

Coastal sand dunes

Introduction

Sand dunes develop on coasts which have consistent onshore winds and a sufficient supply of sand within the intertidal zone whose surface dries out between high tides. The dry sand is blown landwards and accumulates in the shelter of any debris and vegetation present. This loose sand is trapped by plants such as Marram (*Ammophila arenaria*), Lyme grass (*Leymus arenarius*) and Sea couch (*Elytrigia atherica*), which stabilise the dunes, allowing other plants to colonise.

The natural zonation that occurs in sand dune systems means that there is a range of successional stages over a short distance, providing a varied habitat for invertebrates. The mobile sand ensures a continuity of open vegetation and bare ground which is free-draining and quick to warm, whilst the tussocks of marram grass provide shelter. More stable sand is ideal for solitary bees and wasps to make burrows where their larvae can develop. Calcareous fixed dunes support a greater range of plant species; this floristic richness tends to lead to greater invertebrate diversity. On acidic dunes, acid dune grassland or dune heaths dominated by heather (*Calluna vulgaris*) develop. Wet depressions between dune ridges are known as dune slacks; these are often characterised by creeping willow and mosses and tend to have rich invertebrate assemblages.



Foredunes © Roger Key

Sand dune systems are very rich in invertebrates, being particularly suited to warmth-loving species. BAP Priority species with significant populations on sand dunes include the Bright wave moth (*Idaea ochrata cantiana*), a spider wasp *Evagetes pectinipes*, Northern dune tiger beetle (*Cicindela hybrida*) and Crucifix ground beetle (*Panagaeus crux-major*).

Threats

- **Recreation**

Excessive pedestrian use, car-parking and use of off-road vehicles cause high levels of erosion on many important dune sites. Golf courses on dunes fragment the habitat and also severely modify the vegetation by re-seeding, fertilising and mowing of the fairways, greens and tees.

- **Falling water tables**

Local water abstraction and drainage of adjacent land for agriculture or housing leads to a long-term lowering of the water table. This has an adverse effect on the specialist dune-slack species and may even lead to the loss of these communities as the slacks dry out.

- **Sea defence and stabilisation**

Engineered defence systems generally reduce the natural dynamism of dune systems, and hence their biodiversity.

- **Development**



Darkling beetle (*Phaleria cadaverina*) © Roger Key

Development of fixed dunes for housing and golf courses, for example, has resulted in a depletion of this habitat in Britain. Now, many dunes are designated as SSSIs and fixed dunes and dune heaths are regarded as priorities under the European Habitats Directive.

- **Conversion of fixed dunes to agricultural use**
- **Poor beach management**

Beach cleaning by mechanical methods removes material along the drift line behind which sand would normally accumulate and the strandline invertebrate assemblages suffer loss of habitat. Pioneer plant species and their fauna are very vulnerable to vehicular or pedestrian traffic.

- **Abandonment of traditional management**

A cessation of grazing on previously grazed dunes risks an invasion of coarse grasses and scrub, which out-compete the fixed dune vegetation communities.

- **Invasion by sea buckthorn**

This can smother dunes in a dense thicket of spiny scrub to the detriment of the rest of the flora and invertebrate fauna.

- **Afforestation**

Some sites have been planted with large numbers of conifers, resulting in a lowering of the water table and suppression of dune vegetation communities. However, vegetation resembling the original can be restored following felling.



Sand tailed digger wasp (*Cerceris arenaria*) © Roger Key

Maintain a full range of successional stages

Large dune systems should ideally have a full range of the successive stages of sand stabilisation: mobile foredunes with plants such as sand couch; dense marram clumps on young (yellow) dunes; grey dunes (surface of sand with grey lichens); more established dunes with varied vegetation; stable sandy grassland or dune heath and dune slacks. Some dunes also have streams or small rivers that provide habitat for a special invertebrate fauna.

Ground-nesting insects require bare and sparsely vegetated sand that is not excessively disturbed for nesting, plus a variety of other habitats for hunting and flower visiting. Maintaining flower-rich areas with plants such as scabious, Viper's bugloss and legumes will provide good foraging areas for populations of bees and other insects, which in turn will act as hosts for associated species such as Sarcophagid flies.

Any transitions with adjacent habitats such as saltmarsh, fen and woodland should be preserved. Such transitional areas are of great value to invertebrates and maintaining a range of vegetation types and sward heights will increase the range of habitat niches available. Any areas where the sand dune vegetation intergrades into a ruderal flora on the landward margins of the dunes are likely to support interesting ground beetles and bees.

Prevent excessive damage by disturbance and overuse by trampling

Many invertebrate species may be threatened by public pressure causing erosion and disturbance of the habitat. Management of public access is crucial to enable sensitive areas to be protected. Fences and boardwalks should be used where necessary to allow normal dune fixation and reduce disturbance from trampling. The establishment of a network of protected areas would greatly enhance the habitat quality of dunes where such pressure exists. Measures should not seek over-stabilisation of what should naturally be yellow dunes.

Sparse vegetation between sand couch and marram grass tussocks is especially rich in important invertebrate species such as leaf- and plant-hoppers, spiders and ground beetles. These fore-dunes are especially vulnerable to erosion and trampling, which should be kept to a minimum, if necessary fencing off areas periodically to allow recovery.

Use of dunes for dog walking can damage dune systems as a result of fouling by urine and excrement as well as increased trampling and car parking. Dune grasslands should also be protected from vehicle access, which can cause severe damage.

Ensure continuity of scrub and woodland

Scrub is an important habitat for some species and provides shelter and over-wintering sites for many dune invertebrates as well as being a good nectar source. A small amount of scrub consisting of native shrub species should be retained and managed so that it does not spread over large areas. However, many species, such as sea buckthorn can be aggressively invasive and need active management before their dense cover reduces the areas of bare sand and leads to drying of the site.

Many dunes have had associated woodland lost through development and what remains is often subject to high levels of disturbance. If native woodland is present, it is contributing to the overall habitat mosaic and should be treated as important. Dune slack carr, if present, can develop an interesting invertebrate community and should be retained. Excessive clearance of willow scrub could be detrimental to many species; willow catkins are important for early spring bees, moths and other insects.

Maintain dune slacks

Dune slacks are important for many scarce invertebrate species. The most valuable are those that are seasonally flooded in winter, but dry to mossy pools in the summer. This natural fluctuation should be allowed to continue and dune slack pools should never be deepened to make them permanent. The maintenance of high water tables in the area is important, and water abstraction or drainage of adjacent land should be resisted. Scrapes and pools should not be created on nearby land, as this can have the effect of drying and damaging the existing dune slacks.

Retain seepages, streams and brackish creeks

Any water flowing through or beside coastal dunes tends to be very interesting and should be viewed as an

important component of the habitat. Similarly any areas of organically rich mud present within a dune system should not be cleared. The natural vegetation and sand banks along a stream system should be maintained; if necessary, marginal vegetation should be managed on a rotational basis to ensure continuity of invertebrate habitat.

Consider grazing or rotational management

Although grazing was traditionally used on many dune systems, this has greatly declined. If considering grazing, the needs of each individual site should be examined before implementation and objectives must include the implications for invertebrates since such a rich fauna is at stake.

For some invertebrate species, the maintenance of short grassland is important. Many species are associated with bare areas and grazing may be best in maintaining this. Rabbit grazing tends to produce close-cropped lawns amongst taller vegetation and their scrapes provide areas of bare and disturbed ground that is required by species such as the endangered Sandbowl snail (*Catinella arenaria*). As long as the rabbit population does not increase to the extent that it is likely to threaten the stability of the dunes, eliminate a mosaic of varied vegetation structure or destroy important flower resources, rabbits should be viewed as a positive feature. Their dung and carrion also provide resources for many invertebrates.

Where rabbit populations have declined, sheep grazing may serve to provide areas of short grazed turf, but it is important to be vigilant that the site does not become over-grazed and lose structural diversity. Grasslands should retain patches of tussocky grasses and rushes and flower-rich areas, so rotational management of grazing stock may be necessary.

A cessation of long-established grazing should be avoided as populations of invertebrates such as the rare muscid fly *Hydrotaea velutina* may be dependent on a constant supply of dung. Dosing of livestock with broad-spectrum dewormers which are damaging to insect development should be prevented. Abandonment of grazing can also lead to scrub invasion or dominance of sea buckthorn in fixed dune areas. However, grazing can be detrimental to other invertebrate species. Adults of the RDB crane fly *Nephrotoma quadristriata* have only been found in ungrazed areas of dune, and it is likely that close grazing by domestic livestock or rabbits could be damaging.

It is important to recognise that there is no management strategy that fits all dunes and that there are many dune sites that maintain their high invertebrate value in the absence of grazing. It is a case of 'if there is no problem, don't fix it'.

Retain biodegradable tidal debris

Tidal litter such as seaweed and driftwood found on the strandline provides essential shelter for many invertebrates and should not be cleared away as is often the case with beach tidying schemes. The removal of driftwood for beach barbecues or decorative purposes is highly damaging. The large, nationally scarce Beach comber beetle (*Nebria complanata*) requires fairly large items of flotsam such as driftwood under which to shelter and find the sandhoppers on which it feeds. The French zipper spider (*Drassyllus lutetianus*) also lives among wet tidal debris.

Avoid over-stabilisation of dunes

Dunes are dynamic features and blowouts are a natural and desirable feature of large dune systems, maintaining open conditions amongst areas of grassland and heath. Any dune stabilisation needs to be proportionate and to only go so far as to restore the natural conditions in the dune zone concerned. Coastal defences on site or even some distance away may interrupt sediment flow and thus the supply of sand necessary for continued accretion of dunes. Allowing coastal protection works to fall into disuse and even be actively removed may help restore natural processes, but careful assessment of outcome is first required.

Embryo dune development can be encouraged by the creation of sand trap high beach groynes, which collect wind blown sand on the foreshore. This is a potential means of building up natural defences where the sea is unduly eroding into the dunes, and is an option where the loss of pioneer vegetation zones and their fauna are threatened with elimination.



Beach comber (*Nebria complanata*) © Roger Key

BAP species associated with coastal sand dunes:

Sandbowl snail (*Catinella arenaria*)
Crucifix ground beetle (*Panagaeus cruxmajor*)
Northern dune tiger beetle (*Cicindela hybrida*)
a ground beetle *Dyschirius angustatus*
a ground beetle *Ophonus cordatus*
a ground beetle *Harpalus dimidiatus*
a click beetle *Melanotus punctolineatus*
Dotted bee-fly (*Bombylius dicolor*)
a spider-hunting wasp *Evagetes pectinipes*
Northern colletes (*Colletes floralis*)
Brown-banded carder bee (*Bombus humilis*)
Shrill carder bee (*Bombus sylvarum*)

For a more comprehensive list of species associated with this habitat, please see the download list.

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