

Clapham, Melanie, Nevin, Owen, Ramsey, Andrew D. and Rosell, Frank (2012)  
Using Markov Chain Analysis to assess stereotyped scent marking behaviour in  
wild brown bears. In: 14th International Behavioural Ecology Congress (ISBE),  
12-17 August 2012, Lund, Sweden. (Unpublished)

Downloaded from: <http://insight.cumbria.ac.uk/id/eprint/3568/>

*Usage of any items from the University of Cumbria's institutional repository 'Insight' must conform to the following fair usage guidelines.*

Any item and its associated metadata held in the University of Cumbria's institutional repository Insight (unless stated otherwise on the metadata record) may be copied, displayed or performed, and stored in line with the JISC fair dealing guidelines (available [here](#)) for educational and not-for-profit activities

**provided that**

- the authors, title and full bibliographic details of the item are cited clearly when any part of the work is referred to verbally or in the written form
  - a hyperlink/URL to the original Insight record of that item is included in any citations of the work
- the content is not changed in any way
- all files required for usage of the item are kept together with the main item file.

**You may not**

- sell any part of an item
- refer to any part of an item without citation
- amend any item or contextualise it in a way that will impugn the creator's reputation
- remove or alter the copyright statement on an item.

The full policy can be found [here](#).

Alternatively contact the University of Cumbria Repository Editor by emailing [insight@cumbria.ac.uk](mailto:insight@cumbria.ac.uk).

## Using Markov Chain Analysis to Assess Stereotyped Scent Marking Behaviour in Wild Brown Bears

Melanie Clapham<sup>1\*</sup>, Owen T. Nevin<sup>2</sup>, Andrew D. Ramsey<sup>1</sup> and Frank Rosell<sup>3</sup>

<sup>1</sup> Centre for Wildlife Conservation, University of Cumbria, Penrith, United Kingdom, CA11 0AH.

<sup>2</sup> CQUniversity, Bryan Jordan Drive, Gladstone, 4680, Australia.

<sup>3</sup> Faculty of Art and Sciences, Department of Environmental and Health Studies, Telemark University College, Norway.

Members of the order Carnivora employ a wide range of postures and stereotyped patterns to mark their scent onto objects, and therein communicate with conspecifics. Despite much anecdotal evidence on the marking behaviour of Ursids, empirical data examining marking patterns displayed by wild populations is lacking. Situated on the west coast of British Columbia (2009-2011), we used trail cameras stationed at marking trees to investigate scent marking and investigatory behaviour by wild brown bears *Ursus arctos*. Transitions between postures were assessed using Markov Chain Analysis. Results showed that scent marking patterns varied by age and sex; adult males exhibited a cyclic pattern of marking behaviour which included 'core' and 'secondary' postures, whereas adult females failed to exhibit any subset postures. The behaviour of subadults (sexes combined) was a variation and simplification of the patterns displayed by adult males and females. The wider variety of marking postures selected by adult males may convey a more complex signal, relating to the function of scent marking in the species. Females with young were classified separately to assess potential similarities/differences in the behaviour of all members of the family group. Using a simplified ethogram, we found the behaviour of cubs to be dependent on their age and the behaviour of their mother. Younger cubs were more likely to conduct the same behaviour as their mother, whereas older cubs exhibited behaviours independently. This study presents the first detailed description of the development of scent marking behaviour by cubs in the Ursidae.

### Abstract summary

Stereotyped scent marking behaviour was assessed in wild brown bears to examine differences by age sex class and season. Marking behaviour varied by age sex class, with adult males using the widest variety of postures in a cyclic manner. The behaviour of cubs at marking trees was dependent on the behaviour of their mother and their age.

**Clapham, M., Nevin, O. T., Ramsay, A.D. & Rosell, F. (2012) Using Markov Chain Analysis to Assess Stereotyped Scent Marking Behaviour in Wild Brown Bears. 14th International Behavioural Ecology Congress (ISBE), Lund, Sweden.**