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Islands and coastal regions are threatened the most

With participation by researchers from the University of Konstanz, worldwide hotspots for alien plant and animal species have been identified for the first time

The distribution of established alien species in different regions of the world varies significantly. Until now, scientists were uncertain about where the global hotspots for established alien species are located. An international research team that includes Professor Mark van Kleunen, ecologist at the University of Konstanz, is the first to provide an analysis of these hotspots: According to their study, most alien species can be found on islands and coastal regions. The study was published in the renowned journal *Nature Ecology and Evolution* on 12 June 2017.

Humans are responsible for the movement of an increasing number of species into new territories which they previously never inhabited. The number of established alien species varies according to world region. What was previously unclear is where the most established alien species could be found and which factors characterise their distribution.

An international team consisting of 25 researchers under the leadership of Dr Wayne Dawson from the University of Durham (United Kingdom), who began his research on this topic in Mark van Kleunen's research group in Konstanz, created a database for eight animal and plant groups (mammals, birds, amphibians, reptiles, fishes, spiders, ants and vascular plants) that were found to occur in regions outside of their original habitat. The study of the distribution of these species led the research team to identify 186 islands and 423 mainland regions in total. This project allowed the researchers to illustrate the global distribution of established alien species within a large number of organism groups for the first time.

Important result: The highest number of alien species can be found on islands and in the coastal regions of continents. The island of Hawaii was found to have the most alien species, followed by the north island of New Zealand and the small Sunda Islands of Indonesia. "Hawaii and New Zealand lead the field for all examined groups", explains participating ecologist Dr Franz Essl from the University of Vienna (Austria): "Both regions are remote islands that used to be very isolated,

lacking some groups of organisms altogether - such as mammals, for instance. Today, both regions are economically highly developed countries that maintain intense trade relationships. These have a huge impact on the introduction and naturalisation of non-indigenous species”.

The researchers also examined the factors responsible for the number of alien species in any one region. “We found the number of alien species to be particularly high in densely populated areas as well as in economically highly developed ones”, says Dr Dietmar Moser, also at the University of Vienna and second author of the study. “These factors increase the likelihood of humans introducing many new species to an area. This almost invariably results in the destruction of natural habitats, which in turn allows non-indigenous species to spread. Islands and coastal regions seem to be particularly vulnerable because they occupy leading roles in global overseas trade”. Professor Mark van Kleunen from the University of Konstanz, third author of the study, adds: “There is yet another considerable risk besides the introduction of new alien species. Many of the alien plants and animals that, until now, have been kept in people’s homes and gardens and are not yet to be found in the wild might well spread in the future. Given the world-wide effects of climate change, this is in fact a distinct possibility”.

The presence of large numbers of alien species across many regions of the earth comes with serious consequences, especially in cases where indigenous species are driven out and natural habitats are changed. This is very problematic with regard to islands since many indigenous species tend to exist only on the island itself and are therefore particularly vulnerable to the threat of alien invaders.

Various laws and treaties designed to reduce the spread of alien species have been passed around the globe. “Our study reveals that previous efforts were not efficient enough to keep up with the quickening pace of globalisation. It is of vital importance to implement more effective legal measures, especially with regard to islands”, says Essl. New Zealand, for instance, passed comprehensive legislation designed to prevent the introduction of further alien species over the past few years. And on some smaller islands, alien predators such as rats or mice were successfully eliminated. These examples show that it is possible to take successful action.

Original publication:

W. Dawson, D. Moser, M. van Kleunen, H. Kreft, J. Pergl, P. Pyšek, M. Winter, B. Lenzner, T. Blackburn, E. Dyer, P. Cassey, S. Scrivens, E. Economo, B. Guénard, C. Capinha, H. Seebens, P. Garcia-Diaz, W. Nentwig, E. Garcia-Berthou, C. Casal, N. Mandrák, P. Fuller, C. Meyer, and F. Essl (2017) "Global hotspots and correlates of alien species richness across taxonomic groups", Nature Ecology and Evolution
DOI: [10.1038/s41559-017-0186](https://doi.org/10.1038/s41559-017-0186)
<http://nature.com/articles/doi:10.1038/s41559-017-0186>

Facts:

- The University of Konstanz's contribution to the publication consists of research carried out in the framework of the Global Naturalized Alien Flora (GloNAF) project
- GLoNAF is being funded by the German Research Foundation (DFG) to the amount of approximately 228,000 euros
- The team, which is led by Dr Wayne Dawson from the University of Durham (UK), consists of 25 researchers
- The study investigated the distribution of alien species across 186 islands and 423 mainland regions in total

Note to editors:

You can download photos here:

<http://bit.ly/2r1QG10>

Rose-ringed parakeet (*Psittacula krameri manillensis*), originally from Asia and now found in London. Credit: Tim Blackburn

<http://bit.ly/2s3xp2B>

Grey squirrel (*Sciurus carolinensis*), from North America, now widespread in the UK. Credit: Tim Blackburn

<http://bit.ly/2r2fZQi>

Scotch broom (*Cytisus scoparius*) a plant originally from Europe, invasive in New Zealand. Credit: Wayne Dawson

<http://bit.ly/2r1loq1>

Asian needle ant (*Brachyponera chinensis*) from East Asia now found in the Southeastern USA. Credit: Benoit Guénard

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