

# Graduate Meeting: Animal Behaviour 2017

of the Ethologische Gesellschaft

and the Animal Behaviour Section of the German Zoological Society (DZG)

from the

**11.05. - 12.05.2017**

at the Institute of Animal Welfare & Animal Husbandry

Friedrich-Loeffler-Institut in Celle

Programme and Abstract Book

Organisation by E. Tobias Krause & Anissa Dudde

(Institut für Tierschutz und Tierhaltung, Friedrich-Loeffler-Institut,

Dörnbergstr. 25-27, 29223 Celle)

# How to find the FLI Institute in Celle



# PROGRAMME

Thursday 11th of May

10:00 Welcome

## Session I

Chair: Tobias Krause

10:15 Keynote by **Marc Naguib**

*The evolution of communication: a network perspective*

11:15 Coffee break

11:30 Hanja Brandl

*Information use in wild Zebra Finches*

11:50 Dominique Treschnak

*Multimodal Courtship Communication in the Polymorphic Gouldian Finch (Erythrura gouldiae).*

12:10 Sarah Golüke

*Disentangling the mechanism of kin recognition in zebra finches*

12:30 Lunch

## Session II

Chair: Marc Naguib

14:00 Keynote by **Lars Schrader**

*What do we can know about the needs and feelings of (farm) animals?*

15:00 Christian Nawroth

*Social referencing in domestic goats*

15:20 Christina Veit

*Characterisation of performers and receivers of manipulative behavior in pigs*

15:40 Verena Schöller

Poster Talk : *Impact of kinship on allopreening behaviuor in adolescent bengalese finches*

15:45 Coffee break

- 16:00 Anissa Dudde  
*Effects of selection for productivity on social and fear related behaviour in laying hens*
- 16:20 Kathrin Engel  
*Microbes on finch skin*
- 16:40 Institute Tour
- 19:00 Nachtwächtertour
- 20:00 +Meeting at the bar - Bell Mundo (Hafenstraße 2, 29223 Celle)

## Friday 12th of May

### Session III

Chair: Anissa Dudde

- 10:00 Keynote by Wiebke Schuett  
*Nosy neighbours and the evolution of animal personality*
- 11:00 Coffee break
- 11:20 Lisa Kalnins  
*The influence of enriched housing conditions on the behaviour of zebra finches*
- 11:40 Antonia Patt  
*The effect of milk allowance and weaning method on the behaviour of dairy calves*
- 12:00 Sabine Kraus  
*Born to be aggressive, curious or fearless? - Heritability of personality*
- 12:20 Eliane Küpfer  
*Identifying mechanisms to avoid fishes as natural predators: an experimental study on salamander*
- 12:40 Farewell

# ABSTRACTS

## Information use in wild Zebra Finches

Hanja Brandl

University of Hamburg & Macquarie University (Sydney)

In harsh and unpredictable environments information about the quality of local habitat can greatly help to improve an individual's fitness. Nevertheless, very little is known about the mechanisms and significance of information use in reproductive decisions, and particularly in unpredictable habitats, such as arid zones. We tested the hypothesis that the perceived breeding success of conspecifics serves as cue for habitat quality and hence may influence breeding decisions, both in terms of where to breed and investment in a clutch. Zebra finches breed in loose colonies and often visit and inspect the nests of conspecifics, potentially prospecting for social information. We conducted a brood size manipulation experiment in an opportunistic breeder, the Zebra Finch (*Taeniopygia guttata*) in Australia, to create the perception of high quality areas and low quality areas. In six different areas, clutch sizes of almost 300 nests of breeding zebra finches were either all increased or reduced throughout one breeding season and reproductive decisions of breeders were monitored. We found that the number of naturally laid eggs was not considerably affected by the brood size manipulation. However, our data suggest that some individuals might have used social information to a certain degree. Birds changing the breeding area between consecutive broods were rare, irrespective of the treatment and parental condition could not predict clutch size. Our findings suggest that zebra finches employ high opportunism as a key strategy for reproduction in an unpredictable environment and might use a combination of different sources of information.

## Multimodal Courtship Communication in the Polymorphic Gouldian Finch (*Erythrura gouldiae*).

D. Treschnak, R. Fragueira, M. Eberhard, M. Beaulieu

University of Greifswald

Phenotypic polymorphism is widespread among animals in nature. Responsible mechanisms or driving forces are diverse and often case-specific. The polymorphic gouldian finch (*Erythrura gouldiae*) is here no exception. With its discontinuous polymorphism into two main head colour morphs, which are genetically determined, it represents an interesting and rare case to investigate. In natural populations of *E. gouldiae*, all morphs coexist in relatively stable frequencies and show assortative mate preference for their own morph. Until now, this preference is supposed to be mainly due to the assessment of the head colour. Looking at *E. gouldiae*'s courtship behaviour and its multiple potential informational modalities, we suppose that the birds use information from additional sources. We therefore investigate proximate mechanisms of the assortative mating and hypothesise that black- and red-headed *E. gouldiae* show morph-specific characteristics in their visual, acoustic and vibratory communication during courtship.

Within our experimental setup, we examined the males' courtship behaviour and the female's response in video- and audio-recorded trials. Occurrences of courtship display were additionally recorded with a high-speed camera for precise analyses of visual aspects of the behaviour. Produced substrate vibrations during courtship dance were recorded with a laser vibrometer.

Confirmation of our hypothesis could elucidate the existence of differences within morphs besides the obvious head colouration and indicate the need for further investigations into characteristics that may be responsible for the assortative mating. Finally, distinct communicational differences and their behavioural base could be seen as indication towards a separation of the gouldian finch morphs.

# Disentangling the mechanism of kin recognition in zebra finches

Sarah Golüke, Barbara A. Caspers

Bielefeld University, Department of Animal Behaviour, Bielefeld, Germany

Recognising close relatives, i.e. kin, is crucial to avoid inbreeding. Many vertebrate species, including the zebra finch, use olfactory cues to recognize kin, even without prior association. This indicates that zebra finch females use phenotype matching to recognise kin. Whether females use their own odour as a template (self-referent phenotype matching), or a family odour learned during the nestling period (family-referent phenotype matching) is unknown yet. This study aimed to disentangle the two potential mechanisms. We conducted a mating experiment to test whether females hatched from fostered eggs show a different mating preference than females that grew up in their natal nest. We formed groups of five individuals, consisting of two females and three males, each. Males and females in each group were unfamiliar. The experiment consisted of two different conditions: The first experimental condition contained one female and her unfamiliar genetic brother. In the second experimental condition each group contained one female, which hatched from a cross-fostered egg and was therefore exposed to another family odour after hatching. In this group, she encounters both a genetic brother and a foster brother, i.e. male offspring of the foster parents. We predict that if females recognise kin based on self-referent phenotype matching, females should generally avoid mating with their unfamiliar brother. If females use the family odour learned early in life, we expect females from fostered eggs to show a different mating preference.

To determine mate choice, we used observations of pair bonding in combination with genetic parentage analysis.

## Social referencing in domestic goats

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<sup>2</sup> Leibniz Institute for Farm Animal Biology, Institute of Behavioural Physiology, Dummerstorf, GER

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For social animals, it is beneficial to seek information about their environment from other individuals to guide their own behaviour. In particular, dog domestication seems to have enhanced their ability to comprehend a variety of human communicative cues. Dogs can also use human emotional information directed to an unfamiliar object or other individuals, a mechanism known as social referencing. However, it is not clear whether other domestic species (e.g. goats) show similar socio-cognitive abilities. We investigated whether goats (N = 29) use emotional information provided by humans to adjust their behaviour to a novel object (plastic table covered with shower curtain). Goats received one single test trial (duration 60s) and were assigned to two groups: one group received a positive emotional message (positive facial expression, positive vocalization: 'Oh, ist das toll') from the experimenter, whereas the other group received a negative emotional message (negative facial expression, negative vocalization: 'Ih, ist das pfui) directed to the novel object positioned in the center of a test arena. Locomotion, standing and interaction behaviour (with either object or experimenter) of goats were scored and analysed. We found that goats from the positive group interacted more with the object compared to subjects from the negative group, but no differences in other behaviours were found. Our results provide evidence that a species domesticated for production rather than companionship uses emotional cues from humans to guide its behaviour towards novel objects.



# Characterisation of performers and receivers of manipulative behavior in pigs

Christina Veit<sup>1</sup>, Joachim Krieter<sup>2</sup>

<sup>1</sup> Institute of Animal Welfare and Animal Husbandry, Friedrich-Loeffler-Institut, Celle, Germany

<sup>2</sup> Institute of Animal Breeding and Husbandry, Christian-Albrechts-University, Kiel, Germany

There are indications that tail biting, which is supposed to be redirected exploration behaviour, might have the same motivational background as other manipulative behaviours in pigs. It is known that individual differences regarding performed manipulative behaviour exist, but the individual piglet contributions to tail biting outbreaks remains unclear. We characterised piglets based on performed and received manipulative behaviour prior to a scored tail biting outbreak. Therefore, 60 piglets (respective 12 piglets per pen) were individually marked and monitored by video during the rearing period. Video records were analysed using data of four days prior to a scored tail-biting outbreak and on the day of an outbreak itself. Behaviour was sampled in intervals, i.e. the first 20 min of every other hour between 06:00 and 18:00. Instantaneous scan sampling (every 2 min) was applied for lying, standing, feeding, manipulation of enrichment and pen, whereas continuous observation was applied to record performers and receivers of tail exploration (TE), belly nosing (BN) and nosing (NO). Based on the frequencies, scores were established for each piglet in order to characterise it as performer<sub>P</sub>, receiver<sub>R</sub> or neutral<sub>N</sub> of the respective manipulative behaviour. Scores ranged between -1 (absolute receiver) and +1 (absolute performer). In order to analyse relations between pig-directed behaviour and other behavioural patterns Wilcoxon rank sum tests were used.

TE and BN were performed to a similar extent (median [Q25 | Q75] = 13.0 [10.0 | 21.5] vs. 10.5 [3.5 | 19.0]), whereas NO was performed more often by the piglets during the five days observed (36.0 [21.5 | 53.0]). Compared to TE, frequencies for BN and NO differed stronger between the pens and both behaviours were most frequently performed in the pen that was observed closest to weaning (BN: 41.0 [33.0 | 114.0], NO: 71.0 [37.0 | 79.0]), which indicates redirected suckling behaviour as motivational background.

All calculated scores differed between the pens and ranged on average from -0.34 to 0.25 for TE, -0.2 to -0.05 for BN and -0.34 to -0.01 for NO. Mean scores for TE increased towards the day of an outbreak (-0.11 [d<sub>-4</sub>] vs. -0.01 [d<sub>0</sub>]), whereas scores for BN and NO did not follow a clear trend.

Few piglets were either performer (n = 6), receiver (n = 6) or neutral (n = 8) for all pig-directed behaviours simultaneously, all other piglets differed regarding their respective defined character. NO<sub>R</sub> lied significantly more often than NO<sub>P</sub> (mean ± std

=  $242.5 \pm 28.1$  vs.  $214.4 \pm 25.8$ ,  $p = 0.01$ ) and  $NO_P$  were standing significantly more often than  $NO_R$  ( $71.2 \pm 23.8$  vs.  $52.8 \pm 17.5$   $p = 0.04$ ). Thus,  $NO_P$  showed a higher general activity than  $NO_R$ . Regarding feeding as well as manipulation of enrichment and pen no differences were found, which might be due to low frequencies of the respective behaviour performed. Regarding  $TE_{R,P}$  and  $BN_{R,P}$  no significant relations in any of the behaviours were found.

There are indications that pig- directed behaviours are not as strongly connected as supposed. Clear character differences were found and individuals can be simultaneously performer and receiver of pig-directed behaviour.

# Poster-Presentation

## Impact of kinship on allopreening behaviour in adolescent bengalese finches

Verena Schöler

University Bielefeld, Department of Animal Behaviour

Allopreening behaviour is defined as the act of cleaning those areas of conspecifics that cannot be cleaned by the other individual itself, such as the face or the neck. This behaviour is particularly common in social birds and is comparable to allogrooming observed in social mammals. While there is robust evidence showing that the degree of kinship influences allogrooming behaviour in mammals, less is known about the impact of kinship on allopreening behaviour in birds. This proposed project aims to disentangle the effect of familiarity, i.e. association and kinship on allopreening behaviour in Bengalese finches (*Lonchura striata domestica*). Using a classical crossfostering design this project investigates the impact of familiarity and kinship on allopreening behaviour during adolescence in the Bengalese finch. Half of the eggs of each clutch will be crossfostered into another nest to create broods that consist of unrelated and related nest mates. After reaching nutritional independence, "Teeniegroups" will be formed that contain at least two different crossfostered broods. This way each "Teenie-group" consists of unfamiliar but close related individuals (same parents raised in different nests) and familiar but unrelated individuals (different parents - raised in same nest). Daily observations should reveal whether and to what extent familiarity or kinship has an impact on allopreening behaviour.

# Effects of genetic background and selection for productivity on behavioral traits in laying hens

Anissa Dudde<sup>1</sup>, Lars Schrader<sup>1</sup>, Steffen Weigend<sup>2</sup>, Lindsay Matthews<sup>3</sup>, E. Tobias Krause<sup>1</sup>

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Resource allocation theory (RAT) suggests that highly productive layer hens sacrifice activity to direct energy to maintain egg output. Productivity and genotype have been implicated in differences in fearfulness and stress reactivity in layers but their relative contributions have not been fully explored. We aimed to determine the separate effects of selection for high productivity and genetic strain on fearfulness and sociality. Therefore, we used 80 hens from a 2x2 group design, with two white and two brown layer lines which differed in laying performance (200 versus 300 egg/y) within colours, respectively, to measure two key behavioral dimensions, fearfulness and sociality, using six different test paradigms (visual cliff, emergence from a box, social approach, novel-object, mirror approach and tonic immobility). The data from the tests were analysed using General Linear Models with genetic background (white/brown) and productivity level (high/low) and their interaction as explanatory variables. The highly productive lines were consistently and significantly less social than the less productive lines, and the white were more social than brown layers (e.g., in the social approach test: mean times to reach conspecifics 11s vs. 37s for white vs brown layers (GLM factor  $F_{1,73}=29.17$ ,  $p<0.0001$ ); 36s vs. 14s for high vs. low productivity (GLM factor  $F_{1,73}=25.03$ ,  $p<0.0001$ )).

Genetic background but not productivity had a significant effect on fearfulness, with the white layers being more fearful (e.g., mean time to end tonic immobility: 321s vs. 182 s for white vs. brown layers (GLM:  $F_{1,73}=14.47$ ,  $p<0.001$ )).

Our results show that genetic strains and selection for production efficiency can affect different dimensions of behavior differently i.e. sociality but not fearfulness has been affected strongly by selection for productivity. This needs to be taken into account when characterising the effects of genotype on behavioural traits. Further, RAT can explain the effects of selection for production on sociality but not fearfulness, and the impact of unintentional changes in behavior that accompany intense selection pressure on productivity deserves further study e.g. effects on welfare or function.

## Microbes on finch skin

Kathrin Engel, Jan Sauer, Sebastian Jünemann, Anika Winkler, Daniel Wibberg, Jörn Kalinowski, Andreas Tauch, Barbara A. Caspers

University Bielefeld, Department of Animal Behaviour

In my talk, I focus on the skin microbiomes of three passerine birds (zebra finches, Bengalese finches and diamond firetails). By means of next generation sequencing, I characterize the physiologically existing skin microbes. This enables me to compare microbiomes of different individuals and species. In my research, I investigate how far the host's genotype, social interactions and environment shape an animal's skin microbiome. Furthermore, I aim to discover whether skin microbes are involved in birds' body odour and therefore facilitate species and individual recognition.

# The influence of enriched housing conditions on the behaviour of zebra finches (*Taeniopygia guttata*)

Lisa Kalnins

Department of Animal Behaviour, Bielefeld University

The influences of housing conditions in relation to animal welfare are well examined in many groups of animals like e.g. farm animals, laboratory rodents and companion animals. The zebra finch (*Taeniopygia guttata*) is a key avian model organism, which, however, has received little attention in these topics.). Housing condition as a factor of influence on the outcome and comparability of experiments is less attended in zebra finch research. In this study we will do some steps to explore this topic. In a first experiment, we examined effects of different cage sizes on zebra finches. We measured physical indicators for well-being (weight, status of plumage and amount of visible subcutaneous fat) and behavioural indicators (exploration and associative-learning). As earlier studies detected strong genetically differences between domestic strains, we addressed our questions in two different strains. Related to the behaviour it seems that there is no influence of birds kept in small or medium-sized cages. However, there seem to be some differences from the cage-size treatment with respect to the physical factors. Breeding lines different in behaviour and morphology. In further experiments the influence of stronger variations in cage sizes will be studied and the number of physical attributes will be extended by measuring the flight ability.

# The effect of milk allowance and weaning method on the behaviour of dairy calves

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To foster the transition to ruminants, dairy calves are conventionally fed low milk rations which may result in prolonged hunger. Furthermore, calves are often weaned off milk, without considering individual ability to feed on solid food.

Using generalized linear mixed models, we investigated the effects of two feeding regimes differing in milk allowance before weaning and weaning method on number of unrewarded visits to the milk feeder and concentrate intake of female calves before and during weaning. For “individually weaned” calves (n= 9), milk allowance of 6 litres/day before weaning was reduced based on each calf’s increasing consumption of concentrate during weaning. “Ad libitum calves” (n= 8) were allowed ad libitum milk for 28 days before being weaned in 49 days irrespective of individual concentrate consumption.

Time from birth until end of weaning was similar in both treatments ( $p= 0.5176$ ) but varied greatly between individually weaned calves (56-113 days). Before weaning, individually weaned calves, i.e. calves with restricted milk access, engaged in more unrewarded visits/day than ad libitum calves. During weaning, the number of unrewarded visits of individually weaned calves decreased, while it increased in ad libitum calves compared to before weaning ( $p< 0.0001$ ). Concentrate consumption increased in both groups. However, both before and during weaning, it was higher in individually weaned calves ( $p< 0.0001$ ).

We conclude that calves in both treatments showed signs of prolonged hunger before and/or during weaning. This may be solved by feeding ad libitum milk before weaning and by weaning based on individual concentrate consumption.

## Born to be aggressive, curious or fearless? - Heritability of personality

Sabine Kraus, Yvonne Würz, Oliver Krüger

Department of Animal Behaviour, Bielefeld University

Animal personality describes behavioural differences between individuals that are consistent across time and contexts. Especially the evolutionary mechanisms generating and maintaining individual differences as well as the functions and consequences of different personality types are still difficult to explain. Heritability, the transmission of the phenotypic variability within a population from generation to generation, is a key genetic parameter regarding whether natural selection is able to generate evolution on a trait or not.

We have developed a standardized test battery comprising three personality traits. We measured aggression towards a mirror, exploration in a novel environment and fearlessness in a tonic immobility test in a captive population of wild-type zebra finches (*Taeniopygia guttata*). We established bi-directional selection lines on each of these three traits to study their genetic and environmental causes. We calculated the heritabilities of the three selection line personality traits using parent-offspring regression, where the slope of the regression between mid-parent and mid-offspring personality trait scores gives an estimate of (narrow-sense) heritability. Preliminary analyses indicated that personality traits in zebra finches are partly heritable with heritability estimates between 0.12 and 0.44 after three generations of selection.



# Identifying mechanisms to avoid fishes as natural predators: an experimental study on salamander larvae in streams

Eliane Küpfer<sup>1</sup>, Daniel Goebloed<sup>1</sup>, Ori Segev<sup>2</sup>, Leon Blaustein<sup>2</sup>, E. Tobias Krause<sup>3</sup>, Sebastian Steinfartz<sup>1</sup>

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Fire salamander are rarely reported to co-exist with fish species. In the Tel Dan Nature Reserve, a large permanent brook system with native fish species, we found a large population of adult fire salamander (*S. infraimmaculata*), but their aquatic larvae were hard to find probably as they were well hidden, as they might not be too rare as the adult population was considerable stable. To approach the strategies that help the fire salamander larvae to avoid encounter with fish and allow co-existence in the aquatic phase, we conducted a series of experiments to maternal salamanders' and larval behaviour. Adult females have strong abilities to select the breeding habitat and we tested whether they possess preferences for fish free environment over fish occupied waters to deposit their larvae. Furthermore, we expected larvae from the fish occupied habitats to show specific developmental and behavioural adaptations compared to larvae from populations without fish presence. From both habitats larvae were reared in a fish cue treatment and a fish free control treatment. Adult females showed no adaptive behaviour response and deposited their larvae randomly to waters regardless whether or not fish were present. However, we found larvae growth pattern to be affected from fish presence in dependence to the local population the larvae originated from. Larvae from Tel Dan, where naturally fish are present, showed reduced growth in presence of fish, whereas no such effects were present for larvae from Kaukav, a site that is naturally fish free. At metamorphosis, these effects had been compensated, but the larvae from Tel Dan fish treatment metamorphosed much slower. In a behavioural test all naïve larvae from different (fish / fish-free) local populations, showed a higher probability to hide, if they were faced to fish cues, than in the fish cue free control. In conclusion, we found no evidence for maternal adaptations against fish, but all larvae showed a natural hiding response to predator cues and larvae from fish occupied habitats were specifically influenced in their developmental trajectories compared to larvae from fish free spots. We discuss the opportunity of respective adaptiveness of these specific changes.