Quantifying CH_4 and NH_3 emissions from wild-living animals

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Metabolic processes in the intestines of animals and in their excreta are responsible for gas formation. One pathway concerns the decay of urea or uric acid to ammonia in animal manure (mammals or birds), which will act as a precursor of atmospheric particles. Emissions are much more pronounced for high density of manure, which is the case for domestic animals (where manure is actually collected and kept liquid for longer periods of time) or for bird breeding colonies on small islands, e.g. in the North Sea. Another pathway leading to methane formation is the anaerobic degradation of plant cellulose by symbiotic microflora in the intestines of animals. Mammals (primarily ruminants and rodents) and termites are known to emit methane.

The information about emissions from wild-living animals available is very sparse. While the emission process (emission factors) may be derived from animal husbandry, the number of wild-living animals is extremely different to estimate. For certain large animals (game) hunting statistics can be applied, but species and counting methods strongly differ between countries. Smaller mammals like rodents, or birds are not condidered at all.

We have now introduced a new approach to produce comparable numbers, especially for the smaller mammals, and to reduce uncertainty. The method is based on allometric relations between body mass of animals and abundance (population density). Several authors have reported appropriate data to support the theory that the body size is related with the animal abundance (see the compilation by Peters, 1983). The best relation is described for mammals, which are the main focus for the emission calculation within Europe from wild-living animals. Peters (1983) proposed that the average density (number of animals km^{-2}) of herbivorous mammalian populations declines

as $W^{-0.93}$, and as $W^{-1.16}$ for carnivores(W stands for body mass in kg).

The method of allometric relations has been evaluated calculating population numbers of several mammal species for the UK and results compared favourably to the population estimates derived from hunting statistics or extrapolation from sample counts. The method promises to provide spatially distributed animal population figures using data about the distribution for mammals e.g. from the European Mammals Society (http://www.european-mammals.org/).

Literature:

Peters R.H (1983): The Ecological Implications of Body Size. Cambridge University Press ISBN 052128886X-paperback; latest reprint 1993.