Plenary Talks

Predator – prey interaction in the boreal vole community – behavioral and survival game in the changing world

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Climate change and habitat fragmentation cause major threat for populations and challenge for individuals and their interactions. Predator-prey interaction is especially in our northern latitudes with strong seasonality modified by climate processes. I review results of a series of experiments in the cyclic bank vole – least weasel system, focusing also changing habitat or climate conditions affecting the interaction. Complicated network of predation cues, risk recognition by prey and behavioral and reproductive effects on prey voles is illustrated and discussed. In climate change scenarios the major expected change is happening in duration and stability of winter and snow cover. Snow provides thermoregulation, shelter for nest sites and hide from most predators. Predicted increase in instability of winter forms a major challenge, both for small mammal prey but also their small specialist predators in northern latitudes. Future studies focus on how the fear along the changing environment is experienced both by the vole prey when confronted by weasels, and by weasels when confronted by larger predators.

Plenary Talks

Rat-free New Zealand 2050 – fantasy or reality?

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Rats introduced into previously mammal-free New Zealand (NZ) seriously impact our vulnerable native flora and fauna. As a result, considerable research effort has focused on developing control techniques for reducing and/or eradicating rats with excellent success in the eradication of both Norway rats and ship rats from many offshore islands (n = 105 mammal-free islands). This control work has created numerous predator-free sanctuaries thus enabling the translocation of many endangered native bird species. Unfortunately, we have run out of defendable, non-human occupied islands and the current focus is on the NZ mainland, with a new government goal of ridding NZ of rats, brush-tail possums and stoats by 2050 (called Predator Free NZ 2050 Ltd). During 2010-15, the Centre for Wildlife Management and Conservation (CWMC; based at Lincoln University) began a research programme investigating alternatives to brodifacoum for environmentally-safer rat control, with a focus on tools that could be used on the NZ mainland. In addition to this work, we also investigated the attractiveness of social lures for ship rats and species-specific delivery options for sustained ground-based rat control. In 2015, a privately-funded research and development entity called Zero Invasive Predators Ltd (ZIP; also at Lincoln University) was established with the goal of developing technologies to remove predators from large areas and then defending those areas from reinvasion. In addition to the results from the above CWMC research programme we will also present the results from recent ZIP research investigating the use of "virtual" and geographical barriers designed to prevent reinvasion of rodents back into predator-free areas. ZIP have also developed modified techniques for applying aerial 1080 cereal bait that has potentially removed all rats from a 2,300-ha NZ mainland field site.

Plenary Talks

5 critical areas for rodent population biology

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I will review briefly the strong inference approach that has characterized the great progress population ecology has maintained for the last 60 years. Population ecology is the cornerstone of all ecological studies, and without good population studies we cannot make progress in answering the scientific problems that confront us today. I concentrate my talk on 5 areas of rodent population ecology - population dynamics, the problem of rarity, pest management, the economic impacts of rodents, and landscape ecology. I will highlight the progress we have made and the major questions that are not yet resolved, including the impacts of climate change, the regulation of breeding seasons, the problem of infanticide, and the role of chronic stress in rodent demography. The problem of rarity in rodents is rarely discussed, and yet is so critical for the conservation of rare species. We have no clear ideas about why so many species are so rare. I will cover some highlights of progress in pest management, with an overview of fertility control issues and the use of poisons. The economic impacts of rodents in forestry are important in many countries, as are landscape ecology issues that are most difficult to study yet most important in our human-modified landscapes. The importance of long-term monitoring underlies much of what we need to do in our future research. All these areas of rodent population biology will be addressed in more detail in the plenary talks and in many of the presentations at this conference. Much has been achieved and much remains to be done.

Plenary Talks

The ecology of emerging tick-borne diseases in a changing world

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Most emerging infectious diseases of humans are transmitted to us from non-human mammals and birds, that is, they are zoonotic. For any given disease, only a small group of species maintains and transmits the disease agent; these are called "reservoir hosts". The abundance and distribution of these reservoir hosts affects the probability of disease emergence and epidemics. Recent research reveals that, while reservoir hosts can amplify disease risk, many other species can reduce transmission and disease risk. They can do this, for example, by regulating the abundance of reservoir hosts or by absorbing but not transmitting the disease agents. A prominent example is Lyme disease, for which the white-footed mouse, eastern chipmunk, and

are the main reservoirs of the bacterial agent and prominent hosts for the tick vector. Other hosts, such as foxes and opossums, can reduce abundance of the small mammals or the ticks. Humans inadvertently increase abundance of some small mammals and decrease that of other mammals when they destroy or fragment natural habitat, for instance by suburbanizing the landscape. This presentation will use three tick-borne diseases, all of which are rapidly emerging in the United States and Europe, as case studies to illustrate general principles relating biodiversity to infectious diseases. Meta-analysis of the published literature shows that the loss of biodiversity generally increases the transmission of infectious diseases of humans, animals, and plants worldwide. In addition to the effects of biodiversity, risk of human exposure to tick-borne diseases is predictable from bottom up forces (e.g., acorn masting) and top-down effects of specific mammalian predators on small-mammal reservoir hosts. The community ecology of mammals is clearly relevant to public health policy.

Plenary Talks

Responses to human-induced changes - ecological and genomic drivers of wildlife health

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Anthropogenic environmental change and loss of biodiversity has been shown to increase the infection prevalence in wildlife reservoirs and drive zoonotic diseases. However, despite recent advances in theoretical concepts and mathematical models, empirical data concerning the ecological and genomic drivers of pathogen transmission in wild animal populations, especially from the tropics, remain scarce. We have studied small mammal populations in three tropical landscapes in central Panama differing in their degree of human-induced changes to test whether shifts in species richness affect host population density, species ecology and virus prevalence. We furthermore investigated the effects of host adaptive (TLR, MHC) diversity on infection and resistance pattern to infer the impact of genomic constraints and reduced genetic diversity. Our study has revealed ecological and genomic mechanisms by which human-induced landscape change can have significant effects on pathogen transmission and infection susceptibility.