The Swiss Institute for Dryland Environmental & Energy Research (SIDEER)

Mitrani Department of Desert Ecology

Controlling rabies outbreaks in wild canids in Israel: theory and reality

Dr. Amit Dolev

Israel Nature and Park Authority

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Two elements have recently been identified as responsible for irregularities in the movement of disease wave fronts across space: (a) landscape characteristics that act as barriers, and (b) long sparks, probably driven by dispersal. Both elements imply that future improvement of our ability to predict and understand the dynamics of disease waves necessitates in depth understanding of the movement ecology of hosts. Specifically, our attention should be focused on: (1) the various factors that direct and channel the host through landscape matrix, (2) the types, timing, and distribution of irregular long-range movements, and (3) the interaction between (1) and (2). In a recent study of foxes we demonstrated that their movement through the landscape is not random and is dependent, at least in part, on the steepness of the slope. Long range forays consisted of two types: dispersal of up to 15 km performed solely by sub-adult males, and long-range forays of up to 6 km carried out by all individuals. We simulated the advancement of a rabies front (the paradigm for wildlife disease waves) through a real landscape, using an individual-based diffusion-type model, with and without the derived likelihood distributions of the long-range movements and individual animal responses to the landscape. Results suggested that as

animal movements become more landscape-dependent and long-range-movement distance and frequency increases, the wave evolves into a directional series of local ‘floods'. While theory has unraveled the key issues in the dynamics of epidemic waves, a fundamental understanding of the ecology of host movement patterns is necessary to fully predict and manage the spread of diseases across real landscapes.

amitd@npa.org.il