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Propagation and future prognosis of Rosa rugosa on an isolated island

Rosa rugosa, also known as "potato rose", has its origins in Asia and was brought to Europe in the 19th century, where it shows a very invasive behavior in coastal regions. On Kieler Ort, a German isolated island in the south-west Baltic Sea, an increasing spread of this rose was found in recent years, which is why in this work, investigated the propagation speed and the current state of coverage on Kieler Ort with the aim of creating a forecast for the next 10 and 20 years.

For the determination of the current state and the speed of growth, aerial photographs of the years 1994, 2000, 2007 and 2016 were digitized and analyzed. For validation an on-site inspection was performed on 3rd of November 2017.

In 2016, more than 10% of the island was already covered by the rose and an average growth rate of 11.5% per year was determined, but the growth rate and rate of new shrubs between the investigated periods (1994-2000, 2000-2007, 2007-2016) varied a lot.

An analysis showed that the *Rosa rugosa* grows on the island mainly in areas higher than 57cm above sea level, with *Rosa rugosa* being scarcely below 27cm above sea level and between 27-57cm an increase with height was seen. The study also showed that the rose grows preferably on east and south-east slopes (together 60% of all roses) and decreases in south, south-west, west and north-west slopes.

For the 10 and 20 years forecast, a cellular automata - a spatially explicit modeling and simulation method - was implemented in Matlab. In addition to the growth rate and the island boundary, this also takes into account suitability in terms of elevation and slope aspect. For the calculation, the northern part of the island was excluded, due to the extensive changes of the island by erosion, which would distort the results.

The 10 and 20 year forecasts were carried out with different growth rates according to the rates determined in the various periods, in order to determine a range in the forecast. For 2036, a rose coverage of 21.5% (2-period average) to 30.3% (3-period average) is expected. Since the new establishment in the model is likely to be underestimated due to terrain suitability, these values should be considered as lower estimates.

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