and in some species of non-human primates, might have prepared the left hemisphere for the development of language as both activities rely on a hierarchical organization to achieve a goal. Furthermore, the right hemisphere has been claimed to be involved during emotional processes. Nine chimpanzees and 9 gorillas have been observed during daily activities with a 10-minute continuous focal animal sampling method (9 sessions per subject), focusing on the type of the target of the action: "animate" (self or social partner) and "inanimate" (not living things). Although an overall handedness did not emerged, both groups demonstrated a significant right hand preference when the target was inanimate. Additionally, subjects employed proportionately more left hand use (right hemisphere) for social and emotive encounters in comparison with inanimate encounters suggesting the potential of additional emotion processing resources specifically for social events. These findings suggest that the kind of the target can exert an influence on handedness.

Venislava Racheva Poster N. 85

BADGER SETT RELATED BEHAVIOUR

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Badger sett related behaviour was recorded using camera traps in two model habitats. For a period of one year a wade range of behavioural patterns was registered allowing us to create an ethogram of the species. The fact that the cameras were making 5 seconds long videos every one minute permits us to analyze the frequency and duration of different behaviours.

Anke Rehling Poster N. 86

PARENTAL CARE IS STATE DEPENDENT IN LESSER BLACK-BACKED GULLS (LARUS FUSCUS)

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Parents should optimize resource allocation to their offspring with regard to maximal lifetime reproductive success. They are predicted to adjust their effort to variation in their own body condition and in species with biparental care also to variations in their partner's state and effort. In many sea birds, nest attendance time competes with foraging time and incubation is energetically costly. In this field study, female body condition in lesser black-backed gulls was experimentally reduced by inducing the laying of additional eggs resulting in a reduction of female parental care during incubation. Underlying hormonal changes may mediate such state dependent changes in parental care and here correlations of care share and prolactin are going to be investigated. Conflict theory predicts each parent to extend its foraging bouts to its optimum which is more than optimal for its incubating partner. However, in gulls, a minor reduction in nest attendance incurs high costs due to high predation pressure and the duration of foraging bouts is constrained by the partner's nest attendance time. Consequently, males adjusted the duration of foraging and nest attendance to compensate for the reduction in female parental care share.

Thomas Riebli Poster N. 87

SOCIAL FACILITATION AND RECIPROCITY: SIMULTANEOUS AND SUCCESSIVE COORDINATION OF COOPERATION

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Group members often temporally coordinate their behaviour, for instance in defence or foraging. Temporal coordination can be either simultaneous (social facilitation) or sequential (e.g., taking turns). If such behaviour provides benefits to other group members, mutualistic or reciprocal cooperation may ensue. These mechanisms may be important in cooperative breeders, because many components of their behaviour clearly benefit other group members. However, this aspect of the behaviour of highly social animals has yet received little attention. Here we investigated whether and when social partners would coordinate cooperation in the cichlid fish Neolamprologus pulcher, a cooperative breeder from Lake Tanganyika. We created situations with randomly selected experimental partners where they could either cooperate or defect in (1) digging sand away from their common shelter, or (2) defence against a predator. We found no indication that territory defence was temporally coordinated. However, the social partners temporally coordinated territory maintenance behaviour with their partner, resulting in synchronous cooperative digging. Furthermore, the partner's behaviour affected the propensity to cooperate also in the subsequent time interval: if the social partner had defected in a previous phase, the latency to begin digging and the time lag between subsequent digging bouts increased compared to when the partner had cooperated. These results support the hypothesis that simultaneous and successive coordination of behaviour can facilitate cooperation.

Antonio Rolando Poster N. 88

IMPACT OF SKI-PISTES ON THE HABITAT USE AND MOVEMENT PATTERNS OF THE ENDANGERED GROUND BEETLE SPECIES, CARABUS OLYMPIAE (COLEOPTERA: CARABIDAE)

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Carabus olympiae Sella, 1855, is a steno-endemic and endangered ground beetle species inhabiting two small areas in the western Italian Alps. One of the two areas has been recently classified as Site of Community Importance (SCI), with the main conservation aim of protecting this species. Despite the great ecological and conservation relevance of the area, in the last fifty years the impact of human activities has increased, mainly due to the construction of ski-runs and ski-pistes. In the present study we used pitfall traps to study habitat selection and phenology, and radiotelemetry to measure differences in movement parameters between sexes, habitats and periods. Data from pitfall trapping suggested that C. olympiae actively selects both shrubberies and beech forests and avoids open habitats (pastures and ski-pistes). All radio-tagged individuals (n = 21) moved without a preferred direction and, as a rule in most Carabus species, were more active at night than by day. Males covered greater distances and had more tortuous trajectories than females. Movement parameters suggested that both beech forests and alpen rose shrubberies are suitable for this species and indicated that anthropogenic activities may reduce habitat connectivity and thus constrain C. olympiae dispersal power. In one occasion a male of a shrubbery reached twice the border with the pasture and immediately turned round and went back to the shrubs. We therefore conclude that C. olympiae could be a useful bioindicator to monitor the effect of ski-activities on forest ground-welling arthropods in this SCI.

Emilia Romano Poster N. 89

REELIN HAPLOINSUFFICIENT MICE DISPLAY BEHAVIOURAL ABNORMALITIES ISOMORPHIC TO AUTISM SPECTRUM DISORDERS (ASD)

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Autism is characterized by impaired reciprocal mother-child interaction, repetitive behaviours and attentional deficits. Additionally, a subset of autistic patients show reduced levels of reelin (an extracellular matrix protein) and/or altered cerebellar morphology (reduced number of Purkinje cells, PC). Moreover, excess perinatal testosterone has been suggested to precipitate an underlying genetic vulnerability ('extreme-male brain theory'). Yet, correcting for such hormonal abnormality may hamper disease progression. Heterozygous (hz) reeler mice, a putative ASD model, show a 50% reelin reduction and a substantial loss of PC. To further corroborate their isomorphism with ASD, we compared hz and wild-type (wt) mice on the following domains: social motivation (in infancy, homing test), attention (attentional set-shifting test), repetitive behaviours (d-amphetamine-induced [10 mg/kg i.p.] behavioural stereotypies, face-washing and licking/gnawing) and brain morphology. We also studied whether neonatal treatment with estradiol in cisterna magna (correcting for testosterone imbalance) contrasted the expected mutation-related phenotype. Infant hz reeler mice showed reduced motivation to reach the nest-scented area; adult hz mice displayed increased perseverative responding, behavioural stereotypies and reduced numbers of cerebellar and amygdalar GABAergic neurons. Furthermore, most of these abnormalities were contrasted by estradiol administration. Thus, the isomorphism between hz reeler mice and ASD ranges from the behavioural phenotype to some of the basic biological endophenotypes.

Orsola Rosa Salva Poster N. 90

LATERALIZATION AND TIME COURSE OF SOCIAL LEARNING IN CHICKS

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Lateralization effects have been described both in social recognition and non-social learning tasks. Thus social learning following the observation of conspecifics' behaviour may also be influenced by brain lateralization. To investigate this issue we employed a social version of a PAL (passive avoidance learning) task in which one chick (the demonstrator) pecks at a bead whilst another chick (the observer) views the demonstrator's response. The bead is either coated in a bitter-tasting substance or left dry. Later both chicks are presented with a similar, dry, bead to determine if learning had taken place. With this procedure young chicks have been shown capable of learning to avoid pecking by observation only of a disgust reaction enacted by a conspecific after pecking a bitter-tasting bead. This learning is lateralized: access to the right hemisphere is necessary for successful recall. This is in contrast to the non-social learning version of this task, in which the left hemisphere plays the dominant role, although both the left and right hemispheres are, in turn, subject to brief windows of "enhanced recall" during memory formation. We also investigated whether such recall events are prevalent in the social learning task. We tested 3 such windows: 25 min after training (a right hemisphere event), 32 min (a left hemisphere event) and 64 min (a possible left hemisphere event following an interconnection of both hemispheres allowing memory transfer between them). At 32 and 64 min after training we found no evidence of functional lateralization. At 25 min, however, we found right hemisphere dominance. We suggest that a lateralization effect occurs in the social version of the PAL only at time points associated with right hemisphere dominance.

Anna Elisa Roser Poster N. 91

PROSODIC CUES IN ISOLATION CALLS OF KITTENS

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Human speech does not only communicate linguistic information but also paralinguistic features, e.g. information about the identity or the affective state of the sender. This information is conveyed by prosodic cues that refer to specific characteristics in different spectral and temporal parameters of the voice. To explore to which extent this trait is shared with other taxonomic orders of mammals, we studied the domestic cat (Felis silvestris catus) as a member of the order Carnivora. Cats are a good model for analyzing prosodic cues in acoustic communication as they are highly vocal. Kittens produce isolation calls attracting the attention of the mother. They depend strongly on the care of their mother in respect of nutrition, thermoregulation and protection. Thus the acoustical conveyance of identity and arousal-related features may be important for survival of the kitten. This study explores to which extent individuality and arousal state of kittens are conveyed acoustically. Calls were recorded in a separation context under two different arousal conditions. In this context kittens were placed outside the nestbox for three minutes, spatially separated from mother and siblings. Low arousal was induced by separation without manipulation, high arousal by additional soft handling of the kitten. Multiparametric sound analysis revealed significant longer call durations, shorter inter-call intervals and increasing peak frequencies in high arousal compared to low arousal conditions. Further analyses will concentrate on identity conveying cues. Findings support that universal acoustic cues convey the intensity of affect states across mammals.

Rosa Rugani Poster N. 92

SUMMATION OF LARGE NUMEROSITIES BY NEWBORN CHICKS

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Newly-hatched domestic chicks, reared with 5 identical objects, when presented with sets of 3 vs. 2 objects disappearing one-by-one, each set behind one of two opaque identical screens, spontaneously inspected the screen occluding the larger set; even when the continuous variables (total surface area or contour length) were controlled for (Rugani et al., 2009). Here, using a similar paradigm, we investigated the ability of chicks to solve additions involving larger sets. Chicks imprinted on 5 identical two-dimensional objects, were presented at test with 6 vs. 9 objects disappearing one-by-one (Exp.1). When objects all identical in size were used, birds (N=10) spontaneously inspected the screen occluding the larger set, but when the size of the objects was adjusted to control for the total surface area or contour length, birds (N=8) did not express any preference. In Exp.2, the same overall number of stimuli was used, but employing an easier ratio, i.e. 5 vs. 10. Again, when identical objects were employed at test, chicks (N= 10) chose the larger number of elements, but when the continuous variables were controlled for, chicks' (N= 16) choices were at chance. Results showed that chicks mastered one-by-one additions in two separate sets of large numerosities and then compared the outcomes in order to be able to choose the larger. However, differently to what described for small numerosities, chicks succeeded only if non-numerical cues, as well as numerical, were available. This study suggests that continuous variables are computed by the animals even for objects that are not present at the same time and that are no longer visible at the time of choice.

Adi Sadeh Poster N. 93

THE ROLE OF THE NON FERTILIZING SPERM IN THE CRYPTIC CHOICE OF LOBESIA BOTRANA FEMALE MOTHS

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All lepidopteran males bear two sperm types: 1. Eupyrene that fertilize the eggs and 2. apyrene that are sterile, of unknown function but essential for fertilization, and more abundant than the eupyrene ones. L. botrana displayed eupyrene metaphases throughout the pupal stage while in other lepidopterans eupyrene metaphases discontinue either at the latest of the larval stage or early pupae. Earliest apyrene metaphase appears in L. botrana from three days old pupae. Therefore, gamma irradiation of early pupae would damage mainly apyrene spermatogenesis and not the already differentiating eupyrene cells, resulting into adults bearing only eupyrene cells. Based on the above we tested the role of apyrene sperm in 1. egg fertilization and 2. female mating choice by presenting virgin females to males that were gamma irradiated at different spermatogeneous stages. We hypothesized that a female mated with a male irradiated at early pupal stages, will lay only unfertilized eggs, as opposed to those mated with late irradiated males. In addition, mated females may exert female cryptic choice of sperm and fertilized the egg based on the male phenotype. Accordingly, females rejected males irradiated at early pupal stages but were fast to accept naïve males. However, after mating in a tube, females accepted sperm of irradiated males, regardless the pupal stage of radiation and their phenotype. Moreover, females mated with early irradiated males did laid fertilized eggs. Therefore, (1) are the apyrene sperm essential for fertilization? (2) do the irradiated individuals renew apyrene spermatogenesis during the following development?

Sara Santarelli Poster N. 94

COMMUNAL NEST REARING INCREASES MATERNAL AND PEER INTERACTIONS AND AFFECTS ADULT DOPAMINE FUNCTION AND COPING RESPONSE TO STRESS

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Different social features of the mouse nest environment take part in shaping the adult individual. In order to investigate how these features contribute in determining developmental trajectories, we have recently exploited a novel experimental paradigm that provides the pup with a highly stimulating environment: the Communal Nest (CN). CN consists in a single nest where three mothers keep their pups together and share care-giving behavior from birth to weaning and mimics the natural ecological niche of the mouse species. CN pups, compared to mice reared in standard laboratory conditions (SN), received higher levels of maternal behavior, such as arched-back nursing and licking (ABN/L), and showed more "early fighting" and tenacious attachment – considered indexes of sibling competition. At adulthood, CN mice had higher levels of homovanillic acid (HVA), a dopamine metabolite, in the hypothalamus and increased dopamine metabolism in the hippocampus. With regard to behavior, CN mice are more resilient to social stress compared to SN mice, displaying reduced anhedonia, lower corticosterone (CORT) levels following social stress and decreased anxiety-like behavior. ABN/L and tenacious attachment positively correlated with adult HVA levels in hypothalamus and negatively correlated with anhedonia and CORT levels. Passive maternal behavior positively correlated with hippocampal dopamine metabolism and thigmotaxis while negatively correlated with CORT levels. Overall, our results show that both maternal and peer interactions affect adult behavior and suggest that modifications in the monoamine system could represent one factor mediating the long-term effects of the early environment.

Michela Santochirico Poster N. 95

CONTAMINATION RISK OF WILD POPULATION OF MUS MUSCULUS LOCALIZED IN AREAS OF HIGH ANIMAL FACILITY DENSITY: A PUBLIC HEALTH AND CONSERVATIONIST CONSIDERATION

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According to European Directive 86/609/EEC, published in 1986, the psycho-physical wellness of vertebrates used in animal experimentation is protected. Such guideline is presently under revision in order to further control activities involving vertebrate and invertebrate subjects, including those employed in psycho-physical stress studies. One of the most commonly used laboratory species is the House mouse (Mus musculus), both outbred and inbred strains. Recently, the number of genetically modified strains housed in laboratories is enormously increased, leading to two main risks for the health of mouse natural populations and the integrity of the environment. 1) the risk that inbred or mutant subjects – many of them selected for an impaired immune system – might escape and transfer infections to autochthonous and sympatric wild mouse populations (and sympatric humans). 2) the risk that laboratory mice might breed with individuals from natural populations, polluting their genetic pool. Strategies may include placing capture systems in facilities and monitoring the presence of feces and fur from wild subjects, placing owl nest boxes. The scientific community working with micro-mammals should draw guidelines aimed at reducing the risk of intra-specific (wild vs. genetically modified mice) encounters to avoid both transmission of pathogens and contamination of natural genetic pools. Branchi I, Alleva E (2007) http://www.iss.it/binary/publ/cont/07-40.1197018941.pdf

Cristina Sartori Poster N. 96

DYNAMICS OF AGONISTIC BEHAVIOUR IN COWS SELECTED FOR COMBATS

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Strict hierarchies are typical in herds of both feral and domestic cattle, where individuals compete in dyads for establishing firm social relationships. In domestic cattle (Bos taurus) the beginning of the grazing season is characterized by passionate battles taking place every time when unfamiliar animals meet. The outcome of a conflict and the subsequent dominance relationship are influenced mainly by weight and age, but also by breed and sex in mixed herds. Moreover, it has been hypothesised that prior experiences also play a role. The importance of different factors in the outcome of a conflict between cows has been investigated analyzing the agonistic performances of Valdostana breed's cows that take part to the non-cruel traditional competition called "Batailles de Reines" yearly organized for decades in Aosta Valley. Each tournament receives around 200 participants that fight in couple in a grass arena contending the title of

Delphine Scaion Poster N. 97

ONTOGENESIS OF AGGRESSIVE ENCOUNTERS IN JUVENILE VOCALIZING CICHLID FISH METRIACLIMA ZEBRA

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Many species of fish display agonistic behaviours, especially when defending a territory. In Metriaclima zebra (a vocalizing Cichlid fish of Lake Malawi), agonistic behaviours are associated to sound production. Nevertheless, little is known about the agonistic behaviours, sound production establishment during the post-hatching development and about the hormonal determinism of the appearing aggressive behaviours. First we intended to determine when the different aggressive behaviours occurred in post-hatching Metriaclima zebra. For that purpose, we recorded sounds and visual displays exhibited by several groups of fish every week from day 1 to day 180 after hatching. We also measured the cerebral AVT level by means of immunocytochemistry coupled to image analysis. First results show that Metriaclima zebra displayed many of the aggressive behaviours occurring in adults in the first post-hatching days while AVT expression varies according to the social status (dominant/subordinate).

Linda Scheider Poster N. 98

DOGS' UNDERSTANDING OF THE HUMAN POINTING GESTURE

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Previous studies show that dogs (Canis familiaris) reliably use human-given pointing gestures to find hidden food. Here we examined which type of understanding underlies this behavior; i.e. whether the pointing gesture is interpreted as an imperative signal or as an informative one. Dogs had to choose between one of two cups, one of which was baited. Sometimes subjects knew that one of the cups was empty, while sometimes they did not. Regardless, the human experimenter always pointed to the empty cup. After this initial experience, the dogs then had to choose between the two cups either when alone, or when a human was present. If the pointing gesture is understood as a command, subjects should follow it more often in cases where the human is present, while following a command is more likely to happen if authority is present. If it is understood as informative, dogs should ignore the gesture and rely on their own knowledge. Results showed that the dogs followed the pointing gesture if they had not seen the baiting process before. However, the dogs chose the baited cup, regardless of human presence in those cases where they have observed the baiting process before. Results are discussed in terms of dogs' understanding the pointing gesture as more 'informative' than 'imperative'. However, further studies should be conducted in order to more precisely define dogs' level of comprehension when interpreting the human pointing gesture. Keywords: dog-human communication, pointing gesture, social cognition.

Judith Schmidt Poster N. 99

GREY PARROTS (PSITTACUS ERITHACUS) USE INDIRECT INFORMATION TO FIND HIDDEN FOOD

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Choice by exclusion means using indirect information to solve a problem by avoiding other potential alternatives. If based on inferential reasoning, it may indicate causal understanding of the underlying problem. Among birds, only food caching corvids demonstrated exclusion so far, but jackdaws and keas did not. To investigate the evolutionary history of this behavior, we here tested another parrot species, the grey parrot, which is known for its cognitive and communicative skills. In our task, we hid food under one of two cups. Before they made their choice, the birds received direct or indirect information about the food location when one or both cups were lifted. When the content of the empty cup was shown, the birds significantly chose the other, correct cup. In a further experiment, we aimed to investigate potential effects of local enhancement and put two additional cups under the prior ones, which were now lifted simultaneously. Thus, the information about the food was manipulated by using transparent or opaque interior cups. In this experiment, the performance of the parrots was increased. These results show that using indirect information to find food is not restricted to food caching birds but may be present in several highly developed cognitive systems.

Giovanna Serena Poster N. 100

GET READY FOR LOVE: COMPARATIVE EVALUATION IN MATE CHOICE DECISIONS IN POECILIA RETICULATA

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It is traditionally assumed by models of rational decision making that, when animals evaluate alternative options, the value assigned to an option is absolute and independent on the others available. On the contrary, this expectation is frequently violated and such an apparent irrationality seems to be the result of use of heuristics that enable animals to compare alternatives separately and choose quickly and efficiently between options differing in multiple attributes (comparative evaluation). Comparative evaluation has been suggested to have implications for mate choice, but it has been rarely experimentally investigated. The aim of the present study is to evaluate if female guppies (Poecilia reticulata) base their mate decision on the comparative evaluation of males rather than on an absolute value assigned to each one. Female guppies usually prefer males with specific phenotypic traits (body colour spots). Despite this, coloration pattern of male guppies show an astonishing variability. For this reason we have tested virgin females comparing two males differing in two attributes (orange and iridescent coloration) and then adding a third option to the choice test that is commonly known as an asymmetrically dominated decoy (ADD). If choice is comparative, rather than be based on absolute values, we will expect that the addition of an ADD should shift the preference towards the male that has the greatest phenotypic difference with the ADD (i.e. the male that dominates the decoy). The study of comparative evaluation and the influence of irrelevant irrational alternatives on female choice may help shading light on the evolution and maintenance of multiple ornamentations in the guppy.

Barnard Shanis Poster N. 101

ARE DEVICES USED IN TEMPERAMENT TESTS VALID TOOLS FOR PROFILING DOGS' BEHAVIOUR?

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Temperament tests are widely accepted as instruments for profiling behavioural variability in dogs, and they are applied in numerous areas of investigation (e.g. suitability for adoption or for breeding). During testing, in order to elicit a dog's reaction toward novel stimuli and predict its behaviour in everyday life, simulating devices such as a fake hand, a child-like doll, or a fake dog, are often employed. However, the reliability of these devices to accurately stimulate dogs' reactions to real hands, children or dogs, is unknown and often overestimated. This is particularly true in the case of aggressive behaviour, a significant public health concern. The aim of this study was to: 1) evaluate the relationship between dogs' reactions to these devices, and owners' reports of their dog's aggression history (using the C-BARQ©); 2) compare reactions toward the devices of dogs with and without histories of aggression. Subjects were selected among those visiting for behavioural consultation at the Veterinary Hospital of the University of Pennsylvania, and previously categorised as aggressive toward adults, unfamiliar children, and/or conspecifics, or as non-aggressive dogs (controls). Test 1 consisted of an unfamiliar female tester approaching the dog and petting it with a fake hand. Test 2 involved presentation of a fake plastic dog followed by a live neutered female Golden retriever. Finally, in test 3, reactions shown toward a child-like doll were recorded. All tests were videotaped and durations of behaviours were later analysed on the basis of a specified ethogram. The test dog's reactions were compared to C-BARQ scores.

Katja Siegeler Poster N. 102

INFLUENCE OF THE PRENATAL SOCIAL ENVIRONMENT ON ENDOCRINE STATUS AND BEHAVIOUR IN MALE WILD CAVIES

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Social instability affects behaviour, endocrine systems and health in adult individuals. Furthermore, it has prenatal effects on offspring in many species. In guinea pigs, the influence of different prenatal social environments has been thoroughly investigated, but it is unknown whether these effects are a consequence of domestication or an evolutionary answer to different social conditions in their ancestor, the wild cavy. Thus, we investigated potential prenatal effects in sons of female wild cavies that have lived in an unstable social environment during pregnancy and lactation (UE-sons) in comparison to sons of mothers from a stable social environment(SE-sons). UE-sons showed more play behaviour up to an older age in comparison to SE-sons, suggesting a delayed behavioural development (behavioural infantilisation). They also displayed less agonistic, sociopositive and orientation behaviour. These low levels of energy consuming behaviour in UE-sons correspond to higher body weights compared to SE-sons. Considering plasma testosterone levels, SE-sons reached high constant levels at considerably earlier ages than UE-sons. As testosterone is important for sexual maturation, this finding points towards a delayed gonadal development in UE-sons which is in line with the observed behavioural infantilisation. In conclusion, our results show that a distinct influence of the prenatal social environment on endocrine status and behaviour is not only present in domestic guinea pigs but also in wild cavies. The two identified phenotypes may represent different strategies, beneficial at different population densities. This might reflect an epigenetic adaptation to different social environmental conditions induced by natural changes in population density.

Timothy Sparkes Poster N. 103

PARASITE SPECIALIZATION, NUPTIAL COLOR AND REPRODUCTIVE SUCCESS IN A NATURAL POPULATION OF THREEESPINE STICKLEBACK: EFFECTS OF A GENERALIST NEMATODE

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Male threespine stickleback develop a conspicuous nuptial color on their throats during the breeding season that is carotenoid-based. We examined the relationships among color expression, reproductive success and infection by larval stages of a generalist nematode. Reproductive male stickleback were collected from Lynne Lake (Cook Inlet, Alaska, USA) during the egg-guarding stage of their first reproductive cycle and color measures (reflectance scores) were obtained from their throats. Reproductive success was estimated by recording the number of eggs in the nest. We found that infected and uninfected males did not differ in either color or reproductive success. Analysis of the correlates of reproductive success revealed that male body size, rather than nuptial color or infection status, was a predictor of the number of eggs in the nest. We discuss the potential importance of parasite specialization (generalist vs. specialist), multihost availability and parasite virulence in explaining the relationships between infection status, color and reproductive success in this and other studies of threespine stickleback.

Paula Stockley Poster N. 104

ADAPTIVE PLASTICITY OF EJACULATE PRODUCTION IN HOUSE MICE: EFFECTS OF SPERM COMPETITION AND MATING RATE

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Optimal ejaculate production strategies are likely to vary between populations according to both average sperm competition risk and the availability of mates. Males may therefore be sensitive to cues of sperm competition and mating rate, and vary their investment in ejaculate production accordingly. To test these predictions, we manipulated the social experience of male house mice (Mus musculus domesticus) for a period of 12 weeks from weaning. Confirming previous findings, we found that males modulate ejaculate production in response to differing experimental encounter regimes with potential sexual competitors: testis size, daily sperm production and numbers of sperm in the caput epididymis were all significantly elevated in subjects that had regularly encountered social cues from three other males during development compared to those that encountered social cues from just one other male. However, variation in ejaculate production was not explained by differing experimental encounter regimes with potential mates: subjects that had regularly encountered social cues from four sexually mature females did not have consistently higher sperm production rates compared to those that encountered social cues from two females. Adaptive plasticity of ejaculate production in house mice thus appears tailored to cues of sperm competition risk rather than to cues of anticipated mating rate. Such plasticity could be a potentially widespread phenomenon explaining variation in fertility and reproductive success in natural populations.

Rafal Stryjek Poster N. 105

TRANSPORTING DEVICE FOR SMALL MAMMALS

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In a laboratory, animals can be subjected to handling-induced stress, which may be a source of constant and variable experimental errors. In the case of wild species, handling may be dangerous to laboratory staff and to the animals themselves. In order to protect all in involved a useful device was created and is described in this paper. This instrument was designed to cope with wild Rattus norvegicus but it is likely that it may be used with all mammals of comparable size (e.g gerbils, hamsters, and opossums). It has proved to be especially helpful for wild rats in a laboratory setting, as wild rats are more aggressive and skittish than their laboratory counterparts. The device is helpful when physical contact with humans is a problem (e.g. SPF conditions of breeding, and behavioral procedures that do not allow handling)."

Beata Symonowicz Poster N. 106

EFFECTS OF CHRONIC ORAL OCTOPAMINE TREATMENT ON EXPLORATORY BEHAVIOUR OF WORKERS OF THE RED WOOD ANT (FORMICA POLYCTENA) AND ON THEIR RESPONSES TO BUILDING MATERIAL

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The biogenic amine octopamine (OA) is implicated in the mediation of many behavioural and physiological processes in invertebrates. Among others, it exerts a stimulatory effect on responses to olfactory communication signals in solitary and social insects, and enhances nestmate recognition in honeybees and ants. We investigated the effects of chronic oral OA treatment on exploratory behaviour of workers of the red wood ant Formica polyctena and, in particular, on their responses to potential building material (dry pine needles) marked and not marked with olfactory cues involved in colony recognition. Workers from queenright groups were fed during a month with sucrose solution supplemented with OA (5 mg OA/1 ml of 50% sucrose solution) or with pure sucrose solution (control groups). During the subsequent 15 min behavioural tests single workers were exposed to a pine needle marked or not marked by olfactory colony recognition cues inside a set of two connected test tubes. 4 experimental groups (n = 30 workers) were tested: control/fresh needle; control/marked needle; OA/fresh needle; OA/marked needle. Marking of the needle alone tended to stimulate antennal contacts with the needle and locomotion on the needle more strongly than OA treatment alone, but these effects were not significant. Only the combination of chronic OA treatment with marking of the needle with olfactory colony recognition cues exerted a significant stimulating effect on responses of the ants to potential nest material.

Rajagopal Thangavel Poster N. 107

ASSESSMENT OF DOMINANCE HIERARCHY THROUGH URINE SCENT MARKING AND ITS CHEMICAL CONSTITUENTS IN MALE BLACKBUCK ANTELOPE CERVICAPRA, A CRITICALLY ENDANGERED SPECIES

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In ungulates the process of chemical communication by scent urination has been related to reproductive dominance, territorial defense and proximity of resources. We tested the hypothesis that there were differences in the frequency of scent urination marking and chemical composition of urine of dominant male before, during and after dominance hierarchy period. The data are compared with that of the bachelor male to find out how these factors influence dominance hierarchy in the blackbuck herd confined under semi-natural captive conditions. Urine samples collected those from dominant (n=9) before, during and after the dominance hierarchy period, bachelor (n=5) and sub-adult males (n=5). The frequency of scent urination marking is significant ($P<0.001$) in dominant male than bachelors. Twenty eight major constituents were identified from the urine sample in the dominant (before, during and after dominance hierarchy period), bachelor and sub-adult male blackbucks. Among these, three specific compounds namely, 3-hexanone (I), 6-methyl-5-hepten-2-one (II) and 4-methyl-3-heptanon (III) were seen only in the urine of dominant male during the dominance hierarchy period. Based on the behavioural evidence and the chemical signals in the urine, it is concluded that the blackbuck scent urination odour paves the way to suppress aggression, scent marking, scent production, territorial patrolling activities in subordinate males, through which the dominant male establish its hierarchy and success in reproduction.

Inga Tiemann Poster N. 108

DO CHICKENS AND PIGEONS ENCODE DISTANT INFORMATION?

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Learning about spatial characteristics of an environment is an underlying process of navigation which allows animals to relocate important sites such as nesting and feeding areas. Homing pigeons (Columba livia f.d.) and chickens (Gallus gallus f.d.) have been studied to understand how spatial cues are used for orientation, but these studies have traditionally used different approaches and experimental paradigms. In our experiments, we used a comparative approach to examine the encoding of geometric and featural information by pigeons and chickens when searching for a hidden goal within a rectangular environment. Three age-groups of each species were observed: young (12 days), adult (12 weeks) and aged (45 weeks) chickens as well as young (30 days), adult (3 years) and aged (9 years) pigeons. All animals were trained to locate food at one corner within the rectangular arena; a distinctive feature was placed in each corner of the arena. After successful training, the two features in the geometrically correct corners were removed from the arena (Distant Feature test). Thus, during testing the birds could only use the features located in the geometrically incorrect corners (i.e., the distant corners from the goal location) to determine the location of the goal. In both species, we found age-related changes in choice behavior. We will discuss these results focusing on how reliance on spatial cues may differ for chickens and pigeons. Also, the influence of an individual's ontogeny on spatial cue use will be discussed.

Gholamhassan Vaezi Poster N. 109

EFFECT OF INHALATION ALCOHOLIC EXTRACT OF PEGANUM HARMALA, ON INDUCTION OF ANXIETY LIKE BEHAVIOR IN ELEVATED PLUS-MAZE

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Abstract Introduction: Based on the extensive application of Peganum harmala (P.h) seeds in the Asian traditional medicine, we tried to investigate its possible anxiety effect. Method: The effect of P.h. extract inhalation was evaluated in adult male rats using elevated plus- maze apparatus. The humidity of prepared ethanol extract was 37% Animals in different groups (n=6) received 2, 4, 6, 12 or 18 gr/ml doses of the extract using Nebulizer. Harmaline drug(0.13 gr/ml) was used as positive control drug. Results: Compared with saline treated group, harmaline as the positive control significantly caused fear in rats as it was shown by increased time spent in closed arm of plus-maze ($p<0.05$). Also, ethanol extract of P.H was able to show anxiety effect at doses 6, 12 and 18 mg/ml($p<0.05$). Conclusion: Our data showed effective anxiety effect of ethanol extract of Peganum harmala its effect should be considered in the context of its extensive usage in the men daily life. More studies are required to elucidate its mechanism and site of action.

Sandra Valderrama Poster N. 110

SPATIO-TEMPORAL VARIATION IN THE VOCAL BEHAVIOUR OF THE NORTH ISLAND KOKAKO (CALLAEAS CINEREA WILSONI)

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Studies of geographic and temporal vocal variation provide insights into learning, cultural differentiation and speciation. Vocal learning by imitation can result in cultural drift that occurs by processes like copy error, innovation and improvisation. Song traits are selected and vary based on their role in species recognition, mate choice and individuality. Life history and ecological factors such as fragmentation and population depletion can also affect cultural transmission. We studied song variation in the endangered North Island kokako across its range, to investigate (1) sexual song differences, (2) variation of song traits in structure and complexity across populations, and (3) temporal stability of song patterns. We analysed historical and contemporary vocalizations from six surviving populations, one "supplemented" population, and two re-established populations. We detected acoustic differences between males and females; a discriminant function analysis revealed that duration, energy, entropy and frequency characteristics are distinctive. Analyses across populations showed vocal differences in song structure (i.e. entropy, song duration and amplitude modulation), complexity (i.e. diversity of syllables) and configuration between populations. We found a decreasing similarity (%) of phrase types between translocated and source population individuals; with variation in frequency modulation and entropy. The findings provide a foundation for studies examining the relevance of birdsong variation, divergence and learning.

Silke Voigt-Heucke Poster N. 111

DO BATS JAZZ? SONG COMPOSITION AND SYNTAX IN THE SONG OF THE COMMON NOCTULE BAT

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Complex vocalizations during the mating season are a common feature in birds, but only in few mammal species, males compete for females and defend their territories with song. Bird song has often been described to be characterised by syntax-like rules, e.g. in the order of elements, motives or songs. In mammals, only few examples of songs have been studied to date. Here, we examine the song composition and syntax in the complex song of the common noctule bats (Nyctalus noctula). Male noctule bats establish mating roosts in autumn that they acoustically defend against other males. We analysed individual song characteristics of 12 male noctules of an individually marked population in Berlin. First, we found all males to produce strophic complex songs composed of overall 8 motives. We detected however considerable between and in-between individual variation of pause duration between strophes. Second, males differed markedly both in the number and combination of motives in their strophes. Third, we found no stereotypic and species-specific syntactic rules in noctule song. Instead, individuals seem to freely combine motives and pauses of different length in their song. We conclude that in contrast to many bird species and bat species studied so far, noctules are able to time, combine and order their motives to liberally compose individual songs. Individual song variation suggests that these differences offer great potential for pronounced female choice in the social system of the noctule bat.

Corinna von Kuerthy Poster N. 112

CAPITAL BREEDERS AND INCOME BREEDERS AMONG MALES PURSUING ALTERNATIVE REPRODUCTIVE TACTICS

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When individuals pursue alternative reproductive tactics their reproductive investment patterns may diverge substantially, as the adoption of bourgeois and parasitic behaviours can result in very different trade-offs and limitations. The Lake Tanganyika cichlid Lamprologus callipterus shows three alternative male tactics involving an extreme size dimorphism between different types of males that is determined by a Mendelian genetic polymorphism. Large males construct nests of empty snail shells in which females breed, and they invest heavily in courtship and nest defence. In contrast, dwarf males do not court and only attack other dwarf males while attempting to parasitize the reproductive effort of nest males. The reproductive investment patterns of these two types of males differ substantially: nest males accumulate reserves before breeding and use these up during their reproductive activity, thereby performing a 'capital breeder' strategy. In contrast, dwarf males use assimilated energy immediately for reproduction, thus acting as 'income breeders'. A third, temporary and opportunistic, conditional tactic is performed by males of all sizes by sneaking into the nest to steal fertilizations when a nest male is spawning. Here we asked whether in the field, these different male tactics are associated with different patterns of energy use and reserve accumulation. We predicted that the body condition of males pursuing the two parasitic tactics would remain constant during their reproductive activities, whereas the body condition of nest males should decrease during their nest holding period due to investment in nest building and defence, recruitment of females and the defence of offspring. As predicted, the body condition of nest males decreases during the nest holding period, which is also reflected by a change of their behaviour. This confirms their role as capital breeders, which is probably responsible for the fact that nest holding periods are limited in time in the natural situation. In contrast, sneakers and dwarf males generally dispose of a better body condition and there is less variation between them, which is consistent with their role as income breeders.

Kathrin Wagner Poster N. 113

EFFECT OF CONTACT TO THE MOTHER DURING THE FIRST 12 WEEKS OF LIFE ON BEHAVIOUR OF DAIRY HEIFERS DURING INTEGRATION INTO THE COW HERD

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The integration of dairy heifers into the cow herd shortly before their first parturition is a common management practice associated with stress. In this study we investigated if the ability to cope with such challenges of integration is affected by experiences during early age. Three groups of heifers that differed with respect to the contact to their mother during the first 12 weeks of life were compared: running with their mother and other cows (permanent, P, n=7), sucking their mother two times a day outside herd (suckling, S, n=9), artificial group rearing (automat, A, n=10). At the age of 25?0.2 months heifers were integrated individually into the cow herd and observed for 33 hours. Social and other behaviour of the heifer was recorded by continuous behaviour sampling and nearest neighbour by time sampling. Heifers reared with contact to their mother (S, P) used the cubicles quicker and more consistently (more animals lay down in cubicles, Fisher Exact test p=0,046; lay down more often, Mann-Whitney test p=0,041, with shorter latency p=0,067) compared to the automat heifers. Heifers S and P and especially Heifers P tended to differ from automat animals in their social behaviour in that the ratio of initiated to received aggression was lower (p=0,097) and more animals initiated a low amount of agonistic interactions (p=0.087). These preliminary results suggest some long-term effects of early social environment on later challenge response.

Benjamin Zipser Poster N. 114

MATERNAL EFFECTS IN FEMALE DOMESTIC GUINEA PIGS INFLUENCE DOMINANCE STATUS AND BODY WEIGHTS IN DYADIC INTERACTIONS

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Maternal effects are phenotypic alterations induced perinatally by non-genetic influences. In guinea pigs, daughters whose mothers lived in an instable social environment during gestation (IDs) show a behavioural masculinisation and marked neuroendocrine changes in comparison to daughters of mothers living in social stability during this phase (SDs). If these effects are non-pathological, an alternative hypothesis is that they represent adaptive modifications that enable the adult offspring to deal better with environments that resemble those of their mothers during pregnancy. In this study, adult individuals (IDs & SDs) were confronted in an enclosure unfamiliar to both animals, representing a socially instable situation. The confrontation was sustained for one week, passing into a socially stable situation. SDs gained dominant positions in the sustained, stable part of the confrontations, indicating an advantage, whereas no difference in dominance could be found in the socially instable situation. Additionally, the course of body weights indicated advantages of SDs in the socially stable situation, matching the degree of stability they experienced prenatally. In the initial part of the confrontation IDs and SDs did not differ regarding weight loss/gain, indicating that IDs did not have an advantage in the socially instable situation. However, they did not have any disadvantage as well, contradicting a pathology interpretation. In the sustained part, SDs gained weight whereas IDs did not and hence SDs seemed better adapted to a socially stable situation. Since dominance and body weight are correlated with reproductive success, these data may provide evidence for an adaptational view of maternal effects in guinea pigs.

Francesca Zoratto Poster N. 115

INCREASED GAMBLING PRONENESS FOLLOWING L-TRYPTOPHAN DIETARY DEPLETION IN THE RAT

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Impulsive decision making is associated with risk-taking, sensation-seeking and pathological gambling. Psycho-genetic studies on self-control impairment revealed a role for components of brain serotonin system, e.g. the serotonin transporter. We aimed to assess if manipulation of brain serotonin levels, through the removal of its precursor from the diet, affected gambling proneness in animal models. Rats were exposed to an L-tryptophan deficient diet (T?) or to a control diet (T+; 2.8 g/kg), from 2 weeks before the experiment. Among operant-behaviour tasks aimed at assessing impulsive decision making, the probabilistic-delivery (PD) task is based on choice between a "large & luck-linked" (LLL) or a "small & sure" (SS) reinforcer. Food-restricted male rats were daily tested in operant chambers: nose-poking in one hole (SS) resulted in the delivery of 2 precision (45 mg) pellets, whereas nose-poking in the other hole (LLL) delivered 6 pellets. The level of probability governing successful (or omitted) LLL delivery was fixed for daily sessions and decreased progressively each day. As expected, T+ subjects showed a clear shift in preference from LLL to SS reinforcer as the level of probability decreased. On the contrary, T? animals maintained a significant but sub-optimal attraction for the LLL reinforcer despite its rarefaction. In summary, hyposerotoninergia apparently sustain a trait of gambling proneness, as evidenced by enhanced nose-poking for LLL in the PD task. Indeed, an impaired brain serotonin function was associated with a significant reduction in sensitivity to the rarefaction of large-reinforcer delivery. Thus, we validated a new reliable method to measure gambling proneness in rat models.

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