Migration – utopia or myopia[1]?

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Peter Osborne spent a sabbatical in northern America and was surprised that so many scientists and students stated that caribou migration was largely the result of mosquito pressure. He failed however to find any documented evidence of this claim although he was constantly confronted by the well known «facts» that mosquitoes had been observed to drive caribou crazy and even kill juveniles. The issue Osborne wishes to focus is that an experimentally unsubstantiated anthropomorphism appears to have become critical evidence in support of a theory. A recent article in Nature (393, 511-513, 1998) devoted to the uses of 'science in fiction' to stimulate thought and discussion about aspects of academia encouraged him to write the following comment in the form of a parody of ancient Greek dialogues.

Rangifer, 18 (3–4): 155–156

Skepticus: What makes Alaskan and Canadian caribou migrate?

Status Quovicus: If you mean what factors contribute to the seasonal movement of caribou from highland calving grounds to Arctic coastal tundta then the answer is considered to be the interaction of availability of forage and insect pressure.

S: Intuitively I can accept the importance of the availability and quality of forage but, insect pressure?

SQ: Yes, mosquito harassment of caribou is considered by biologists and some members of the general community to be a most important factor contributing to the migration of caribou.

S: How can that be possible?

SQ: As you know on the tundra, during the summer calving period the biomass of mosquitoes is tremendous, some estimates say equal to the weight of the caribou herds themselves. As such the mosquitoes can be considered as a predatory burden upon the caribou.

S: You mean the mosquito's predation upon the caribou results in anemia of the caribou?

SQ: No. Russian studies have shown that the daily blood loss from the caribou, as a consequence of mosquitoes predation, is unlikely to be more than a healthy caribou can replace. It is considered that the cumulative predation pressures of the *Aedes* mosquitoes results in relentless harassment of the caribou which then adopt the strategy of continual movement in order to escape. Anecdotal reports from hunters and researchers suggest that in some instances mosquitoes have been observed to drive caribou crazy and under extreme circumstances be associated with the death of calves.

S: This axiom would appear to hang heavily on the researchers and hunters ability to assess the mental condition and motives of caribou - an extremely challenging task, even of animals that are capable of speech. Your evidence is at best a tenuous relationship and certainly doesn't indicate cause. I have two disagreements with your line of logic which I will

[1] Myopia means short-sightedness.

attempt to expose to you. Firstly, this particular predator- prey relationship is long standing with both participants interacting for thousands of years. As such I would suppose that the influence of the mosquito upon the caribou would be, in general, innocuous as neither of these two participants display anatomical peculiarities indicative of an evolutionary battle between skin thickness and ever increasing proboscis length. Secondly and more importantly, if movement away from an area of extreme mosquito density was used as a strategy by the caribou it is unclear to me how this would result in migration. What you are implying is that caribou move continually down gradients of mosquito harassment. Within a given area of tundra surely mosquito numbers would vary according to microclimatic features such as temperature, wind velocity and height. Topographically, this is unlikely to result in corridors of low mosquito density leading from spring calving grounds to the sea or summer feeding grounds. It is more likely to result in what would effectively be described as the brownian motion of caribou between the mosaic of pockets of low mosquito density randomly scattered across the tundra. However even if we should invoke the use of chaos theory to illuminate order from these patterns of movement, I am even then unwilling to accede that this would result in the movement of herds of caribou in determined but unobvious trails from mountain to sea.

SQ: No. I think your flippancy disguises that you miss the point. I agree with your doubt regarding the existence of corridors of low mosquito density but I dispute your denial that mosquito pressures are reduced between the calving grounds and the summer pasture.

S: Oh, sir, you are mistaken. I do not dispute your observation, merely your statement that this observation is related to the cause of migratory behavior in caribou. Given this observation, I would suggest that this migratory behavior is not a learned avoidance of mosquito harassment since with learned behaviors the greater the time interval between the task or stimulus and the reward, the quicker the learned behavioral response becomes extinct. In the scenario you proffer, the behavior of moving on to avoid the mosquito harassment would be reinforced only upon arrival at an area of low mosquito density. If this time interval between departure and arrival was long, in the order of a few minutes, the behavior you attempt to explain would not be reinforced. In addition unless the wind is horrendously strong and the caribou herd is well spaced I must also doubt that the migrating caribou would move at a pace that would out distance the predatory mosquito.

– *thoughtful pause* –

However, after uttering this last doubt I am now forced to reassess my entire argument. It would seem reasonable to conclude from the available evidence that the pursuing mosquito is driving the caribou in a manner analogous to sheep dogs driving cattle. What say you Status Quovius?

SQ: I think that both unlike and like the caribou, I will grow a thicker skin and walk away from this argument before I am driven crazed to my death.