Biosecurity, climate change, and the invasion biology of vector borne disease

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The ecology of vector-borne infectious disease is a quintessential example of biocomplexity science. How do patterns of land use, climate change, the density and distribution of vectors, the evolution of vector-pathogen interactions, and human population dynamics affect the likelihood and severity of infectious disease outbreaks? Predicting the impact of economic development, globalization, and climate change on the distribution and prevalence of invasive species (including pathogens and their vectors) is a major scientific challenge that has serious implications for human well being. While trade, transport, tourism, and travel have obvious benefits for society, they can also create massive ecological disturbance, and in the worst case, have even contributed to the virtual extirpation of human populations. The existence of broad relationships between human activities, climate change, and the incidence of infectious disease is not in doubt, but available models remain controversial and blunt instruments for predicting the threat of emerging infectious diseases and their public health consequences. Critical knowledge gaps concerning the biology of parasites and vectors are one major cause of this uncertainty. The islands of Polynesia are natural laboratories for addressing these questions and for developing approaches to reduce the risks associated with climate change.