SPECIES SHOWDOWN

TONY SINCLAIR IS UNCOVERING HOW INFINITESIMAL CHANGES TO AN ECOSYSTEM CAN PRODUCE DRASTIC RESULTS FOR US ALL

Deep in the soil of New Zealand, buried traces of a richer moment in the country's history form an archeological record of a world now vanished. Many layers down, strips of nitrogen-rich earth are evidence of a time when billions of seabirds nested, their droppings completing an immense transfer of nutrients from the ocean to the land. It only took a short while, probably less than a century, for the enormous population of seabirds to be decimated by an unfamiliar foe. Their demise caused a key change in the soil; the insects that feasted on their litter died off, setting in motion a larger change that profoundly affected the entire country.

"We've just woken up to what really happened in New Zealand — until recently nobody had any idea," says UBC Professor of Zoology Tony Sinclair, who's been consulting with the New Zealand government. "There must have been an explosion in the rat population of astronomical proportions — the whole island must have been swimming with rats. The birds just stood around and got eaten. They had no time in which to evolve behaviour to deal with them." The rats ransacked the nests of the seabirds and in doing so, caused a complete shift in the ecosystem. Without the nutrients the seabirds supplied, a rich fauna simply disappeared. One famous example is the Moa, a species of large, ostrich-like bird that is now completely extinct. With no written or oral record of the time, the evidence lay buried underground until the story was pieced together. "It's an eye-opener on how the world works and how it has changed," says Sinclair.

The Pacific rat still lives in New Zealand and is now regarded as a benign pest. But when the rats arrived, in the canoes of the Maori people who traveled to the island, they were one of the first mammals to land there. There are marine mammals native to New Zealand; seals and dolphins can travel

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Tony Sinclair is a professor at the Beaty Biodiversity Research Centre at UBC where he was its first director. The current director is Professor Dolph Schluter. Tony Sinclair's projects have received funding from NSERC, CFI, the BC Knowledge Development Fund, National Geographic and the British Ecological Society. He is supported by a Senior Killam Research Fellowship from the Canada Council for the Arts.

anywhere. And two species of fruit bat were also native; but there were no terrestrial mammals at all. So the other inhabitants of the islands — the birds, lizards, and insects — had never developed any behaviour to protect themselves against a predator of this kind. It would have taken about 1,000 years for that kind of behaviour to evolve, but the rats weren't going to wait.

What happened in New Zealand is a dramatic example of the kind of change Sinclair works tirelessly to understand, and to prevent if possible. He explains the concept of what he calls a "keystone" species; it might be operating on a low level, perhaps a microbe in the soil. But if it disappears, then the whole ecosystem will change rapidly. Any interference with the keystone group, human or otherwise, could have drastic results. "Just how much can we destroy before it starts to spiral downwards, out of control? That's the most important issue that's facing humans right now, I think," he suggests.

Putting together the pieces of the system, and figuring out how it functions, is Sinclair's life work. It's a job that has taken him all over the world, but Tanzania, where he was raised, has always been a primary area of study. Beginning in 1965, he built a detailed record of the Serengeti National Park, one of the world's oldest and most diverse natural ecosystems. Sinclair and his colleagues have created, and continue to create, a comprehensive picture of life in the park that includes the large mammals, birds and insects — right down to the microbes in the soil. He's published the results in a series of books entitled *Serengeti*; the fourth book is in the planning stages. His study of 40 years forms an ongoing sequence, one of the longest detailed records of any place on earth.

While the Serengeti is a unique area, the results of Sinclair's study there have applications elsewhere. "The Serengeti is an important baseline concept," he claims. "We are using the Serengeti to understand how the whole system works and how it changes if you start interfering with it. So I can compare human areas where much of it has been removed with a natural area where it's relatively intact."

The complex and biodiverse world of the Serengeti offers a good contrast to an environment such as the one found in Canada's north, another area of interest for Sinclair. "Does more species mean more stability? If you take out more species, does that mean it becomes more unstable and therefore more prone to these collapses? We actually don't know the answer to this." So Canada's far north, with very few species, serves as another kind of extreme: "If you take some things out of that kind of environment, does that have a greater or lesser impact?"

Sinclair envisions a new experiment, what he refers to as "a grand-scale biodiversity knockout experiment," or as he calls it, BIOKO, which proposes to use a gradient of natural diversity from Canada's high Arctic to the Prairies. Researchers will remove a key species from a controlled study plot and then further disturb the plot, for example, by adding fertilizer. The effect of removing the species from the plot will be monitored for three years. Roy Turkington, a colleague in the botany department, designed the pilot study and is already at work in the Yukon.

If the pilot study is successful, similar experiments will be done in a range of geographical environments. This is a massive, worldwide project that will be run from UBC's Integrated Biodiversity Laboratory, a new facility that will be built with $33 million from the Canada Foundation for Innovation and the BC Knowledge Development Fund, and funding from UBC. The new lab is due to be completed in five years.

As Sinclair nears his retirement from formal academic life, he may not steer this project to its completion, but it will form part of his legacy to UBC: "That's a 20-year program — something that I have suggested and others can decide if they want to follow on." He envisions a new generation of ecosystem specialists from all over the world getting involved in knockout research.