

Metapopulations and habitat shift as mechanisms of small mammal resilience on islands

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Aim Extinction and colonisation are two major factors of population survival or demise. Survivability is a key component in species fitness to cope with changing environments and to extend the range of a species. This study looks into the effects of structure on species occurrence on islands. The four main problems investigated are (1) the function of structure elements in young and dynamic landscapes, (2) mechanisms of population limitation on islands, (3) the applicability of a metapopulation model to small mammal populations on islands and (4) an assessment of population dynamics in this space.

Methods Small mammals were captured with live traps in dune habitats and adjacent structures, additionally structures were classified using the key of the Trilateral Monitoring and Assessment Programme (TMAP). Species occurrence was interrelated with structure types and compared with island topography and dune topography.

Results Species occurrence was binarily distributed between a large and two smaller islands with a total absence of shrews from the latter and Wood Mice, *Apodemus sylvaticus* from the former. Both taxa were exclusively confined to dune habitats, in spite of suitable habitats on every island.

Main conclusions Dune habitats are attractive for either species group and provide flood-free terrain during winter floods. Species persist on islands despite adverse conditions in colonisation-limited populations. The spatial arrangement of dunes facilitates survival on young and dynamic islands within a patchy metapopulation model on the island level. On the landscape scale a mainland-island metapopulation is superimposed, albeit with very slow island colonisation rates for shrews. The species distribution suggests a minimum of 500 years for Wadden Sea island colonisation through shrews.

Keywords Dune habitats, *Sorex minutus*, *Apodemus sylvaticus*, habitat preference, survival strategy, patch meta population, colonisation, island biogeography, landscape level