

ELECTRONIC APPENDIX

This is the Electronic Appendix to the article

High olfactory sensitivity for dimethyl sulphide in harbour seals

by

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ONLINE APPENDIX

Calculation of the application concentrations: Calculations considering ambient temperatures, vapour pressure, boiling points, and equilibrium concentration for DMS (equations derived from Prah *et al.* 1995 and Hass & Newton 1975) showed that ambient temperatures occurring during the experimental period (1-22°C) did not affect the gaseous DMS concentrations used for threshold determination. At 22°C and 1°C, vapour pressures for DMS are 457.6 mmHg and 190.8 mmHg, respectively. Corresponding vapour saturation concentrations are 2.5×10^{13} pmol/m³ (22°C) and 1.1×10^{13} pmol/m³ (22°C). As both vapour saturation concentrations clearly exceed the highest DMS-concentration used in this study, total vaporization of DMS could be assumed.

References:

- Prah, J. D., Sears, S. B. & Walker, J. C. 1995 Modern approaches to air dilution olfactometry. In *Handbook of olfaction and gustation* (ed. R. L. Doty), pp. 227-255 New York, Basel, Hong Kong: Marcel Dekker, Inc..
- Hass, H. B. & Newton, R. F. 1975 In *Handbook of Chemistry and Physics*. 55th edn. (ed. R. C. Weast) pp. D155-D156. CRC, Boca Raton, FL.

Threshold determination: Detection thresholds were determined using the psychophysical method of constant stimuli which defines the threshold as the stimulus intensity the subject responded to in 50% of stimulus-present trials (Gescheider 1985, Goldstein 2003). The exact threshold value is deduced from linear interpolation between percentage of go-responses to the last stimulus intensity above threshold and the first stimulus intensity below threshold. As a measure of a subject's response bias, the false-alarm-rate is calculated for each stimulus intensity from trials in which a subject shows a go-response to a control stimulus. Low false-alarm-rates at stimulus intensities that produce a high percentage of correct go-responses demonstrate the reliability of a test animal's response to the stimulus. To find the stimulus

intensity where detection of DMS differs significantly from the respective false alarm rate, a chi-squared test of homogeneity was conducted. For a DMS concentration of 80 pmol/m³ both animals still showed a highly significant difference between DMS detections as opposed to false alarms (Bill: $\chi^2=30.03$, $p<0.001$; Nick: $\chi^2=30.00$, $p<0.001$). For a DMS concentration of 8 pmol/m³ only the seal Bill yielded a significant difference between DMS detections and false alarms (Bill: $\chi^2=6.008$, $p<0.05$; Nick: $\chi^2=1.2$, $p>0.05$). Irrespective of whether the classical psychophysical threshold criterion (50% detections) or a level of statistical significance is considered (chi-squared test of homogeneity), our results demonstrate that the olfactory sensitivity of harbour seals is extraordinarily high.

References:

Gescheider, G.A. 1985 Psychophysics: Method and Theory. Lawrence Erlbaum Associates, Hillsdale.

Goldstein, E. B. 1996 Sensation and Perception. Brooks/Cole Publishing Company, Pacific Grove.