

Wenche Sørmo defended her thesis "*Interactions between the function of the digestive system and pasture plants in reindeer*" for the degree of *Doctor scientiarum* at the University of Tromsø 13th June 1998.



Wenche Sørmo was born in Mo i Rana, North Norway in 1966 and was educated at the University of Tromsø where she joined the Department of Arctic Biology in 1988. Here she started research on the bacteria of the small intestinal mucosa of reindeer. Since 1994, her focus has been on the functional anatomy of the digestive system of Svalbard reindeer and the impacts different pastures have on the function of the digestive system.

The thesis is formed by the following five papers:

1. Sørmo, W., Haga, Ø. E., Gaare, E., Langvatn, R. & Mathiesen, S. D. The effect of plant species in the rumen and chemical and structural fibre composition on the fill of the fermentation chambers in Svalbard reindeer. Submitted *J. Zool.*
2. Sørmo, W. & Mathiesen, S. D. 1993. Bacteria in the small intestine of lichen-fed Norwegian reindeer (*Rangifer tarandus tarandus*). – *Letters in Applied Microbiology* 16: 170–171.
3. Sørmo, W., Aagnes, T. H., Olsen, M. A. & Mathiesen, S. D. 1994. The bacteriology of the small intestinal mucosa of free living reindeer. – *Rangifer* 14: 65–78.
4. Sørmo, W., Haga, Ø. E., White, R. G. & Mathiesen, S. D. 1997. Comparative aspects of volatile fatty acid production in the rumen and distal fermentation chamber in Svalbard reindeer. – *Rangifer* 17: 81–95.
5. Sørmo, W., Haga, Ø. E. & Mathiesen, S. D. 1998. Cellulolysis in the rumen and distal fermentation chamber in Svalbard reindeer

(*Rangifer tarandus platyrhincus*). – *Rangifer* 18: 47–50.

Abstract: The plant quality did not affect the size of the rumen in Svalbard reindeer but the distal fermentation chamber (DFC) seemed to increase in size with increasing amounts of hemicellulose in the diet (Paper 1). Size of particles in the rumen contents was not dependent on plant quality and differences in gastro-intestinal (GI) tract fill were mostly a result of changes in body mass. However, in autumn the GI tract of lactating females was larger than of non-lactating females with the same body mass.

The next two papers describe how a diet of pure lichen and a normal winter pasture respectively affects upon the adherent small intestinal bacterial populations. The mucosal bacteria are thought to create a protective, physical and chemical barrier between the small intestinal epithelium and the ingesta. Reindeer in pens fed pure lichens had high population densities of lactic acid producing bacteria associated with the small intestinal mucosa compared to the very low densities in free living animals on a normal winter pasture. This difference could either be explained by the release of antibacterial substances in the diet of the free living animals after the food had been exposed to the acidic environment in the abomasum, or by a higher contamination pressure of micro-organisms when the animals were kept in pens. The role of the micro-organisms in the small intestinal mucosa of reindeer is still unknown.

Paper 4 describes how differences in plant quality influenced on the production rate of volatile fatty acids (VFA) in the rumen and in the DFC of Svalbard reindeer. Ruminal and DFC concentration of VFA were not correlated to production rates of VFA, probably owing to differences in pH, and therefore differences in rates of absorption over the intestinal wall. Ruminal and DFC production of VFA were low in winter when food was of low quality but high in summer and autumn. High production rates of VFA in DFC were not related to the size of the organ but to high plant quality.

The fifth paper illustrates how energy and nitrogen levels in the food affect rumen and DFC micro-organisms' ability to digest cellulose *in vitro*. If water soluble carbohydrates and protein were of relatively high concentrations in the rumen contents, rumen fermentation of cellulose *in vitro* was high, and DFC fermentation was low, and *vice versa*. In the DFC, fermentation of cellulose *in vitro*, seems to be inversely related to content of cellulose.