Expansion of Rosa rugosa in Coastal Dunes

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Shrubs in Coastal Dunes

The non-native Rosa rugosa establishes and spreads both in yellow dunes as well as in landward following grey and brown dunes (Fig. 1). As a result of dense dominant stands, many plant species of typical dune communities are shaded out.

In comparison to the native Hippophaë rhamnoides, Rosa rugosa occupies a larger ecological niche (Fig. 1).

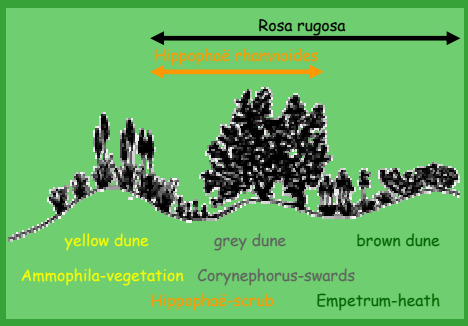

Fig. 1. Rosa rugosa and Hippophaë rhamnoides in coastal dunes.

Rosa rugosa

Rosa rugosa was introduced to Europe in the 18th century. In comparison to its native range, R. rugosa establishes in NW Europe in various plant communities, at a wide range of environmental conditions [1].

In European coastal areas R. rugosa was planted for sand stabilisation, for marking boundaries of pathways (Fig. 2), and it was also used as ornamental plant.

From these introduced sites, R. rugosa spreads into neighbouring dune areas, and due to tillers, it creates large, dominant and dense stands. Today it is widely distributed along the German North Sea Coasts.

Rosa rugosa occurs in dunes in various forms because of garden escapes that go wild, and which based on different cultivars.

Fig. 2. Rosa rugosa marking the boundary of pathways (above left); flowers and hips.

In short - in coastal dunes

Rosa rugosa

- establishes in all dry dune habitats
- changes the environmental conditions
- reduces species-richness and species-diversity
- out-competes especially light demanding species
- displaces many typical dune communities
- effects are similar in all dune habitats
- effects are similar at different scales (1-16 m^2) [2]
- ecological consequences are more improved in comparison to Hippophaë rhamnoides [2]

Light availability

In general, relative light availability beneath shrubs decreases with increasing shrub cover. As to different growth- and leaf-forms, shading by R. rugosa is clearly more pronounced than shading by Hippophaë rhamnoides (Fig. 3). In the case of H. rhamnoides, the relative light availability decreases to about 20%, but in the case of R. rugosa there is a more or less complete shading.

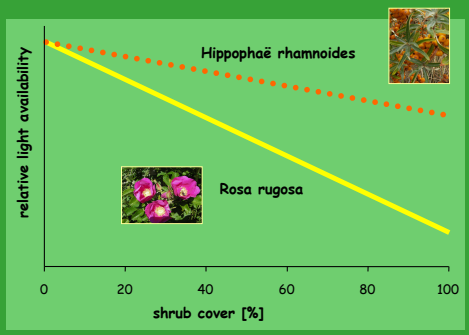

Fig. 3. Decreasing light availability with increasing cover of Hippophaë rhamnoides and Rosa rugosa.

Current Research Project (2008-2011):

Dr. Maike Isermann, Prof. Dr. Martin Diekmann, Bremen University;
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Using Rosa rugosa the project will exemplify, how a differentiate analysis of species invasion potential in relation to various habitats, could be used for nature conservation strategies. The project is dealing with following questions:

- Which genotypes and Rugosa-hybrids were and are planted in German coastal areas?
- What differences of invasion potential exist, regarding dispersal, establishment, and spreading between Rosa rugosa types in various coastal dune areas?
- How do different dune types vary in relation to habitat suitability in relation to Rosa rugosa?

Species-richness of Coastal Dunes

Coastal dunes are one of the most valuable habitat type in Europe. They are often species-rich (Fig. 4) and contain many regionally rare plants. Therefore, dunes represent priority habitat types of the European FFH Directive. The preservation of semi-natural dune grass- and heathlands has a high conservation priority and the expansion of species-poor shrubland poses a serious conservation problem.

Fig. 4. Species-richness in dunes, for example with Polypodium vulgare, Cladina spec., Lycoperdon cf. perlatum, Calystegia soldanella, Sedum acre, Sorbus aucuparia, Empetrum nigrum, Polytrichum piliferum.

Decreasing Species-Richness

Total species-richness decreases with increasing cover of R. rugosa, and declines in all dune vegetation types [3]. The number of typical grassland species declines especially in the case of species-rich Corynephorus-swards, but also in the case of Ammophila-vegetation and Empetrum-heathlands (Fig. 5). Moreover, the number of Red-Book-Species decreases with increasing R. rugosa cover. Furthermore, decline in species-diversity (Shannon, evenness) is more improved in the case of R. rugosa than in H. rhamnoides [2].

Conclusion

Decline in species-richness, change of vegetation composition as well as reduction of landscape diversity due to extensive dominant stands manifest Rosa rugosa as a serious problem in relation to sustainable protection of biodiversity in coastal dunes.

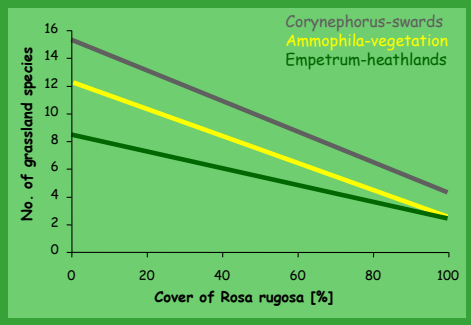

Fig. 5. Decline in the number of grassland species with increasing Rosa rugosa cover in different dune types [3].

References

[1] Isermann, M. 2008. Classification and habitat characteristics of plant communities invaded by the non-native Rosa rugosa Thunb. in NW Europe. Phytocoenologia 38. in press.

[2] Isermann, M. 2008. Expansion of Rosa rugosa and Hippophaë rhamnoides in coastal grey dunes: effects at different spatial scales. Flora 203: 273-280.

[3] Isermann, M. 2008. Effects of Rosa rugosa invasion in different coastal dune vegetation types. In: Tokarska-Guzik B., Brock J.-H., Brundu G., Child L., Daehler C.C. & P. Pyšek (eds.) Plant Invasions: Human perception, ecological impacts and management. Backhuys Publishers, Leiden, The Netherlands, pp. 289-306.