## Predicting biosecurity risk for islands using Bayesian belief networks: Mammalian threats and threatened mammals

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In the Pilbara region of Western Australia there are approximately 600 islands spread out over 30,000 km$^2$ of ocean. Many of the islands are refuges for threatened and endemic species. Notably, foxes (*Vulpes vulpes*) probably extirpated black-flanked rock-wallabies (*Petrogale lateralis lateralis*) from Depuch Island. Foxes and black rats (*Rattus rattus*) are present on other islands that host the endangered northern quoll (*Dasyurus hallucatus*), and vulnerable bandicoots (*Isoodon auratus*). Feral cats (*Felis catus*) are a frequently appearing, but rarely establishing, threat. With such widely dispersed publically accessible islands effective quarantine is infeasible. Surveillance programs become cost-prohibitive unless we limit surveys to high-risk islands. We designed Bayesian belief networks (BBNs) that estimate the risk of threats arriving and establishing on each island via five dispersal pathways: recreational boats, industrial transport, tidal land-bridges, swimming and floods. BBNs are particularly useful for modelling complex systems where data are incomplete or uncertain. The BBNs were based on data derived from literature or expert elicitation. The probability of animals entering a natural dispersal pathway proved to be the most sensitive and uncertain variable. Relative arrival and establishment rates identify the high-risk islands and high-risk threats. Assuming threats were not already present: 11 islands have > 5% chance of rodents establishing a new population within one year; 7 are at similar risk from cats and 3 have > 2% chance of a new fox population. Dolphin Island hosts northern quolls and all three threats despite on-going aerial fox baiting, and has a 2.8% chance of fox re-invasion.


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# ABSTRACT BOOK