

# Exploring behavioural variations in a bachelor pack of *Canis lupus occidentalis*

Emily Gorsuch<sup>1,2</sup>, Kathrin M. Röper<sup>3</sup>, Carina A. Kolkmeier<sup>1,4</sup>, Udo Gansloßer<sup>1,2</sup>

## Background and aim

To describe and analyse the communication behaviour of animals there are several methods used in ethology.

For a discussion on the applicability of two of these methods, behavioural data on grey wolves (*Canis lupus occidentalis*) was collected.

A huge behavioural variation was found.

## Methods

Five surgically castrated half-brothers (\*April 2021) were observed in their outdoor enclosure (947 m<sup>2</sup>) at Hannover Zoo. Communication interactions were filmed on 29 and 31 of August 2023.



Two different methods were used:

- An ethogram-based sequence protocol documented the behaviours during 36 interactions.
- The Eshkol-Wachmann movement notation (originally developed for dance choreography) described the behaviour during 5 of these interactions.

To show the differences, we use one typical communication behaviour as an example.

### a) Sequence protocol (see Gansloßer 2021 and Lehner 1996)

#### Ethogram

= catalogue with total of 115 behaviours

e.g.

**Behaviour:** passing under the head of the interaction partner

**Abbreviation:** 'Ukd'

**Description of the behaviour:** The individual passes under the head of the interaction partner. In doing so the head of the interaction partner will often be pushed upward or the interaction partner moves his head out of the way. Physical contact is made between the interaction partners.

#### Exemplary sequence protocol

Ivan	sends to...	Igor	sends to...
previous behaviour		previous behaviour	
Ukd/EP-F/T3	Igor	st/lo/O-S/T3	
following behaviour		following behaviour	

Abbreviations:

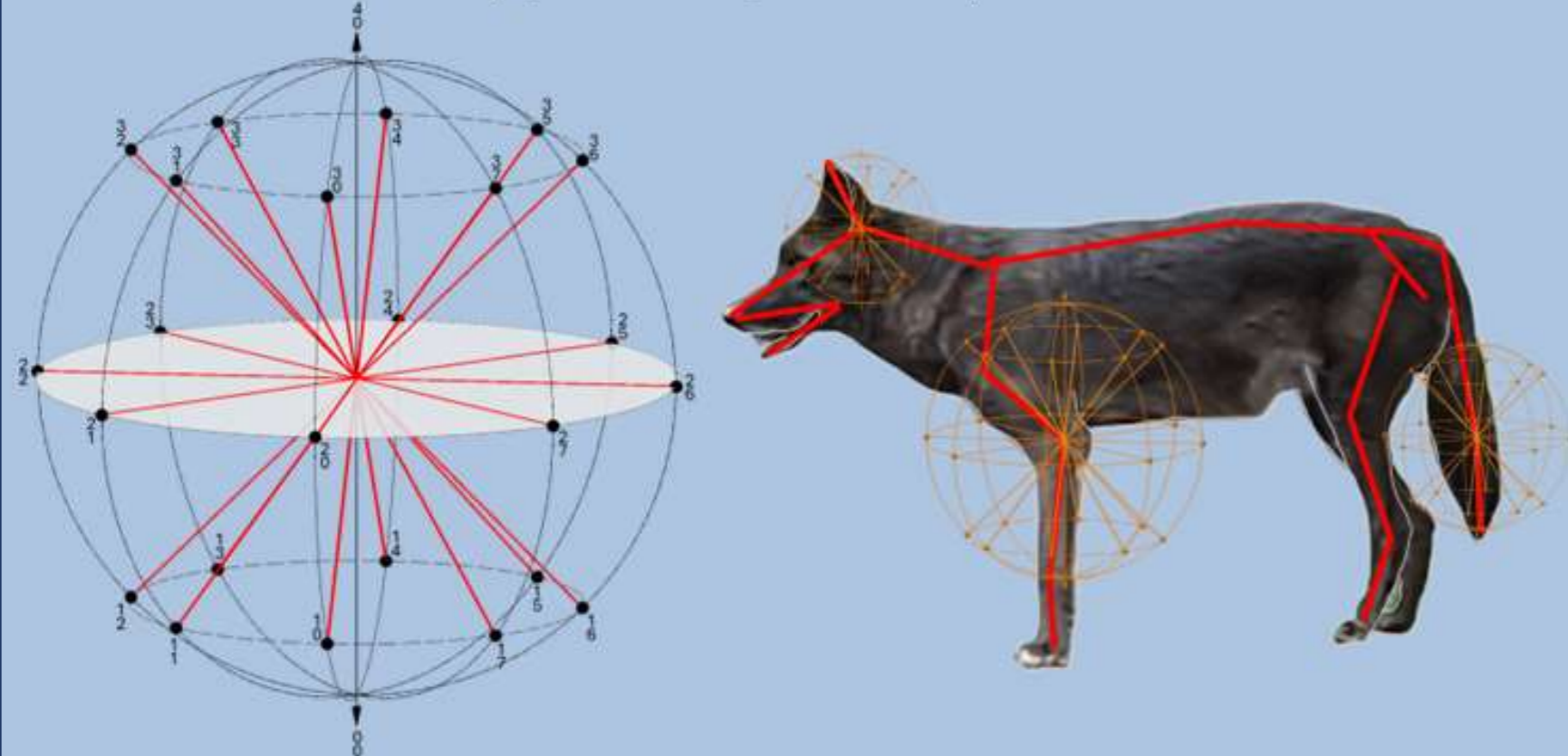
Ukd	passing under the head of the interaction partner
EP-F	ears picked-turned forward
T3	tail below the backline
st	standing
lo	looking around
O-S	ears picked-turned sideways
T3	tail below the backline

#### Results

- in total 1844 behavioural variations, i.e. different combinations of behaviours, were found
- 37 of these contained the behaviour 'Ukd'
- 4 different ear positions and 6 different tail positions appeared in combination with the behaviour 'Ukd'

### b) Eshkol-Wachmann movement notation (see Eshkol et al. 1970 and Golani 1976)

#### Position of each body part in a spherical system of reference



#### Symbols for the notation of movement



#### Exemplary notation

10 frames per second were analysed in detail, i.e. very time-consuming notation



left ear	left front leg (radius - ulna)	(tip of) tail
previous movements		
V1- 3/2 - 3/1	(2)↑1 1/2 - 1/1	(6)↓1-
Small anti-clockwise conical movement. The end position is between the coordinates 3/2 - 3/1.	Vertical upward movement in plane no. 2 to the end position between the coordinates 1/2 - 1/1.	Small vertical downward movement in plane no. 6.
following movements		

#### Results

- analysis leads to an almost endless variability in behaviours

## Conclusion

In comparison to the sequence protocol the Eshkol-Wachmann movement notation describes the behaviour in more detail.

Both methods show that physical contact between two individuals can vary greatly depending on the positioning of body parts.

In addition, other studies prove that the social and environmental context of the interaction add to this variation (see e.g. Cordoni 2009, Faragó et al. 2013, Lehner 1996, Naguib 2006 and Gansloßer 2021 for details) even more.

"Animals are always behaving" (Lehner 1996).  
The analysis of this exemplary behaviour only gives a small glimpse into the variability of animal behaviour.

## Literature

- CORDONI, G. 2009. Social play in captive wolves (*Canis lupus*): not only an immature affair. *Behaviour*, 1363-1385.
- ESHKOL, N., VON FOERSTER, H., MELVIN, P., MICHL, J. & WACHMANN, A. 1970. *Notation of movement*, University of Illinois.
- FARAGÓ, T., TOWNSEND, S. & RANGE, F. 2013. The information content of wolf (and dog) social communication. *Biocommunication of animals*, Springer.
- GANSLOSSER, U. 2021. *Zootiere - Verhalten und Haltung*, Filander.
- GOLANI, I. 1976. Homeostatic motor processes in mammalian interactions: A choreography of display. *Perspectives in Ethology: Volume 2*, Springer.
- LEHNER, P. N. 1996. *Handbook of ethological methods*, Cambridge University Press.
- NAGUIB, M. 2006. *Methoden der Verhaltensbiologie*, Springer.

## Affiliation

- <sup>1</sup>Friedrich Schiller University Jena, Institute for Zoology and Evolutionary Research, Erbertstr. 1, 07743 Jena, Germany
- <sup>2</sup>Mammalia AG (Mammal research network on animal welfare, ecology and social mechanisms), Germany
- <sup>3</sup>Hannover Adventure Zoo, Adenauerallee 1, 30175 Hannover, Germany
- <sup>4</sup>University of Vechta, Department of Biology, Driverstraße 22, 49377 Vechta, Germany