15 years of beach flora monitoring along the Belgian coast

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1. INTRODUCTION

Sandy beaches are a hostile environment for many species, including vascular plants. Ecological stress and disturbance factors include soil mobility, frequent inundation and a high salt concentration. Still, a limited number of plant species is able to grow in these harsh conditions through physiological, morphological and/or phenological adaptations. These species play an important functional part in the sandy coastal ecosystem as their establishment often preludes the initial stage of dune development. Furthermore some are rare in a regional or even international context and deserve special attention in terms of biodiversity conservation. Plenty of reasons to monitor the characteristic beach flora.

2. METHODS

Beach vascular plants are monitored for 15 consecutive years (2007-2021) in 23 transects, regularly distributed over the entire Belgian coast. The transects consist of longshore stretches of 500 m, ranging cross shore from the floodline to the dune foot. Within these transects, individual plants, clones or clusters of plants are mapped using hand held gps. For each gps point location, plant abundance is estimated in classes. Point maps are rasterized to 25x25 m² gridcells for further analysis.

Environmental variables are attributed to both the gps point locations and the grid cells. They include landscape type (urban area, dune or dune with dyke), presence of brushwood fencing and changes in topography. The latter is deduces from the LiDAR based digital elevation maps which are acquired twice a year for the entire beach by the Flemish agency for Maritime and Coastal Services (MDK).

3. RESULTS

About 20 coastal species were found within the transects but only 8 are characteristic for sandy beaches. *Cakile maritima*, *Elymus farctus* and *Ammophila arenaria* are the most common species, with up to hundreds of individuals growing within the transects. Population size, however highly fluctuates in time. *Ammophila* and *Elymus* show a general increase over the 15 years of monitoring, both in total population size as in area (expressed as number of occupied 25x25 m² grid cells). *Cakile* however, shows an overall decline. The others species are rare or very rare and often appear ephemerally. Only *Honckenya peploides* and *Salsola kali* have a stable population. They show no clear trend over time.

Beach plants are far more abundant on beaches adjacent to dunes. This is highly related to a more limited recreational pressure and the absence of mechanical beach cleaning. The presence of brushwood fencing generally has little effect on the distribution of the characteristic beach flora. Only *Atriplex glabriuscula* and *Beta vulgaris* subsp. *maritima* show a clear preference for the shelter of brushwood.

Finally, the beach flora seems well adapted to the dynamics of the beach sand. *Cakile* and *Ammophila*, are found on beaches with up to about 50 cm of beach erosion and 37 cm of accumulation per year. Erosion tolerance for Elymus seems to be smaller. While an optimal beach for *Cakile* is stable, *Elymus* and *Ammophila* are clearly prefer beaches accumulating about 6 cm per year.

4. CONCLUSIONS

The characteristic beach flora consists of a limited number of species adapted to the natural dynamics of this habitat. Populations of the 5 major species show yearly variation in size but remain relatively stable over a longer time. Other species are very rare and often ephemeral. Recreational pressure seems to be a major factor determining local species decline.