Diary 8 - 1 August 2010.

Well, it is time for one of the “dinosaurs” (so called by one of the Zackenberg “fresh men” in the last diary, 18 July) at Zackenberg to give a small lecture. So I’ll take the opportunity to talk about lemmings, on which I have been doing research for more than 15 years. Coming to Zackenberg this summer with one of many objectives to study lemmings and their use of Cassiope (kantlyng) as nest material, it was not the best news to find myself in the record low lemming situation. But science is also about stamina, so after 10.950 trapping hour I finally caught the first (hopefully not the last and only!) lemming this year. Not much scientific data to work with, but I have other sources of data that can make the story worth to tell. A story that has nothing to do with lemming fluctuations, so I leave it for another time.

There are ten different species, but I’ll stick to only two and one of them in particular. They are cute looking and a small handful of soft fur with a round head, small black eyes and a very short fury tale, not at all like a mouse. A lot of animals find the extremely tasty and base their breeding success on the availability on lemming. But lemmings are not plentiful every year. They fluctuate, and in the north these fluctuation seems to be cyclic. These cycles has called for scientific explanations for almost a hundred years. The Scandinavian lemming was the main source of the very robust myth, that lemming when being plentiful committed mass suicide by swimming out to sea or jumping off cliffs. The story being so dramatic, epic and scenic, that Walt Disney wanted to capture this scientifically unapproved truth on film. He did that very efficiently and thereby strengthening the mythic “truth” of the faith of the lemming. Populations of Scandinavian lemmings do (at least a decade ago) get very big and during these peaks they were easily and often seen as they moved out of their prime habitats in search for new virgin lands. By doing this they eventually came across a stream or even a river which they might have attempted to cross even with the risk of drowning. The fact that lemmings (like all other animals) can swim and do so if necessary, lead to occasional findings of “piles” of drowned lemmings in calm waters of the rivers. This is of course not a proof of the lemmings committing communal suicide, but just a simple fact that drifting material gathered over many kilometres tends to coil up in calm waters. Still, even in 2010 the myth of the suicidal lemming lives.

The scientific community has long debated the key factor of the lemming cycle. Social stresses, genetic factors, inter annual changes in food quality and predation just to mention the four most prominent of the key candidates. Well, nature and ecology is, almost as a rule, not as simple as that. When non social animal, like lemmings, are getting crowded they do get stressed and some will leave the area in search for non occupied habitats. Lemmings do, as other microtine rodent, have a “super” version of the female sex chromosome, the X-chromosome. A normal female having a double X (female = XX) and a normal male having one male chromosome (Y) and a X-chromosome (male = XY). The super X-chromosome X” actually dominates the presence of a Y-chromosome, so what genetically seems to be a male (X”Y) is effectively a female. The presence of the X” makes it possible to find “super females” (X”X), which will give birth to 75% females and only 25% males, while normal female will give birth to 50% of each sex. Wow, what a female explosion! Food quality is important, and many plants (that lemmings eat) defend them selves with secondary plant defence (chemical), making it hard for the lemming to extract the protein from the food, which leads to a lower fitness or/and forces the animal to consume more food spending more time foraging and hence expose them selves to predation. Predators are lethal to the lemming, and the more abundant the variety of predators is, the more vulnerable the lemming become. So in conclusion the answer the question on what drives the cyclic lemming fluctuation is not straight forward and is in fact quite complex. Never the less, the predation factor

is for the time being the strongest candidate for the key-factor driving lemming fluctuation if such one exists – I doubt it.

Nature, though, has other jokers at play and something strange has been going on around lemmings in Northeast Greenland over the past decade. In the “old times” lemmings were quite abundant every 3-5 years, but since the last well defined lemming peak year in 1998, the lemming population at Zackenberg and on Traill Island 220 km to the South, have never reached the same population density and the cycle (seemingly still running) has been shorten down to three year. 2010 was expected to be the next “small” peak year, but having gone through three quarter of the one square kilometre lemming monitoring area we might face the lowest lemming population ever recorded at Zackenberg. The six million dollar question is: Why??
Roughly speaking there are two seasons in the Arctic. One with snow (winter and spring) and one without (summer and autumn). In the “without” season predators are abundant, with Arctic foxes and Long tailed being the most important predators. In the “with” season, it’s only the resident predators, the Arctic fox and the stoat that makes up the death patrol on lemmings. In order to escape predators during summer, lemmings seeks hide in sub terrain burrows, restricting their search food to roughly one meter away from the burrow entrance. Of cause four square meters is not enough to provide food enough for the whole season, so the lemming uses several burrows (around 8 to 12) within running distances from each other. Restricting their forage area to such a small area, may stress the plants leading to increased levels of plant chemical defence. During the long (and very cold) winter lemmings can expand their search for food to a much greater distance. They leave their summer burrows and build small and cosy looking winter nest, mostly out of grass on top of the tundra. BUT they need snow to hide the winter nest from the predators. The thicker snow cover the better and that is probably where the key to the answer on the “why” question should be found. Snow is a highly important insulator, without which the lemming (and the stoat) would freeze to death. Snow also minimise the risk of being caught by foxes, all though foxes do eventually catch lemmings through the snow if the snow pack isn’t too thick.

Here at Zackenberg most scientific focus is on the effect of climate on the arctic flora and fauna as well as the feed-back mechanisms. I’ll leave the last issue to somebody else. The snow regime is highly variable. Even though we have experienced extremes at both ends, the trend and has clearly pointed in the direction on a prolonged season without snow especially a prolonged autumn without snow. This is the reason why the monitoring at Zackenberg for the coming years will stay open two more months in order to reach the beginning of the real snowy season. I have a strong feeling that snow is a “new” strong candidate in the ongoing story and discussion on what drives the faith of fluctuating lemming population.

Finally the weather: We are enjoying round the clock sunlight from a blue sky for the third week in a row. It does, however, hide behind the mountains to the North giving us a couple of night hours in the shadows.

Thomas Bjørneboe Berg
Naturama, Svendborg (BioBasis)