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Preserving the beach deposits (high-water driftlines) and the embryo dunes on the coastline of the North Department (France)

Guillaume Lemoine and Laurent Faucon

Service Espaces Naturels Sensibles, Direction du Sport, du Tourisme et des Espaces Naturels,
Conseil Général du Département du Nord, Hôtel du Département, 51 rue Gustave Delory,
F-59047 Lille Cedex, France
E-mail: dsten-sen@cg59.fr

Abstract

The management experiences presented here have been realised since 1994 owing to the 'Conseil Général' of the North district on the upper beaches of the Flemish dunes owned by the 'Conservatoire du Littoral' situated on the Bray-Dunes and Zuydcoote municipalities (France). This experience aims at the restoration of the habitats on the sea frontline of the border dune. The matter is the space that starts from the annual halo-nitrophilic strip on the upper beach, goes on with the embryo dune and finishes with the quick white dune dominated by the European beachgrass (marram). The requirements of beach cleanness, especially regarding seaside tourism, have led to the destruction of these patrimonial important habitats by the regular and complete mechanical raking of the strand. The first step consisted in limiting this mechanical raking to the rights of sea-side resorts. At the same time, the upper strip of the beach along dunes is managed softly by a selective manual picking up of the biggest trashes. This change of cleaning process rapidly produced the emergence of noticeable habitats that didn't exist before. It concerns water marks mingled with sand and embryonic dunes with sand couch grass. To a reduced extent, these methods of management lead to a reinforcement of the white dune with marram and sand ryegrass and the white dune which is warmer with marram and sea spurge. Some of these habitats are listed as part of the Guideline 'Habitat' and are listed as vulnerable or endangered after the red book of the littoral terrestrial phytocoenoses according to the definitions proposed by the International Union for Nature Preservation. Moreover, the obstacles kept on the upper strip of the beach afford the start of a process of sand accumulation and build the embryonic dune. According to the sedimentary context, this type of operation assists the fertilisation of the upper beach and reduces the retreat phenomenon of the coastline. The cost of operations is much reduced, money is even saved with the reduction of the number of interventions. It was only difficult to convince our partners about modifying their cleaning habits. This successful experience over a 1.5km distance of beach, facing preserved dune massifs, shows the large potentialities of spontaneous restoration of these natural environments. The extreme simplicity of this method and its very small cost, except employment, allow us to envisage and adapt it all along the European coastline.

Keywords: Beach; Strand; Beach deposits; High-water driftlines; Embryo dunes; North Sea coastline; Ecological management.

Introduction

The management experiences presented in this article have been going on for the past 10 years as the result of the 'Conseil Général du Nord' (North Department Council- France) initiative. They are placed on the strand (intertidal zone) of the North Department coastline, within immediate proximity of the Franco-Belgian border. They are concerned with beach heights (what we call 'beach heights' in this text is the upper part of the beach where it joins the dune) 'Perroquet' dunes (250ha) and 'Marchand' dunes (110ha), located on Bray-Dunes and Zuydcoote cities territories. They faced the dune ranges that today are owned by the 'Conservatoire de l'Espace Littoral et des Rivages Lacustres' (sea and lakeshores lands Conservatory: a national committee for preservation), and are managed by the North Department Council.

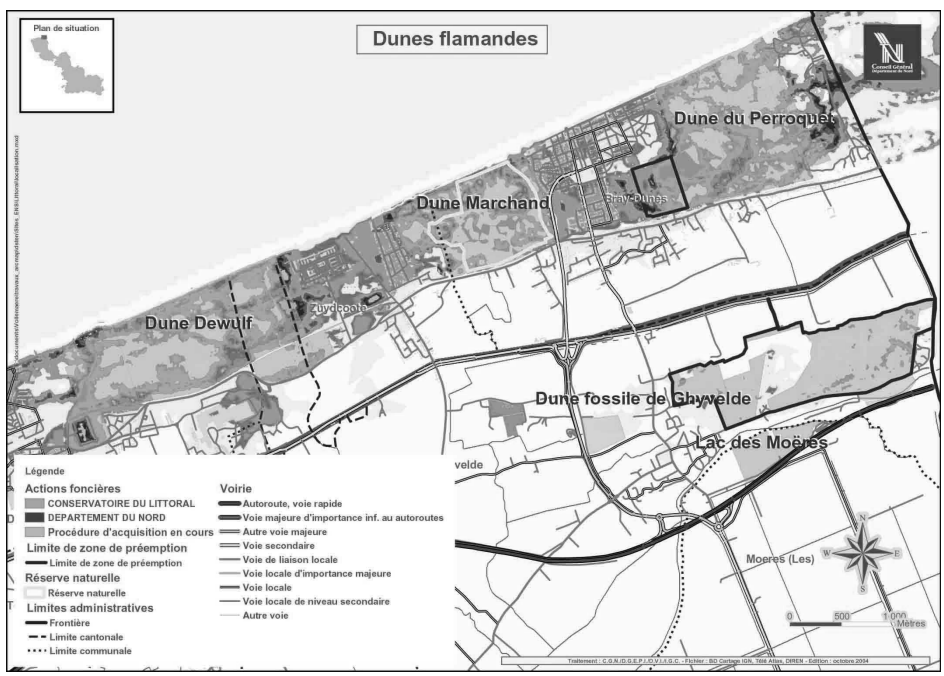

Fig. 1. Localisation of ecological management of beach heights in the north of France.

Presentation

The young dunes are usually found in large beaches, which have a shallow strand and are fed by sediments from the tides. The young dunes can form spots of embryonic dunes that merge, grow higher as vegetation develops (Elymus, Ammophila); this also occurs because these plants are able to trap in the dunes the sand taken away from the beaches by the wind.

This beach-front vegetation forms groups generally organised perpendicularly to the shore. The regularity of the transaction could be disturbed by the frequent remodelling of the dunes, which are truncated by erosion, or even modified depending on the latitude. In temperate Europe, the big steps of the sequence are usually clear in the dune landscapes, for example:

- the sequence starts at the beach's highest point by the strand of the annual 'halo-nitrophils' (Cakile, Atriplex, Salsola…) grouping (high-water driftlines);
- it continues with the embryonic dunes, where Sand Couch (*Elymus farctus*) starts the construction of the dunes, in lines or in successive islands;
- with the end of the white dune, the domain of the Marram Grass (*Ammophila arenaria*) usually forms the larger and sometimes higher (10-30cm) fringes. It is the dunes construction zone where the European Beaches Grass is resisting to the annual sedimentation of about 80-100cm, thus encouraging the growth of the dunes.

Particularity

The experiences presented will try to restore the different habitats of the maritime front found on the coastal dunes. In fact, bordering the lands of the 'Conservatoire du Littoral' (under departmental management), the three remarkable habitats described could be found. But due to the beaches uncleanliness, especially as a result of seaside tourism, the first two have been systematically destroyed on the entire coastline of the North department and of Belgium. These remarks are equally valid for all European coasts with the same cleaning constraints as a result of human use, even though the vegetal association changes with the latitude.
The restoration undertaken by the North Department Council had to take into consideration several different interests. A collaboration has been restored with the management authority of the beaches, to reduce and stop the regular and radical cleaning of the strand. In fact, from May to September, all strands are raked each week by tractors equipped with claws. The frequency of the raking occurs on a daily basis during summer. It is easily understood that this type of treatment reduces all intentions to install vegetal and animal life on the beaches.

The intervention of the North Department Council, who is in charge of the coastal dunes, has drawn the attention of the SIDF ('Syndicat Intercommunal des Dunes de Flandre') to do the cleaning of the beaches in the patrimony's interest of the beaches heights habitats. Following this first step, the spaces concerned by the intense raking were reduced only to the portions facing the beneficiant seaside communities (a strip of 100 additional meters on each side of the pier is also included in this perimeter).

The other part of the beach (strand) is parallel to the department-managed dune ranges, which have so benefited from a softer management. There is no more raking and only the biggest trash brought in by the sea is picked up every two weeks by the departmental team. In this way the conservation's state of the dunes. Ecoflandres is checked. Ecoflandres, a social insertion association, which is specifically financed by the North Department Council for this work, also regularly helps. At last, some volunteers (associations, schools or general public) help to clean during spring operations organised by the State Ministry of Ecology.

Fig. 2. Ten years ago (1993): all strands were raked each week by tractors equipped with claws.

Fig. 3. Some volunteers help to clean the beach during public actions.

Fig. 4. Trash and waste are evacuated by the departmental team.

This type of operation rapidly allows the habitat to express itself. A pioneer vegetation settles in the beach heights at the high-water driftlines level. Besides, the smallest obstacles to the wind (natural or anthropic) initiate the process of sand accumulation thus recreating embryo dunes.

During the first recorded years, after the vegetation installed in the spring had been checked, cleaning of the beaches started again here and there in the usual way, but the tractor drivers used to avoid raking the formations and vegetations that were newly installed. Later, as a result of the awareness-raising campaigns, the managers of the strand decided to abandon all intruding interventions on the ecologically managed beaches.

Patrimonial interest

The interest in this approach is great: the North Department's action has allowed the return of previously absent remarkable habitats on the beach shores (experience underhand on 1.5km of coastline). These are:

- sea deposits mixed with sand on the beach front (*Beto maritimae - Atriplicetum laciniatae*), open pioneer vegetation of annual 'halo-nitrophils' plants in scattered groupings, migratory and normally aligned along the great tides deposits on the beach front; this vegetation, characterised by the Sea Rocket (*Cakile maritima*) and the Prickly Salwort (*Salsola kali*), is described as a fragile and rare habitat because of the erosion of the coastline and of the beach raking;

Fig. 5. During the first year of the experiment, the embryo dunes began to reappear after ecological management actions.

- embryonic dunes composed in Sand Couch (*Elymo arenarii - Agropyretum juncei - formis*) and in hardy social 'graminous' vegetation which is initiating the process of sand accumulation, characterised by the Sand Couch (*Elymus farctus* subsp. *boreo - atlanticus*) accompanied by the Sea Lyme Grass (*Leymus arenarius*) and the Rush-leaved Fescue (*Festuca rubra* subsp. *arenaria*).

In a lesser measure, these experiences will allow to reinforce the following habitats:
- primary white dunes with Beach Grass and Sea Lyme-grass (*Elymo arenarii - Ammophiletum arenariae*) composed of a dense plantation of European Beach Grass (*Ammophila arenaria*), poor in species that contribute to the edification of the dunes in which Sea Lyme-grass (*Leymus arenarius*) can be found;
- primary white dunes with European Beach Grass and Sea Spurge (*Euphorbio paraliadis - Ammophiletum arenariaere*): that is an habitat close to the previous one, although more thermophile, and also characterised by the presence of the European Beach Sea Grass (*Ammophila arenaria*), the Sea Spurge (*Euphorbia paralias*), the rare Sea Bindweed (*Calystegia soldanella*) and the Sea Holme (*Eryngium maritimum*).

Evaluation of the project

The coming back or the development of these habitats represents a great patrimonial asset. These are in fact recorded in the frame of the 'European habitats directive' under the codes Corine Biotope nº16.211 and 16.212 for the habitats B, C and D. The

embryonic dunes of Sand Couch and the primary white dunes of European Beach Grass and Sea Lyme-grass are also recorded in the red book of terrestrial phytocoenosis of the coastline. They are respectively described as vulnerable and threatened (of which the area or the surface is reduced to a critical level), according to the definitions proposed by the World Conservation Union (IUCN).

The national and regional criteria of evaluation class them as 'rare' (for the habitats A and D) and 'very rare' (for the habitats B and C) at a national level, 'fairly rare' (A and D) and 'rare' (B and C) at a regional level. They are equally considered as withdrawing (for the A, B, C) except the D that appears to be stable.

The scientific follow-up consists in phytosociological countings of the concerned zone. Despite the fragmentary side of these habitats, we have witnessed their spatial augmentation as soon as the second year of intervention after their reappearance.

Although difficult to quantify, the habitats cover homogenously a 300m beach front area by 15-20m wide facing the Marchand and Perroquet dunes. On samplings of 100m² realised two years after the implementation of the program, we observed a covering of 10% of the concerned zone. The zone is composed of 25% of Prickly Salwort (*Salsola Kali*), 20% of Sea Rocket, 15% of Sand Couch. Some sea deposits are more sheltered in the Perroquet dune: it has also allowed the installation of wilds Sea Beet and Sea Cabbage (*Beta vulgaris* subsp. *maritima* et *Crambe maritima*) that are protected species in the Nord-Pas-de-Calais or in France, but that had nevertheless disappeared in the meantime.

Fig. 6. Aspect of embryo dunes in 2004. A width of 15m of new dune is gained.

Today, the embryonic dunes of Sand Couch are very important and have a width of 15m. We can also find there the Ovate Sandwort (*Honckenya peploides*) there.

This project is of multiple interests. The cost of the operation is almost nothing. Some savings are even realised with the reduced number of interventions (stopping of the rakings). The only difficulty was to convince our partners and to modify the cleaning habits. This type of operation is quite efficient when we leave the spaces potential express themselves. It can be duplicated on all the European coasts at a very low cost. It has also allowed a very important sand accumulation on the beach front, and it is slowing down the generalised retreat of the shore line on this portion of coast.

The return of the embryonic formations over the last 10 years also has a pedagogical interest, allowing to show to a large public during organised guided visits: the formation of the dune ranges, the aeolian sedimentation phenomenon, the coastline geomorphology, and the organisation of the different 'phytocoenos' whose sequences are now present and preserved from the 'estran'(strand) to the wooded dunes.

Table I. List of interesting vegetal species recorded on these habitats

Species	Site (1)	Regional rarity criteria (2)	Protection (3)	Red list
Ammophila arenaria	DD, DM, DP	AR		
Atriplex hastata	DD, DM, DP			
Altriplex lacinata	DM, DP			
Beta maritima	DM			
Cakile maritima	DD, DM, DP	AR		
Calystegia soldanella	DD, DM, DP	R	Belgium	
Corispernum leptopterum	DM, DP			
Crambe maritima	DD		National	National
Elymus farctus	DD, DM, DP	AR		
Eryngium maritimum	DD, DM, DP	R	Regional, national	
Euphorbia paralias	DD, DM, DP	AR		
Festuca juncifolia	DD, DM, DP	AR		
Glaucium flavum	DP	R		
Glaux maritima	DM	AR		
Leymus arenarius	DD, DM	R	National	
Plantago coronopus	DP			
Salsola kali	DD, DM, DP	R		
Honckenya peploïdes	DP			

Conclusion

Despite the retreat of the shoreline that today seems less and less pronounced, the experiences initiated by the North Department Council have allowed the return of remarkable habitats of the Northen Sea beaches front by an adequate management. The interest of this management approach is also zoological: more than once, Little Ringed Plover (*Charadrius dubius*) and the Kentish Plover (*Charadrius alexandrinus*) were observed during the summer period on the embryonic dunes. The presence of regular

seaweed and vegetal debris at the level of the sea deposits leaves us to hope for the restoration of some beaches invertebrates' habitat. This experience, successful on a strand of 1.5km of beach, facing preserved dune ranges, shows the strong potential for spontaneous restoration of certain natural spaces, and the good health of the existing ranges on the North coastline. The extreme simplicity of the method and its cost efficiency, allow to consider its extension to the whole European coastline.

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