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BIODIVERSITY

VEGETATED SHINGLE SURVEY - METHODS AND RESULTS

P.J.R.Fitzsimons, K.R.Cole, A.I.Tait, 2007

Yellow Horned-poppy (*Glaucium flavum*) on shingle beach at Tide Mills, East Sussex.

Beaches At Risk is a partnership project part-financed by the European Regional Development Fund (ERDF). The principal partners are the University of Sussex, East Sussex County Council, Kent Wildlife Trust, Université de Rouen, Université de Caen & Université du Littoral.

Vegetated shingle at Rye Harbour Nature Reserve, East Sussex. Sea-kale (*Crambe maritima*), Yellow Horned-poppy (*Glaucium flavum*), Bittersweet (*Solanum dulcamara*) in the foreground and Viper's-bugloss (*Echium vulgare*) in the middle ground with purple flowers visible.

Contents

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Please accept our apologies to any one who we have missed out, or whose name we have misspelled.

VEGETATED SHINGLE SURVEY - METHODS AND RESULTS

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1. SUMMARY

A robust method for surveying shingle beaches within the Beaches At Risk (BAR) project area was developed and tested on beaches between 2005 and 2006 on both sides of the Channel.

The survey method has been produced as a pack in both French and English including detailed instructions, a recording sheet, and a photographic identification guide for the species to be looked for.

Fifty-one volunteer recorders attended at least one of 11 training and testing sessions. Of those, at least 15 individuals completed a minimum of one survey post-training without supervision.

Thirty-seven sites in all, twenty-nine on the English coast and eight sites on the French coast, were surveyed. At each site two belt transects, perpendicular to the shore and running inland from the seaward side of the beach were surveyed. Each transect was walked twice, once up the beach and once back down. The presence of selected plant species or species groups was recorded. The plant species selected were.

- Species, subspecies or varieties of species that are typically found on vegetated shingle (or closely associated coastal habitats.
- Rare species found on the coast.
- Species groups that can indicate broad community types on shingle.
- And/or species that have important species associated with them on shingle and other coastal habitats.

Forty-six of the 52 species (or species groups) that were looked for were recorded. Estimations of species distribution and other shingle beach features were also recorded.

These data were used to categorise the beaches in terms of their biodiversity value into one of the following three categories: Excellent, Good or Impoverished. Each site was evaluated with respect to 12 criteria and a Biodiversity Value Category (BVC) for each site was determined by the mean category value for all 12 criteria. Six sites were categorised as Excellent, twenty-two as Good, and nine as Impoverished.

The method described in this paper could be applied to other coastal habitats such as sand dunes and salt marshes with few changes.

2. INTRODUCTION

Shingle beaches

Large sections of the eastern Channel coasts in the Beaches At Risk (BAR) project area are bordered by shingle beaches (277 km out of a total of 470 km) (Table 2.1 and Figure 2.1), much of it composed of flint eroded out of the Chalk. Although most shingle beaches are narrow (< 100m from seaward side to landward side) a few stretch inland over several 100s of metres, such as those at Rye and Dungeness. Although shingle beaches play an important role for coastal defence and recreation, and are fascinating for such disciplines as geology and geomorphology, this study is primarily concerned with their potential to develop into a habitat type known as vegetated shingle made up of unique and rare plant species and communities adapted to grow on natural shingle beaches. For the purposes of this report, the term vegetated shingle applies to all vegetated or potentially vegetated shingle sites found on the coast within the BAR area.

	continuous band	discrete pockets e.g. fringing beaches under chalk cliffs	
England	109 km	42 km	151 km
France	55 km	71 km	126 km
		total extent of shingle	277 km

Table 2.1 - Extent of shingle beaches along the BAR coasts (total coastline 470 km) (after Robinson *et al*., 2005).

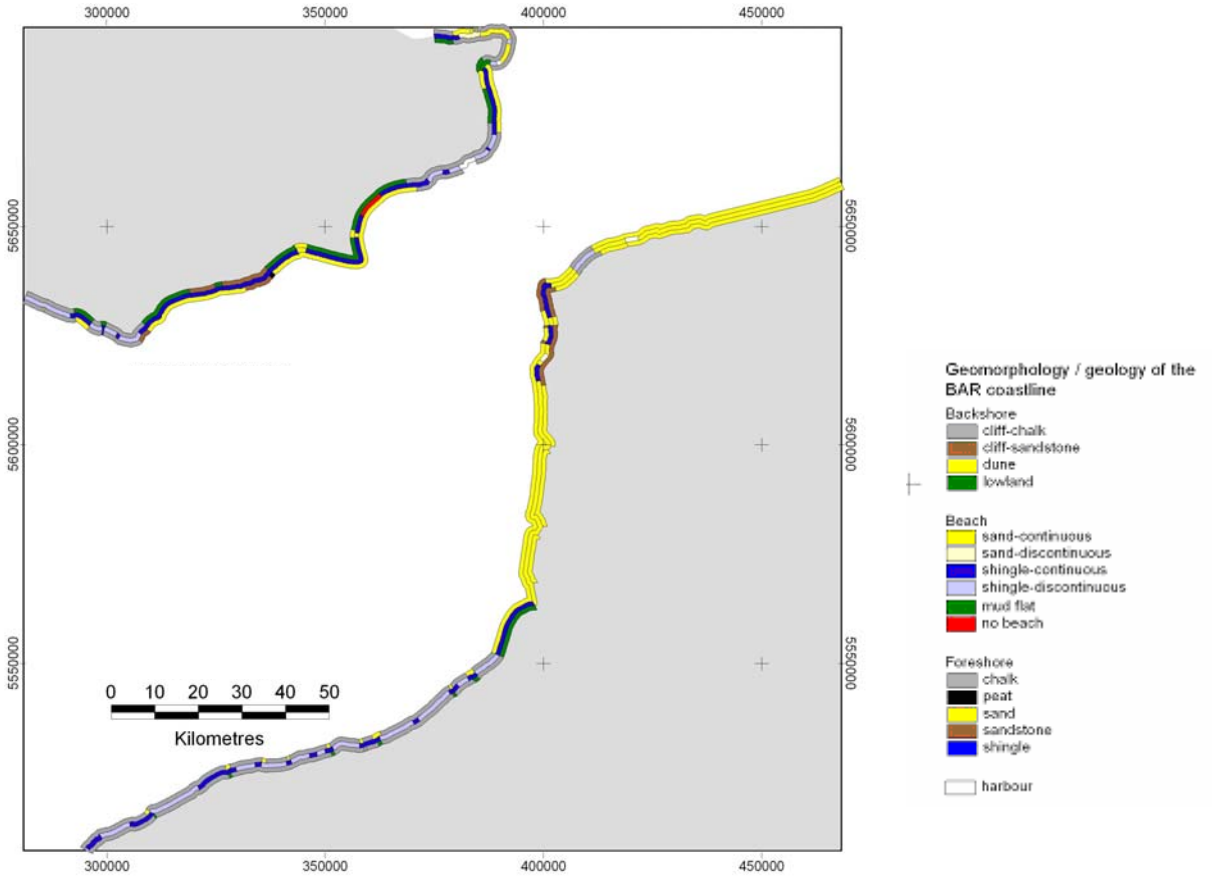

Figure 2.1 - Geomorphology and geology of the coastline in the BAR project area

Vegetated shingle

Shingle beaches are often transient and can undergo massive and rapid change. They are harsh environments, with little soil, very little freshwater, strong winds, salt spray and occasional inundation by the sea, burial under fresh shingle or even the loss of whole ridges during big storms. Nonetheless, some plants and animals have adapted to survive these conditions. Many of these are adapted to intermittent disturbance and may quickly colonise new areas of disturbed shingle. Vegetation communities on shingle beaches depend on the amount of finer materials mixed in with the shingle, how much fresh water there is, climatic conditions, the width of the foreshore, and past management of the site and are strongly influenced by stability (e.g., Scott, 1963; Scott, 1965; Fuller, 1987; Doody and Randall, 2003). The number of species able to colonise the shingle increases as stability increases, so that on older parts of a beach, mature grassland, lowland heath, moss and lichen communities, and sometimes scrub may develop. Note that the longer a community takes to develop the less resistant and resilient to disturbance it is. Many of the species and communities on shingle appear to be specific to it, and some communities are only known from Dungeness (Randall and Sneddon, 2001). For example, bare shingle colonised by prostrate *Cytisus scoparius* (Broom) but is known only at Dungeness (Scott, 1965).

Shingle beaches represent one of the small numbers of habitats where natural primary succession can occur (Randall and Sneddon, 2001). Understanding succession, i.e. the vegetation sequence and the reasons for its development, is an important part of predicting the effects that factors such as climate change or management of a site may have. However, the few studies which have described succession on shingle (reviewed in Randall and Sneddon, 2001) suggest that succession proceeds as an anastomosing (dividing and coming together again) sequence often resulting in site-specific communities, and that succession may be halted at any stage of the sere by the degree of oceanicity (i.e. the influence from the physical attributes of the sea). Nevertheless, they have described a generalised sequence for vegetation on shingle which was adapted for the sites in the BAR area (Figure 2.2).

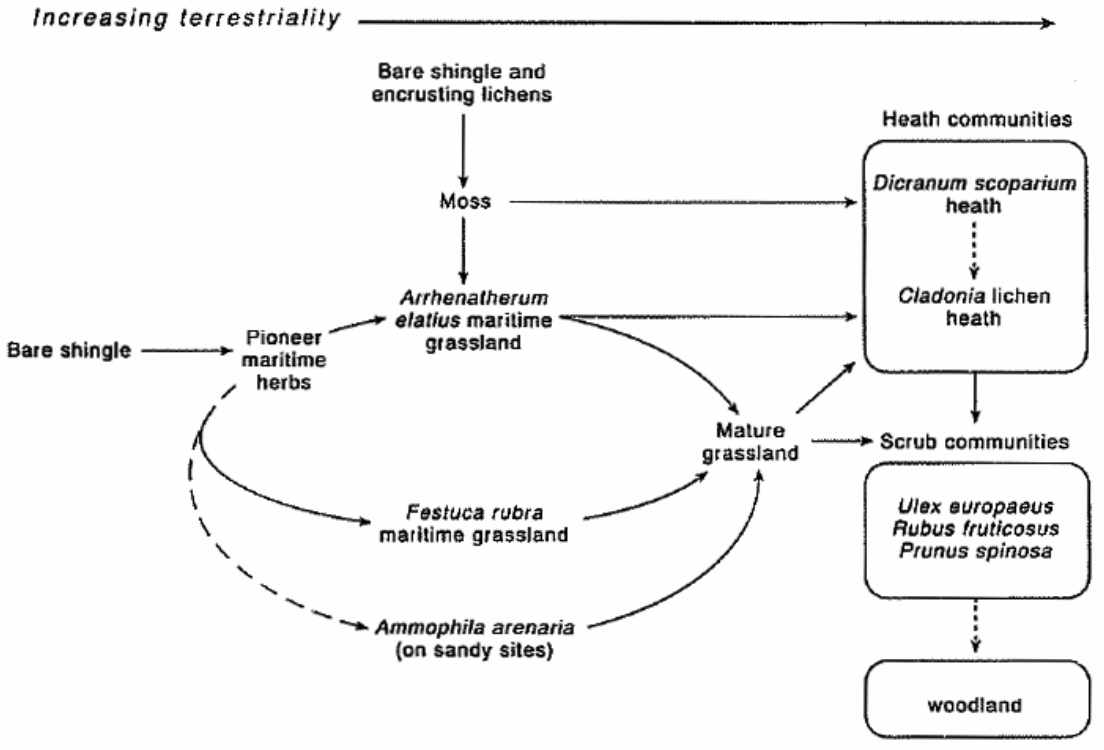

Figure 2.2 - Generalised sequence of vegetation on shingle sites in the BAR project area (adapted from Randall and Sneddon, 2001).

In practice, succession and factors such as oceanicity on shingle generally leads to zonation of the vegetation, especially on beaches that extend inland well beyond the reach of the highest tides, which can be divided into the broad categories shown below.

- **Bare shingle** – describes areas with no vegetation, for example, at the foot of sea-cliffs, on high-energy beaches where beaches are disturbed too frequently to support plant growth (Doody and Randall, 2003). Bare shingle with or without a lichen cover on areas well out of the reach of waves occur and some may remain bare for long periods of time (e.g. at Rye Harbour Nature Reserve, Yates, pers. com.).
- **Ephemeral communities** – occur on parts of the beach which are stable over the growing season only. The vegetation is ephemeral and composed of annual or short-lived perennial species which may form only sparse cover, and may be highly variable both temporally and spatially and both within and between sites. Plants are usually composed of summer annuals (Doody and Randall, 2003). E.g. *Atriplex* species (spp.) (Oraches) on the drift line, especially that left from the previous winter's storms.
- **Pioneer communities** – occur on parts of the beach which have been stable for over three years - include short-lived perennials and may consist of considerable strand and foreshore vegetation. E.g. *Glaucium flavum* (Yellow Horned-poppy), *Rumex crispus* subspecies (ssp). *littoreus* (Curled Dock), *Beta vulgaris* ssp. *maritima* (Sea Beet) (e.g. Randall and Sneddon, 2001; EC, 2003).
- **Established communities** – occur on stable shingle and consist of long-lived perennial species. Communities range from grassland to lichen-heath on beaches still subject to occasional inundation, lichen-heath and/or scrub communities on entirely stable beaches. Increased stability of shingle is often accompanied by an increase in *Festuca rubra* variety (var.) (above, you spell out subspecies before you give the abbreviation, but you don't do that here. Either spell out variety or delete the subspecies above. I'd go for the latter) *rubra* (Red Fescue) or *Arrhenatherum elatius* (False Oat-grass) grading inland to a heath community (e.g. Hubbard, 1970; Fuller and Randall, 1988; Randall and Sneddon, 2001). Although the development of heathland is primarily restricted to areas outside the BAR area, lichen-heath may represent the *Calluna vulgaris* (Heather) equivalent (Randall and Sneddon, 2001) within the BAR area. Encrusting lichens at Dungeness such as *Rhizocarpon* spp. and *Lecanora* spp. found only on otherwise bare shingle indicate that the shingle is stable and therefore suitable for further colonisation, although lichen establishment is not an essential component to succession Scott (1965).

Increasing terrestriality – decreasing oceanicity

Animals

Although this study is predominately concerned with plants, many animals also depend on vegetated shingle. Many species of bird, for example *Sterna* spp. (terns) and *Charadrius* spp. (plovers) nest on shingle, while some waders will use the sparsely vegetated areas on the seaward side of a beach as high-tide roosts. There is a very distinctive invertebrate fauna associated with shingle habitats (Shardlow, 2001). A large number of invertebrate species breed, feed or live on shingle plants, e.g. the caterpillar of the rare *Calophasia lunula* () is found almost exclusively on shingle at a few sites in East Sussex and Kent. There are several spiders which are only found on shingle beaches and a completely new species of fly (*Megaselia* spp. Family Phoridae) was recently found living deep within the beach at Rye Harbour (see Doody and Randall, 2003; Shardlow, 2001 for comprehensive lists).

Main ongoing threats

Shingle supply

Some of the main long-term threats to vegetated shingle are as a result of interference with natural coastal processes (Doody and Randall, 2003). Cliff protection works affect the source of shingle and structures such as harbour arms influence its movement by longshore drift, which alters the recharge rate of shingle to beaches. In many places the rate of shingle accretion is exceeded by its loss through longshore drift. The movement of shingle is likely to be accelerated by sea level rises. To counteract falling beach levels, beaches are often topped up with sand and shingle taken from elsewhere which may significantly alter the structure of the matrix in which previous vegetated shingle communities had developed. Natural shingle vegetation may not be able to colonise and any potential communities that develop may be very different to those originally there.

Coastal squeeze and climate change

As sea levels rise the vegetation on a beach may not be able to migrate inland as it is "squeezed" between the sea on one side and immovable land structures (artificial or natural) on the other (Doody and Randall, 2003). Climate change is likely to affect shingle habitats in other ways as for example, the summers become dryer and winters wetter, or through human behavioural responses, e.g. increased water extraction lowering the water table, increased visitor pressure on beaches.

Lack of public awareness

Shingle vegetation is fragile; the wear and tear caused by access on foot, and particularly by vehicles, has damaged many sites. There is a lack of public awareness of the value of the shingle habitat. Fringing beaches in particular are threatened by human-related damage such as development, introduction of exotic species, vegetation stripping, trampling, dumping, burning, dog fouling and other forms of enrichment. Such disturbance can also affect breeding birds.

Biodiversity value

The Convention on Biological Diversity defines "biological diversity" as "..the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (CBD, 1992). For the purposes of this study, the terms "biodiversity" and "high biodiversity" will generally refer to plant species and a high species richness of typical shingle plant species respectively.

The value we assign to biodiversity is determined by subjective opinion, albeit one generally reached by experts. Biodiversity value in this study was determined by value criteria concerned with rarity and 'naturalness' of plant species, and community types. Therefore, a beach's biodiversity value was characterised mainly by the presence and distribution of typical coastal plant species and communities, both rare and less rare. A beach with high biodiversity value had a relatively higher number and wider distribution of such species and communities relative to a beach with low biodiversity value. Other value systems which involve other biodiversity measures such as genetic diversity, economic value or potential as future biological resources were beyond the scope of this study.

Conservation

Vegetated shingle is an internationally rare habitat with few occurrences outside north-west Europe, Japan and New Zealand (N.B. different species are found in Japan and New Zealand). Within Europe, it is scarce with the UK supporting a high proportion of the European resource (Doody and Randal, 2003). Estimations of the area covered by vegetated shingle in the UK vary from about 4000 to over 6000 hectares (e.g. UK Biodiversity Group, 1999; JNCC, 2007a; Rich *et al*., 2005a), a large part of which is at just two sites, Rye Harbour Nature Reserve (East Sussex) and Dungeness (Kent and East Sussex) (Doody and Randall, 2003). These values are likely to be underestimates, missing areas that could potentially become vegetated. The French resource in the BAR area is much smaller and is based mainly between Ault and le Hourdel on the south side of Baie de Somme. Many vegetated shingle sites are outside designated areas and therefore receive no direct form of protection.

The following describes some of the more important legislation protecting vegetated shingle.

Natura 2000

The European Community (now the European Union) adopted two Directives to meet its obligations as a signatory of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979) namely, Council Directive 79/409/EEC (EC Birds Directive), and Council Directive 92/43/EEC (EC Habitats Directive). They protect species and habitats of European importance, particularly by means of a network of Sites of Community Importance (SCIs). Once adopted, these are designated by Member States as Special Areas of Conservation (SACs), and along with Special Protection Areas (SPAs) classified under the EC Birds Directive, form a network of protected areas known as Natura 2000. In France the equivalent of SACs and SPAs are “Les zones spéciales de conservation” (ZSC) and “Les zones de protection spéciale” (ZPS) respectively. Vegetated shingle is listed under two habitat types on Annex I of the EC Habitats Directive.

- H1210: "Annual vegetation of driftlines”, “Végétation annuelle des laissés de mer”.
- H1220: "Perennial vegetation of stony banks", “Végétation vivace des rivages de galets”.

H1210 describes communities that occur on shingle lying at or above mean high-water spring tides, generally on fringing beaches that are periodically displaced or overtopped by high tides and storms. Although a large part of the BAR coastline is fringed by shingle or sand/shingle beaches (Figure 2.1), much of it is too dynamic to sustain drift-line vegetation. The beaches that do are small, and annual vegetation may exist in one location in one year but not another. Therefore, although widespread, sites where H1210 is persistent are rare. H1220 describes several kinds of communities that occur on shingle above the limit of high tides, on more permanent ridges out of reach of storm waves (see Cole *et al*., 2005 pages 3-8; JNCC, 2007a for more details). There are only a few extensive examples of H1220 in Europe, a significant part of which occur in the BAR area (Rye Harbour Nature Reserve and Dungeness in the UK, South of Baie de Somme in France) (JNCC, 2007a).

Convention on Biological Diversity

England and France are also signatories to the Convention on Biological Diversity (CBD), one of the key agreements adopted at the 1992 Earth Summit in Rio de Janeiro. The CBD obliged member states to produce and implement national strategies and action plans to conserve, protect and enhance biodiversity. The European Union (EU) further committed itself to halting the rate of biodiversity loss by 2010 at the Gothenburg Summit in 2001, and both England and France, along with other Heads of Government committed themselves to achieving a significant reduction in the rate of biodiversity loss by 2010 at the World Summit

on Sustainable Development in Johannesburg, 2002 (UKBP, 2006).

Legislation - England

The main piece of legislation relating to nature conservation in Great Britain is the Wildlife and Countryside Act 1981 (as amended). Under the Act, Natural England (formerly English Nature) has responsibility for identifying and protecting Sites of Special Scientific Interest (SSSIs) which gives legal protection to the best sites for wildlife and geology in England. The SSSI legislative regime was significantly enhanced through the Countryside and Rights of Way (CRoW) Act 2000 and the Natural Environment and Rural Communities (NERC) Act 2006. For example, the NERC Act created a duty for public and statutory bodies to integrate biodiversity into their decision-making (Defra, 2006). Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9) set out the Government's national policies on different aspects of planning in England, a key principle of which being that development plan policies and planning decisions should be based upon up to date information about the relevant biodiversity resources of the area (ODPM, 2005).

The UK's legalisation to meet the Birds and Habitats Directives' obligations in England are the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). All Natura 2000 sites in England are also SSSIs. The additional designations are recognition that some or all of the wildlife and habitats are particularly valued in a European context.

The UK Government's response to the CBD was to produce a UK Biodiversity Action Plan (UK BAP) (Department of the Environment, 1994), the first step in describing the UK's biodiversity and detailing plans for its protection and enhancement. Under the plan there are 436 costed and targeted national action plans for threatened habitats and species in the UK (although these targets are currently under review plans to reduce and streamline the number of actions (UK BAP, 2007a)), and these are supported by approximately 150 Local biodiversity action plans, often at County level (UK Biodiversity Partnership, 2006).

Coastal vegetated shingle is listed as a priority habitat under this plan and a specific Habitat Action Plan (HAP) was produced in 1999 (UK Biodiversity Group, 1999). There are also nine BAP priority species with significant populations on vegetated shingle sites: *Calophasia lunula*, *Hadena albimacula* (white spot), *Crepis foetida* (Stinking Hawk's-beard), *Silene gallica* (Small-flowered Catchfly), endemic *Limonium* spp (Sea-lavenders), *Galeopsis angustifolia* (Red Hemp-nettle), *Bombus humilis* (brown-banded carder bee), *Bombus ruderatus* (large garden bumble bee), *Bombus subterraneus* (short haired bumble bee), and the hopper *Aphrodes duffieldi*.

The England Biodiversity Group advises the Government on the implementation of the UK BAP in England. In particular, it oversees development and delivery of the biodiversity strategy for England as set out in "Working with the grain of nature: a biodiversity strategy for England" (Defra, 2002). Its approach comprises a combination of protecting the best wildlife sites, promoting the recovery of declining species and habitats, embedding biodiversity in all sectors of policy and decision-making, enthusing people and developing the evidence base (Defra, 2006). Of particular relevance to the method described in this report are the two latter points.

France

The main piece of legislation relating to nature conservation in France is the "Environmental Code" (Loi nº 2002-276 du 27 février 2002 art. 132 Journal Officiel du 28 février 2002, (as amended)) (Legifrance, 2007). Under the Act, the "Conservatoire de l'espace du littoral et des rivages lacustres" (Coastal Protection Agency) ensures the protection of outstanding natural areas on the coast. It can acquire land either privately, through legacies, by first refusal on coastal areas, or more rarely, through compulsory purchase. Once acquired, the

land becomes inalienable, meaning that it cannot be resold. The Conservatoire own land, or have first refusal on a large expanse of coast in the BAR area, including vegetated shingle around Hâble-d'Ault (Conservatoire du littoral, 2007). Areas can also be protected under the act by an "Arrêté Préfectoral de Protection de Biotope" which aims to protect sites with high biodiversity value, and includes the "Cordon de galets de La Mollière", 262 hectares of vegetated shingle between Cayeux-sur-Mer and Baie de Somme.

France's legalisation for designation of Natura 2000 sites comes under "Le décret n° 2001-1031 du 8 novembre 2001 relatif à la procédure de désignation des sites Natura 2000 et modifiant le code rural" (Legifrance, 2007). France has a contractual rather than a legislative policy for the management of Natura 2000 sites under "Charte Natura 2000" (Natura 2000 Charter). A management plan called a "Document d'objectif" is established for every site. Landowners can sign a voluntary contract ("Contrat Natura 2000") by which they get financial support to change practices that damage biodiversity. New plans and projects can undergo an impact assessment and can be refused, although this does not apply to ongoing activities (MNHN, 2003-2006). "Cahier d'habitats" (habitat notes), an up-to-date summary of the scientific knowledge and an overall approach to conservation management of the habitats and species making up Natura 2000 sites have been written (MNHN, 2003-2006).

The French Government's response to the CBD was the "Stratégie nationale pour la biodiversité (National strategy for biodiversity)" (MEDD, 2004) with a similar function to the UK BAP, including halting biodiversity loss by 2010. Ten "Plan d'actions" (Action Plans) were published during 2006, including "Plan d'action patrimoine naturel", (Action Plan for natural heritage) and "Plan d'action mer" (Action Plan for the sea) which both make reference to "Le Littoral" (The Coast), although vegetated shingle is not specifically mentioned and "Plan d'action recherche" (Research) addressing the need for data (MEDD, 2006). Its approach, in a similar vein to the UK Biodiversity Strategy, includes the following ideas: protecting and promoting the recovery of declining species and habitats, the inclusion of all the "actors", including key socio-professional sectors (i.e. companies, farmers, seaworkers) in the implementation of the strategy, improving public awareness of biodiversity loss as well as its responsibility for protecting it, and developing baseline data and surveying/monitoring techniques (MEDD, 2004). Again, of particular relevance to the method described in this report are the two latter points.

Targets

Both the UK and France have committed themselves to reducing biodiversity loss by 2010. The UK Government has a Public Service Agreement (PSA) target to bring "…. into favourable condition, by 2010, 95% of all nationally important wildlife sites" (HM Treasury, 2004). A baseline assessment of the condition of all SSSIs showed that 73% of coastal habitats within SSSIs were in "favourable" condition in 2003, which increased to 85% in March 2006 (Defra, 2006). However, although there were positive signs of progress under the UK BAP between 2002 and 2005, there was continuing or accelerating declines in a number of coastal habitats reflecting a range of pressures, including coastal squeeze (Defra, 2006). The biggest concern was the limited progress made towards BAP targets for habitat restoration and expansion (Defra, 2006). Revised national BAP targets require the achievement of "favourable" or "recovering" condition of an as yet unspecified (but likely to be c. 95%) area by 2010. Condition of vegetated shingle is currently only assessed on SSSIs so there are few data for many of the shingle sites within the BAR area. There are even less data for much of Europe outside the UK (Doody and Randall, 2003). In order to reach biodiversity strategy targets there have to be good baseline data for, and an effective way of monitoring shingle sites. Non-designated sites should also be surveyed and monitored especially as they may help achieve, for example, BAP targets for habitat restoration and expansion.

Enthusing people

Both the UK's and France's biodiversity strategies recognise that more people need to be engaged in taking action to maintain and enhance biodiversity as part of their everyday lives. For example, priorities for 2006-2010 in the UK's Biodiversity Strategy include raising awareness and understanding of open spaces with high biodiversity as an important component for a good quality of life, engaging a million new people to take part in enhancing and protecting biodiversity, improving communication, education, participation and action for biodiversity activities (Defra, 2006).

Developing the evidence base

The ability to identify species, monitor their population trends and determine their habitat preferences, or at least, their level of association with a particular habitat is essential for any conservation effort. By surveying important habitats regularly we can for example, locate particularly rare species or identify declines in habitat quality. This kind of information is vital for effective conservation management. "Collecting basic data on coastal habitats is an important first step in identifying the most ecologically significant sites, and establishes a baseline for monitoring and understanding the impact of management practices and developments on them" (Sneddon and Randall, 1994, p5).

In the UK, the National Vegetation Classification (NVC) is the standard system used for identifying vegetation habitats (Birnie *et al*., 2005), is used for the selection of biological SSSIs, and has also been used to interpret EC Habitats Directive Annex I habitats. Vegetated shingle is covered under "Shingle, strandline and sand-dune communities", but only one of 19 communities is found on coastal shingle (SD1). Two communities are associated with strandlines (SD2 *Honkenya peploides – Cakile maritima* and SD3 *Matricaria maritima – Galium aparine*), and the remaining sixteen are sand-dune communities (Rodwell, 2000; see also Cole *et al*., 2005, page 3-8). SD1 is accepted as being comparable with H1220. H1210, less easy to classify using the NVC, can include NVC types SD2 and SD3 on stony substrates, MC6 *Atriplex prostrata – Beta vulgaris* ssp. *maritima* sea-bird cliff community and other vegetation with abundant *Atriplex* spp. (JNCC, 2007b).

Although useful at a national scale the limited number of NVC categories does not adequately describe the variety of vegetation on shingle beaches. Therefore, commissioned by the Nature Conservancy Council (now Natural England, *inter alios*) in 1987, Sneddon & Randall (1993) carried out a major survey describing 60 UK shingle sites with a permanent flora above the strandline using the NVC system. They described 124 communities, only 31 of which were closely matched by NVC communities, suggesting the uniqueness of many of the communities on shingle. These were further divided into 25 major communities in six divisions (pioneer, secondary pioneer, mature grasslands, grasslands, heath and scrub) (Sneddon and Randall, 1993; see Cole *et al*., 2005, page 5). Other studies (e.g. Ferry *et al*., 1990; Williams and Cooke, 1993; Ryland, 1993) have each suggested other divisions with differing plant assemblages. These studies and studies on succession have highlighted the difficulties in classifying vegetated shingle. Furthermore, they have relied on labour- and expertise-intensive methods. For example, NVC is a slow and labour-intensive method requiring botanical expertise; additionally it is not designed as a monitoring tool (Birnie *et al*., 2005).

The limited number of NVC categories applicable to shingle, the large number of communities described by other studies, and the time, labour and expertise needed by these methods may not provide the most effective way of discriminating between sites. Additionally, a high level of expertise is needed to analyse the data (Birnie *et al*., 2005). This report and previous work by Cole *et al*. (2005) have also emphasised the need to survey and monitor all vegetated shingle sites within the BAR area, including those without statutory or local protection (mainly the smaller fringing beaches) which have been missed by previous studies (e.g. Ryland, 1993; Williams and Cooke, 1993; Sneddon and Randall, 1993) or are

not included in national monitoring targets (e.g. the Joint Nature Conservation Committee (JNCC) guidelines for monitoring coastal vegetated shingle are designed for designated sites (Doody and Randall, 2003)).

The method described in this report was designed to be easily and objectively applicable over the whole BAR project area. The method was also designed to be doable by people with little or no previous experience of surveying, or of shingle plants, but who are likely to be interested in, and have current knowledge of the state of their local beaches. It was also developed to allow non-experts a simple and objective way of assigning the same biodiversity value to a site as might an expert. This was achieved by identifying easily measurable parameters for a site, and a range of criteria that allowed a site to be assigned a biodiversity value dependent on those parameters.

3. AIMS

East Sussex County Council's role in the BAR project was to develop a method for evaluating the quality of a shingle beach in terms of its biodiversity so that individual beaches could be placed into one of three biodiversity value categories, namely: Excellent, Good or Impoverished.

Objectives

- To develop a method of recording the vegetation on shingle beaches using a relatively simple and repeatable method, that was quick and simple to apply with a minimum of training.
- To develop a method to assess the relative biodiversity value of surveyed sites.
- To involve volunteer recorders in the survey work to validate the survey methodology and raise awareness of the importance of vegetated shingle as a natural habitat, and encourage the involvement of local communities.

4. METHODS

A methodology that would enable the biodiversity value of a shingle beach to be evaluated was developed. The method involved determining the presence and distribution of selected species and community types, and various other attributes from a shingle beach. The data needed were selected to provide sufficient information in which to assess biodiversity value, but also so that non-experts could collect them simply, quickly, and in an objective way with a minimum of training. Criteria were also developed against which the data were matched so that a beaches' biodiversity value could be assessed.

A list of species was prepared using the criteria described below and refined (checked by Paul Harmes, Dr. Barry Yates, Dr Roland Randall pers. com.) so that it included species that were easy to identify throughout the survey season with a minimum of training. Selected taxa that only needed to be identified to groups, for example, grasses, mosses and lichens were added to the list. To identify these to species level needs a high level of expertise and a fair amount of time to achieve. Furthermore the period over which the survey ran would have made it hard for even the very experienced to identify for example, grasses at the end of the survey in contrast to many of the herbs which remain identifiable even after they have died. However, although these taxa were not identified to species they provided useful, if broad, indicators of the communities that were potentially present on a site (see section 2).

A vegetated shingle survey workshop was held during the BAR conference at Dunkirk 2006, during which ecologists and non-ecologists discussed and tested various methodologies. This useful exercise helped make the final method accessible to, and doable by non-experts.

Species chosen

The plant species (or species groups) included in the survey (Table 4.1) were selected to match at least one of the following criteria.

- Species, subspecies or varieties of species that are typically found on vegetated shingle, or closely associated coastal habitats.
- Rare species found on the coast. In England these were species that are listed in the Wildlife & Countryside Act, the JNCC list of rare species and/or are a UK BAP species (see below for details). In France these were species with either national or regional protection within the BAR area.
- Species groups that can indicate important community types on shingle, e.g. mosses, which may be an important precursor to the development of shingle sere where nutrient input is minimal (Sneddon and Randall, 2001).
- Species that have important species associated with them on shingle and other coastal habitats, e.g. *Linaria* spp (Toadflax species) are eaten by the caterpillars of *Calophasia lunula* (toadflax brocade moth) which has a Species Action Plan in the UK.

Species name	English common name	French common name
Armeria maritima	Thrift	Gazon d'Olympe
Beta vulgaris ssp. *maritima*	Sea Beet	Betterave (de mer)
Brassica oleracea	Wild Cabbage	Chou sauvage
Cakile maritima	Sea Rocket	Cakilier
Calystegia soldanella	Sea Bindweed	Liseron soldanelle
Centranthus ruber	Red Valerian	Valériane rouge
Cerastium tormentosum	Snow-in-summer	Céraiste tomenteux
Crambe maritima	Sea-kale	Chou marin
Crithmum maritimum	Rock Samphire	Criste marine
Cytisus scoparius	Broom	Genêt à balai
Echium vulgare	Viper's-bugloss	Vipérine commune
Eryngium maritimum	Sea-holly	Panicault de mer
Euphorbia paralias	Sea Spurge	Euphorbe maritime
Frankenia laevis	Sea-heath	Frankénie
Galeopsis angustifolia	Red Hemp-nettle	Galéopsis à feuilles
Geranium robertianum ssp. *maritimum*	Herb Robert	Herbe à Robert
Glaucium flavum	Yellow Horned-poppy	Pavot cornu
Hippophae rhamnoides	Sea-buckthorn	Argousier
Honckenya peploides	Sea Sandwort	Pourpier de mer
Lactuca saligna	Least Lettuce	Laitue à feuilles de saule
Lathyrus japonicus (*Lathyrus japonicus* ssp. *maritimus* (éteint))	Sea Pea	Gesse maritime
Lavatera arborea	Tree Mallow	Lavaterre arborescente
Plantago coronopus	Buck's-horn Plantain	Plantain corne-de-bœuf
Polygonum maritimum	Sea Knotgrass	Renouée maritime
Prunus spinosa	Blackthorn	Epine noire, Prunellier
Raphanus raphanistrum ssp. *maritimus*	Sea Radish	Radis (de mer)
Rumex acetosella	Sheep's Sorrel	Petite oseille
Rumex crispus ssp. *littoreus*	Curled Dock	Patience crépu
Salsola kali	Prickly Saltwort	Soude salsovie
Sambucus nigra	Elder	Sureau
Senecio cineraria	Silver Ragwort	Séneçon cinéraire
Senecio viscosus	Sticky Groundsel	Séneçon visqueux
Silene uniflora	Sea Campion	Silène à une seule fleur
Solanum dulcamara var. *marinum* (*Silene vulgaris* ssp. *maritima*)	Bittersweet	Douce amère
Teucrium scorodonia	Wood Sage	Sauge des bois
Trifolium squamosum	Sea Clover	Trèfle maritime
Tripleurospermum maritimum (*Matricaria maritima* ssp. *maritima*)	Sea Mayweed	Matricaire (de mer)
Ulex europaeus	Gorse	Ajonc d'Europe
Urtica dioica	Common Nettle	Grande ortie
Species groups		
Atriplex spp.	Orache species	Arroches
	Grasses (cropped)	Herbes (taillées)
	Grasses (tussocks)	Herbes (touffes)
	Lichens (black,	Lichens (taches noires)
	Lichens (greyish	Lichens (verts, touffues)
	Lichens (yellow)	Lichens (jaune)
	Mosses	Mousses
Limonium spp.	Sea-lavender species	Statices
Linaria spp.	Toadflax species	Linaires
Rubus spp.	Brambles	Ronces
Sedum spp.	Stonecrop species	Orpins
Suaeda spp.	Sea-blite	Soudes

Table 4.1 - Species and species groups selected for the vegetated shingle survey. Species' Binomial name (Stace, 1999), English and French common names are shown. Species in purple represent country's rare species. The binomial names in brackets indicate where Stace and the Inventaire National du Patrimoine Naturel differ (MNHN 2003-2006). A more comprehensive table can be seen in Appendix 1.

To select these species the following databases were used.

In the UK

To assess the distribution of plant species

- New Atlas of the British and Irish Flora (Preston *et al*., 2002). Used to identify both species with a predominately coastal distribution, and species which may occur as maritime subspecies or varieties (e.g. *Geranium robertianum* ssp. *maritimum* (Herb-Robert) and *Solanum dulcamara* var. *marinum* (Bittersweet).

To assess the conservation status of plant species

- The Wildlife and Countryside Act, 1981 (Schedule 8 plants) provides the principle mechanism for the legislative protection of wildlife in the UK. All wild plants are protected against unauthorised uprooting under Section 13 of the Act. Plants listed on Schedule 8 of the Act have extra protection against picking, uprooting, destruction and sale.
- The Vascular Plant Red Data List for Great Britain (Cheffings *et al*., 2005) uses the IUCN (2001) criteria to assess the conservation status of UK species (see IUCN web site for details of the categories).
- Nationally rare and nationally scarce. In addition to the Red list, there are also criteria to define nationally rare and nationally scarce defined to be (JNCC, 2007c):
    - Nationally rare (NR) - Occurring in 15 or fewer hectads in the UK.
    - Nationally scarce (NS) - Occurring in 16-100 hectads in the UK.
- Species Action Plans (SAPs) set priorities for nationally and locally important species (UK BAP, 2007).
- The Sussex Rare Species Inventory (SxRSI, 2002). Species are selected according to strict criteria of rarity associated with their occurrence in Sussex. The aim is to list the rare species of Sussex in all taxa.
- Kent Red Data Book. Includes species on national Red Data Book, nationally rare and scarce and Priority UK BAP species that occur in Kent. Does not add any species not already covered by other databases (KRDB, 2006).

In France

- Le Inventaire National du Patrimoine Naturel (INPN, 2003-2006). This database includes an inventory of plants in France collected by the Muséum national d'Histoire naturelle, including their current protection status and known distribution.
- SOPHY (Ruffay *et al*., 2000 – 2007) is a French database which includes descriptions of plant distributions in France.

N.B. The data from these sources reflect current knowledge and cannot be regarded as exhaustive.

Additional species

The following species, which did not match the criteria above but were considered important to monitor, were also added. *Urtica dioica* (Common nettle) can indicate excessive enrichment of a site; *Cerastium tomentosum* (Snow-in-summer) and *Centranthus ruber* (Red Valerian) have the potential to be invasive on shingle. All three species indicate the potential for native shingle specific plants and communities to be extirpated through competition with non-shingle specific species. *Teucrium scorodonia* (Wood Sage), although common and not confined to the coast, with no maritime variety, and with no known associated SAP species, was also included as it is often found on older and more stable sections of shingle (Scott, 1965; Hubbard, 1970; Ferry *et al*., 1990; Rose, 1995).

Where possible, plant nomenclature follows Stace (1999) for the English side of the project and the INPN (2003-2006) for the French side of the project. There are a few cases where the binomial name for a species differs between the two sides of the channel. Most of the species selected were likely to be present on both sides of the channel. Exceptions were *Lathyrus japonicus* (Sea Pea) considered extinct in France, and *Linaria purpurea* (Purple Toadflax) not found in France. However, it is also important to note that some species are relatively more abundant on one or the other side of the channel. For example, *Crambe maritima* (Sea-kale) is much rarer in France (INPN, 2003-2006), where it is nationally protected, than in the UK. This report will use binomial names throughout, followed by the English common name when it is first mentioned. French common names can be found in Table 4.1.

The species and species groups selected were divided into three broad community types; pioneer, grassland/lichen-heath, and scrub (as suggested by Randall and Sneddon's (2001) generalised sequence of vegetation - Figure 2.2) by reference to the literature and communication with two shingle plant specialists, Mr Paul Harmes and Dr Barry Yates (Figure 4.1).

Depending on conditions such as sand content and hydrological regime, vegetated shingle is often found in association with other important coastal habitats including sand dunes and saltmarsh. Species that could indicate a transition to these associated habitats were noted (Figure 4.1).

Authority	Orache species	Sea-kale	Yellow Horned-poppy	Curled Dock	Bittersweet	Herb Robert	Black lichens	Yellow lichens	Red Hemp-nettle	Rock Samphire	Sea Beet	Sea Campion	Sea Knotgrass	Sea-lavender spp.	Sea Mayweed	Sea Pea	Sea Radish	Silver Ragwort	Sticky Groundsel	Stonecrop spp.	Toadflax spp.	Tree Mallow	Viper's-bugloss	Wild Cabbage	Least Lettuce	Prickly Saltwort	Sea Bindweed	Sea-holly	Sea Rocket	Sea Sandwort	Sea Spurge	Sea-blite	Sea Clover	Sea-heath	Sea Purslane	Buck's-horn Plantain	Grasses (cropped)	Grasses (tussocks)	Green lichens	Mosses	Sheep's Sorrel	Thrift	Wood Sage	Blackthorn	Brambles	Broom	Elder spp.	Gorse	Sea-buckthorn
1210/1220 - habitats directive	1	1	1										1	2		1	1													1	1																				
Brightmore & White, 1963																1																																			
Brightmore, 1979																							2																											
Hubbard, 1970	1	1	1	1							1																										2	2	2	2										
Pakeman & Lee, 1991																					1					1			1	1																			
Packham & Spiers, 2001	1																				1					1			1	1																			
cited in Randall & Fuller, 2001	1	1	1	1								1								2																2	2	2	2	2									
cited in Randall and Sneddon, 2001	1	1		1				1	1			1		1		1	1			1									1							2	2	2	2					3	3			3	
Scott, 1963			1																																									3	3			3	
Scott, 1985						1																																						3	3			3	
Sneddon & Randall, 1993	1	1	1	1	1	1				1	1	1	1		1	1	1		1	1		1				1	1	1								2	2	2	2					3	3			3	
Tofts, 2004					2																																												
Woodell & Dale, 1993																																										2							
Harmes (pers. com)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3
Yates (pers. com)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	1
Mean	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	2

Broad community types:
1 = Pioneer
2 = Established
3 = Scrub

Broad community indications for method: pioneer species

may indicate: sand; saltmarsh

grassland, lichen heath

scrub

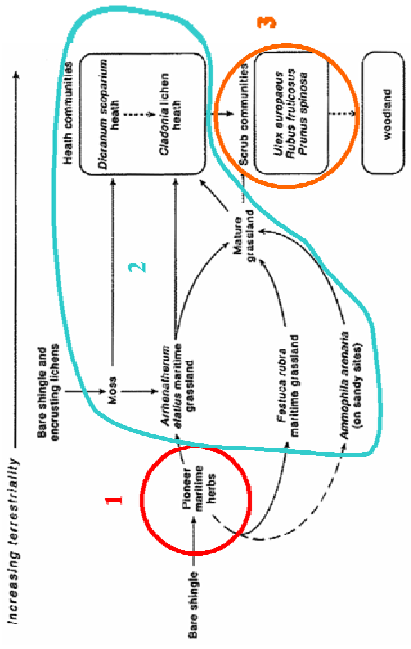

Figure 4.1 - Broad community type for each selected species or species group. A broad community type (numbers refer to three broad community types; pioneer, grassland/lichen-heath, and scrub as suggested by Randall and Sneddon's (2001) generalised sequence of vegetation – refer also to Figure 2.2) was assigned to each species/species group with reference to the literature and the opinion of two specialists, Paul Harmes and Dr Barry Yates. Although Sea-buckthorn was assigned a mean value of 2 it was placed in the scrub category because of its physical characteristics.

Vegetated Shingle Survey

The methodology is described in the following section.

The survey method is available as a pack and includes detailed instructions on all aspects of the methodology, and recording sheets designed to make it as simple as possible to record the necessary data (in both English and French). The pack also contains a photographic identification guide for the plant species that need to be looked for. For each plant, there are several photographs showing its diagnostic features at different times of the year, and a short descriptive text. It also contains an identification guide for a small selection of rare insect species that may be seen, examples of shingle features to look for and a risk assessment for recorders (see Appendix 2). It also available to download from the BAR web site.

http://www.geog.sussex.ac.uk/BAR/index.html

Site selection

Shingle beach sites were initially chosen from aerial photographs using different databases for East Sussex, Kent, and France, followed by visits where possible. Some beaches were chosen by volunteer recorders who had local knowledge of suitable and accessible beaches.

Surveys took place between June and October 2006, the period over which the selected species were considered identifiable.

Transects

At each site two belt transects, perpendicular to the shore and running inland from the seaward side of the beach were surveyed. Each transect was walked twice, once up the beach and once back down, and the presence of selected plant species or species groups was recorded. Estimations of species distribution and other shingle beach features were also recorded as described later.

The location for the starting point of the first transect was either predefined and indicated by an X on a map, or marked on a map *in situ* with reference to a suitable (and assumed permanent) landmark. It was desirable that transects should record as good a representation of the vegetation on the beach as possible. Therefore, if the recorder thought that a transect from the predetermined starting point would not achieve this, they could select a new starting point.

Criteria were developed to locate the actual starting point of each transect. Wherever possible, transects were started from the highest strandline (not necessarily the newest strandline, especially later in the season), considered the easiest feature to locate on many beaches. For beaches where there was no obvious strandline (e.g. where beaches had been cleaned or recharged) the top of the highest ridge along the shore, seaward of the majority of the vegetation was used as a starting point. If the criteria above could not be matched start points were located subjectively and an appropriate description given.

A 100 m surveyors' tape was run along the middle of the transect (Figure 4.2). The area approximately two and half metres either side of this central line was surveyed. Although most beaches were less than 100 m, the method allowed for up to a 200 m transect to be surveyed for each beach in two 100 m sections.

Figure 4.2 – Transect at Tide Mills, Newhaven showing surveyors' tape.

Data collected

At each site the data described under the following headings were collected.

Proportion of bare shingle

The percentage of bare shingle within the transect was estimated over 10 m sections (effectively 5 by 10 m rectangles). The area covered by vegetation was further divided according to the height of the vegetation, and percentage cover in each of the following height categories estimated: low (i.e. cropped and/or prostrate), medium (i.e. vegetation up to waist high) and high (i.e. above the waist). For any cover that did not fit the categories so far described, two further categories were used: exposed shingle in soil/sand and bare soil/sand.

Presence and distribution of pre-selected species

Both the first and last occurrence of the preselected species or species group within the transect were measured in metres from the starting point of the transect. Their presence in every 10 m section along the transect was also recorded to give an idea of their distribution on the beach. If a plant occurred on the seaward side of where the transect started its first occurrence was measured as a negative value.

Structured walk

A V or W-shaped walk (depending on length of transects) was made between transects so that any of the preselected species not already found in transects could be recorded.

Shingle characteristics

Characteristics of the shingle were recorded by estimating to the nearest 5%, the percentage occurring in colour, size and shape categories at the start, the middle and end of a transect.

Other features of interest

The presence of, or evidence for any other features such as vehicular activity, fire damage, trampling etc. were also recorded. A brief description of what surrounded the site, which could be compared against aerial photographs, was recorded. Recorders were also asked to make a note of any other species not on the pre-selected list that they felt was worth recording.

For further details see survey pack in Appendix 1.

Volunteer recorders

The survey method was designed to be easily doable by people with no particular expertise in either plant species or surveying. To help achieve this aim, we enlisted the help of volunteer recorders. They were recruited in a variety of ways including magazine and newspaper articles, flyers distributed at events, direct contact with conservation groups and by word of mouth.

Training sessions were organised so that all volunteer recorders had surveyed at least one transect and correctly filled in a recording sheet under supervision. Each volunteer had access to a Vegetated Shingle Survey Pack (Figure 4.3).

Figure 4.3 - Volunteer recorders at Pevensey Bay (top) and Rye Harbour Nature Reserve (bottom).

Biodiversity Value Category

Three biodiversity value categories were selected as follows:

- **Excellent -** the highest category for sites with e.g. SSSI equivalent (Rye, Dungeness).
- **Good -** typical species well represented, good distribution, some rare species.
- **Impoverished -** the lowest category for sites that had few or none of the species described previously.

These categories were chosen to provide a useful tool by which coastal managers might assess the implications for biodiversity that any disturbance, both anthropogenic and non-anthropogenic might have. A simple example of how this may be applied is to use a risk matrix to determine the required action for a particular site dependent on its biodiversity value and the risk of damage because of, for example, sea level rise, or sea defence works (Figure 4.4).

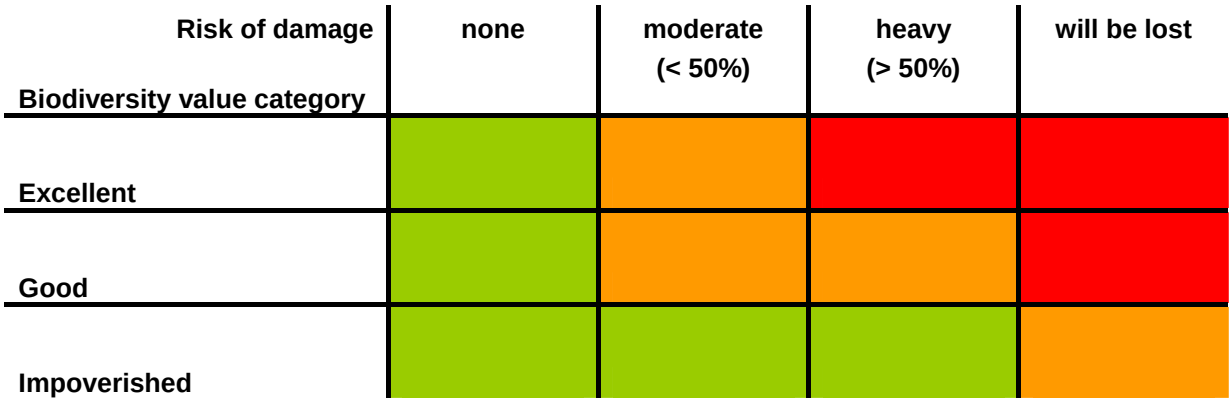

Figure 4.4 – Example of a simple risk matrix. The colour of the box determines the required action for a particular site dependent on its biodiversity value and the risk of damage. Red = protection /mitigation required, amber = some protection mitigation may be required, green = no action required.

Biodiversity value (see section 2, page 9) was determined mainly by the presence and distribution of the species and communities recorded at a site. Twelve criteria by which each site could be evaluated were developed (Table 4.2). They are as follows (including an indication of the community types they relate to):

Ephemeral communities

1. Orache. This criterion refers to the presence of *Atriplex* spp., and is an indicator for ephemeral communities (Doody and Randall, 2003). Early in the season they may be present as very small seedlings. Volunteer recorders were trained to look carefully for the presence of these seedlings, especially along the storm ridges on the seaward side of a beach. *Atriplex* spp. distribution is highly variable throughout the survey season and generally occurs in a narrow band, making it difficult to score its distribution as in the following criteria. Therefore value was awarded for presence only, and within 30 metres from the start of the vegetation on the seaward side of the transect. [It is only possible to score either 1 or 3 for this criterion which has a small effect on the mean category, i.e. the mean

category can never be exactly 2.]

Pioneer communities

2. Typical 1. Value was awarded as a function of the presence of three typical vegetated shingle species, *Crambe maritima*, *Glaucium flavum* and *Rumex crispus* ssp. *littoreus* (Rodwell, 2000; EC, 2003).

3. Distribution of at least one of above. The method allowed the spread up the beach of each species recorded to be measured. Value was awarded as a function of the distance that was covered by at least one of the three species cited in criterion 2.

4. Typical 2. Value was awarded as a function of the presence of a further four typical vegetated shingle species, *Beta vulgaris* ssp. *maritima, Silene uniflora, Solanum dulcamara* var*. marinum* and *Tripleurospermum maritimum* (EC, 2003).

5. Distribution of at least one of above. The method allowed the spread up the beach of each species recorded to be measured. Value was awarded as a function of the distance that was covered by at least one of the three species cited in criterion 4.

6. Remaining 27 pioneer species. Value was awarded as a function of the number of the remaining pioneer species not already covered in criteria 1, 2 and 3 (Figure 4.1).

7. Distribution of black & yellow lichens. Value was awarded as a function of the distance that was covered by either black or yellow lichens. Although these taxa were not identified to species they provided a useful indicator of how stable and therefore suitable for further colonisation a beach may be (e.g. Scott,1965).

Grassland, lichen-heath communities

8. Distribution of Grassland. Value was awarded as a function of the distance up the beach that was covered by any one of the taxa used as an indicator of community type (Figure 4.1), if there was grass distributed over at least 20 metres.

9. Green lichens Value was awarded as a function of the distance that was covered by green lichens. Although these taxa were not identified to species they may suggest the presence of a community type that can take decades to establish and may contain very rare lichens (Simon Davey, pers. com.).

Scrub communities

10. Scrub. Value was awarded as a function of the distance up the beach that was covered by any one of the taxa used as an indicator of this community type (Figure 4.2).

Miscellaneous

11. Rare species. Value was awarded as a function of the presence of species considered rare (section 4.1). There were nine species, although some were different, for both the English and French coasts (Table 4.1). This score was not awarded when the Sea-lavender recorded was known to be the non-native species *Limonium hyblaeum* (Rottingdean Sea-lavender).

12. Potential for Migration inland. Value was awarded as a function of the distance that a beach could potentially migrate inland. This was calculated from aerial photographs, maps and recorder observations and takes no account of landownership or proposed developments.

	Criteria	Biodiversity Value Category		
		Excellent	Good	Impoverished
1	**Orache**	present within first 30m of vegetation on seaward side of transect		none found
2	**Typical 1** – *Crambe maritima, Glaucium flavum, Rumex crispus* ssp. *littoreus*	>= 2 present	1 present	none found
3	**Distribution of at least one of above**	>= 40 m	>= 20 m	< 20 m
4	**Typical 2** - *Beta vulgaris* ssp. *maritima, Silene uniflora, Solanum dulcamara* var. *marinum* , *Tripleurospermum maritimum*	>= 3 present	>= 1 present	none found
5	**Distribution of at least one of above**	>= 40 m	>= 20 m	< 20 m
6	**Remaining 27 pioneer species**	>= 6 present	>= 3 present	< 3 present
7	**Distribution of black & yellow lichens**	>= 40 m	>= 20 m	< 20 m
8	**Distribution of Grassland**	>= 40 m	>= 20 m	< 20 m
9	**Green lichens**	>= 20 m	< 10 m	none found
10	**Scrub**	at least 2 species >= 40 m	at least 2 species >= 20 m	none or few recorded
11	**Rare species**	>= 2 present	>= 1 present	none found
12	**Potential for Migration inland**	Very large extent (e.g. Rye, Dungeness) >= 100 m	possible < 100 m	impossible

Table 4.2 Criteria selected for assigning biodiversity value to a shingle beach. See text for explanation.

5. RESULTS

Sites surveyed

Twenty-nine sites along the English coast were surveyed during June to October 2006 (Figure 5.1). Eight sites were surveyed in France at the end of July, 2006 (Figure 5.2). A full list of the sites surveyed showing their locations, the dates they were surveyed and by who is shown in Appendix 3. The mean transect length was 63 m (Figure 5.3).

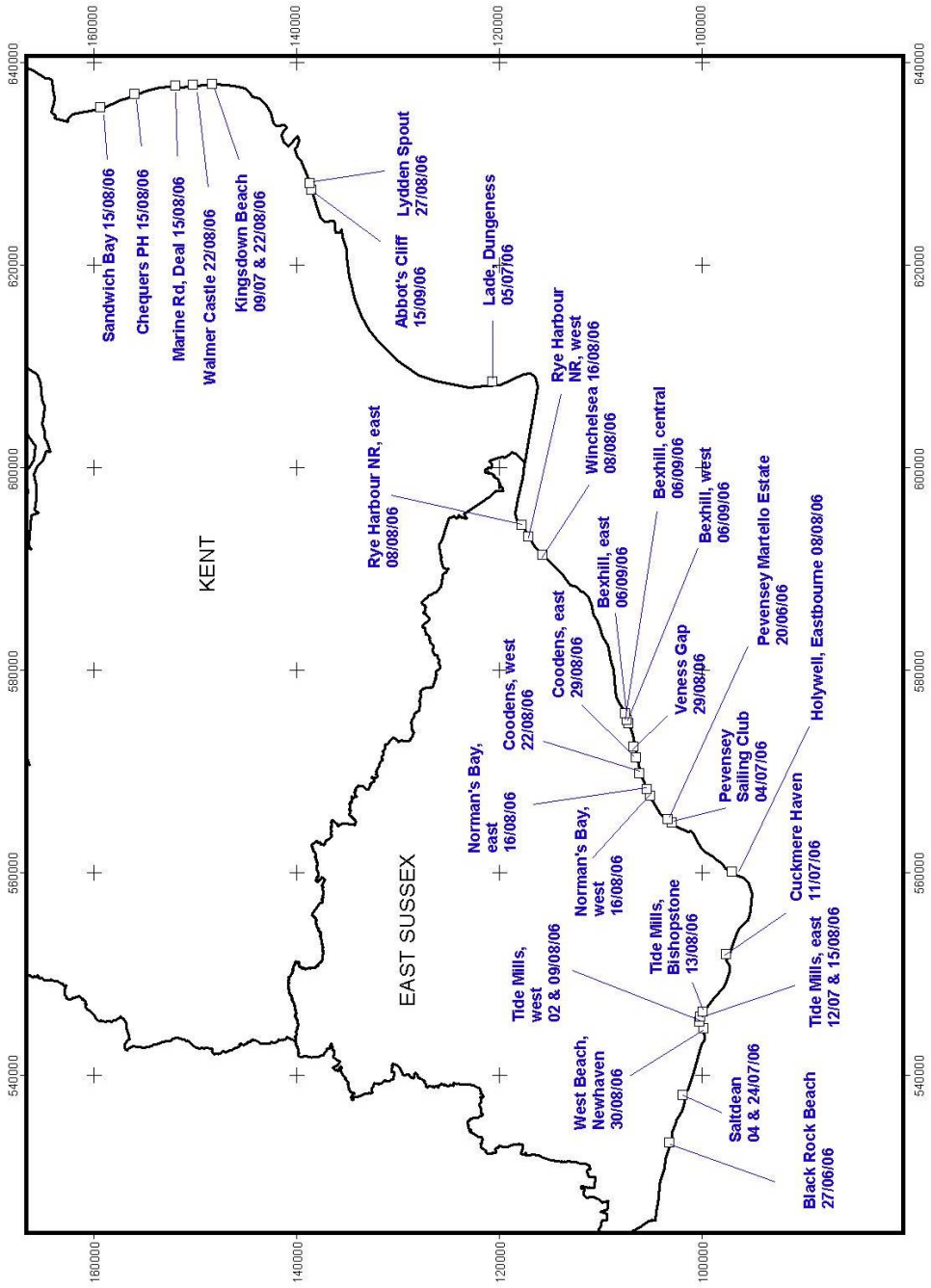

Figure 5.1 - Locations of sites and dates when they were surveyed on shingle beaches along the English coast of the BAR project area. The coastline runs from Brighton & Hove in the west to Sandwich Bay in the east. Grid squares represent 20 km^2. Reproduction of this map is not allowed without prior permission from East Sussex County Council.

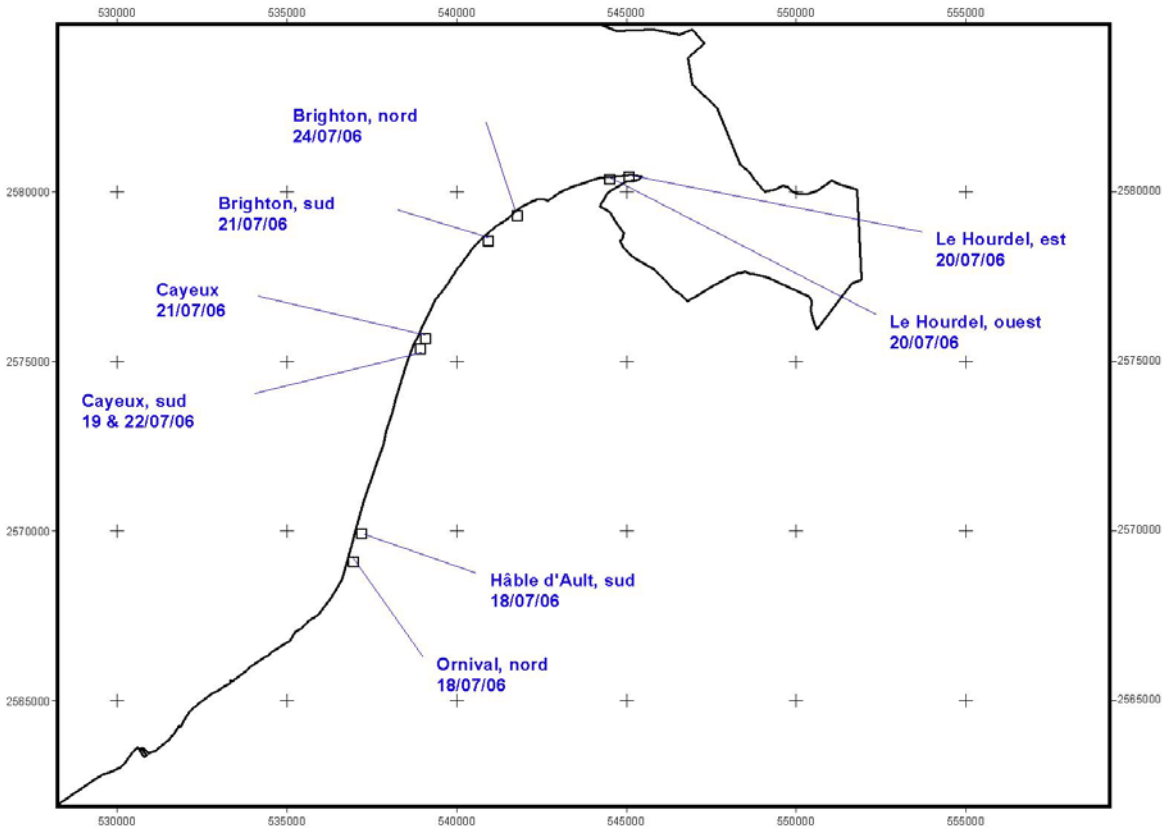

Figure 5.2 - Locations of 2006 transect surveys and dates they were surveyed on shingle beaches along the French coast of the BAR project area. The coastline runs from le Tréport in the west to le Crotoy in the east. Grid squares represent 5 km^2. Reproduction of this map is not allowed without prior permission from East Sussex County Council.

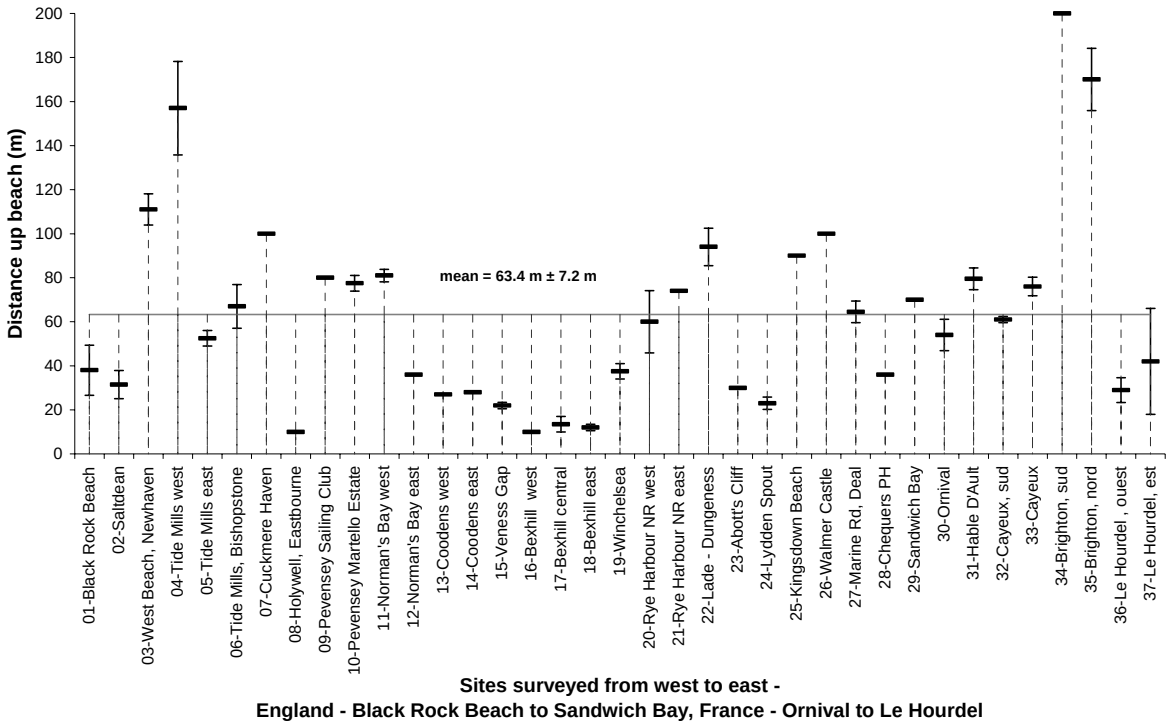

Figure 5.3 - Mean transect length ± standard error of the mean (SEM) of the 37 sites surveyed during 2006.

Species recorded

Of the 52 pre-selected species, 46 were found (Table 5.1). The number of species recorded from each site varied from 26 (Rye Harbour Nature Reserve west) to three (Veness Gap and Bexhill central). Several characteristic species of pioneer shingle communities *Atriplex* spp*., Beta vulgaris* ssp. *maritima, Crambe maritima*, *Glaucium flavum* and *Rumex crispus* ssp. *littoreus* (e.g. Williams & Cooke, 1993; EC, 2003) were well represented, with *Crambe maritima* being recorded on the most sites (32/37). *Crambe maritima*, considered rare in France was found on all French sites surveyed, although its distribution at Hâble d'Ault was very low. Rare species such as *Galeopsis angustifolia* (four sites) and *Lathyrus japonicus* (five sites) were also found but only on the English coast.

Urtica dioica, selected as an indicator of excessive enrichment, was only recorded on two sites; Rye Harbour Nature Reserve west and Pevensey Martello Estate (Table 5.1). The potentially invasive species *Centranthus ruber* was recorded on no French sites, but on 12 out of 29 English sites, whereas *Cerastium tomentosum* was only recorded on one site (Pevensey Sailing Club). *Teucrium scorodonia*, selected as it is often found on older, more stable shingle, was only recorded from two sites in England (Tide Mills west and Pevensey Sailing Club) and none in France.

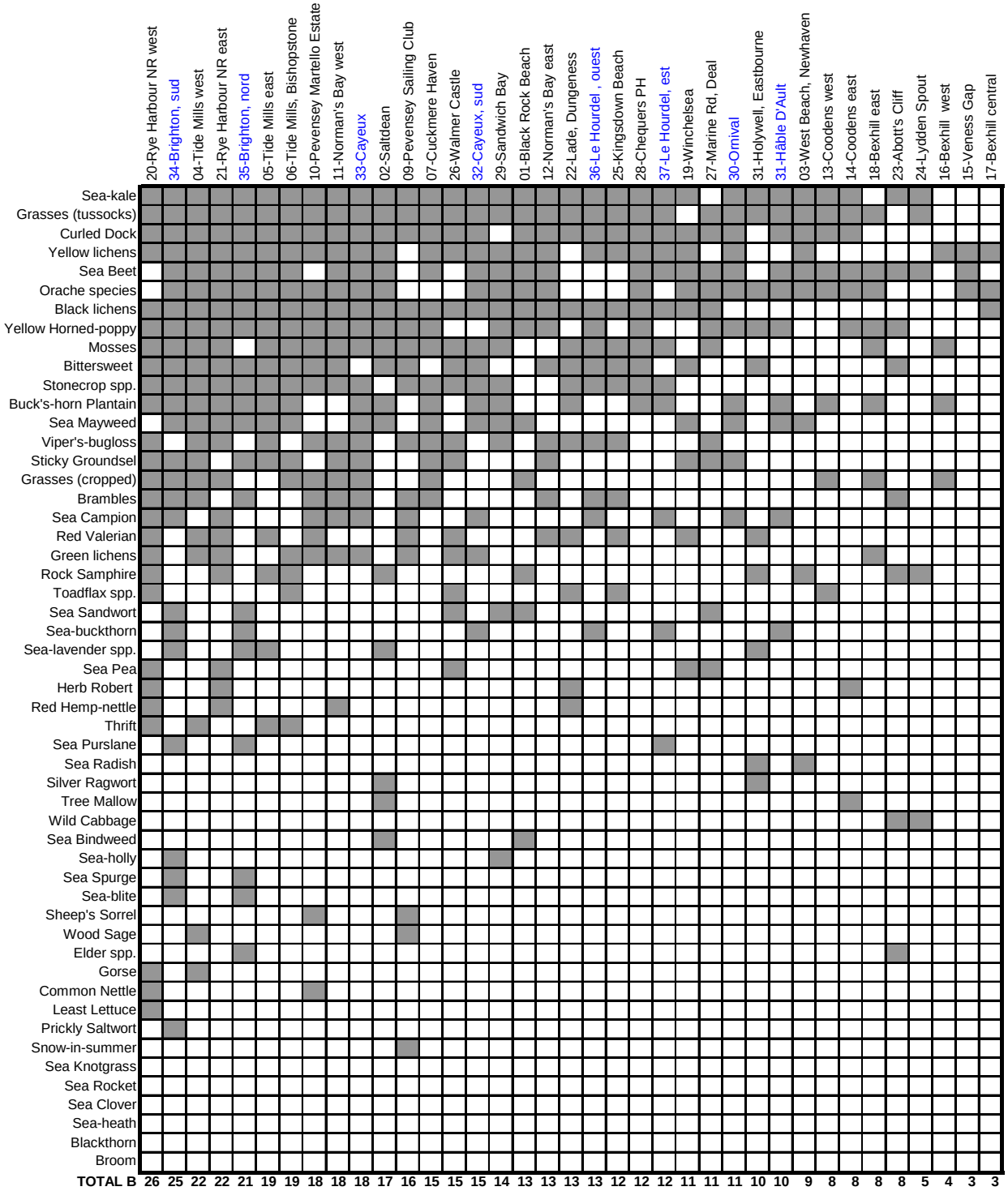

Table 5.1 - Grid showing presence of species recorded on every site. Presence of a species at a particular site is denoted by a grey square. Sites and species recorded are ranked so that the most species-rich site, and the most recorded species are top left. **Total A** in the far right hand column is the number of sites (out of 37) on which each species was recorded. **Total B** in the bottom row is the number of individual species recorded at each site. French sites are in blue.

Site profiles

For each site the data are represented visually as follows. Two examples are given (Figures 5.4 and 5.5). The profiles for all sites are shown in Appendix 4.

Figures 5.4 and 5.5 - Profiles for sites 13 – Coodens, west and 21 – Rye Harbour Nature reserve, east.

For each site the data are represented visually as follows:

- The site name and date(s) when it was surveyed are shown.
- Going up the page, the site is shown in 10-metre sections from the seaward side to the landward side.
- On the left of the page, the mean percentage of shingle, sand and vegetation (in three height categories) in 10 m sections is shown.
- On the right of the page, the cumulative distribution of each species over the two transects in 10 m sections is shown.
- If the transects were less than 100 m long their length is denoted by a blue line. Transects of different lengths are shown by two blue lines (and may be reflected in the shingle percentage diagram if the difference between the two transects lengths was more than 10 m). If there is no blue line then both transects were 100 (or 200 m) long.
- The note on the landward end of the species section describes briefly the habitat beyond the transects.
- Species are grouped together into three broad community types; pioneer, grassland/lichen-heath and scrub. Potentially invasive species are in a final group.
- Species are colour coded to aid interpretation.
- Species noted as being present on the beach but not recorded in the transects are shown in grey.
- The total number of species in each grouping is shown in the first four columns of the graph in the bottom right. The last column, [rare], shows species that were given a rare classification and are already included in the first four columns and do not need to be added to the species total.

(See Appendix 4 for the remaining sites.)

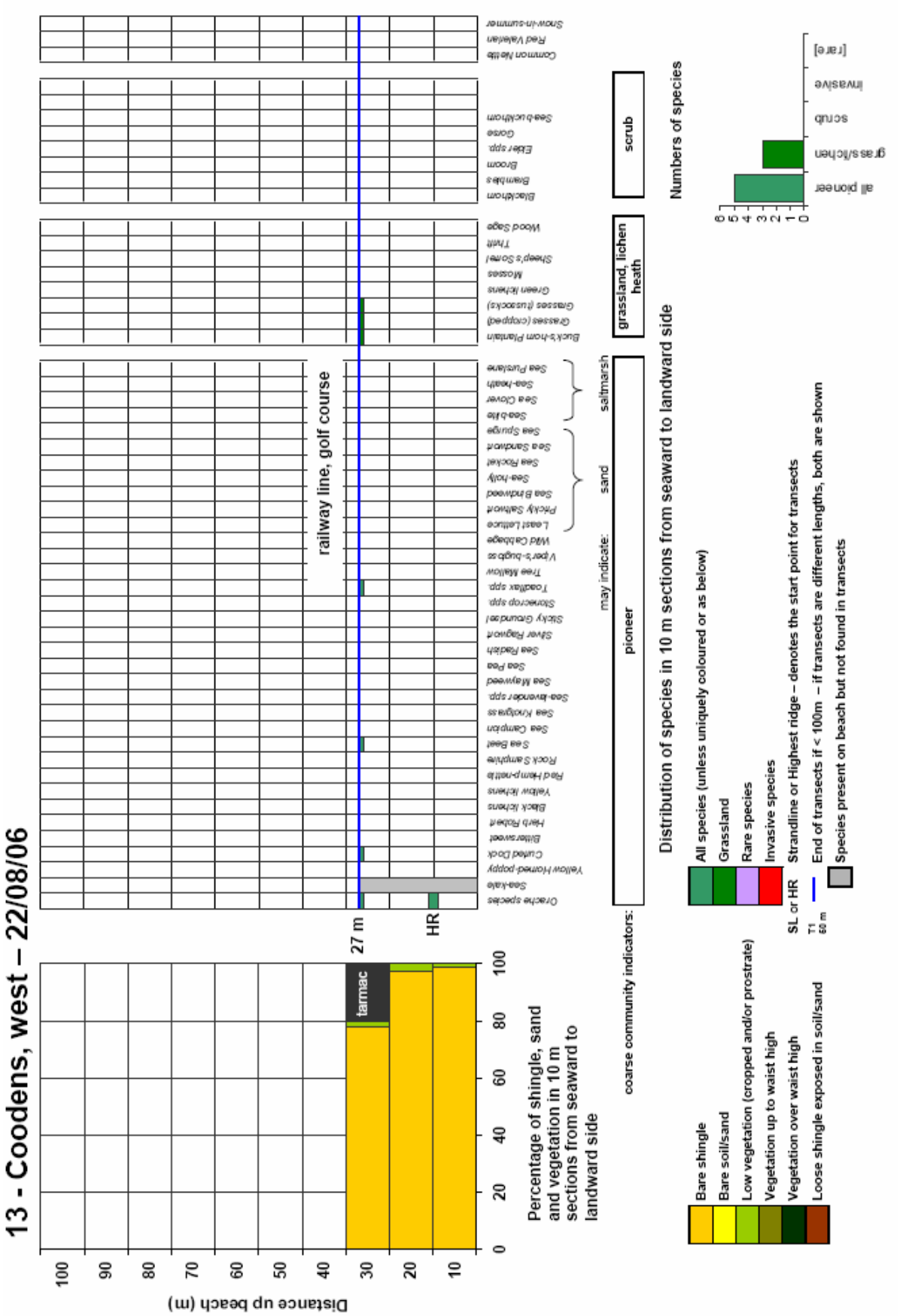

Figure 5.4 – Profile of Site 13 – Coodens, west. See previous page for explanation.

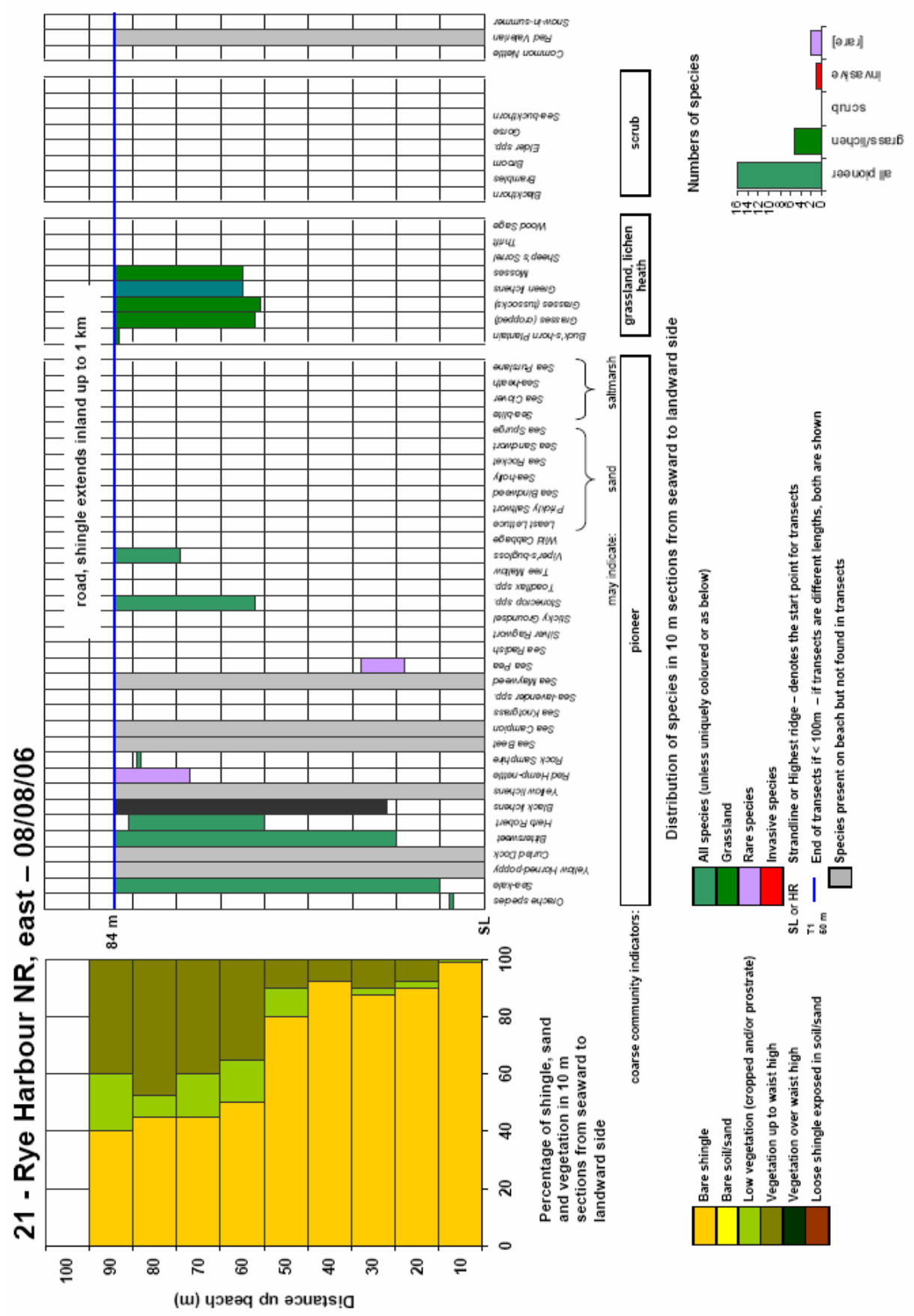

Figure 5.5 – Profile of Site 21 – Rye Harbour Nature Reserve, east. See page 33 for explanation.

The mean distribution of each species from its mean start point for all the sites combined is presented in Figure 5.6. Zonation of the vegetation is apparent (the distribution of species that were only recorded at a few sites are not necessarily representative). For example, *Atriplex* spp. were rarely found more than 20 m and grasses rarely less than 40 m from the seaward side of transects. Plants such as *Crambe maritima*, *Glaucium flavum* and *Lathyrus japonicus* which can withstand periodic disturbance (Randall and Sneddon, 2001) were more widely distributed from the seaward end of the transect up to the point where grassland species were first recorded.

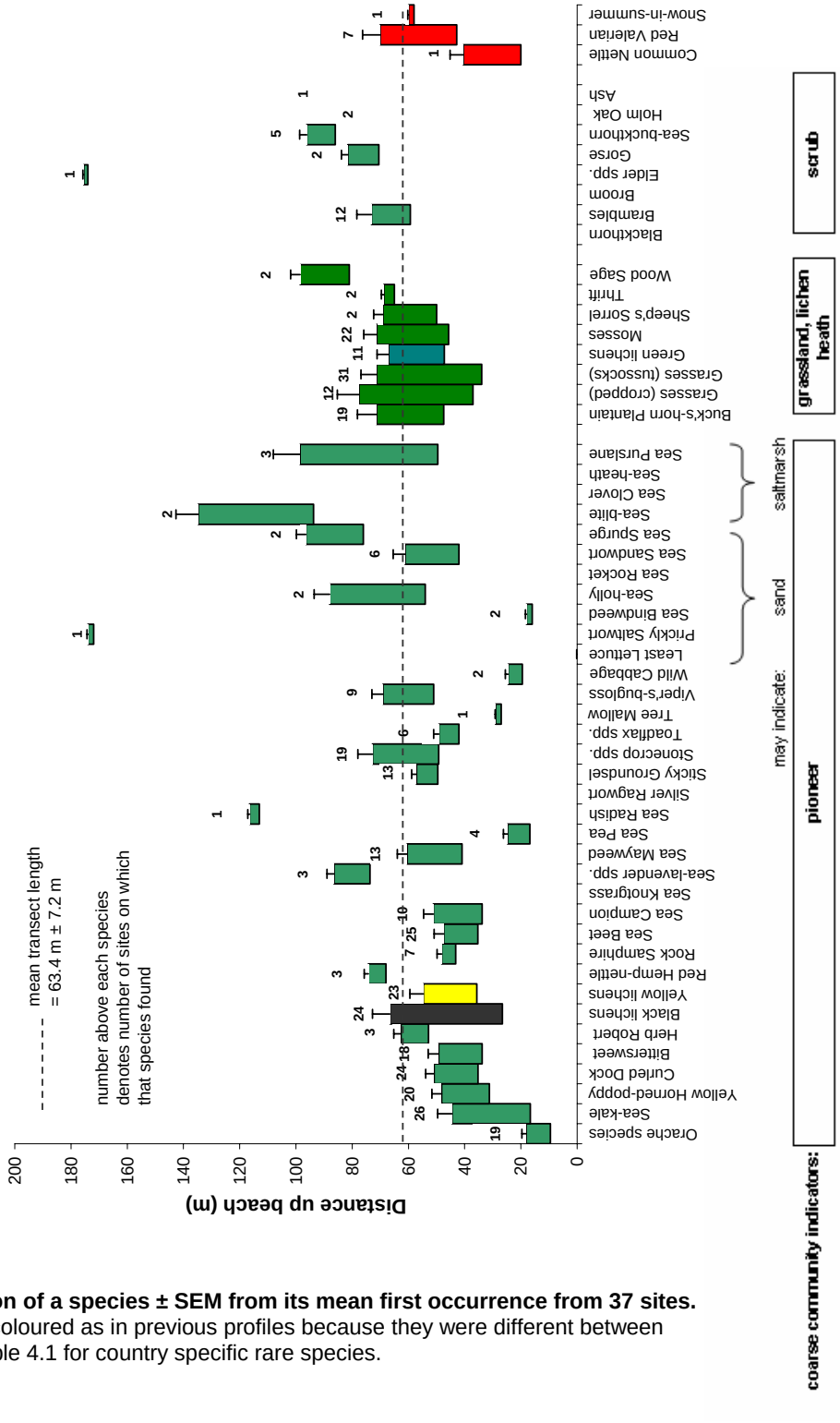

Figure 5.6 - Mean distribution of a species ± SEM from its mean first occurrence from 37 sites. Rare species have not been coloured as in previous profiles because they were different between England and France. See Table 4.1 for country specific rare species.

Biodiversity Value Category

Each site was evaluated with respect to each criterion and scored either 1 (representing Impoverished), 2 (Good) or 3 (Excellent). The Biodiversity Value Category (BVC) for each site was determined by the mean category value for all 12 criteria. The modal biodiversity value(s) i.e. the most common category for each criterion was also calculated for each site. Using the mean value, six sites were categorised as Excellent, 22 as Good and nine as Impoverished (Figure 5.7 and Table 5.2).

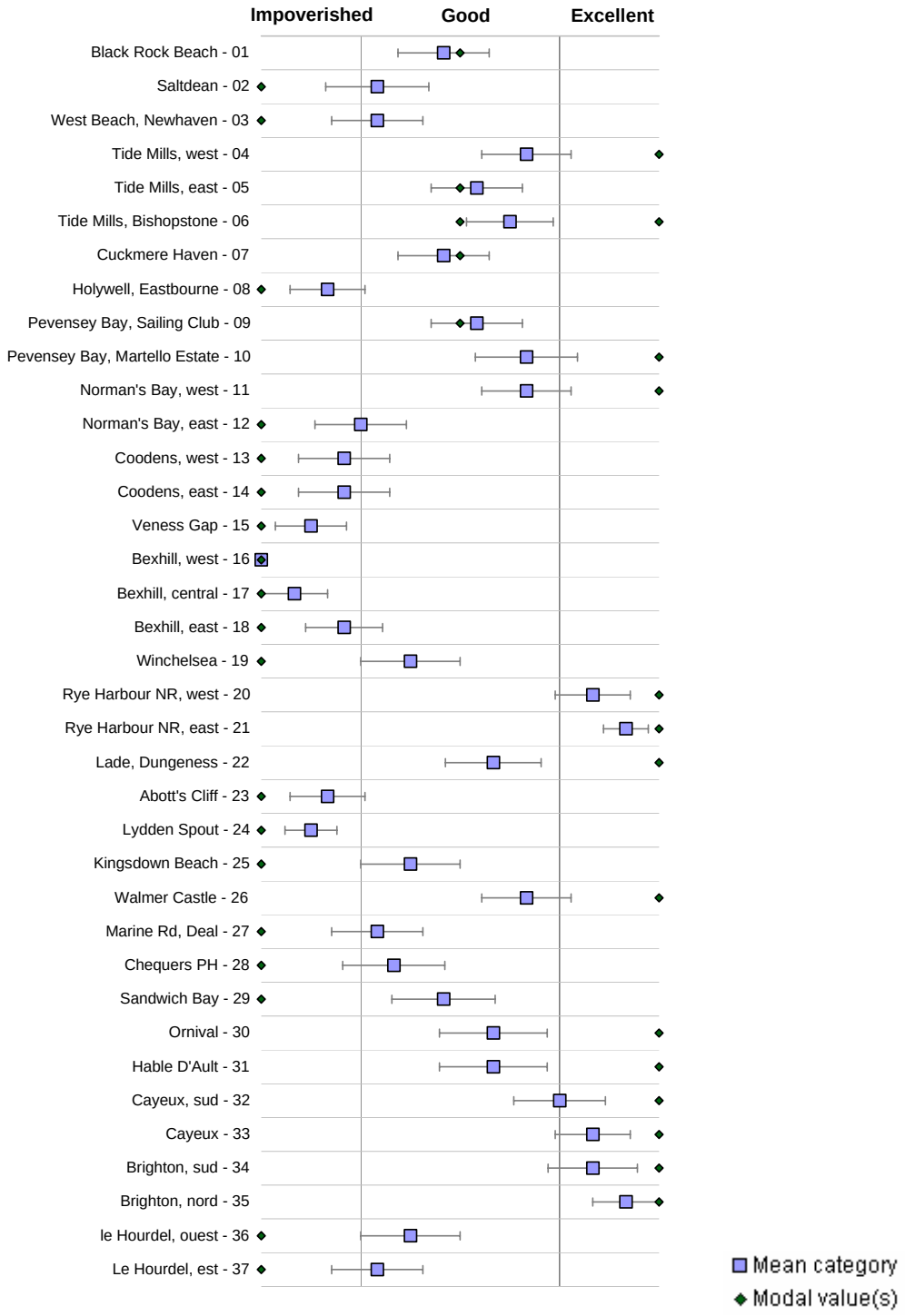

Figure 5.7 - Mean category ± SEM and modal value(s) for biodiversity value for 37 sites. Biodiversity Value Categories are on the x-axis.

Site	Biodiversity Value Category	Mean	SEM	1	2	3	4	5	6	7	8	9	10	11	12	M	M(2)
01 - Black Rock Beach, England	Good	1.92	0.23	3	3	3	2	2	2	2	2	1	1	1	1	2	
02 - Saltdean, England	Good (Impoverished)	1.58	0.26	3	3	1	3	1	2	1	1	1	1	1	1	1	
03 - West beach, Newhaven, England	Good (Impoverished)	1.58	0.23	3	3	2	2	2	1	1	1	1	1	1	1	1	
04 - Tide Mills, west, England	Good (Excellent)	2.33	0.22	3	3	2	3	3	2	3	3	2	1	1	2	3	
05 - Tide Mills, east, England	Good	2.08	0.23	3	3	3	3	2	2	1	2	1	1	2	2	2	
06 - Tide Mills, Bishopstone, England	Good (Impoverished & Excellent)	2.25	0.22	3	3	2	3	2	2	3	3	2	1	1	2	3	2
07 - Cuckmere Haven, east, England	Good	1.92	0.23	1	3	2	2	1	2	3	2	1	2	1	3	2	
08 - Holywell, Eastbourne, England	Impoverished	1.33	0.19	1	3	1	2	1	2	1	1	1	1	1	1	1	
09 - Pevensey Bay, Sailing Club, England	Good	2.08	0.23	1	3	3	2	2	1	3	3	2	2	1	2	2	
10 - Pevensey Bay, Martello estate, England	Good (Excellent)	2.33	0.26	3	3	3	2	3	2	3	3	3	1	1	1	3	
11 - Norman's Bay, west, England	Good (Excellent)	2.33	0.22	3	3	2	3	2	2	3	3	3	1	2	1	3	
12 - Norman's Bay, east, England	Good (Impoverished)	1.50	0.23	3	3	1	2	1	2	1	1	1	1	1	1	1	
13 - Coodens, west, England	Impoverished	1.42	0.23	3	3	1	2	1	1	1	1	1	1	1	1	1	
14 - Coodens, east, England	Impoverished	1.42	0.23	3	3	1	2	1	1	1	1	1	1	1	1	1	
15 - Veness Gap, England	Impoverished	1.25	0.18	3	1	1	2	1	1	1	1	1	1	1	1	1	
16 - Bexhill, west, England	Impoverished	1.00	0.00	1	1	1	1	1	1	1	1	1	1	1	1	1	
17 - Bexhill, central, England	Impoverished	1.17	0.17	3	1	1	1	1	1	1	1	1	1	1	1	1	
18 - Bexhill, east, England	Impoverished	1.42	0.19	3	2	1	2	1	1	1	1	2	1	1	1	1	
19 - Winchelsea, England	Good (Impoverished)	1.75	0.25	3	3	1	3	1	2	2	1	1	1	2	1	1	
20 - Rye Harbour Nature Reserve, west, England	Excellent	2.67	0.19	1	3	3	2	3	3	3	3	3	2	3	3	3	
21 - Rye Harbour Nature Reserve, east, England	Excellent	2.83	0.11	3	3	3	3	3	3	3	2	3	2	3	3	3	
22 - Lade, Dungeness, England	Good (Excellent)	2.17	0.24	1	3	3	2	1	2	3	3	1	2	2	3	3	
23 - Abott's Cliff, England	Impoverished	1.33	0.19	1	3	1	2	1	1	1	1	1	1	2	1	1	
24 - Lydden Spout, England	Impoverished	1.25	0.13	1	2	1	2	1	1	1	1	1	1	2	1	1	
25 - Kingsdown Beach, England	Good (Impoverished)	1.75	0.25	1	3	1	2	1	2	3	3	1	2	1	1	1	
26 - Walmer Castle, England	Good (Excellent)	2.33	0.22	1	3	3	2	1	3	3	3	3	2	2	2	3	
27 - Marine road, Deal, England	Good (Impoverished)	1.58	0.23	3	3	1	2	1	2	1	1	1	1	2	1	1	
28 - Chequers PH, England	Good (Impoverished)	1.67	0.26	3	3	2	2	1	1	1	1	1	1	1	3	1	
29 - Sandwich Bay, England	Good (Impoverished)	1.92	0.26	3	3	1	2	1	2	2	3	1	1	1	3	1	
30 - Ornival, France	Good (Excellent)	2.17	0.27	3	3	2	3	3	1	1	2	1	1	3	3	3	
31 - Hâble d'Ault, France	Good (Excellent)	2.17	0.27	3	3	1	3	2	1	1	3	1	2	3	3	3	
32 - Cayeux-sur-Mer, sud, France	Excellent	2.50	0.23	3	3	2	3	3	1	3	3	2	1	3	3	3	
33 - Cayeux-sur-Mer, France	Excellent	2.67	0.19	3	3	2	3	3	2	3	3	3	1	3	3	3	
34 - Brighton-sur-Mer, sud, France	Excellent	2.67	0.22	3	3	3	3	1	3	3	3	1	3	3	3	3	
35 - Brighton-sur-Mer, nord, France	Excellent	2.83	0.17	3	3	3	3	3	3	3	3	1	3	3	3	3	
36 - Le Hourdel, ouest, France	Good (Impoverished)	1.75	0.25	1	3	1	2	1	2	1	1	1	3	2	3	1	
37 - Le Hourdel, est, France	Good (Impoverished)	1.58	0.23	1	3	1	2	1	2	1	1	1	1	2	3	1	

Table 5.2 - Biodiversity Value Category (BVC) for 37 sites. BVC given is calculated from the mean category value shown in 3rd column. The modal value(s) is in brackets if it was different to the mean category value. Values for all 12 criteria are in columns 1-12 and the modal value(s) are in columns headed M and M(2).

Use of volunteer recorders

The survey methodology was tested and applied by volunteer recorders and one of us (Fitzsimons) between May and October 2006. Of 72 people who approached us expressing an interest in taking part in the survey, 51 volunteer recorders attended at least one of 11 training and testing sessions. Of those, at least 15 individuals submitted completed surveys post-training without supervision. One volunteer recorder (Linda Stark) submitted eight completed surveys, and others (Phillippa Morrison-Price, Sylvia Parsons, Fred Booth and the Kent group) submitted more than one each.

6. DISCUSSION

The methodology presented in this report allows sites to be quickly and objectively surveyed. Excel templates have been designed so that the data collected can be entered in a straightforward way, allowing a Biodiversity Value Category to be calculated automatically. It is important to stress that one survey will only give a snapshot of the site, and this is especially relevant in such a potentially dynamic environment. Rich *et al*. (2005a) for example, recommend that the vegetation on shingle beaches be monitored every three years.

The sites surveyed were biased towards those with vegetation, especially on the French side. On the French side time constraints only allowed a percentage of the coast to be sampled and species-rich beaches just south of Baie de Somme were chosen over the species-poor beaches further to the south. A much wider range of sites were surveyed on the English coast, although there was probably a natural inclination for recorders to choose sites with vegetation cover. Whilst the presence of some vegetation is obviously a pre-requisite for a survey of vegetated shingle beaches from a purely botanical point of view, it should be borne in mind that a lack of vegetation does not necessarily mean that the beach has no intrinsic interest. Areas of bare shingle are of importance to birds (Doody and Randall, 2003) and invertebrates (e.g. Shardlow, 2001), and it is suggested that areas of unconsolidated but stable shingle may favour lichen and bryophyte growth when there is insufficient organic material for higher plants to colonise (Lambley & Hodgetts, 2001). They are also of interest to coastal geologists and geomorphologists.

Although a large part of the BAR coastline that supports vegetated shingle is designated at a national or sometimes international level, limiting surveys to those areas which already receive some protection ignores the potential of other areas. Only five out of the 27 sites surveyed on the English coast fall within SSSI designated in part for vegetated shingle (designations in Appendix 5). All French sites fell within designated sites, but as mentioned previously, shingle beaches south of Ornival, some of which are known to be vegetated were not surveyed (unpublished data from previous BAR study). The current study (plus the study by Cole *et al*., 2005) has provided a baseline from which to monitor future change, has highlighted some areas that currently receive no formal protection but should still be considered important in their own right, and some that have the potential to achieve sufficient status to merit protection through designation with appropriate management. For example, the beach at site 26 - Walmer Castle, evaluated as Good (Excellent) is a wide shingle beach with a range of communities and species including *Crambe maritima* and the rare *Lathyrus japonicus*. The proximity of the popular Walmer Castle to the beach means that this would also be an ideal site to introduce vegetated shingle to the general public who may otherwise not have realised its biodiversity value. The beach at site 10 – Pevensey Martello Estate, also evaluated as Good (Excellent), is one of the last remaining fragments of the cuspate shingle foreland known as the Crumbles, most of which has been lost through development. The site showed succession from an ephemeral *Atriplex* spp. community, through to grassland/lichen-heath, and in calculating the BVC, it scored highly for the presence and distribution of characteristic species. However, the invasive species *Centranthus ruber* was present over much of the site, possibly as a result of its proximity to housing. The BVC value did not take its presence into account as we believe there was insufficient data about its possible negative effects. However, monitoring of sites where it is present would enable its distribution to be tracked. The effect of its removal at selected sites could be compared to sites where it was left in place to determine any potential effects on the distribution of native shingle species.

The method was designed to allow enthusiasts to monitor their local beach, often in places that would receive very little attention through more established or formal surveys. Volunteers can play a major role in large-scale monitoring programs and can potentially make significant financial- and time-savings for conservation (Newman *et al*., 2003; Foster-Smith and Evans, 2003; Macdonald and Tattersall, 2003; Irving, 2003). For example, the

National Bat Monitoring Programme relies heavily on volunteers 1133 volunteers took part in surveys and contributed data during 2005 (BCT, 2006). The efficacy of 155 volunteers in various wildlife monitoring tasks were evaluated by Newman *et al*. (2003) who found that they performed well and consistently, compared with professionals. Similarly, Foster-Smith and Evans (2003) found that although 13 volunteers collecting marine ecological data made recording errors, so did experienced scientists. Most other errors were the result of insufficient training and guidelines, emphasising the need for rigorous methodology.

It was anticipated that there would be some sampling error through factors such as recorders estimating percentages differently, not locating or misidentifying species, and weather affecting the survey effort. Nevertheless, it was assumed that between-category variations would be greater than within-category variations. We carried out limited testing which suggested that this was the case, but more formal testing was beyond the scope of this study. Therefore, not all the data collected were used in the evaluation. The data used for the evaluation consisted of those which we were confident had been collected in the same way by different recorders on different beaches. These data consisted mainly of the species present and measurements about their distribution up the beach, and data that could be measured from maps or aerial photographs.

It is fairly common practice to select a representation of a site to survey, and set permanent transects for future monitoring, however the data collected should not be extrapolated much beyond the actual location of the survey (Tucker *et al*., 2005). Therefore, coastal managers wishing to use this method should apply it the location that is likely to be affected by disturbance, and it is important to consider the Biodiversity Value Categories as relevant to that location.

Belt transects were used because they are particularly useful for monitoring vegetation changes along environmental gradients (Rich *et al*., 2005b), i.e. they will pick up the zonation of vegetation discussed in the introduction (section 1). By recording the presence of species and measurements of their position along a fixed line, we kept the data collection as objective as possible. An accurate estimate of species abundance at a site would take a lot longer to collect than a record of their presence and is potentially open to more subjectivity if several recorders are involved over numerous sites. Furthermore the collection of presence data is preferred by volunteers over estimating abundance, which means it may be easier to recruit recorders and the area surveyed (Bart and Klosiewski, 1989). However, some of the data collected did require recorders to make estimates, e.g. percentage of bare shingle, and this was where the most discrepancy between recorders was apparent. Although these data were not used to calculate the BVC, they were considered accurate enough to give an added indication of the zonation along the transect. Further testing would determine the actual level of discrepancy both within and between recorder surveys.

Despite not using all the data, it was worth collecting, as it did not particularly increase the difficulty of, or time spent doing the survey, and provided useful baseline data for a site. For example, shingle characteristics can vary a lot between (and within) beaches especially when compared with beaches in France. The colour for example can give an indication of the age of the shingle. Flint eroded from present day chalk cliffs are generally black or blue-black in colour, whereas yellowish, orangey shingle comes from flints that were first exposed around 65 million years ago to the warm humid climate of the early tertiary period. Whether or not this affects the ecology we do not know but size of shingle and the amount of sand can (e.g. Scot, 1963). We believe that it could play a role in future evaluations but further testing and training should be carried out.

Future work should include an evaluation of the criteria used and the data collected. There may be important species that have not been included in the current survey. This could be especially relevant for the French coast for which our expertise and access to databases was less than that for the English coast. Similarly, we may be collecting data that does not affect the final BVC. It might also be possible to refine the identification of species groups, without

greatly increasing the time or expertise needed, so that the information they indicate is more robust. The time and expertise needed to survey sites were a major consideration for the methodology. On average, two transects could generally be done within a couple of hours. However, future tests should determine whether two transects gives a true picture of the site. It would also be useful to compare the biodiversity value assigned to sites by a range of experts and the methodology. Although not formally described here, a pilot study suggested that the criteria used could assign the same biodiversity value to a site as would a specialist. However, we anticipate that specialists may not always agree. Although the criteria were used to assign an absolute BVC to the site there was much variation possible at the criterion level, as reflected in the mean category values and standard error of the mean. This creates an area of uncertainty at the boundaries between BVCs, an inherent feature of any kind of grouping system and especially so for such a variable landscape. The modal biodiversity value(s) i.e. the most common category for each criterion was also calculated for each site. It provides more instant information about the BVC when the actual mean category value ± SEM is not quoted. A beach rated as Good (Impoverished) will tend to lie at the boundary of Impoverished and Good compared to one rated Good (Excellent). However, these criteria and the data collected could easily be adjusted without altering the main methodology if future work determined it necessary.

The instructions for the survey methodology fit onto two sides of one A4 sheet of paper that can easily be taken out into the field. It is comprehensive and includes diagrams. Future trials could determine whether it is possible to carry out a survey accurately without the need for formal training. The accompanying recording sheet was also designed to fit onto two sides of an A4 sheet of paper. There were two reasons for this. Firstly as much information as possible was on view at all times making it less likely to miss filling sections in and secondly, it is easier to deal with one sheet than several sheets especially on a beach with a strong sea breeze. The disadvantage is that the writing and recording boxes may be considered quite small. With some care and experience, this should not prove an obstacle to accurate recording. Moreover, even after just one training session, only two out of 18 volunteers (11%) wanted a 4-sided recording sheet with bigger print.

Of the 72 people who expressed an interest in the survey 51 attended at least one of 11 training and testing sessions that we held during the summer. These sessions lasted between 1 ½ and 3 hours and were mainly attended by people who apart from a few exceptions had both little botanical knowledge and no surveying experience. Nevertheless, these sessions seemed to be well received and the method was not thought daunting. Of four choices in a questionnaire given to 18 volunteers after they had received one training session, none felt that the method was impossible to do, only one (6%) felt they needed a lot more training, seven (38%) only wanted a little more training, and eight (44%) were confident that they could carry out a survey without supervision. The few occasions when it was possible to test the repeatability of the method by comparing the results of two groups on the same site or by one of us checking a site surveyed by a volunteer suggested that repeatability was consistent. These tests should be carried out more formally in the future. At least 15 individuals went on to complete a minimum of one survey post-training without the supervision of the authors. In addition, 10 groups or individuals expressed an interest in carrying on monitoring at 10 sites over the coming years. This suggests that the method is very doable, is considered important and may even be enjoyable to a wide range of people.

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APPENDICES

1 Wildlife & CA 1981	2 JNCC-IUCN	3 JNCC-other	BAP status	4 SRSI	New Atlas (Preston *et al*., 2002)	5 Number of 10km² squares in which species occurs (from total of 3859)	6 change relative to average species	7 distribution	English common name	English - found during surveys 2003-2005 (exc. Dungeness)	French - (INPN, 2003-2006; Ruffray *et al*., 2000-2007)	French common name	On Bar coast according to SOPHY	On Bar coast according to INPN - some pre-1980	Protection	Protection in BAR area	In UK BAR?
					nat	1002(43)	-0.14		Thrift	*Armeria maritima*	*Armeria maritima Willd.*	Gazon d'Olympe	no	yes			
											Armeria maritima Willd. ssp. maritima	Gazon d'Olympe maritime, l'Armérie maritime	no	yes	Régional	yes	
				y	nat	456	-0.93	coastal	Babington's Orache	*Atriplex glabriuscula*	*Atriplex glabriuscula Edmondston*	Arroche de Babington	yes	yes	National Art 1	yes	
											Atriplex hastata sensu 1		yes	yes			
					nat	308(212)	1.59	coastal	Grass-leaved Orache	*Atriplex littoralis*	*Atriplex littoralis L.*	Arroche du littoral	yes	yes	Basse-Normandie Art 1	no	
					nat	1588(8)	1.1		Spear-leaved Orache	*Atriplex prostrata*	*Atriplex prostrata Boucher ex DC. ssp. prostrata*		yes	yes			
											Atriplex prostrata Boucher ex DC.	Arroche hastée	yes	yes			
											Atriplex tatarica L.	Arroche de Tartarie	yes	no			Not in UK, Tartarion Orache
					nat	456(5)	-0.26	coastal	Marram Grass	*Ammophila arenaria*	*Ammophila arenaria (L.) Link*	Oyat					
					nat	3498	0.37		False Oat-grass	*Arrhenatherum elatius*	*Arrhenatherum elatius (L.) P.Beauv. ex J. & C.Presl*	Fromental élevé					
					nat	321(7)	0.32	coastal	Sea Couch	*Elytrigia atherica*	*Elytrigia atherica (Link) Kerguélen ex Carreras*	Chiendent du littoral		yes			
					nat	430	-0.28	coastal	Sand couch	*Elytrigia juncea*	*Elytrigia juncea (L.) Nevski ssp.*		yes	yes			
									Red Fescue	*Festuca rubra*	*Festuca rubra L.*	Fétuque rouge	yes	yes			
				y	nat	398(9)	0.27	coastal	Lyme-grass	*Leymus arenarius*	*Leymus arenarius (L.) Hochst.*	Seigle de mer, Grand Oyat, Elyme des sables	yes	yes	National Art 1	yes	
				y	nat	6	0.01	coastal	Matted Sea-lavender	*Limonium bellidifolium*	*Limonium bellidifolium (Gouan) Dumort.*	Statice à feuilles de pâquerette	no	no	Départemental	no	
			SAP	y	nat	133(2)	0.16	coastal	Rock Sea-lavender	*Limonium binervosum agg*	*Limonium binervosum (G.E.Sm.) C.E.Salmon*	Statice de Salmon	yes	yes	Départemental	no	
											Limonium vulgare Mill. ssp. vulgare		no	no	Départemental	yes	
					nat	169(1)	-0.31	coastal	Common Sea-lavender	*Limonium vulgare*	*Limonium vulgare Mill.*	Statice commun	yes	yes	Départemental et Préfectoral	no	
					intro-natra			coastal	Rottingdean Sea-lavender	*Limonium hyblaeum*							
									a Sea-lavender	*Limonium minutum*	http://inpn.mnhn.fr/isb/isb/espece.jsp	put name in search - 4 species					
											Polygonum oxyspermum C.A. Mey et Bunge EX Ledeb. ssp. Raii (BAB) D.A.Webb et Chanter	See below - see Jouet_11.pdf			found in Cayeux-sur-mer		
				y	nat	195(1)	0.015	coastal	Ray's Knotgrass	*Polygonum oxyspermum Ledeb.*	*Polygonum oxyspermum Ledeb.*						
					nat	1784(48)	-0.24		Biting Stonecrop	*Sedum acre*	*Sedum acre L.*	Poivre de muraille, Orpin acre		yes			
					arch	1373	2.41		White Stonecrop	*Sedum album*	*Sedum album L.*	Orpin blanc	no	yes			
					nat	851(40)	-0.21		English Stonecrop	*Sedum anglicum*	*Sedum anglicum Huds.*	Orpin anglais	no	no			
					nat	278(2)	0.06	coastal	Sea Purslane	*Atriplex portulacoides*	*Halimione portulacoides (L.) Aellen*	Obione faux pourpier	yes	yes			
					nat	605(7)	1.27	coastal	Sea Beet	*Beta vulgaris ssp. maritima*	*Beta vulgaris L. ssp. maritima (L.) Arcang*		yes	yes			
											Brachypodium pinnatum (L.) P.Beauv.	Brachypode penné	yes	yes			
		NS		y	nat	62(182)	0.92	found as an apparent native on sea-cliffs, predominantly on chalk and limestone but also on other base-rich substrates. It is most frequent on bare cliff edges, but also grows in maritime grassland	Wild Cabbage	*Brassica oleracea*	*Brassica oleracea L.*	Chou sauvage	yes	yes	Régional	yes	
				y	nat	435(1)	-0.38	coastal	Sea Rocket	*Cakile maritima*	*Cakile maritima Scop.*	Cakilier	yes	yes			
											Cakile maritima Scop. ssp. maritima		yes	no			
				y	nat	192	-0.58	coastal	Sea Bindweed	*Calystegia soldanella*	*Calystegia soldanella (L.) Roem. & Schult.*	Liseron soldanelle	yes	yes	Régional	no	
					nat	185	0.29	coastal	Sea-kale	*Crambe maritima*	*Crambe maritima L.*	Choux marin	yes	yes	National Art 1	yes	
					nat	273	0.23	coastal	Rock Samphire	*Crithmum maritimum*	*Crithmum maritimum L.*	Criste marine	yes	yes	Départemental et Préfectoral	no	
					nat	725(27)	-0.24		Viper's-bugloss	*Echium vulgare*	*Echium vulgare L.*	Vipérine commune	yes	yes			
				y	nat	169	-0.8	coastal	Sea-holly	*Eryngium maritimum*	*Eryngium maritimum L.*	Panicault de mer, Chardon des dunes, Chardon bleu, Pan	yes	yes	several Régional	yes	
				y	nat	174	-0.35	coastal	Sea Spurge	*Euphorbia paralias*	*Euphorbia paralias L.*	Euphorbe maritime	yes	yes			
								coastal	Purple Spurge	*Euphorbia peplis L.*	*Euphorbia peplis L.*	Euphorbe péplis	yes	no	National Art 2	yes	probably extinct in UK
	NT	NS		y	nat	26(12)	0.03	coastal	Sea-heath	*Frankenia laevis*	*Frankenia laevis L.*	Frankénie	no	no (in B	Régional et Départemental	no	
	CR	NS	SAP	y	arch	91	-3.31		Red Hemp-nettle	*Galeopsis angustifolia*	*Galeopsis angustifolia Ehrh. ex Hoffm.*	Galéopsis à feuilles étroites	yes	yes			
					nat	2450(3)	-0.41	*ssp. maritimum coastal*	Herb Robert	*Geranium robertianum ssp. maritimum*	*Geranium robertianum L. ssp. maritimum (Bab.) H.G.Baker*	Herbe à Robert		yes			
					nat	184(6)	-0.39	coastal	Yellow Horned-poppy	*Glaucium flavum*	*Glaucium flavum Crantz*	Pavot cornu, Glaucière jaune	yes	yes			
		NS		y	nat	50(352)	1.27	coastal but widely planted, becoming invasive	Sea-buckthorn	*Hippophae rhamnoides*	*Hippophaë rhamnoides L.*	Argousier	yes	yes			

1 Wildlife & CA 1981	JNCC-IUCN	2 JNCC-other	BAP status	3 SRSI	New Atlas (Preston *et al.*, 2002) 5	10km^2 occurences (from 3859) 6	change relative to average species	distribution 7	English common name	English - found during surveys 2003-2005 (exc. Dungeness)	French - (IUPN, 2006; Ruffray *et al.*, 2000-2007)	French common name	On Bar coast according to SOPHY	On Bar coast according to INPN - some pre-1980	Protection	Protection in BAR area	In UK BAR?
					nat	547	-0.58	coastal	Sea Sandwort	*Honkenya peploides*	*Honckenya peploides (L.) Ehrh.*	Honckénya fausse-péplide, Pourpier de mer	yes	yes	Aquitaine : Art 1	no	
y	EN	NR		y	nat	3	-1.51	coastal	Least lettuce	*Lactuca saligna*	*Lactuca saligna L.*	Laitue à feuilles de saule	no	yes			
		NS		y	nat	29	-0.32	coastal	Sea Pea	*Lathyrus japonicus*	*Lathyrus japonicus Willd.*	Gesse du japon	no	no			
											Lathyrus japonicus Willd. ssp. maritimus (L.) P.W.Ball	Gesse maritime, Gesse de mer	no	no	National Art 1	yes	extinct in France
					nat	244(175)	1.2	rarely native more than 100 m from the coast	Tree Mallow	*Lavatera arborea*	*Lavatera arborea L.*	Lavaterre arborescente	no	no			
				y	arch	451	0.3		Pale Toadflax	*Linaria repens*	*Linaria repens (L.) Mill.*	Linaire rampante	no	yes			
					nat	1676	-0.8		Common Toadflax	*Linaria vulgaris*	*Linaria vulgaris Mill.*	Linaire commune	yes	yes			
					nat	690(3)	0.31	coastal	Sea Mayweed	*Tripleurospermum maritimum*	*Matricaria maritima L. ssp. maritima*	Matricaire (de mer)	yes	yes			
					neo	1303	3.66		Purple Toadflax	*Linaria purpurea*	not in France?						Not in France
									Cottonweed		*Otanthus maritimus (L.) Hoffmanns. & Link ssp. maritimus*	Diotis cotonneuse, Diotis maritime, Diotis laineux, Othanth	yes	no	Régional et Départemental	yes	extinct in UK
					nat	1548(16)	0.16	mainly coastal	Buck's-horn Plantain	*Plantago coronopus*	*Plantago coronopus L.*	Plantain corne-de-boeuf	yes	yes			
y	VU	NR		y	nat	9	0.21	coastal	Sea Knotgrass	*Polygonum maritimum*	*Polygonum maritimum L.*	Renouée maritime	no	no	Régional	no	
					nat	287(2)	?	coastal	Sea Radish	*Raphanus raphanistrum ssp.maritimu*	*Raphanus raphanistrum L. ssp. landra (Moretti ex DC.) Bonnier & Layens*		yes	no			
											Rumex crispus L. ssp. crispus			yes			
					nat	2577	0.11		Curled Dock	*Rumex crispus ssp. littoreus*	*Rumex crispus L.*	Patience crépue	yes	yes			
	VU			y	nat	180(2)	-0.61	coastal	Prickly Saltwort	*Salsola kali*	*Salsola kali L.*	Soude salsovie	yes	yes	Régional	no	
					neo	232	2.73		Silver Ragwort	*Senecio cineraria*	*Senecio cineraria DC.*	Séneçon cinéraire, Cinéraire	yes	no			
					neo	1404	0.63	genetically dwarf variety might be native on coast	Groundsel, Sticky	*Senecio viscosus*	*Senecio viscosus L.*	Séneçon visqueux	yes	yes			
					nat	750(5)	-0.39	mainly coastal	Sea Campion	*Silene uniflora*	*Silene vulgaris (Moench) Garcke ssp. maritima (With.) A. & D.Love*	Silène à une seule fleur	yes	yes	Pas-De-Calais/Nord et Loire A	yes	
											Silene conica L.	Silène conique	yes	yes	Régional	no	
					nat	1828(8)	-0.11	var. marinum on coast	Bittersweet	*Solanum dulcamara*	*Solanum dulcamara L.*	Douce amère	yes	yes			
					nat	383(1)	-0.47	coastal	Annual Sea-blite	*Suaeda maritima*	*Suaeda maritima (L.) Dumort.*	Soude maritime	yes	yes			
					nat	2115(2)	-0.69	Found on established shingle(Ferry et al., 1990)	Wood sage	*Teucrium scorodonia*	*Teucrium scorodonia L.*	Germandrée, Sauge des bois	yes	yes			
		NS		y	nat	63(1)	-0.32	coastal	Sea Clover	*Trifolium squamosum*	*Trifolium maritimum Huds. ssp. maritimum*		no	no	Régional	no	
									Total in columns	**56**	**67**						

different species names
extinct or no equivalent

Comments (refer to numbered boxes at top of some columns)

1 Wildlife & CA 1981 — The Wildlife and Countryside Act, 1981 (Schedule 8 plants) - All wild plants are protected against unauthorised uprooting under Section 13 of the Wildlife and Countryside Act.Even non-vascular plants, which have no roots, are protected, because uprooting is defined as removal from the site. Plants listed on Schedule 8 of the Act enjoy special protection against picking, uprooting, destruction and sale. The Schedule is reviewed every five years, but currently it contains 107 vascular plants

2 JNCC-IUCN — Threatened, Rare & Scarce Plant Species A number of criteria have been devised for assessing the conservation status of species. The IUCN criteria have been used to assess the threat status (IUCN, 2001). The categories are: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Data deficient (DD). The CR, EN and VU categories are considered to be threatened categories. Near threatened species should be close to qualifying for one of these categories. Data deficient is not a threatened category, but indicates a need for more information in order to determine the appropriate category.

3 JNCC-other — In addition to IUCN criteria, there are also criteria to define nationally rare and nationally scarce. Currently these are defined to be: Nationally rare (NR) - Occurring in 15 or fewer hectads in Great Britain, Nationally scarce (NS) - Occurring in 16-100 hectads in Great Britain.

4 SRSI — SxRSI Criteria The Sussex Rare Species Inventory was initiated in 1993, and now covers over 3,400 species. Species are selected according to strict criteria of rarity associated with their occurence in Sussex. The aim is to be comprehensive for species i.e. to list the rare species of Sussex in all taxa. The criteria for selection of species (other than birds) are listed below: All species in the national Red Data Books which have ever occurred in Sussex whether extinct or not. All Notable fauna and Nationally Scarce flora which have ever occurred in Sussex whether extinct or not. All taxa endemic to Britain. All taxa on the Biodiversity short list. Internationally rare taxa cited in the Bern Convention, IUCN Red Data lists, or EU Habitats Directive which are not covered by any of the above (provisional criterion; other lists may be added later). County rarities.

5	New Atlas (Preston et al., 2002)	nat = native, arch = archaeophyte, introduced before 1500 AD, neo = neophyte, introduced after 1500 AD, into-natr = introduced - naturalised
6	Number of 10km^2 squares in which species occurs (from total of 3859)	In brackets = alien or native as appropriate
7	distribution	only if coastal or more or less coastal

VEGETATED SHINGLE SURVEY PACK

Produced for Beaches At Risk by East Sussex County Council

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Partners:
Beaches At Risk is a partnership between the University of Sussex (Project Leader), East Sussex County Council, Kent Wildlife Trust, Université de Rouen, Université de Caen, Université du Littoral and SMACOPI (Syndicat Mixte pour l'Aménagement de la Côte Picarde).

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Beaches at Risk - Vegetated shingle survey - Instructions

Aim. You are going to set up a belt transect perpendicular to the shore and running inland from the seaward side of the beach. You will walk this transect twice, once up the beach and once back down, looking for plant species and features, and estimating some beach characteristics as indicated on the **recording sheet** and explained further on **How to fill in the recording sheet** overleaf.

When to do the survey? Ideally, between late May and early September.

Where to start the survey? The rough starting point for your 1st transect will **either** be:

- predefined and indicated by an **X** on a map with reference to a landmark (see **Figure 1**) **or**
- marked on a map by you with reference to a suitable (permanent) landmark.

NB. Your transects should record as good a representation of the vegetation on the beach as possible. If you feel that a transect from the given starting point would not achieve this, please change accordingly and make a record of the new starting point.

e.g. Pace out 80 large steps (or 160 small ones) from a point on the seashore in line with block of flats. Where you actually place the start of the transect will be determined by instruction **1** overleaf.

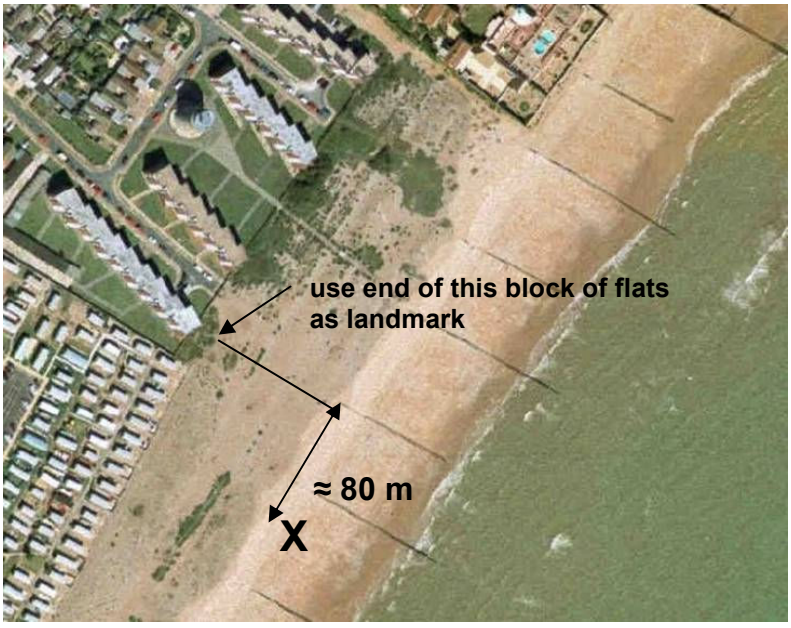


Figure 1.

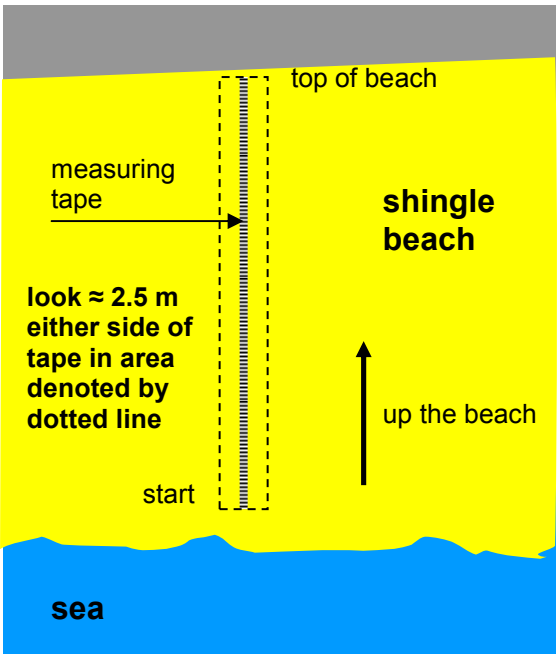


Figure 2.

Setting up the transect. Set out the measuring tape as shown in **Figure 2.** It may be useful to place large pebbles every 10 m, especially if it is windy. Use measuring tape as your central line and roughly estimate 2.5 m either side as shown by the dotted rectangle in **Figure 2** above. This is the area you are going to survey as described overleaf.

How many transects? Please try to do **at least two transects** per beach. If you can only manage one at a time, try and do the second within a week or so of the first. If you want to, you can do two transects at the beginning of the survey season and the same two at the end of the survey season. If the beach is very wide it would be very helpful if you could do additional transects.

When you have filled in your recording sheet. Please send them to: Patrick Fitzsimons at East Sussex County Council, Beaches at Risk, c/o Transport & Environment, County Hall, St Anne's Crescent, Lewes, East Sussex, BN7 1EU or let me know you have them so that I can arrange to pick them up. You can also reach me on 01273 482015 or 07919 227601, or by e-mail: patrick.fitzsimons@eastsussex.gov.uk

Practice transects. You should find it gets easier and quicker to fill in the recording sheet after the first few attempts. Please send the practice sessions in with your final forms – write "**practice session**" on them. They will allow me to assess how easy the method is to do.

P.T.O.

How to fill in recording sheet

1. Wherever possible, start your transects from the highest strandline (**HS**) (a line of seaweed and/or detritus left by the sea). This will not necessarily be the newest strandline, especially later in the season. If you cannot determine **HS**, use the top of the highest ridge (**HR**) along the shore, seaward of the majority of the vegetation. Record where you start in appropriate box or **describe** where you start if you cannot fit the criteria above. If the odd plant occurs on the seaward side of where you start record the distance as a **negative value**. If you start from **SL**, also record where the top of **HR** begins.

2. Run your transects perpendicular to the shore. Line up your 1st transect relative to the start point supplied, or, if you are doing your own survey, estimate and record the start position in relation to permanent landmarks or features. Run measuring tape along the ground (take a picture from either end of your transect if you can).

3. If possible, do up to **100m transect lengths at a time** – if the beach is longer than 100 m, start another transect from the end of the 1st and record on a 2nd recording sheet, marking it in the "Sheet no". **Do not go beyond 200 m.** It's up to you when you do your transects. **Try to do at least 2 transects per session**, and try to keep sessions per beach as close together as possible (e.g. weekly).

4. You are going to walk the length of the transect twice, once up the beach and once down the beach, recording the following:

4.1 - **Estimate % of bare shingle over 10 m sections** and record against distance up beach in first column. Then, **estimate height of vegetation and % cover in each height category**: **L** = (low) cropped and/or prostrate, **M** = (medium) up to waist high, **H** = (high) above the waist. Use **Es** = exposed shingle in soil/sand and **S** = bare soil/sand. Put value in appropriate column. Total should = 100%. Not every box needs to be filled.

e.g.

Transects (W to E or S to N, seaward to landward)		1					
Record whether you start transect at highest strandline **SL**, or highest ridge **HR**							
% bare shingle at distance up beach		%	L	M	H	Es	S
Estimate **% bare shingle** over 10 m sections and record against distance up beach in first column.	up to 10 m	95	5				
	20 m	75	10	10		5	
	30 m						

Between 10 and 20 m from sea, there was 75% bare shingle; the vegetated part was made up of 10% cropped/prostrate vegetation and 10% up to waist. There was 5% exposed shingle in soil/sand.

4.2 - **Record the presence of only the species listed on the recording sheet** within ≈2.5 m either side of the measuring tape. Measure 1st and last occurrence of each species from the seaward side to the nearest metre (e.g. Yellow Horned-poppy, 1st = 11 m, last = 65 m). **Also, record** within which "10 m sections" they also appear in the appropriate right-hand columns with a tick (see below). (**NB**. you are highly unlikely to find all the species on the sheet on any one beach)

e.g.

Only look for these species (record 1st and last occurrence along transect to nearest metre)	1st nearest m	last m	1st m	last m	Tick for each "10 m se Transect 1									
					10	20	30	40	50	60	70	80	90	
Orache species* - *Atriplex* spp.														
Sea-kale - *Crambe maritima*														
Yellow Horned-poppy - *Glaucium flavum*	11	65					✓	✓	✓	✓				

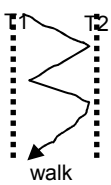
Yellow Horned-poppy was found between 11 and 65 m from sea and was also in every 10 m section between those two extremes.

4.3 - **Fill in shingle characteristics**. Roughly estimate to nearest 5%, percentage of shingle fitting into each category at the start, middle and the end of transect.

4.4 - **Record presence or evidence for** any vehicular activity, fire damage, trampling etc. Record distance up beach where these features are found.

5. **You have now finished the 1st transect**. To locate the start of the **2nd transect**, measure ≈100m along the beach (parallel to shore) from the 1st transect. If the beach is not wide enough for this, or 100m falls somewhere unsuitable, use a shorter distance and record this on the sheet and the map. **Do 6 then repeat 1 - 5.**

6. Make a **V or W-shaped walk** (depending on length of transects) between transects and record any of the preselected species not already found in transects in the appropriate column on the recording sheet. Put a cross on the recording sheet between the relevant transects where you found them – these records can remain even if the species are subsequently found in a transect (walk at normal walking pace).



7. **Repeat 1 - 6** until predetermined number of transects completed.

8. **Remember** to fill in **other details** on the recording sheet, the site, your name, the date, the time taken and a brief description of the beach.

9. Add as much or as little detail as you want in last two sections.

Site		**Recorder(s)**		**Sheet no.**		sketch of beach profile here
Start point - put **X** on map or take GPS reading for each transect			**Date**		**Time to complete**	

Transects (W to E or S to N, seaward to landward)	**1**						**2**						**Record where top of HR is if you start from HS, plus any comments you want to make**	
Record whether you start transect at highest strandline **HS**, or highest ridge **HR**.														
% bare shingle at distance up beach	**%**	**L**	**M**	**H**	**Es**	**S**	**%**	**L**	**M**	**H**	**Es**	**S**	**Transect 1**	**Transect 2**
Estimate **% bare shingle** over 10 m sections and record against distance up beach in first column. Then, estimate height of vegetation and estimate % cover : **L** = low - cropped and/or prostrate, **M** = medium - up to waist high, **H** = high - above the waist, **Es** = exposed shingle in soil/sand. **S** = bare soil/sand. Put value in appropriate column. Total should = 100%. Not every box needs to be filled.														
up to **10 m**														
20 m														
30 m														
40 m														
50 m														
60 m														
70 m														
80 m														
90 m														
100 m														
length of transect (estimate extent of beach beyond end of your transect)														

Only look for these species (record 1st and last occurrence along transect to nearest metre)	**1st** nearest m	**last** m	**1st** m	**last** m	Tick each "10 m section" species also found in Transect 1										Transect 2										on site but not found in transects
					10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100	
Orache species* - *Atriplex* spp.																									
Sea-kale - *Crambe maritima*																									
Yellow Horned-poppy - *Glaucium flavum*																									
Curled Dock - *Rumex crispus* ssp. *littoreus*																									
Bittersweet - *Solanum dulcamara* var. *marinum*																									
Buck's-horn Plantain - *Plantago coronopus*																									
Common Nettle - *Urtica dioica*																									
Herb Robert - *Geranium robertianum* ssp. *maritimum*																									
Least Lettuce - *Lactuca saligna*																									
Lichens* (black, powdery)																									
Lichens* (yellow)																									
Prickly Saltwort - *Salsola kali*																									
Red Hemp-nettle† - *Galeopsis angustifolia*																									
Red Valerian - *Centranthus ruber*																									
Rock Samphire - *Crithmum maritimum*																									
Sea Beet - *Beta vulgaris* ssp. *maritima*																									
Sea Bindweed - *Calystegia soldanella*																									
Sea Campion - *Silene uniflora*																									
Sea Clover - *Trifolium squamosum*																									
Sea Knotgrass - *Polygonum maritimum*																									
Sea Mayweed - *Tripleurospermum maritimum*																									
Sea Pea - *Lathyrus japonicus*																									
Sea Purslane - *Atriplex portulacoides*																									
Sea Radish - *Raphanus raphanistrum* ssp. *maritimus*																									
Sea Rocket - *Cakile maritima*																									
Sea Sandwort - *Honckenya peploides*																									
Sea Spurge - *Euphorbia paralias*																									
Sea-blite - *Suaeda* spp.																									
Sea-heath - *Frankenia laevis*																									
Sea-holly - *Eryngium maritimum*																									
Sea-lavender species* - *Limonium* spp.																									
Sheep's Sorrel - *Rumex acetosella*																									
Silver Ragwort - *Senecio cineraria*																									
Snow-in-summer - *Cerastium tormentosum*																									
Sticky Groundsel - *Senecio viscosus*																									
Stonecrop species* - *Sedum* spp.																									
Thrift - *Armeria maritima*																									
Toadflax species*† - *Linaria* spp.																									
Tree Mallow - *Lavatera arborea*																									
Viper's-bugloss† - *Echium vulgare*																									
Wild Cabbage - *Brassica oleracea*																									
Wood Sage - *Teucrium scorodonia*																									
Grasses* (cropped)																									
Grasses* (tussocks)																									
Lichens* (greyish greenish, bushy)																									
Mosses*																									

* - if you know which particular species you have found make a note

† - if you find these species have a quick look for presence of host-specific invertebrates as highlighted on "Invert species to look for"

Please fold over for scrub and additional observations/comments that need to be entered

Scrub	1st nearest m	last m	1st m	last m	Tick each "10 m section" species also found in Transect 1: 10 20 30 40 50 60 70 80 90 100	Transect 2: 10 20 30 40 50 60 70 80 90 100	on site but not found in transects
Blackthorn - *Prunus spinosa.*							
Brambles - *Rubus* spp.							
Broom - *Cytisus scoparius*							
Elder - *Sambucus nigra*							
Gorse - *Ulex europaeus*							
Sea-buckthorn - *Hippophae rhamnoides*							
Unknown or other							
Unknown or other							

Shingle characteristics		Roughly estimate percentages to nearest 5% in each category in a roughly 2x2m square per transect at start, middle and finish of transect							
		S	M	F	S	M	F	Transect 1	Transect 2
Colour	**orangey**								
	greyish								
Size - size range in brackets	**cobbles (fist - head)**								
	pebbles (50p - fist)								
	gravel (pea - 50p)								
	sand								
Shape	**very rounded**								
	inbetween								
	very angular								

Note also presence of or evidence for	Record distance along the transect that you find these features				on site but not found in transects
Trampling e.g. paths made by people walking across shingle					
Concreted areas or other man-made structures					
Vehicular activity e.g. tyre tracks					
Dog mess					
Rabbit droppings					
Fire damage					
Garden waste					
Garden escapes					
Other damge and/or waste of note					
Shingle ridges					
Other obvious communities (tick if present)	**Salt marsh**		**Salt lagoon**		

Brief description of what surrounds the beach e.g. beach is surrounded by cliffs to west, a coast road on landward side and a harbour wall to the east

Other species of interest - do not have to be plant species (these will not necessarily form part of analysis but are very useful data to have)	1st	last	1st	last			on site but not found in transects

Additional comments This section does not have to be filled in but you can put anything here that you think of not already covered

Plages à Risque – étude de plages de galets avec végétation - instructions

Votre Objectif. Vous allez placer un transect (une ligne) perpendiculaire au rivage en allant vers l'intérieur des terres. Vous marcherez le long de ce transect deux fois, une fois en remontant la plage et une fois en redescendant vers le début, cela tout en cherchant des espèces de plantes et en observant certaines caractéristiques de la plage comme décrit sur la **feuille d'enregistrement** et au verso de ce document à la partie **comment compléter la feuille d'enregistrement.**

Quand faire l'étude? Idéalement, Entre fin mai et début septembre.

Où commencer l'étude? Le point de départ approximatif de votre 1er transect sera **soit**:

- prédéfini par un **X** sur une carte se référant à un repère (voir la **figure 1**) **soit**
- marqué sur une carte par vous-même vous référant à un repère convenable (et permanent).

NB. Vos transects devraient enregistrer une aussi bonne représentation de la végétation sur la plage que possible. Si vous estimez qu'un transect du point de départ indiqué ne rendrait compte de ceci, changez le, et notez le nouveau point de départ.

Ex. mesurez 80 grands pas (ou 160 petits) d'un point sur le rivage en ligne avec le bloc d'appartements. Là où vous placez le début exact du transect sera déterminé par l'instruction **1** au verso.

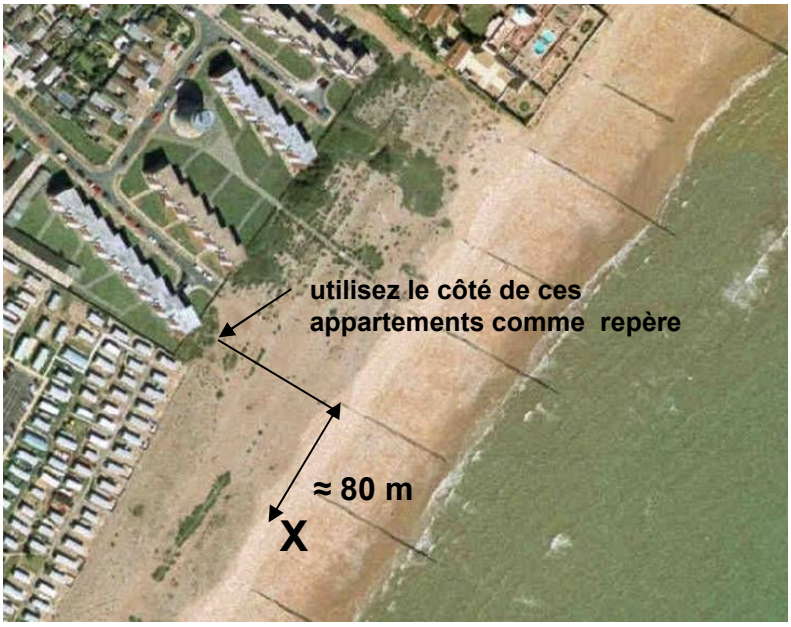


Figure 1.

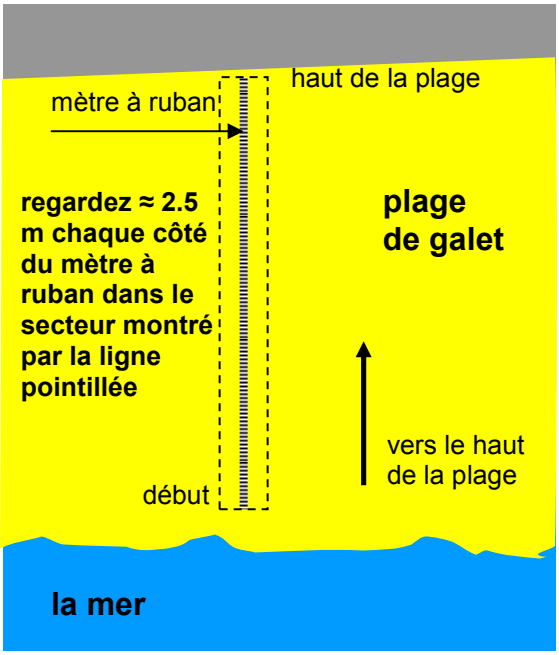


Figure 2.

Placement du transect. Mettez en place le mètre à ruban comme le montre la **figure 2.** Il peut être utile de placer de grands cailloux tous les 10 m, particulièrement s'il y a du vent. Utilisez le mètre à ruban comme votre ligne repère et estimez environ les 2,5m de chaque côté du mètre (illustré en pointillé sur la **figure 2** ci-dessus). C'est le secteur que vous allez examiner en suivant la méthode décrite au verso.

Combien de transects? Essayer si possible de faire **au moins deux transects** par plage. Si vous avez seulement le temps d'en faire un à la fois, essayez de faire le second pendant la semaine qui suit. Si vous voulez, vous pouvez faire deux transects au début de la saison et les mêmes à la fin de saison. Si la plage est grande ce serait très utile d'en faire deux supplémentaires.

Quand vous avez complété votre feuille d'enregistrement. Veuillez SVP les envoyer à: Patrick Fitzsimons, East Sussex County Council, Plages à Risque, c/o Transport & Environment, County Hall, St Anne's Crescent, Lewes, East Sussex, BN7 1EU, ou scannez les et envoyez les mois par E-mail à: patrick.fitzsimons@eastsussex.gov.uk

Transects de pratique. Vous trouverez que ça devient plus facile et plus rapide de compléter la feuille d'enregistrement après les premiers essais. Veuillez SVP envoyer les sessions de pratique avec vos formes finales - écrivez **"session de pratique"** sur les feuilles. Elles me permettront d'évaluer la simplicité de la méthode.

T.S.V.P.

Comment remplir la feuille d'enregistrement

1. Quand cela est possible, commencez vos transects à partir de la laisse de mer (une ligne algue et/ou détritus laissée par la mer) la plus haute. Si vous ne pouvez pas la déterminer, commencez sur le haut de la crête la plus haute le long du rivage vers le large de la majorité de la végétation. Enregistrez votre départ dans la case appropriée ou bien **décrivez** où vous avez commencé si vous ne pouvez pas utiliser les critères ci-dessus. S'il y a une plante quelconque du côté mer avant le début de votre transect enregistrez la distance en tant que valeur négative. Si vous commencez a **LdM**, notez aussi où le haut de **Cr** commence.

2. Parcourez vos transects perpendiculaires au rivage. Alignez votre 1er transect au point de départ donné, ou, si vous commencez ailleurs, estimez et enregistrez la position de début par rapport à un repère permanent. Déroulez un mètre à ruban entre deux marqueurs évidents à chaque extrémité (une photo prise des extrémité de votre transect serait très utile).

3. Si possible, déterminez un **transect de 100 m en une seule fois** - si la plage est plus longue que 100 m, commencez un autre transect à partir de la fin de la 1ère et, sur une 2ème feuille d'enregistrement, marquez bien dans les cases appropriées ("numéro de feuille." et "début"). C'est à vous de décider quand vous faites vos transects. **Essayez de faire au moins 2 transects par session**, et essayez de garder les sessions par plage aussi proches que possible (ex. la semaine qui suit).

4. Vous allez marcher le long du transect deux fois, une fois vers le haut de la plage et une fois en retournant vers la mer, en enregistrant les informations suivantes:

4.1 - **Estimez le % de galets nus à l'intérieur de sections de 10 m de superficie** et enregistrez les données observées en parcourant la distance vers le haut de la plage dans la 1ère colonne. Puis **estimez la hauteur de la végétation et le % de recouvrement dans chaque catégorie de hauteur**: **C** = taillé/prostré, **M** = jusqu'à la taille, **H** = au-dessus de la taille, **Es** = galet exposé dans le sol. Mettez la valeur dans la colonne appropriée. Le total devrait être = 100%. Ce n'est pas nécessaire de remplir chaque case.

ex.

Transects (W to E or S to N, seaward to landward)		1					
Record whether you start transect at highest strandline **SL**, or highest ridge **HR**							
% bare shingle at distance up beach		%	L	M	H	Es	S
Estimate **% bare shingle** over 10 m sections and record against distance up beach in first column.	up to 10 m	95	5				
	20 m	75	10	10		5	
	30 m						

→ *Entre 10 et 20 m de la mer, il y avait 75% de galet nu, la partie végétale était composée de 10% végétation taillé/prostré, 10% jusqu'à la taille. Il y avait 5% galet exposé dans le sol.*

4.2 - **Enregistrez <u>seulement</u> la présence des espèces présélectionnées décrites sur la feuille d'enregistrement** à l'intérieur d'un périmètre de 2.5m de chaque côté du mètre à ruban. Mesurez la 1ère et la dernière occurrence à partir du rivage au mètre le plus proche (par exemple Chou marin, 1er = 10 m, derniers = 65 m). **Enregistrez** dans lesquels des sections de 10 m se trouve l'espèce dedans la colonne droite. (**NB**: il y a peu de chance que vous trouviez toutes les espèces énoncées sur la feuille sur n'importe quelle plage).

ex.

Only look for these species (record 1st and last occurrence along transect to nearest metre)	1st nearest m	last m	1st m	last m	Tick for each "10 m se Transect 1								
					10	20	30	40	50	60	70	80	90
Orache species* - *Atriplex* spp.													
Sea-kale - *Crambe maritima*													
Yellow Horned-poppy - *Glaucium flavum*	11	65				✓	✓	✓	✓	✓			

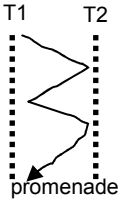
→ *Le Pavot cornu était trouvé entre 11 et 65 m de la mer, et était aussi dedans chaque section de 10 m entre ces deux extrêmes.*

4.3 - **Complétez les caractéristiques du galet.** Estimez au 5% le plus proche, le pourcentage de galets dans chaque catégorie au début, au milieu et la fin du transect.

4.4 - **Présence ou évidence de toute** activité véhiculaire, dommage de feu, piétinement etc. Enregistrez la distance vers le haut de la plage où ces caractéristiques sont trouvées.

5. **Vous avez maintenant fini le 1er transect**. Pour localiser le début du **2ème transect**, mesurez ≈100 m (100 grands pas) le long de la plage (parallèle au rivage) à partir du 1er transect. Si la plage n'est pas assez étendue pour que cela vous soit possible, ou bien si les 100 m tombent sur un endroit peu convenable, mesurez une distance plus courte et enregistrez cela sur la feuille et la carte. **Faites 6 puis répétez les démarches de 1 à 5**.

6. Faites une **promenade en forme de V ou W** (selon la longueur du transect) entre les transects et enregistrez n'importe quelle espèce présélectionnée que vous n'avez pas déjà trouvée dans les transects dans la colonne appropriée (dernière colonne de droite). Marquez d'un X la feuille d'enregistrement entre les différents transects où vous les aurez trouvés - ces enregistrements peuvent rester, même si les espèces sont trouvées ensuite dans un transect. (Marchez au pas normal)



7. **Répétez de 1 à 6** jusqu'à ce que le nombre prédéterminé de transects soit accompli.

8. **<u>N'oubliez</u>** pas les **autres détails** de la feuille d'enregistrement, la location, votre nom, la date, le temps pris et une description courte de la plage.

9. Ajoutez autant de détails que vous voulez dans les deux sections à la fin de la feuille d'enregistrement.

Lieu		**Enregistreur(s)**		**Numéro de feuille**		croquis du profil de plage ici
Point de début - mettez **X** sur la carte ou prenez une mesure SIG pour chaque transect			**Date**		**Temps pour compléter**	

Transects (o à e, ou s à n, du côté large vers l'intérieur)	**1**						**2**						**Notez où le haut de Cr est si vous commencez à LdM plus pour n'importe quels commentaires que vous voulez faire**	
Notez où vous commencez le transect, **LdM** = laisse de mer plus haute, **Cr** = crête plus haute.														
% de galets contre distance du rivage	**%**	**B**	**M**	**H**	**Ge**	**S**	**%**	**B**	**M**	**H**	**Ge**	**S**	**Transect 1**	**Transect 2**
Estimez le **%** de galets nus dans sections de 10 m par rapport à la distance parcourue vers le haut de la plage dans la première colonne. Puis estimez la hauteur de la végétation et estimez le % de couverture: **B** = vegetation bas - taillé/prostré, **M** = jusqu'à la taille , **H** = au-dessus de la taille, **Ge** = galet exposé au sol/sable, **S** = sol/sable nu. Mettez la valeur dans la colonne appropriée. Total = 100% Ce n'est pas nécessaire de remplir chaque case.														
jusqu'à 10 m														
20 m														
30 m														
40 m														
50 m														
60 m														
70 m														
80 m														
90 m														
100 m														
distance du transect (estimez l'ampleur de la plage au-delà la fin du transect)														

Cherchez pour ces espèces seulement (enregistrez la 1ère et la dernière apparition le long du transect au mètre le plus proche)	**1ère m à côté**	**dernière m**	**1ère m**	**dernière m**	**Cochez lesquelles des «sections de 10 m» où se trouve l'espèce**																	sur lieu mais pas dans transects
					Transect 1										**Transect 2**							
					10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100	
Arroches* - *Atriplex* spp.																									
Chou marin - *Crambe maritima*																									
Pavot cornu - *Glaucium flavum*																									
Patience crépu - *Rumex crispus*																									
Douce amère - *Solanum dulcamara* var. *marinum*																									
Betterave (de mer) - *Beta vulgaris* ssp. *maritima*																									
Cakilier - *Cakile maritima*																									
Céraiste tomenteux - *Cerastium tormentosum*																									
Chou sauvage - *Brassica oleracea*																									
Criste marine - *Crithmum maritimum*																									
Euphorbe maritime - *Euphorbia paralias*																									
Frankénie - *Frankenia laevis*																									
Galéopsis à feuilles etroites† - *Galeopsis angustifolia*																									
Gazon d'Olympe - *Armeria maritima*																									
Gesse maritime - *Lathyrus japonicus* ssp. *maritimus* (éteint)																									
Grande ortie - *Urtica dioica*																									
Herbe à Robert - *Geranium robertianum*																									
Laitue à feuilles de saule - *Lactuca saligna*																									
Lavaterre arborescente - *Lavatera arborea*																									
Lichens* (jaune)																									
Lichens* (taches noires)																									
Linaires*† - *Linaria* spp.																									
Liseron soldanelle - *Calystegia soldanella*																									
Matricaire (de mer) - *Matricaria maritima ssp. maritima*																									
Obione faux pourpier - *Halimione portulacoides*																									
Orpins* - *Sedum* spp.																									
Panicault de mer - *Eryngium maritimum*																									
Petite oseille - *Rumex acetosella*																									
Plantain corne-de-bœuf - *Plantago coronopus*																									
Pourpier de mer - *Honckenya peploides*																									
Radis (de mer) - *Raphanus raphanistrum* ssp. *landra*																									
Renouée maritime - *Polygonum maritimum*																									
Sauge des bois - *Teucrium scorodonia*																									
Séneçon cinéraire - *Senecio cineraria*																									
Séneçon visqueux - *Senecio viscosus*																									
Silène à une seule fleur - *Silene vulgaris* ssp. *maritima*																									
Soude salsovie - *Salsola kali*																									
Soudes - *Suaeda* spp.																									
Statices* - *Limonium* spp.																									
Trèfle maritime - *Trifolium maritimum* spp. *maritimum*																									
Valériane rouge - *Centranthus ruber*																									
Vipérine commune† - *Echium vulgare*																									
Herbes* (taillées)																									
Herbes* (touffes)																									
Lichens* (verts, touffues)																									
Mousses*																									

*** -** si vous pouvez identifier l'espèce que vous avez trouvée, faites une note au verso dans « autres espèces d'intérêt

† - si vous trouvez ces espèces cherchez rapidement pour la présence des invertébrés hôtes spécifiques figurés sur la « feuille d'identification »

Repliez svp pour buissons et réflexions additionnelles qui devraient être enregistrées

Buissons	1ère m à côté	dernière m	1ère m	dernière m	Cochez lesquelles des «sections de 10 m» où se trouve l'espèce — Transect 1: 10 20 30 40 50 60 70 80 90 100	Transect 2: 10 20 30 40 50 60 70 80 90 100	sur lieu mais pas dans transects
Ajonc d'Europe - *Ulex europaeus*							
Argousier - *Hippophae rhamnoides*							
Epine noire, Prunellier - *Prunus spinosa.*							
Genêt à balai - *Cytisus scoparius*							
Ronces - *Rubus* spp.							
Sureau - *Sambucus nigra*							
Inconnu ou autre							
Inconnu ou autre							

Caractéristiques du galet		Estimez au 5% le plus proche, le pourcentage de galets dans chaque catégorie dans un secteur d'environ 2x2m par transect au début, au milieu et la fin du transect.							
		D	M	F	D	M	F	Transect 1	Transect 2
Couleur	**orangé**								
	grisâtre								
Taille - classe de grandeur entre parenthèses	**pavé rond (poing - tête)**								
	caillou (€2 - poing)								
	gravillon (pois - €2)								
	sable								
Forme	**très arrondi**								
	entres les deux								
	très anguleux								

Notez aussi la présence de ou l'evidence pour	**Mesurez la distance le long du transect où vous trouvez ces caractéristiques**				sur lieu mais pas dans transects
Activité véhiculaires ex. traces de pneu					
Autres dégâts et/ou déchets					
Cordages					
Crottes de lapin					
Déchets de jardin					
Dommages de feu					
Crottes de chien					
Piétinement ex.chemins faits par des personnes marchant à travers le galet					
Plantes échappées de jardin					
gravats					
D'autres communautés évidentes (cochez si présente)	**Marais salant**		**Lagune salante**		
Description courte de ce qui entoure la plage	ex. la plage est entourée par des falaises à l'ouest, une route de côte sur le côté intérieur et d'un mur de port à l'est				

Autres espèces d'intérêt - espèces autres que plantes aussi (celles-ci ne feront pas nécessairement partie de l'analyse mais sont des données très utiles à avoir)	1ère	dernière	1ère	dernière			sur lieu mais pas dans transects

Commentaires additionnels	Cette section n'a pas besoin d'être complétée mais vous pouvez mettre n'importe quoi si ce n'est pas déjà décrit

Beaches at Risk - Vegetated shingle plant guide

Yellow Horned-poppy (*Glaucium flavum*) – typical colonising plant of bare shingle. Each individual plant produces one to several rosettes with a single flower stalk emerging from each. Flowering starts in mid-May and may last well into October, but yellow flowers (6-9cm across) generally only last a day. After flower has dropped, a very long and curved seed-pod develops (up to 30cm long) which eventually splits lengthways to reveal 100s of small seeds. Waxy leaves are greyish-green (glaucous) and covered with fine short hairs. Each rosette of leaves and its flowering stem dies in autumn and plant overwinters as a rosette whose leaves are smaller and hairier than normal. Overwintering rosettes and new plants may well be mistaken for a different species by casual observer.

Sea-kale (*Crambe maritima*) – long-lived perennial plant. Leaves have a thick waxy covering (may be > 50cm in old plants; established individuals can be several meters across). First flowering generally when plant at least 5 years old. Flowering branches covered with small white flowers (May- August). Fruit ripens a few months after flowering and whole flowering branch, including fruit, dries out and generally break off from plant, hastened by strong winds. Average plant produces 5-10,000 seeds (corky, ≈15mm) a year. At end of growing season, above ground parts die back, underground parts alone survive winter. Each spring, previous year's flowering branch produces a succession of cabbage-like leaves. First leaves are a deep vivid crimson-purple, successive leaves becoming greener.

Curled Dock (*Rumex crispus* ssp. *littoreus*) is a pioneer species on shingle. Stem can reach a height of 3ft. Slightly fleshy leaves with wavy margins. Tiny green or reddish flowers (May-August). Fruit is roughly triangular, with usually, three swollen seeds. Thin membrane surrounding seeds is smooth.

Bittersweet (*Solanum dulcamara* var. *marinum*) or Woody Nightshade grows low to ground. Leaves pointed oval, often 1 or more pairs of narrow lobes at base. Has red berries (deadly nightshade has black) and distinctive purple and yellow flowers (10-15mm) (May-November). This plant is poisonous if eaten. Leaves give strong scent when rubbed.

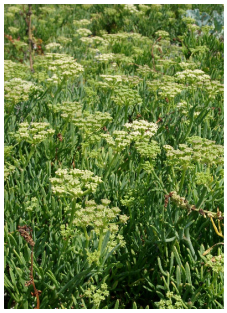
Buck's-horn Plantain (*Plantago coronopus*) – often very small and prostrate, flat rosette of deeply lobed leaves usually downy, one-veined. Flowers on 20-40mm spikes, brownish with yellow anthers (May-October)

Herb-Robert (*Geranium robertianum*) – may be subspecies *maritimum* on coast. Generally prostrate and hairless on shingle, stems and leaves often reddish. Has strong smell. Deep pink flowers (≈13mm – 5 petals) (May-September). Fruits with long beak.



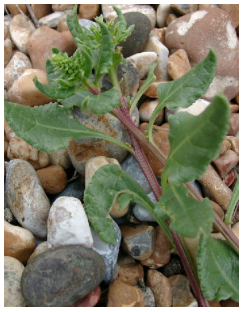
Oraches (*Atriplex* spp.) – found along shingle shoreline, flowering plant growing closest to the high water mark. Forms a low mat of pale green plants in splash zone where previous winter storms scattered seed into spaces between stones. Plants will be very small and harder to find earlier in the year. Tiny green flowers in slender open leafy spikes (July-September). Fruit, one seed between pair of fleshy, often bumpy bracts†. In autumn green stripe along beach turns yellow.


Prickly Saltwort (*Salsola kali*) – stems 20-40cm, often pink-striped. Leaves 10-40mm, fleshy, rounded, spine-tipped. Tiny white or tinged pink flowers (July-August) usually singly in tuft of leaf-like bracts† at base of leaves. **VU.**


Rock Samphire (*Crithmum maritimum*) – bushy, grey-green perennial. Fleshy leaves strong-smelling when crushed. Flowers yellowish-green (30-60mm umbels†) (July –September). Unlikely to be confused with any other plant.





Sea Beet (*Beta vulgaris* ssp. *maritima*) forms sprawling clumps on shingle beaches and cliffs and other coastal habitats. Leathery leaves dark green and glossy; stems often reddish. Long and wavy flower spikes appear from July-September. Tiny stalkless flowers have no petals, but yellow stamens are visible when plant is in full flower. Fruit enclosed in a corky structure.


Sea Bindweed (*Calystegia soldanella*) – trailing plant, hairless, fleshy kidney-shaped leaves. Milky sap. Pink flowers with white stripes 25-40mm across. Flowers June-August. Fruit is spherical 1-celled capsule.



Sea Campion (*Silene uniflora*) – forms mat with prostrate unbranched stems to 30cm. Fleshy, stiff, narrow leaves in opposite pairs. Erect flowers 20-25mm, 5 petals deeply notched, often solitary per stem with yellowish, purplish oblong calyx-tubes† 17-20mm long. Flowers March-October.


Sea Mayweed (*Tripleurospermum maritimum*) - perennial plant, woody at base. Leaves blunt, somewhat fleshy, linear segments. Daisy-like flowers (20-45mm); as flower matures, receptacle† swells up.

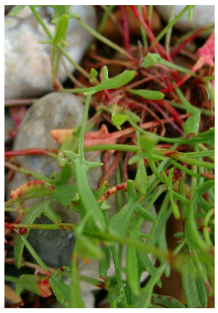


Sea Radish (*Raphanus raphanistrum* ssp. *maritimus*) – up to 1.5m high, yellow flowers – 4 petals (≈25mm) (June-August), beaked pods, 1-5 bead-like joints which do not readily break apart when ripe.

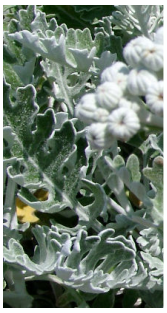

Sea Rocket (*Cakile maritima*) – leaves fleshy, shiny and hairless. Flowers white or pale to darker lilac, 4 petals (6-12mm) (June-August). Usually on drift-line and above on sand, rarely on shingle.



Sea Sandwort (*Honckenya peploides*) – Flowers (6-10mm) (May-August) greenish-white, 5 petals. Narrow petals ≈ sepals† in male flowers, shorter in female flowers. Fruits yellow-green.



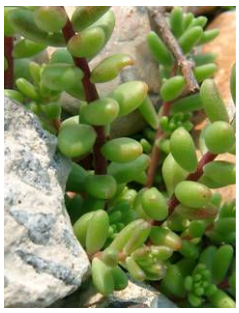

Sheep's Sorrel (*Rumex acetosella*) - leaves have basal lobes pointing sideways or forwards. All leaves stalked. Stems often red. Red flowers (2mm) emerge from upright stem (10-20cm) (April-July). Fruits no warts.



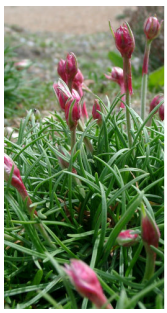

Silver Ragwort (*Senecio cineraria*) – silver-grey, white-felted stiff leaves, may be green on top. Yellow flowers in Umbel-like† clusters (8-12mm) (June-August).

Sticky Groundsel (*Senecio viscosus*) – glandular hairs on stem, which makes it feel very sticky. Flowers (≈8mm) July-September – bracts† around flower green-tipped (not black).





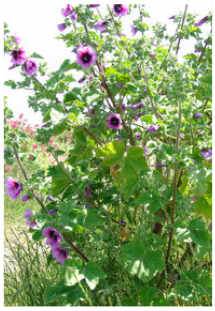

Biting Stonecrop (*Sedum acre*) – low (2-10cm) mat-forming, fleshy egg-shaped yellow-green leaves (3-5mm), pressed close to and lying flat along stem, with peppery taste (taste very little). Yellow flowers (12mm) (July-August). **English Stonecrop** (*S. anglicum*) – low (2-5cm) mat-forming, evergreen, fleshy egg-shaped waxy-grey, usually red-tinged, alternate leaves (3-5mm). Little-branched clusters of few white flowers, pink-tinged on back (12mm) (June-September). **White Stonecrop** (*S. album*) – taller (7-15cm), shiny green to red-tinged cylindrical-oblong, blunt leaves 6-12mm). Flowers in branched umbel-like† clusters, white or pink-tinged (6-9mm) (June-August).


Thrift (*Armeria maritima*) – cushion-forming evergreen, narrow (1-2mm) linear and fleshy leaves. Several pink flowers (8mm-5 petals) in tight roundish heads (1.5-2.5cm) above small brown papery bracts† on 5-30cm long downy, leafless stalks (April-October). Usually on cliffs and saltmarsh.




Toadflax species (*Linaria* spp.) **Common Toadflax** (*L. vulgaris*) Yellow flowers, orange bulge, long straight spur in spikes (June-October) (18-35mm). Erect with very narrow grey-greenish leaves. **Purple Toadflax** (*L. purpurea*) – much smaller purple flowers. **aSAP** (see insects to look for).



Tree Mallow (*Lavatera arborea*) – erect, shrub-like up to 3m, woody stems. Leaves (to 8cm) softly downy. Flowers (3-5cm) purplish-pink and purple-veined, 2 or more at each node (June-September). Nutlets wrinkled.


Grasses – try to distinguish between discrete clumps/tufts of up to knee-high grasses and areas of dense and close-cropped turf (often with evidence of rabbits)



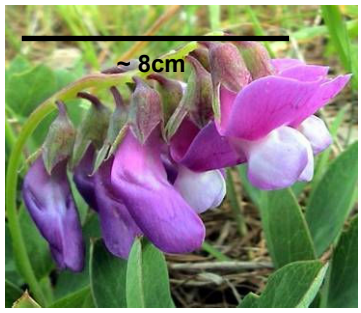
Lichens† **& mosses** – look for crustose lichens on bare shingle, may look like a dusting of black powder to naked eye. Look for foliose and fruticose lichens in vegetation covered sections, often in closely cropped turf, on landward side of beach. Varied shades of grey, green, blue-green and may feel crunchy underfoot.

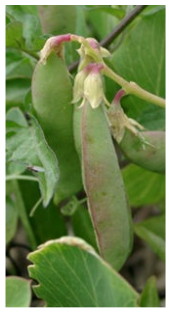

Viper's-bugloss (*Echium vulgaris*) - rough hairy leaves and tall (up to 90cm) flower spike bearing dozens of flowers. Funnel-shaped flowers (15-20mm) (May-September) start pink and turn vivid blue - in a branched spike, with all stamens† protruding. Stamens remain red. Nectar good source of food for moths, butterflies and bees – host plant for several rare moths (see insects to look for).


Broom (*Cytisus scoparius*) - almost hairless, small leaves and very green 5-ridged stems. Flowers (15-20mm), rich yellow, scattered up the stem (April-June). Pods flattened black, hairy edges. **Hairy-fruited Broom** (*C. striatus*) – 10-ridged stems. **Spanish Broom** (*Spartinum junceum*) – no ridges on stems.

Gorse (*Ulex europaeus*) – impenetrable thicket-forming, spiny shrub. Spines furrowed, downy when young. Flowers (15-20mm), rich yellow, almond/coconut scented, throughout year but best April-June. Pods hairy, black, popping loudly on hot days. **Dwarf Gorse** (*U. minor*) – smaller weaker spines, more prostrate, smaller pale yellow flowers (8-15mm) (July-October).

Sea Clover (*Trifolium squamosum*) – narrow trefoil leaves (3-leaved). Erect & downy. Pale pink flowers in short-stalked egg-shaped heads (10-20mm) with two pairs of trefoil leaves closely beneath flower heads (June-August). In fruit teeth of joined sepals† spread outward, star-like. Mainly on brackish mud. **NS.**

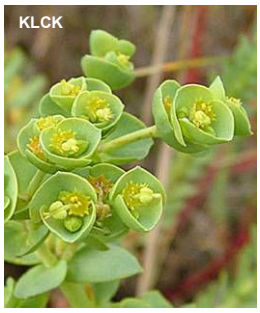





Sea Pea (*Lathyrus japonicus*) – bluish-green, fleshy leaves with 2-5 oval leaflet pairs. Flowers (15-25mm), 2-10 in short stalked spike (June-August). Pods green-becoming brown with 5-8 peas (like garden peas). Does not generally flower before its third year, but a well-established plant may have 40-50 inflorescences each bearing 7-9 flowers. Forms green, low growing mats on bare shingle. Dies back in winter. **NS.**







Sea Spurge (*Euphorbia paralias*) - an erect perennial, up to 1m tall, with close-packed green, fleshy leaves up to 15 mm long, often tinged with red. Yellowish flowers, which lack petals and sepals†, appear June-October. Tends to be found in sand or sandy shingle.



Sea-heath (*Frankenia laevis*) – prostrate, often matted heath-like woody perennial. Leaves short, fleshy, opposite, with inrolled margins. Pink flowers (5-petals) (July-August). **NT, NS.**


Sea-holly (*Eryngium maritimum*) - perennial with spiny holly-like blue-green and white-veined leaves. Globular umbels† of powder blue flowers between July and September, after which seed is set and plant dies back.



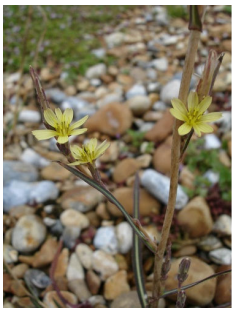



Sea-lavenders (*Limonium* spp.) – simple leaves most of which produced in a dense basal rosette, with flowering stems bearing only small brown bracts†. Flowers produced on a panicle†, small pink/purple flowers (4-10 mm), 5-petals. Some species **SAP.**

Wild Cabbage (*Brassica oleracea*) – stout stem to 60cm and woody at base, with old leaf scars. Leaves wavy bluish-grey, upper clasping stem. Flowers yellow, 30-40mm in long spike well overtopped by buds (April-September). **NS.**



Wood Sage (*Teucrium scorodonia*) – downy perennial. Stem square and hairy. Flowers (July-September) pale greenish-yellow, prominent stamens† and purple anthers†, borne in pairs towards tips of stems. Often found on old established shingle in East Sussex & Kent.




Least lettuce (*Lactuca saligna*) has long green leaves with a very pale mid-rib. Flowering from late July-late August. Flowers 9-11mm and close by mid-day. Plants can be tiny and often show rabbit damage. **W&C, EN, NR.**


Red Hemp-nettle (*Galeopsis angustifolia*) - Flowers from July-October, setting seed late. Softly hairy, weakly-toothed narrow leaves in opposite pairs on stem, nodes not swollen. Produces small rosy-purple flowers (14-25mm), white spots on bottom petal in small whorls around stem. Plants can be tiny and often show rabbit damage. **CR, NS, SAP** (see inverts to look for).

Sea Knotgrass (*Polygonum maritimum*) – prostrate with stem woody at base, leaves 2-5cm long, waxy, grey-green, with edges rolled-back underneath, long silvery sheaths. Flowers, 1-4 together, pinkish-white (July-September). **W&C, VU, NR.**


Common Nettle (*Urtica dioica*) – leaves in opposite pairs, toothed with stinging hairs. Tiny greenish flowers (May-September) in drooping catkin-like structures with yellow anthers†.


Red Valerian (*Centranthus ruber*) – bushy to 80cm high. Leaves pale grey-green, pointed oval, lowest stalked. Fragrant red, pink or white flowers (4-6mm) in loose panicles† - 5 petals on slender tube with pointed spur (April-October).


Snow-in-summer (*Cerastium tomentosum*) – mat-forming, almost white with short woolly hairs. White flowers-5 petals, deeply notched (up to 30mm) (May-August).



Scrub – this vegetation category may include following: **Bramble species** (1) (*Rubus* spp) – very prickly, prostrate to clambering. Leaves 3-5 broad toothed leaflets. Flowers white or pink (20-32mm) (May-November). Fruit blackberry. **Sea-buckthorn** (2&3) (*Hippophae rhamnoides*) – thorny shrub with silvery leaves. Leaves narrow, untoothed, brown below, silvery when young. Flowers tiny, green, petalless, up the stems (April-June) before leaves. Fruit an orange berry. **Elder** (4&5) (S*ambucus nigra*) – strong smelling shrub or small tree. Leaves dark green with 5 leaflets. Flowers white, fragrant (May-August). Fruit, clusters of smooth black berries. (see **Broom** and **Gorse** also)


Ancient shingle ridges – look for series of parallel ridges and troughs with smooth slopes; ridges often vegetated while troughs remain bare. **Often accompanied by Shingle sorting** – smaller on top of ridge often with vegetation, larger in troughs and often bare.

W&C = Plants specifically listed on Schedule 8 of The Wildlife and Countryside Act, 1981 (Schedule 8 plants) which have special protection against picking, uprooting, destruction and sale (all other wild plants also protected against uprooting without landowner's permission. Even non-vascular plants, which have no roots, are protected, because uprooting is defined as removal from the site. Reviewed every five years.

CR = Critically endangered, **EN** = Endangered, **VU** = Vulnerable, **NT** = Near threatened, **DD** = Data deficient. The Vascular Plant Red Data List for Great Britain, Cheffings & Farrell (2005) - IUCN criteria used to assess the threat status (IUCN, 2001). The CR, EN and VU categories are considered to be threatened categories. Near threatened species should be close to qualifying for one of these categories. Data deficient is not a threatened category, but indicates a need for more information in order to determine the appropriate category.

NR = Nationally rare - occurring in 15 or fewer hectads in UK, **NS** = Nationally scarce - occurring in 16-100 hectads in UK.

SAP = Species with its own Action Plan, **aSAP** = Species with associated SAP species.

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† see below for definitions

anther = upper part of the stamen where the pollen is produced.

bract = a leaf or scale, usu. small, growing below the calyx of a plant.

calyx = a whorl of leaves (sepals), forming the outer case of a bud or the envelope of a flower.

lichens: crustose - crustlike, growing tight against the substrate. **foliose** - leaflike, with flat sheets of tissue. **fruticose** - free-standing branching tubes.

panicle = a cluster of flowers in which the central axis branches and rebranches.

receptacle = A fleshy structure at the tip of a stem that serves as a support for one or more attached flowers or flowering parts.

sepal = each of the divisions of the calyx of a flower (esp. when separate and not united into a tube), typically green and leaflike.

stamen = male reproductive organ of a flower, usu. consisting of an anther and a filament

umbel = flat-topped or rounded flower cluster with the flowers on stalks (pedicels) arising from a common point, like the ribs of an umbrella

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FP = used with the kind permission of Fabrizio Puccini, Gruppo Micologico Livornese www.webalice.it/fabriziopucc/polygonum_maritimum.htm (2006)

IF = Interactive Flora of NW Europe < http://ip30.eti.uva.nl/bis/flora.php?selected=beschrijving&menuentry=soorten&id=2378> (2006)

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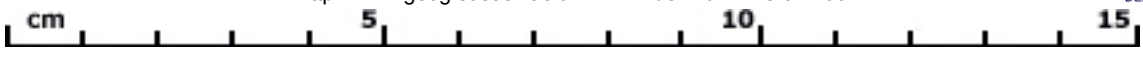
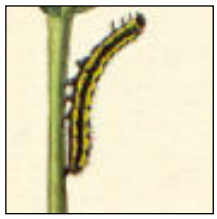


Beaches at Risk – insect species to look for



Toadflax Brocade Moth (*Calophasia lunula*) - wingspan 26-32mm. Restricted to the south-east and central southern coasts of England, where it frequents mainly shingle beaches. Two generations, sometimes overlapping, from May-August. Caterpillars feed on mainly **Toadflax species**. **NR, SAP.**


Viper's-bugloss Moths 1. *Ethmia bipunctella* - wingspan 19-28mm. Restricted to a few areas of coastal shingle in the south-east. Main flight period is May-June, but there is also a partial second generation in the autumn. Both flowers and leaves of **Viper's-bugloss** consumed by caterpillars. May pupate in dead stem. **VU, NR.**

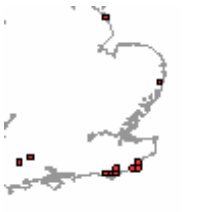

2. *Ethmia terminella* - wingspan 17-19mm - small black and white moth. Caterpillars feed on flowers and unripe seeds of **Viper's-bugloss**. Only reliably recorded from Kent and Sussex, on areas of coastal shingle. **VU.**


3. *Cynaeda dentalis* - wingspan 22-28mm - highly distinctive moth. Restricted in Britain to a few coastal localities in the south-east of England. Single generation flies in July, and is attracted by light. Caterpillar's foodplant is **Viper's-bugloss**. **NR.**

4. *Tinagma balteolella* - micro-moth associated with **Viper's-bugloss**. Only known from Kent and East Sussex where it is found in a very few coastal localities. The picture shows a similar but more common species.

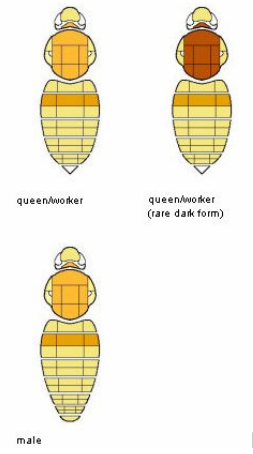

***Dibolia cynoglossi* –** small (2-3mm) flea beetle associated with various plant species, including **Red Hemp-nettle**. Very rare; scattered old records in southern Britain. **EN.**

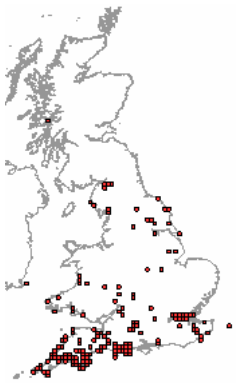





Calophasia lunula ***Ethmia terminella*** ***Ethmia bipunctella*** ***Cynaeda dentalis*** ***Tinagma balteolella*** ***Dibolia cynoglossi***

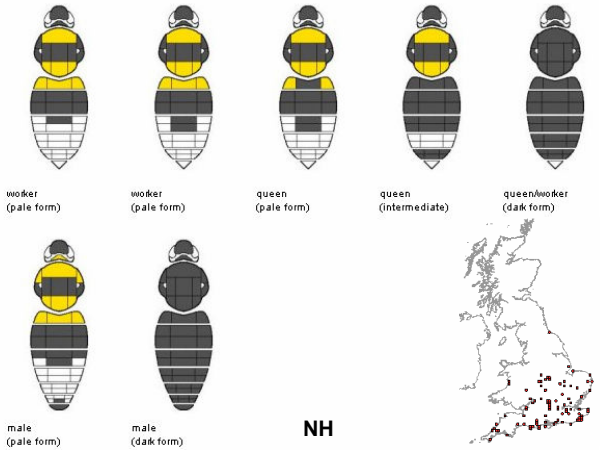
Bumblebees. Five out of 25 UK species restricted to relatively few localities, primarily in the south of Britain, three of which have **SAP**s. May be the most abundant species at a few sites and are often likely to occur together at the same sites. However, most bees encountered will not belong to this group. Unless you are an expert, bumblebees are difficult to tell apart – if you want to record any bumble bee seen, make notes and take a photo if possible.





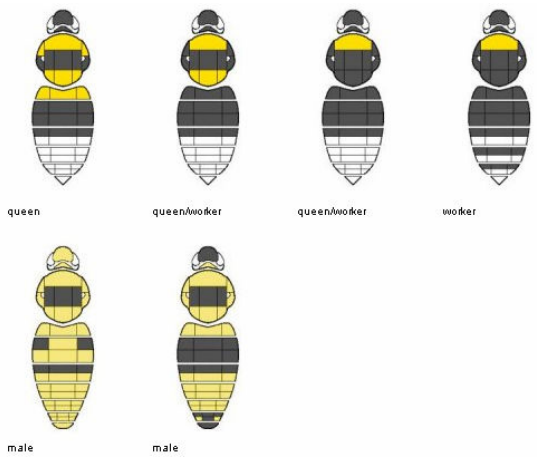
NH

Brown-banded Carder Bee (*Bombus humilis*) - queen length: 16-18mm, worker: 10-15mm. Tawny coloured with characteristic brown band on the upper surface of abdomen - rare dark form has many black hairs intermixed with orange hairs on thorax to appear dark red-brown.– queens, workers & males broadly similar in appearance, but males lack stings and have longer antennae than females. Emerges late spring, nest on the surface of the ground at base of long vegetation, often under accumulated plant litter. **SAP**.



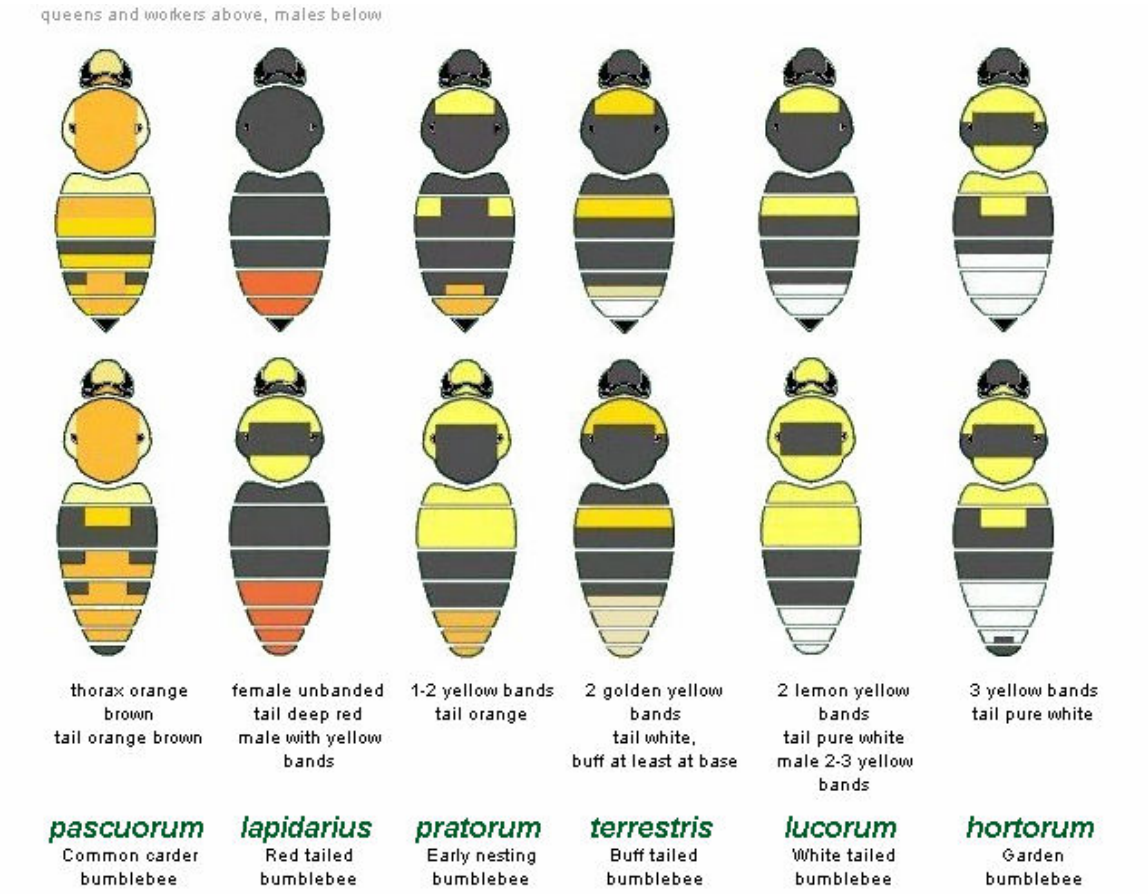
NH

Large Garden Bumblebee *(Bombus ruderatus)* – male length: 15-16mm, queen: 21-23mm, worker: 11mm –large species (especially queens) with a long tongue, long face. Black, with two yellow bands on the thorax, a single yellow band on the abdomen and a white tail. In Britain, a totally black form known as variety *harrisellus* may arise. Very difficult species to separate from *B. hortorum*, except variety *harrisellus*. Number of workers per nest often particularly high. Emerges late spring, nest below the surface of ground. May contain both yellow-banded or all black. **NS, SAP.**



NH

Short-haired Bumblebee (*Bombus subterraneus*) – considered extinct in the wild. Nests underground, emerging late spring. Although queens and workers of this species are fairly readily distinguished from *B. distinguendus*, the males of the two species are extremely difficult to separate. **NS, SAP.**



Six most common UK bumblebees.

NH

CR = Critically endangered, **EN** = Endangered, **VU** = Vulnerable, **NT** = Near threatened, **DD** = Data deficient. The Vascular Plant Red Data List for Great Britain, Cheffings & Farrell (2005) - IUCN criteria used to assess the threat status (IUCN, 2001). The CR, EN and VU categories are considered to be threatened categories. Near threatened species should be close to qualifying for one of these categories. Data deficient is not a threatened category, but indicates a need for more information in order to determine the appropriate category.

NR = Nationally rare - occurring in 15 or fewer hectads in UK, **NS** = Nationally scarce - occurring in 16-100 hectads in UK.

SAP = Species with its own Action Plan.

Images from ESCC and:

A = Arkive <www.arkive.org/> (2006)

BL = Buglife <www.buglife.org.uk/index.htm> (2006)

NH = Natural History Museum <www.nhm.ac.uk/research-curation/projects/bombus/bumblebeeid.html> (2006)

Vegetated shingle features - examples

Bare shingle = 80%
M = 20%

L = 80
M = 15
Es = 5

Typical example of cropped vegetation with mosses, and shingle exposed in soil

Colour	orangey	95
	greyish	5
Size - size range in brackets	Cobbles (fist-head)	
	Pebbles (50p - fist)	5
	Gravel (pea - 50p)	90
	Sand	5
Shape	very rounded	5
	inbetween	90
	very angular	5

Colour	orangey	5
	greyish	95
Size - size range in brackets	Cobbles (fist-head)	
	Pebbles (50p - fist)	95
	Gravel (pea - 50p)	5
	Sand	
Shape	very rounded	35
	inbetween	65
	very angular	

General Health Information for BAR volunteers

General Welfare Remember to bring plenty to eat and drink, a waterproof coat (and waterproof trousers if you have them) and wear clothes that you don't mind getting dirty.

The Weather

The Sun The dangers of exposure to the sun are well known. Most of us have been sun-burnt at some point in our lives, and know that as well as being very sore there is a danger of long term damage to the skin. While out on site in hot weather, wear a hat and loose, long-sleeved clothing and work in the shade if possible. Please use high factor sun cream and re-apply it whenever necessary - remember that you may sweat it off!

Dehydration Even on cold days, and particularly on hot ones, it is possible to become dehydrated. It is important that you bring plenty to drink with you, and drink regularly. On cold days a flask of hot drink is a very good idea! Bring more liquids than you think you will need as you will lose a lot of water doing physical work outdoors! Signs of dehydration include a headache and feeling thirsty.

Heat Exhaustion Keeping your temperature regulated while you are working can be difficult and suffering from heat exhaustion is not limited to hot, sunny days. It is caused by the loss of salts and water from excessive sweating and can be induced by hard physical work and dehydration. Symptoms include: feeling dizzy and sick, confusion, headache, pale sweaty skin and cramps in the limbs or abdomen. If heat exhaustion is suspected move to a cool place and replace lost fluids and salts.

Heat Stroke Heatstroke is where the body overheats rapidly and dangerously. It can follow on from heat exhaustion when sweating ceases and the body cannot be cooled by evaporation. It can cause headaches, dizziness and discomfort and skin will be hot, flushed and dry. If heatstroke is suspected, move to a cool place, and use water to cool the body down – dampen clothing and use a fan.

Hypothermia This condition develops when the body temperature falls below 35°C and can be caused by prolonged exposure to the cold and often wet conditions. Moving air has a much greater effect than still air, and a high 'wind-chill factor' can therefore substantially increase the risk of hypothermia setting in. It is always important to bring the correct clothing with you for your volunteer day, and it is wise never to underestimate the changeability of the British weather. Always plan for the worst, and hope for the best – a waterproof coat is essential! Symptoms include pale, dry skin, blueing around the lips and nails, and disorientation. A warm drink and high energy foods can quickly help you to feel better.

Plants and Animals

Adders These beautiful reptiles are our only venomous snake, although to a healthy adult, their bite is normally no more dangerous than a bee sting. Try to avoid these animals, especially early in the morning when they may be slower to avoid contact with people. If you are bitten, try to remain calm and seek medical attention. Do not apply a tourniquet, slash the wound with a knife or suck out the venom.

Animals and Livestock It is best not to approach or touch animals (wild or domestic) unless it is absolutely necessary to do so. If you do have contact with animals during the course of your work, always make sure that you wash your hands afterwards. Be aware that injured animals or animals with young can be particularly aggressive.

Bees and Wasps While stings from these animals rarely present major problems, it is important to be aware of the risk of anaphylactic shock, which is a major allergic reaction and needs immediate medical attention. If you know that you are allergic to bee or wasp stings and you carry an epipen (to counter the effects of the sting) please ensure that you bring this with you when out on site and tell the supervisor or fellow volunteers.

Brown Tail Moth caterpillars These hairy caterpillars live on the shrub Sea Buckthorn, blackthorn, hawthorn and privet and will also feed on bracken. They hatch in September and can cause a nasty rash if they come into contact with your skin, can cause respiratory problems if the hairs are inhaled, and can cause temporary blindness / conjunctivitis if the hairs are rubbed into the eyes. The toxin can remain in the hairs for up to four years, so old nests and dried skins can still cause a hazard. Mild symptoms can be treated with antihistamines, but if irritation is severe or if the eyes are affected, medical help should be sought.

Giant Hogweed This plant can grow up to 5m tall and has blotched purple stems. Contact with this plant, combined with the sun's ultra violet rays can cause rashes and in severe cases, blisters. Do not touch this plant. If you inadvertently come into contact with it, wash the skin with cold water as soon as possible, and cover the affected area to prevent exposure to sunlight. If blisters appear or the eyes are affected, seek medical assistance.

Ragwort Always wear gloves when handling ragwort, as the toxins in the plant can cause liver problems.

Ticks These small invertebrates are found on vegetation between spring and autumn and attach themselves to passing animals and humans to feed on blood. The current advice is not to try to remove the tick, as the head may be left attached to the skin. Instead visit your GP. Ticks can pass on an infection called Lyme disease – see later section, so it is important to be aware of the symptoms so that medical attention can be sought without delay.

Dead, sick or injured animals Please do not touch any dead, sick or injured animals. If you find a sick or injured animal you may want to inform the RSPCA, your local vet or a local animal rescue centre who have the expertise to help and advise you.

Diseases

Lyme Disease This is a rare bacterial infection, generally occurring in summer or early autumn and is transmitted from animals to humans by the bite of a sheep or deer tick. It is characterised by a patch on the skin steadily increasing in size and gradually clearing in the centre to form a series of concentric rings – known as a target lesion. It is treatable at this stage by appropriate antibiotics. Later stages of the disease are much more difficult to treat and quite diverse in their nature, affecting various systems of the body. If you have been bitten by a tick or suspect that you may have contracted the disease, seek medical treatment immediately.

Tetanus This is a very prolonged and extremely unpleasant illness which is invariably fatal. It can be contracted through contact with soil via cuts, abrasions or puncture wounds made by splinters or thorns. Most people have some level of immunisation whilst at school. Boosters are not usually required as tetanus injections are given automatically if a serious wound occurs. Chat to your GP for advice about this.

Toxicara Canis This is a micro-organism that is found in dog faeces, which can cause blindness in children, although the risk to adults is not considered great. If dog faeces comes into contact with skin or clothes, wash off immediately with soap and water / antibacterial handwash.

Leptospirosis (Weils Disease) Leptospirosis is a rare bacterial infection carried in the urine of rats, foxes and domestic animals, which can contaminate water and wet banks. Infection usually occurs through cuts, abrasions and the lining of the nose, eyes and mouth. An incubation period of one to two weeks is followed by feverish flu-like symptoms, usually characterised by redness of the eyes. The illness will usually last 4-9 days. In rare cases where people are jaundiced, a second phase can develop, known as Weils disease, with sometimes severe results.

When working in or near potentially contaminated water, cuts should be covered with waterproof plasters, and contact with water should be avoided. Exposed skin should be covered and waterproof gloves worn whenever possible. Hands should be washed before eating, drinking or smoking. If symptoms appear seek prompt medical attention from your GP and tell them that you have been working near water.

Additional information

Security It is a good idea not to bring valuables to site with you. If you do bring items such as mobile phones, cameras and wallets with you, please keep them in your possession at all times. Do not leave valuables in bags while out on site. We cannot take any responsibility for lost or damaged items.

SAFE WORKING PRACTICES

GENERAL	
Hazard (potential for harm)	**Standard precautions**
Illness/ disease	Wash hands thoroughly before eating. Ensure any open wounds are covered with waterproof dressing. Be aware of any allergies. Keep Tetanus and Hepatitis inoculations up to date. Be aware of diseases such as Weils disease and Lyme disease. Avoid unnecessary contact with animals.
Hazardous plants and animals	Where hazardous plants are identified notify others. Be aware of areas where adders may be basking and avoid if possible. Do not touch dead, sick or injured animals.
Extreme weather	Ensure recognition of sunburn, hypothermia etc. Use sun block and sun hats. Take regular breaks in shade/shelter where possible. Wear warm, waterproof clothing. Have access to hot/cold drinks. If weather is too extreme cease task and return to base.
SURVEYING	
Contact with soil-borne micro organisms	Wash hands before eating, drinking and smoking. Participants should be advised to have a Tetanus inoculation. Cover any broken skin before work. Any cut received must be promptly washed and covered.
Contact with micro-organisms eg: Lepto-spirosis	Advise people to have Tetanus and Hepatitis B inoculations. Do not drink stream or pond water. Wash hands thoroughly before eating, drinking or smoking. Advise of the risks of Weil's disease. Avoid contact with dead animals.
Slips, trips and falls	Sturdy footwear with firm grip must be worn. Do not rush.
LONE WORKING	
Physical attack	Carry a mobile phone at all times. If approached, stay calm, avoid aggressive language and body posture.
General safety	Inform someone of where you are going and what time you are expected to return.

Location	Transect number	Date	Recorders	Easting	Northing	Grid reference	Transect length (m)	Beach length (m)	Mean transect length (m)	Standard deviation	Mean beach length (m)	Standard Deviation
Black Rock Beach	1	27/06/2006	Phillippa Morrison-Price	533395	103237	TQ333032	30	30	38	11.3	38	11.3
Black Rock Beach	2	27/06/2006	Phillippa Morrison-Price	533430	103237	TQ334032	46	46				
Saltdean	1	04/07/2006	Phillippa Morrison-Price	537944	101911	TQ379019	36	36	32	6.36	32	6.36
Saltdean	2	24/07/2006	Phillippa Morrison-Price	538274	101841	TQ382018	27	27				
West Beach, Newhaven	1	30/08/2006	Patrick F	544676	99887	TV446998	106	106	111	7.07	111	7.07
West Beach, Newhaven	2	30/08/2006	Patrick F	544723	99877	TV447998	116	116				
Tide Mills west	1	02 & 09/08/06	Patrick F	545313	100228	TQ453002	172	172	157	21.2	157	21.2
Tide Mills west	2	02 & 09/08/06	Patrick F	545418	100233	TQ454002	142	142				
Tide Mills east	1	12/07/2006	Friends of Tide Mills (FoTM), Patrick F	545762	100171	TQ457001	55	55	53	3.54	65	13.4
Tide Mills east	2	03/10/2006	M.Trew & FoTM, checked Patrick F	545933	100150	TQ459001	50	74				
Tide Mills, Bishopstone	2	13/08/2006	Phillippa Morrison-Price	546346	99984	TV463999	74	74	67	9.9	67	9.9
Tide mills, Bishopstone	3	13/08/2006	Phillippa Morrison-Price	546450	99927	TV464999	60	60				
Cuckmere Haven	2	11/07/2006	SSCP, Patrick F	551991	97650	TV519976	100	120	100	0	120	0
Cuckmere Haven	3	11/07/2006	SSCP, Patrick F	552076	97609	TV520976	100	120				
Holywell, Eastbourne	1	08/08/2006	Eastbourne Soroptimists, Patrick F	560192	96989	TV601969	16	16	14	2.83	14	2.83
Holywell, Eastbourne	2	08/08/2006	Eastbourne Soroptimists, Patrick F	560207	97020	TV602970	12	12				
Pevensey Sailing Club	1	04/07/2006	Sylvia Parsons	565043	102917	TQ650029	80	170	80	0	170	0
Pevensey Sailing Club	2	04/07/2006	Sylvia Parsons	565058	102955	TQ650029	80	170				
Pevensey Martello Estate	2	20/06/2006	Pevensey Group, Patrick F	565322	103379	TQ653033	75	75	78	3.54	78	3.54
Pevensey Martello Estate	3	27/06/2006	Pevensey Group, Patrick F	565370	103446	TQ653034	80	80				
Norman's Bay west	1	16/08/2006	Linda Stark	567660	105123	TQ676051	79	79	81	2.83	81	2.83
Norman's Bay west	2	16/08/2006	Linda Stark	567752	105170	TQ677051	83	83				
Norman's Bay east	1	16/08/2006	Linda Stark	568269	105386	TQ682053	36	36	36	0	36	0
Norman's Bay east	2	16/08/2006	Linda Stark	568358	105431	TQ683054	36	36				
Coodens west	1	22/08/2006	Linda Stark	569870	106158	TQ698061	27	27	27	0	27	0
Coodens west	2	22/08/2006	Linda Sark	569968	106188	TQ699061	27	27				
Coodens east	1	29/08/2006	Linda Stark	571422	106524	TQ714065	28	28	28	0	28	0
Coodens east	2	29/08/2006	Linda Stark	571521	106544	TQ715065	28	28				
Veness Gap	1	29/08/2006	Linda Stark	572478	106752	TQ724067	23	23	22	1.41	22	1.41
Veness Gap	2	29/08/2006	Linda Stark	572574	106768	TQ725067	21	21				
Bexhill west	1	06/09/2006	Linda Stark	574793	107196	TQ747071	10	10	10	0	10	0
Bexhill west	2	06/09/2006	Linda Stark	574865	107260	TQ748072	10	10				
Bexhill central	1	06/09/2006	Linda Stark	575155	107409	TQ751074	11	11	14	3.54	14	3.54
Bexhill central	2	06/09/2006	Linda Stark	575250	107442	TQ752074	16	16				
Bexhill east	1	06/09/2006	Linda Stark	575754	107553	TQ757075	13	13	12	1.41	12	1.41
Bexhill east	2	06/09/2006	Linda Stark	575852	107584	TQ758075	11	11				
Winchelsea	1	08/08/2006	Patrick F	591398	115705	TQ913157	40	40	38	3.54	38	3.54
Winchelsea	2	08/08/2006	Patrick F	591476	115768	TQ914157	35	35				
Rye Harbour NR west	1	16/08/2006	Francis Winch, Ellen Campbell	593275	117201	TQ932172	50	970	60	14.1	970	0
Rye Harbour NR west	2	16/08/2006	Francis Winch, Ellen Campbell	593202	117145	TQ932171	70	970				
Rye Harbour NR east	1	08/08/2006	Rye Harbour Group, Patrick F	594393	117777	TQ943177	74	970	74	0	970	0
Rye Harbour NR east	2	08/08/2006	Rye Harbour Group, Patrick F	594492	117810	TQ944178	74	970				
Lade - Dungeness	1	05/07/2006	Patrick F	608575	120582	TR085205	88	3000	94	8.49	###	0
Lade - Dungeness	2	05/07/2006	Kent group, Patrick F	608542	120679	TR085206	100	3000				
Abott's Cliff	1	15/09/2006	Fred Booth	627453	138515	TR274385	30	30	30	0	30	0
Abott's Cliff	2	15/09/2006	Fred Booth	627530	138499	TR275384	30	30				
Lydden Spout	1	27/08/2006	Fred Booth, Daphne Mills, Yvonne Sharp	628191	138689	TR281386	21	21	23	2.83	23	2.83
Lydden Spout	2	27/08/2006	Fred Booth, Daphne Mills, Yvonne Sharp	628238	138710	TR282387	25	25				
Kingsdown Beach	1	09/07/2006	Fred Booth	637997	148316	TR379483	90	90	90	0	90	0
Kingsdown Beach	2	22/08/2006	Patrick F	637993	148402	TR379484	90	90				
Walmer Castle	1	22/08/2006	Patrick F	637904	150116	TR379501	100	120	100	0	120	0
Walmer Castle	2	22/08/2006	Patrick F	637893	150313	TR378503	100	120				
Marine Rd, Deal	1	15/08/2006	Patrick F	637841	151891	TR378518	68	68	65	4.95	65	4.95
Marine Rd, Deal	2	15/08/2006	Patrick F	637845	151983	TR378519	61	61				
Chequers PH	1	15/08/2006	Patrick F, Wendy Ward	637014	155957	TR370559	36	36	36	0	36	0
Chequers PH	2	15/08/2006	Patrick F, Wendy Ward	636984	156045	TR369560	36	36				
Sandwich Bay	1	15/08/2006	Patrick F, Wendy Ward	635700	159328	TR357593	70	70	70	0	70	0
Sandwich Bay	2	15/08/2006	Patrick F, Wendy Ward	635675	159428	TR356594	70	70				
Ornival	1	18/07/2006	Patrick F, Wendy Ward	536995	2569130	n/a	59	59	54	7.07	54	7.07
Ornival	2	18/07/2006	PatrickF	536959	2569035	n/a	49	49				
Hable D'Ault	1	18/07/2006	Patrick F	537247	2569954	n/a	83	83	80	4.95	80	4.95
Hable D'Ault	2	18/07/2006	Patrick F	537210	2569862	n/a	76	76				
Cayeux, sud	1	19/07/2006	Patrick F, Patrick Triplet, Julia bastide	538974	2575416	n/a	60	60	61	1.41	61	1.41
Cayeux, sud	2	22/07/2006	Patrick F	538928	2575320	n/a	62	62				
Cayeux	1	21/07/2006	Patrick F, Wendy Ward	539123	2575715	n/a	79	79	76	4.24	76	4.24
Cayeux	2	21/07/2006	Patrick F	539084	2575635	n/a	73	73				
Brighton, sud	1	21/07/2006	Patrick F	540992	2578570	n/a	200	200	200	0	200	0
Brighton, sud	2	21/07/2006	Patrick F	540918	2578497	n/a	200	200				
Brighton, nord	1	24/07/2006	Patrick F	541854	2579330	n/a	180	200	170	14.1	200	0
Brighton, nord	2	24/07/2006	Patrick F	541780	2579260	n/a	160	200				
le Hourdel , ouest	1	20/07/2006	Patrick F	545148	2580435	n/a	33	33	29	5.66	29	5.66
le Hourdel , ouest	2	20/07/2006	Patrick F	545039	2580440	n/a	25	25				
Le Hourdel, est	1	20/07/2006	Patrick F, Wendy Ward	544590	2580377	n/a	59	59	42	24	42	24
Le Hourdel, est	2	20/07/2006	Patrick F	544490	2580369	n/a	25	25				

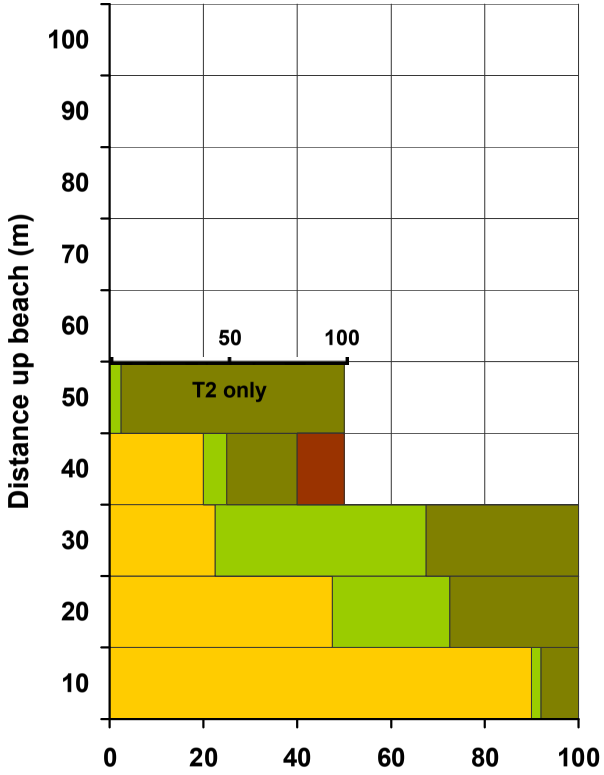
Sites surveyed showing their locations, the dates they were surveyed and by who. French sites are in blue.

Appendix 4 – Profiles for sites surveyed

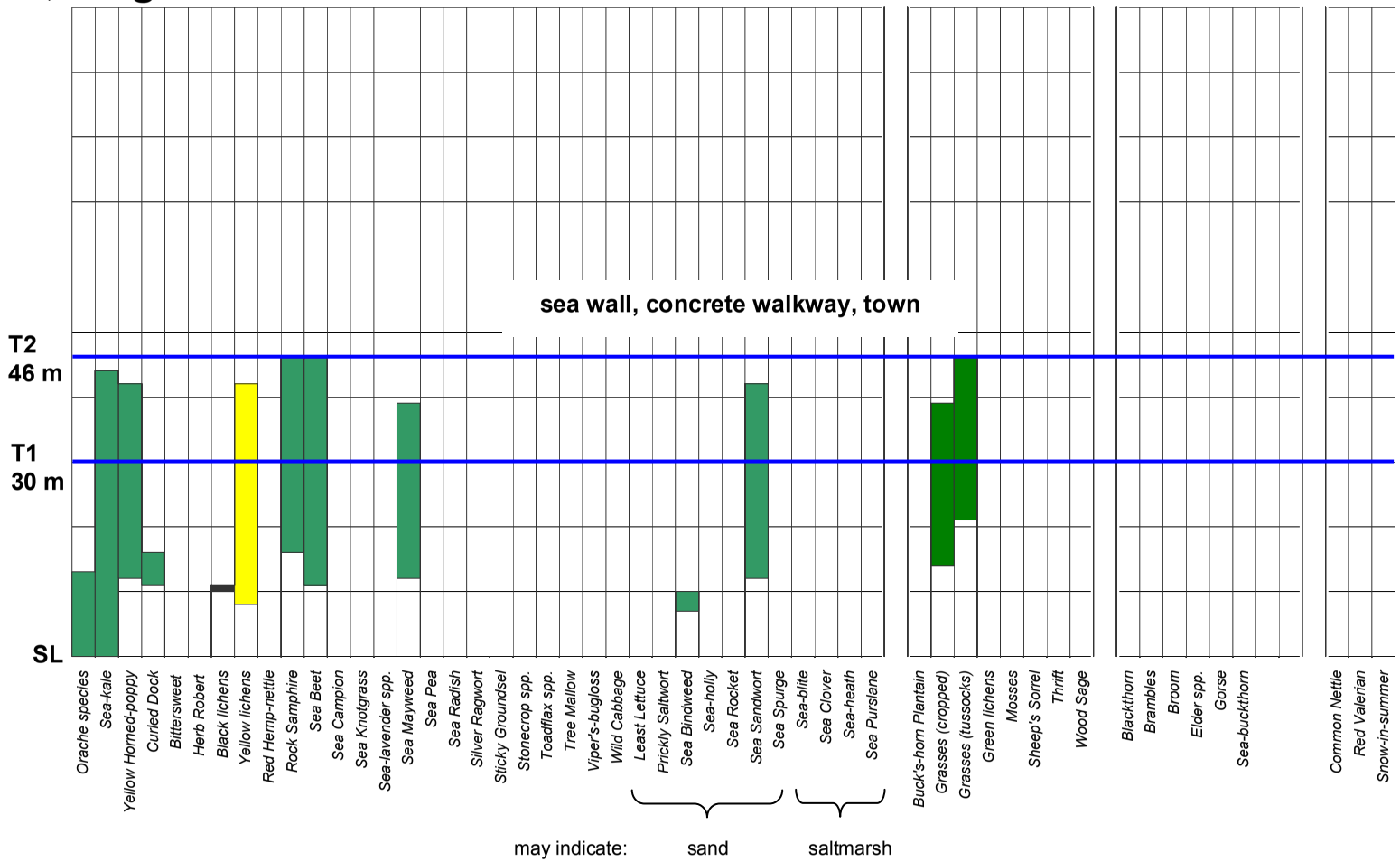
For each site the data are represented visually as follows:

- The site name and date(s) when it was surveyed are shown.
- Going up the page, the site is shown in 10-metre sections from the seaward side to the landward side.
- On the left of the page, the mean percentage of shingle, sand and vegetation (in three height categories) in 10 m sections is shown.
- On the right of the page, the cumulative distribution of each species over the two transects in 10 m sections is shown.
- If the transects were less than 100 m long their length is denoted by a blue line. Transects of different lengths are shown by two blue lines (and may reflected in the shingle percentage diagram if the difference between the two transects lengths was more than 10 m). If there is no blue line then both transects were 100 (or 200 m) long.
- The note on the landward end of the species section describes briefly the habitat beyond the transects.
- Species are grouped together into three rough community types, pioneer, grassland/lichen heath and scrub. Potentially invasive species are in a final group.
- Species are colour coded to aid in interpretation.
- Species noted as being present on the beach but not recorded in the transects are shown in grey.
- The total number of species in each grouping is shown in the first four columns of the graph in the bottom right. The last column, [rare], shows species that were given a rare classification and are already included in the first four columns and do not need to be added to the species total.
- Sites 16 and 17 are not represented because they were so narrow and had very few species present.

01 - Black Rock Beach, Brighton – 27/06/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side



may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

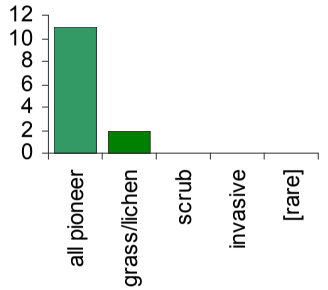
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

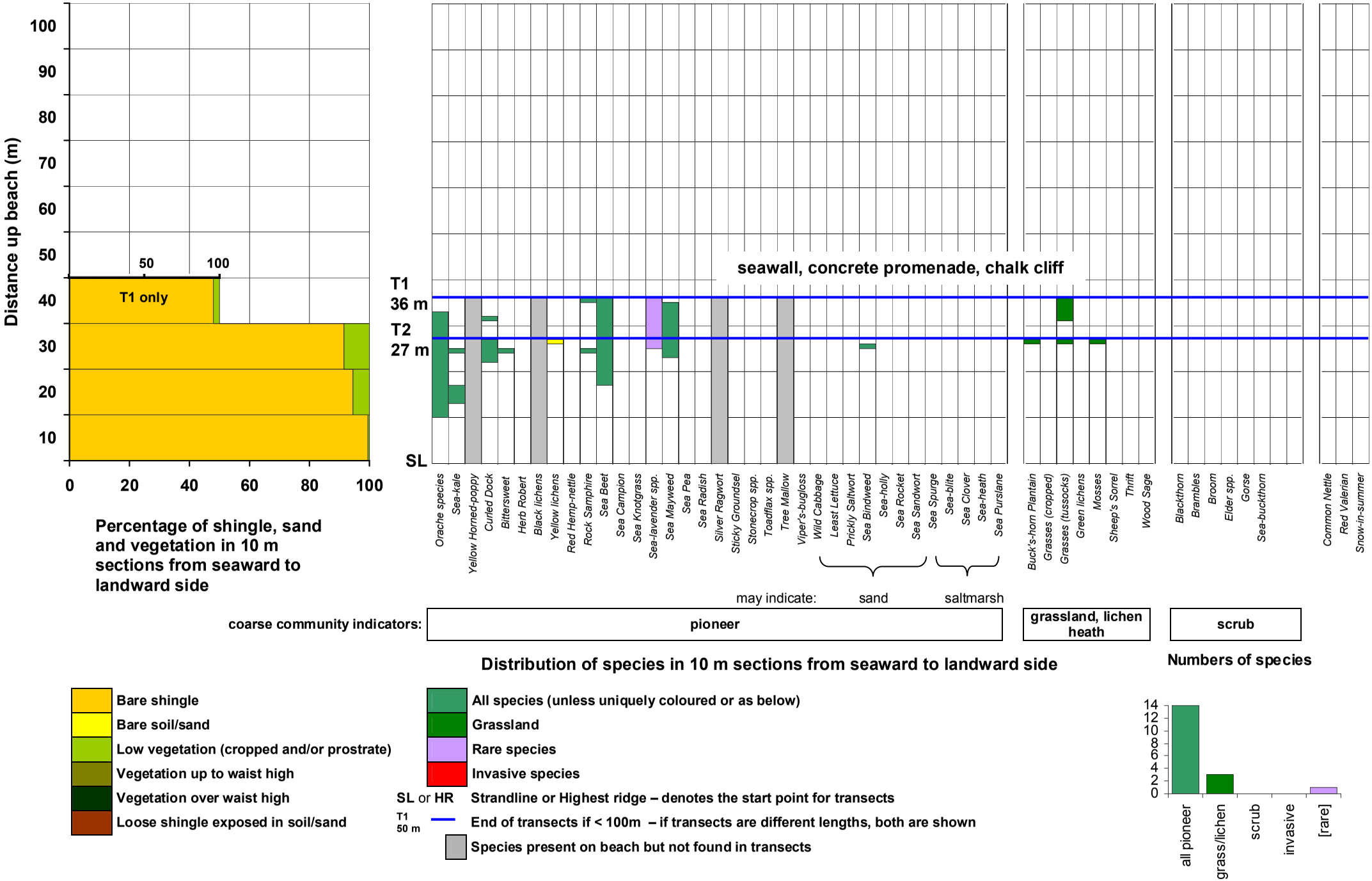
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species



02 - Saltdean – 04 & 24/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

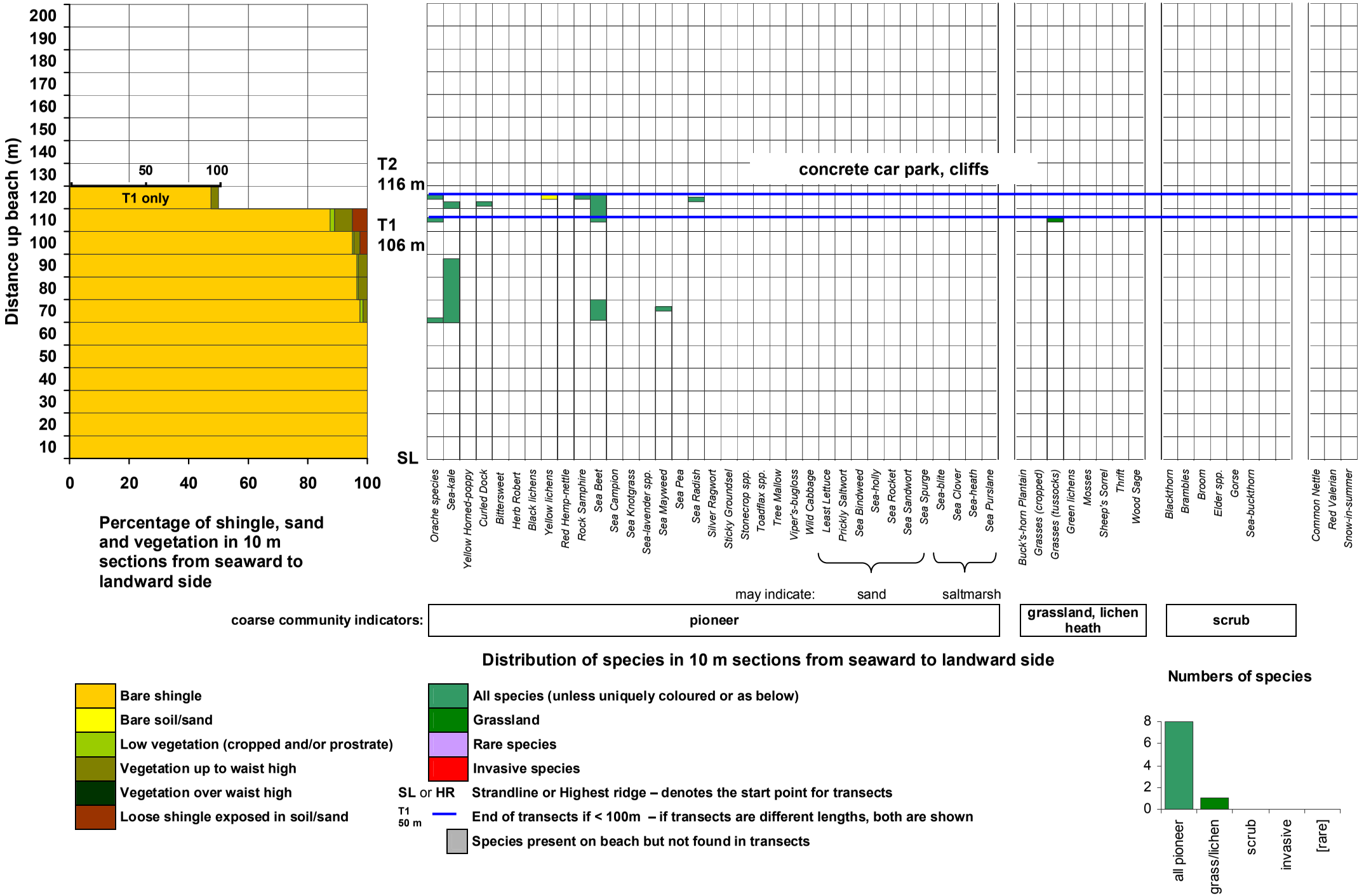
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

03 - West Beach, Newhaven – 06/09/00



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

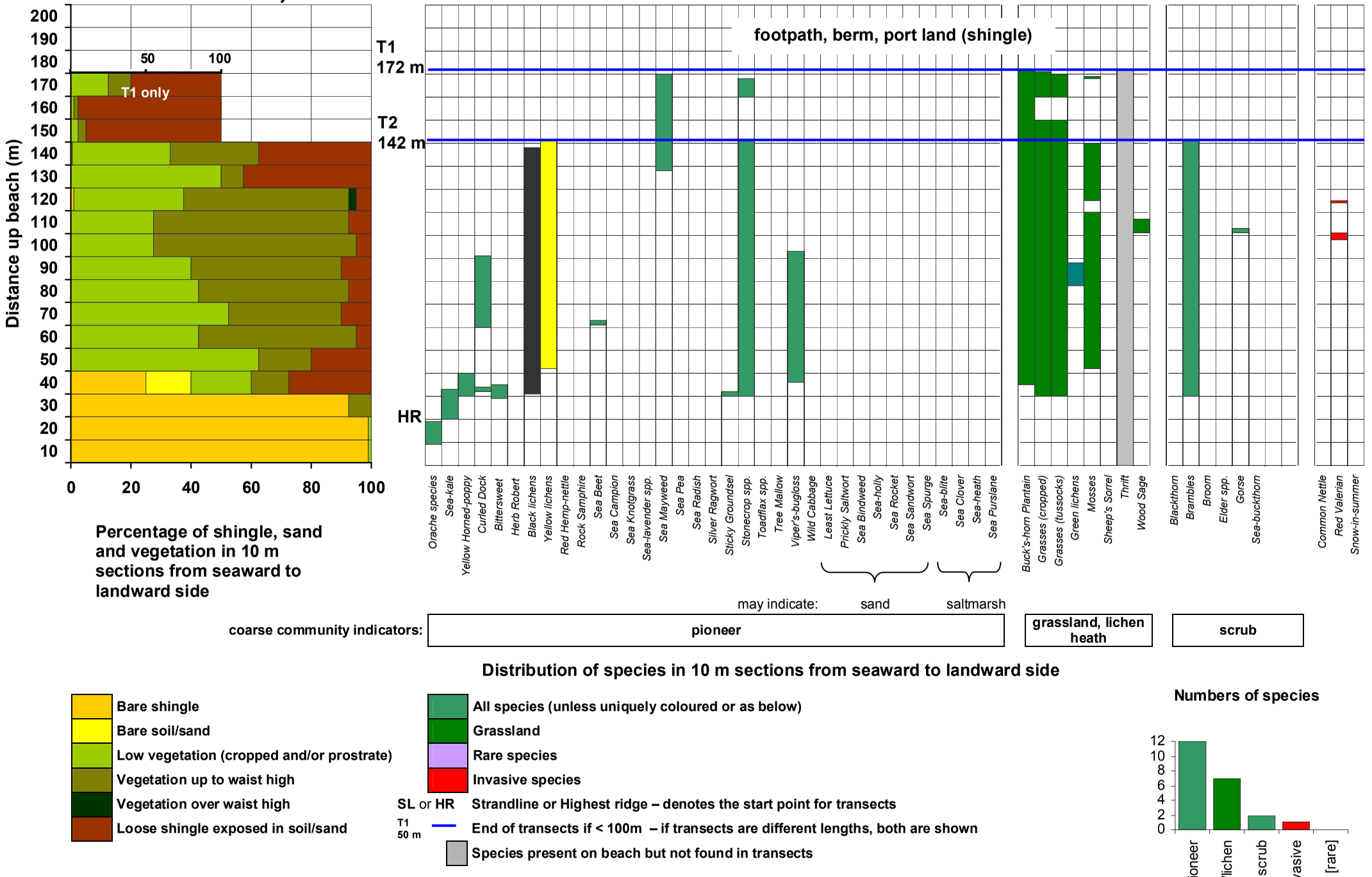
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

04 - Tide Mills, west – 02 & 09/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
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- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

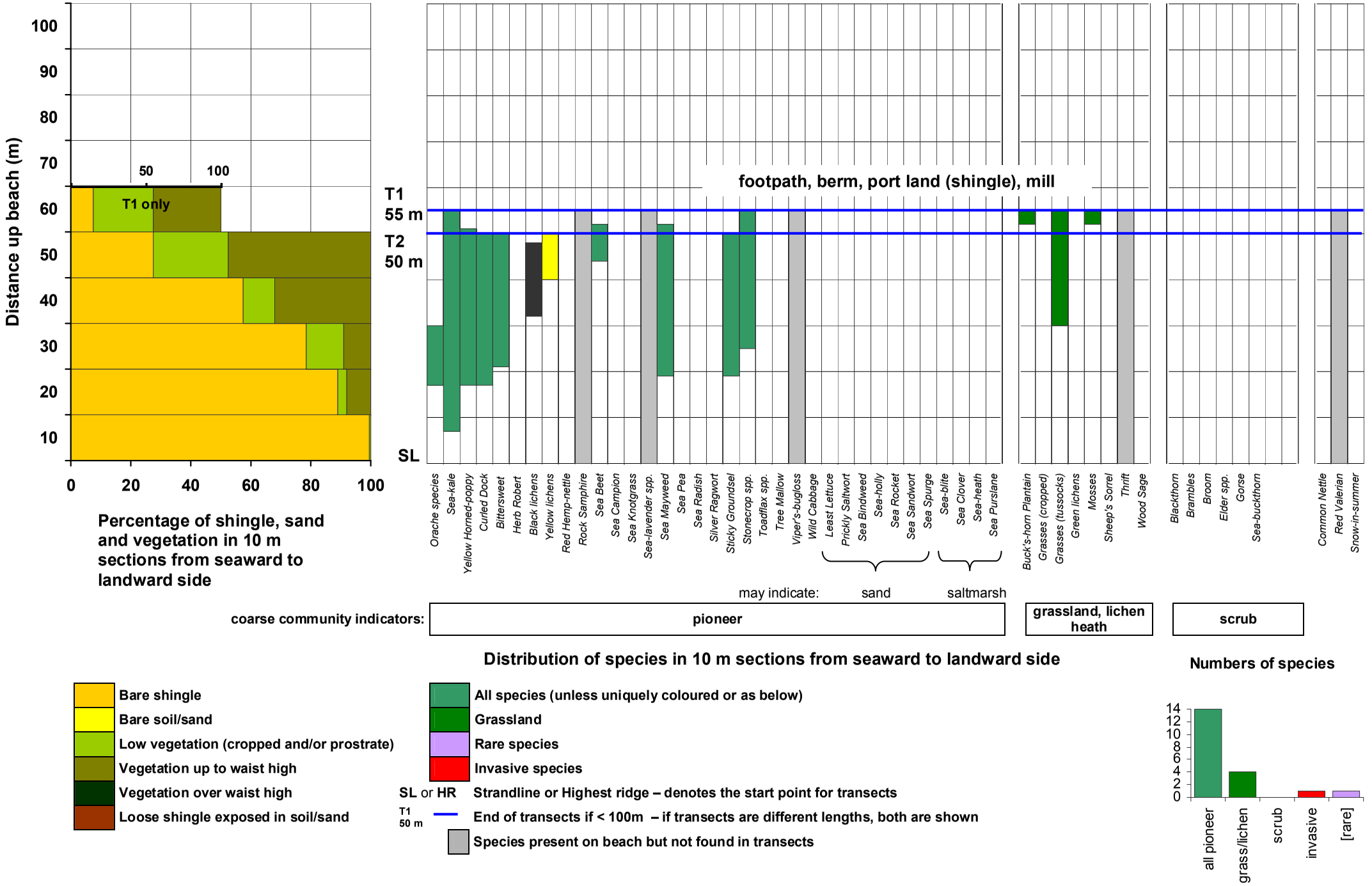
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

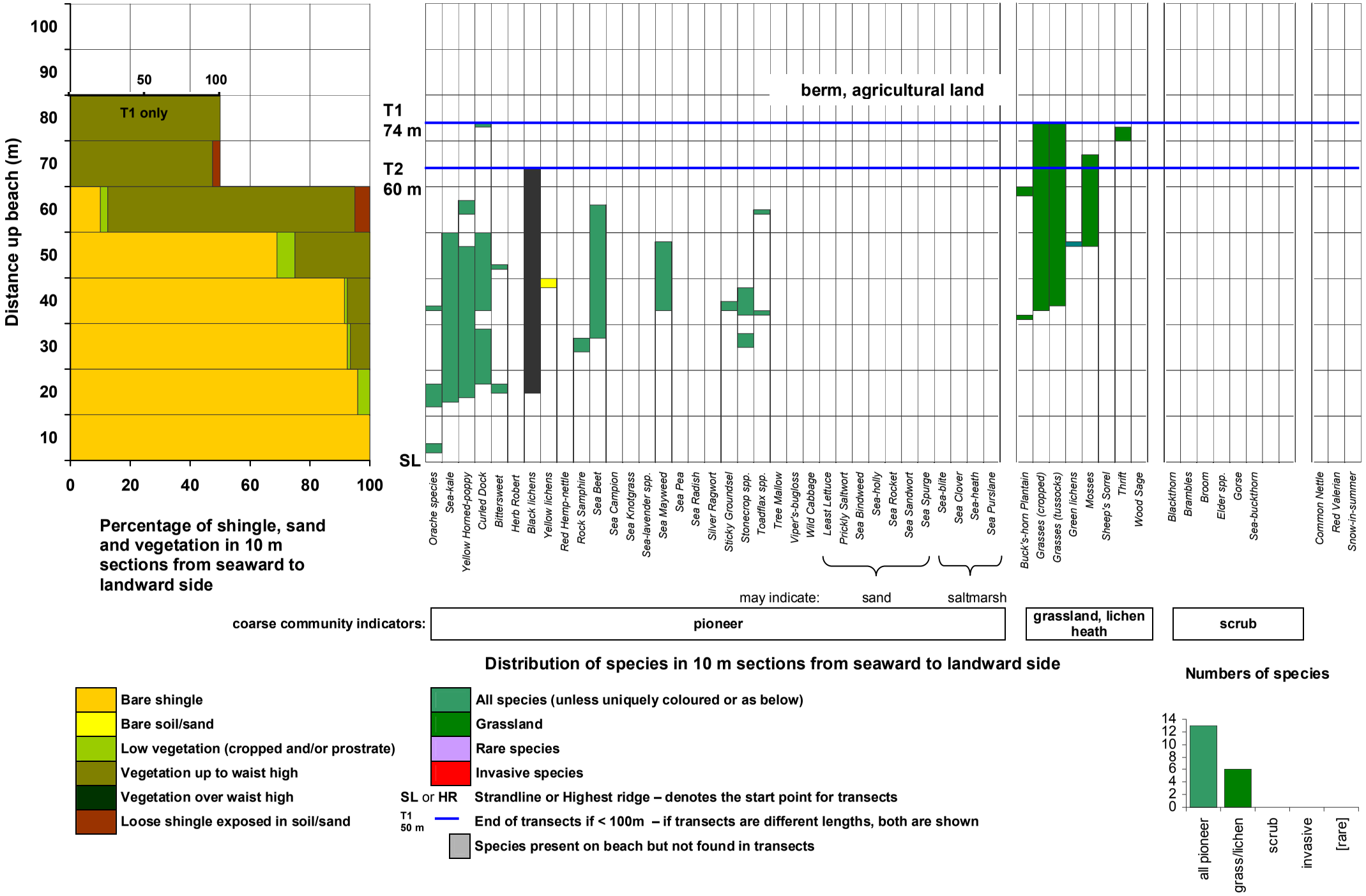
Species present on beach but not found in transects

Numbers of species

05 - Tide Mills, east – 12/07 & 15/08/06



06 - Bishopstone – 13/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

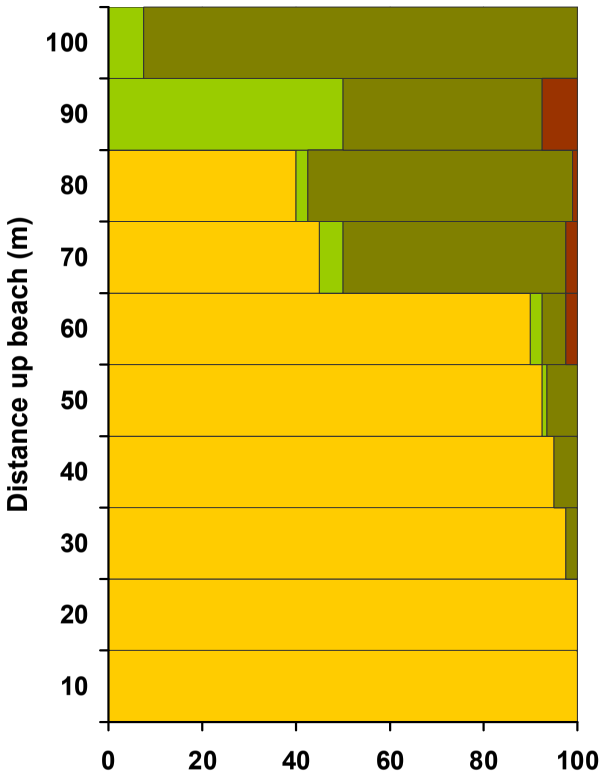
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

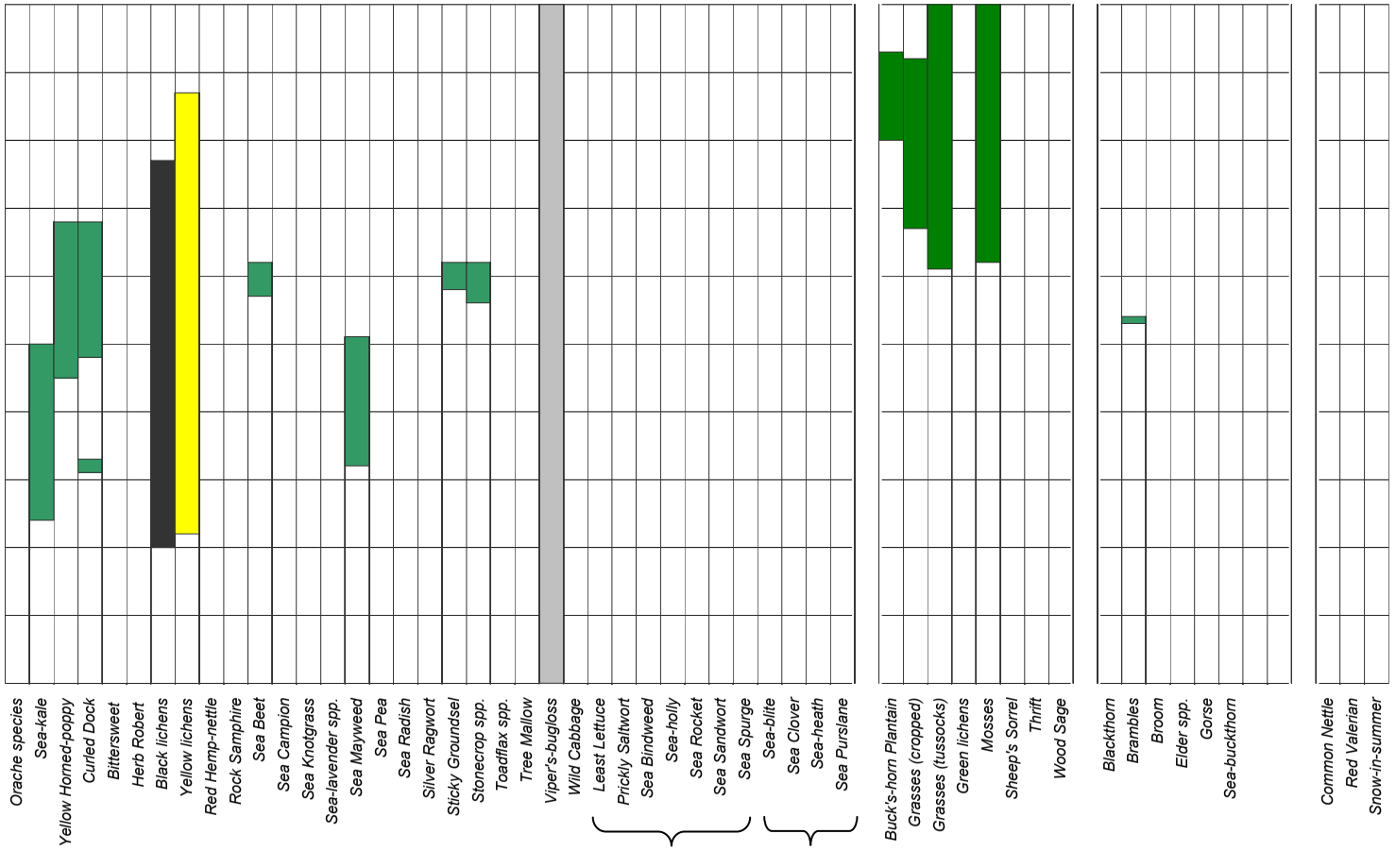
Numbers of species

07 - Cuckmere Haven, east – 07/06/06

grassland extends 20 m to berm, fields



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side



may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

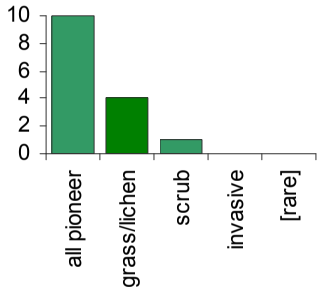
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

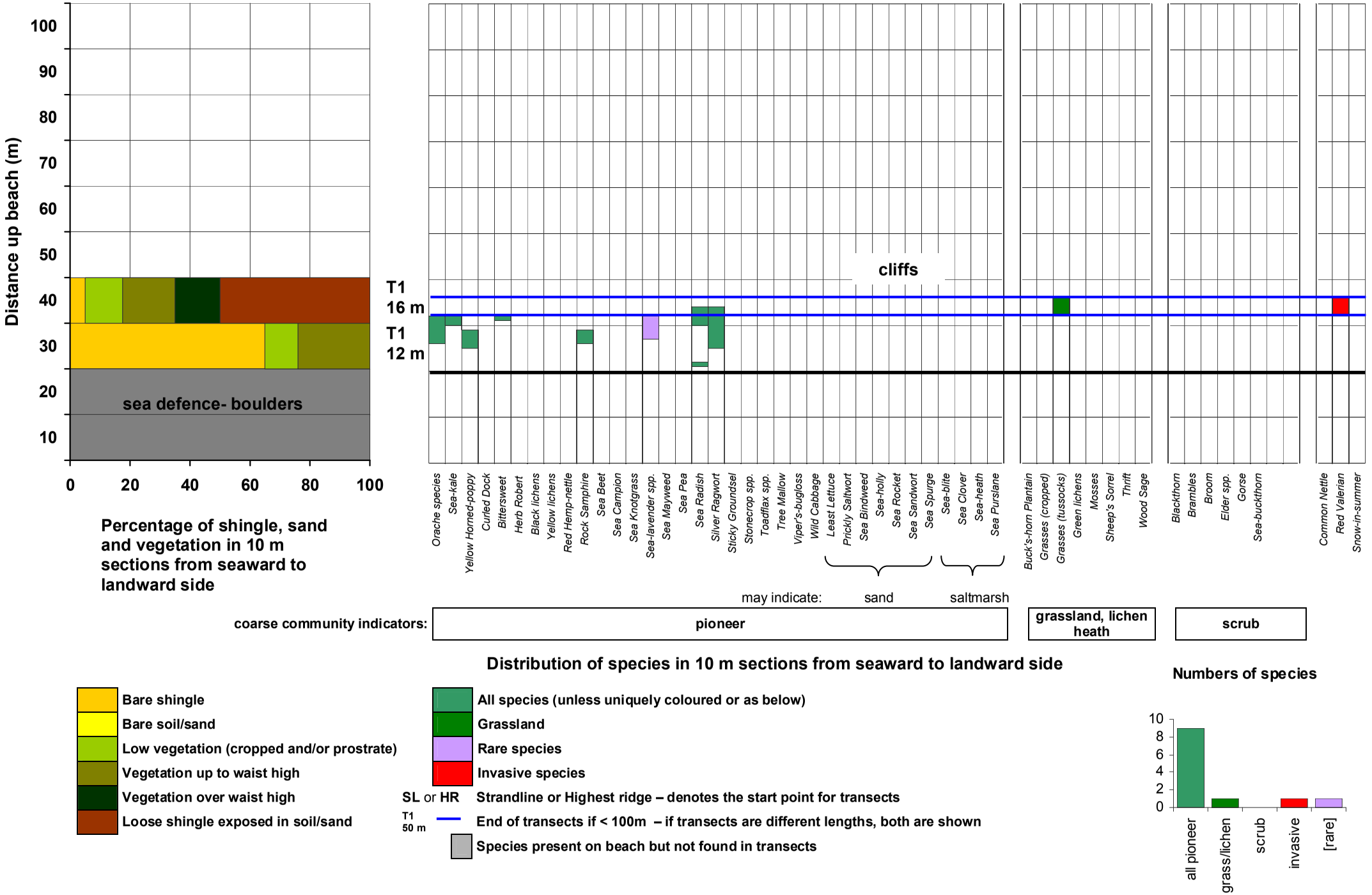
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species



08 - Holywell, Eastbourne – 08/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

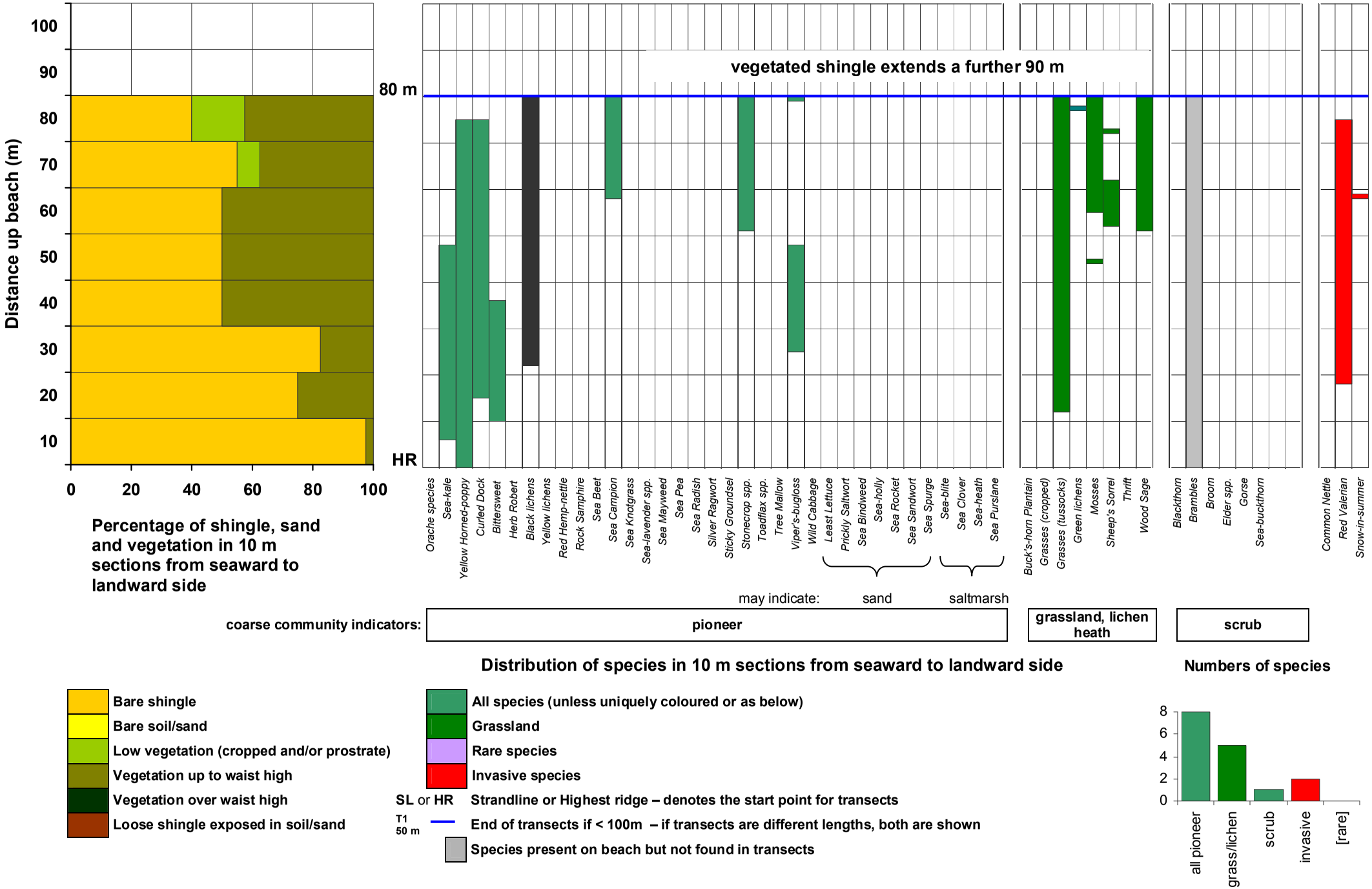
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

09 - Pevensey Sailing Club – 04/07/06



Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

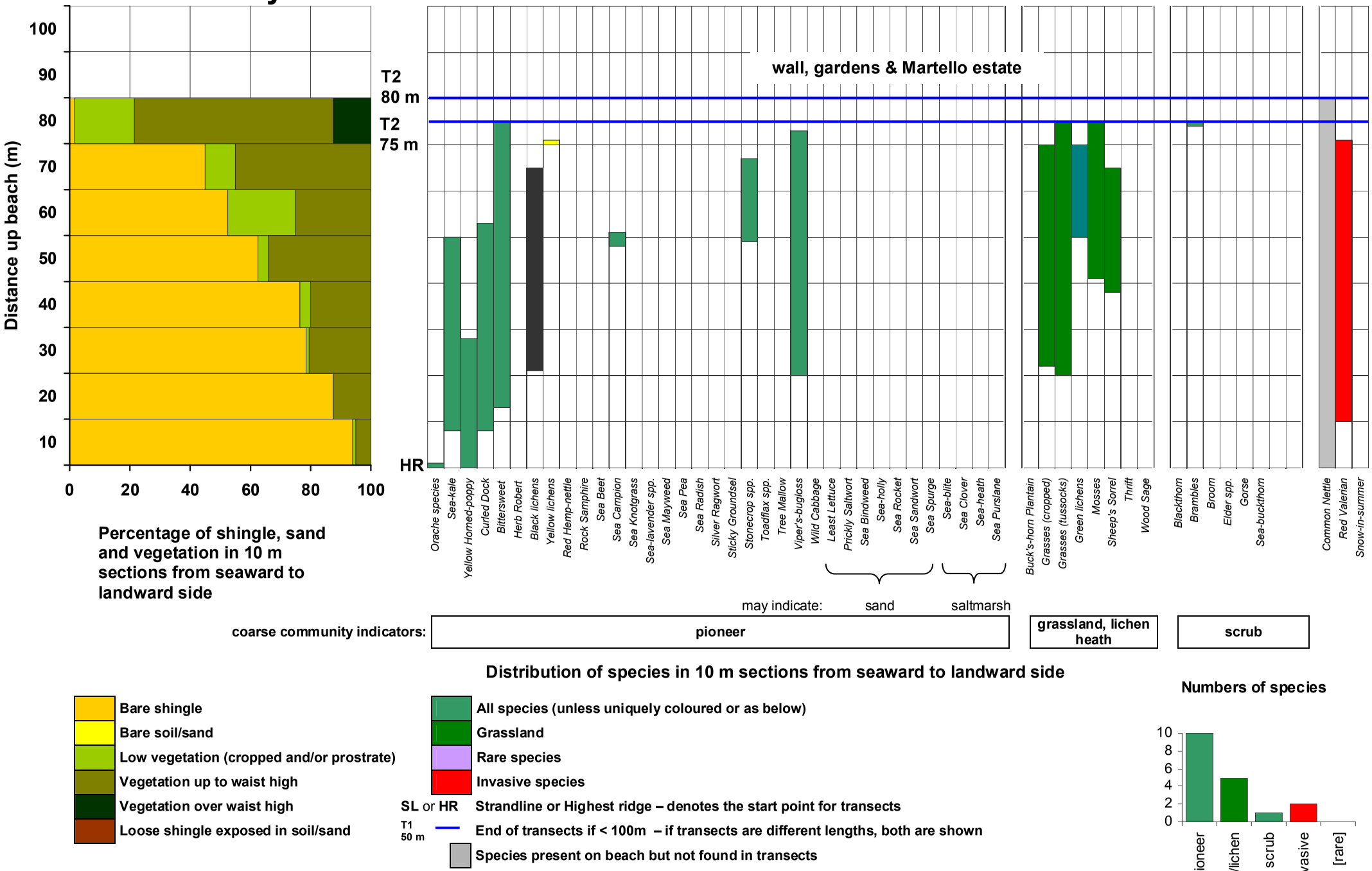
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

10 - Pevensey Martello estate – 20 & 27/06/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

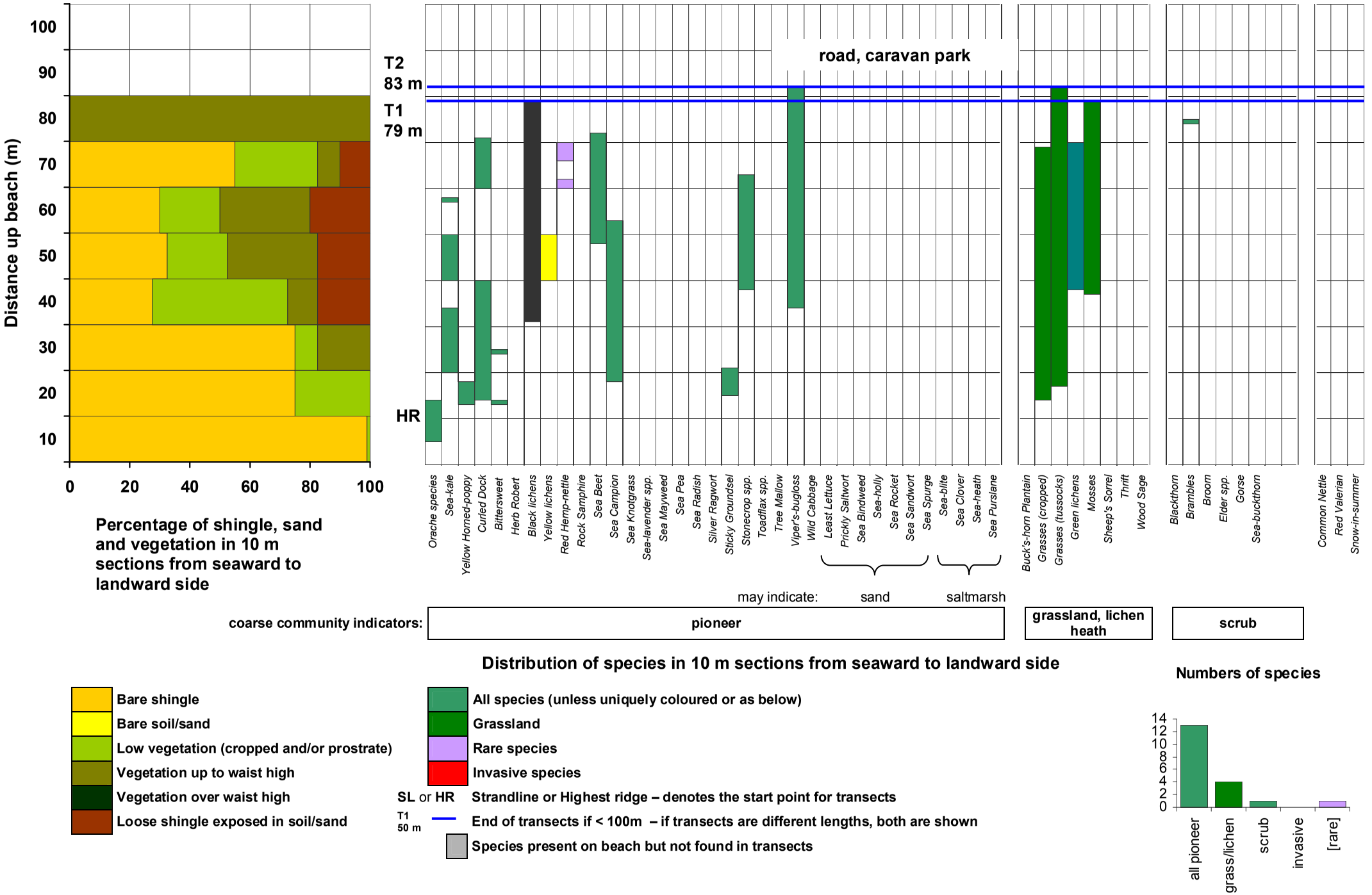
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

11 - Norman's Bay, west – 16/08/06



Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

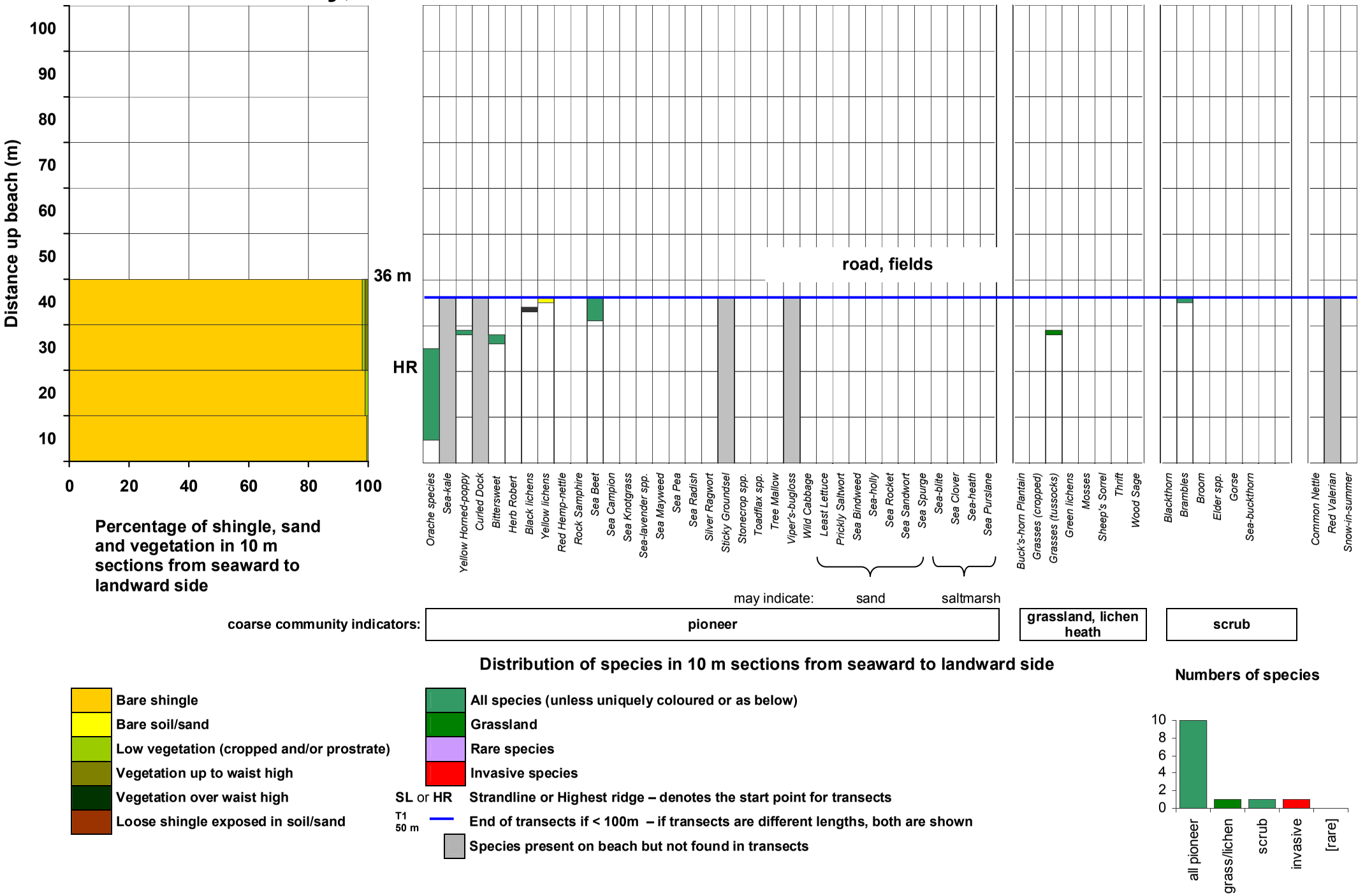
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

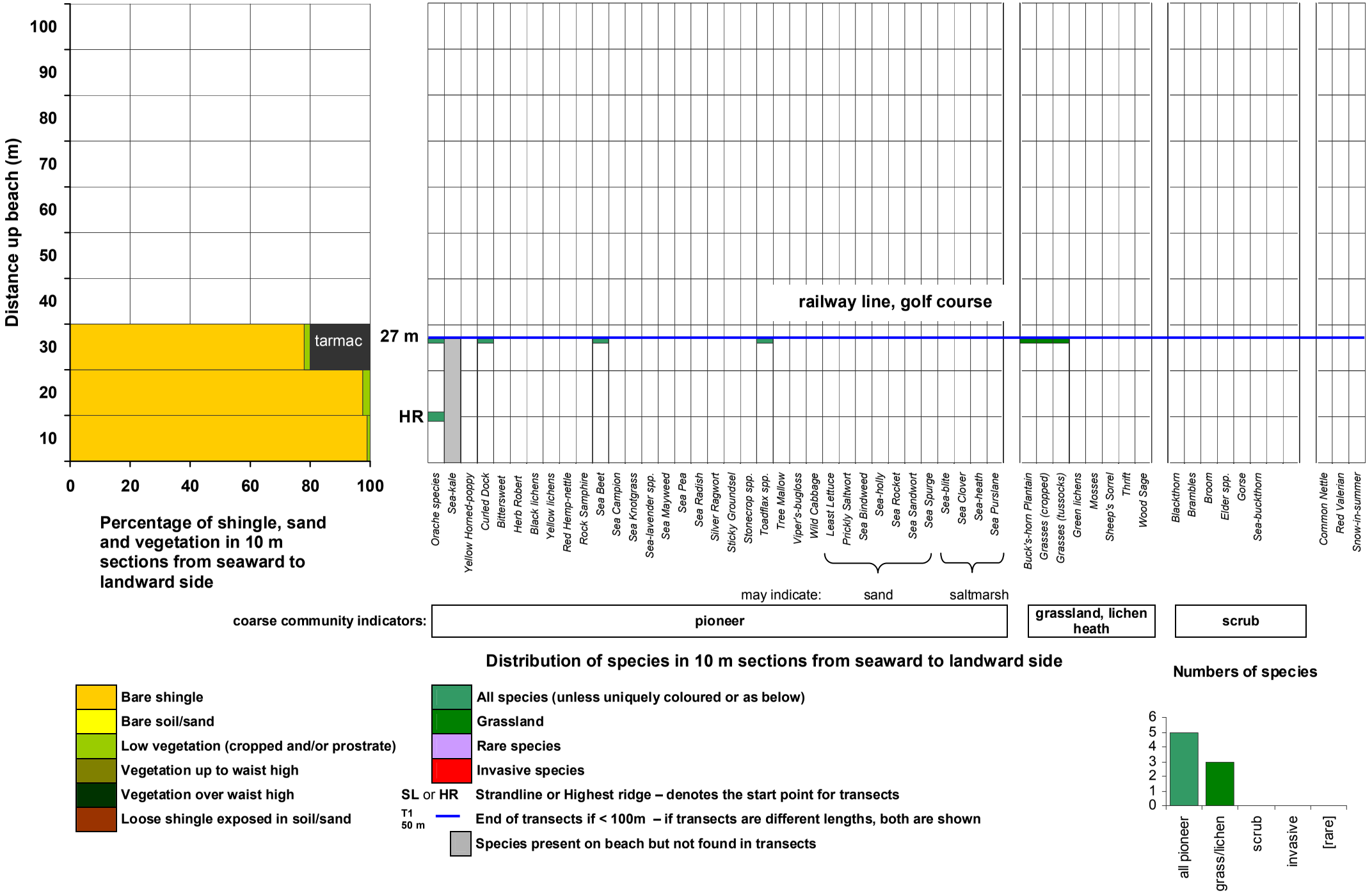
Species present on beach but not found in transects

Numbers of species

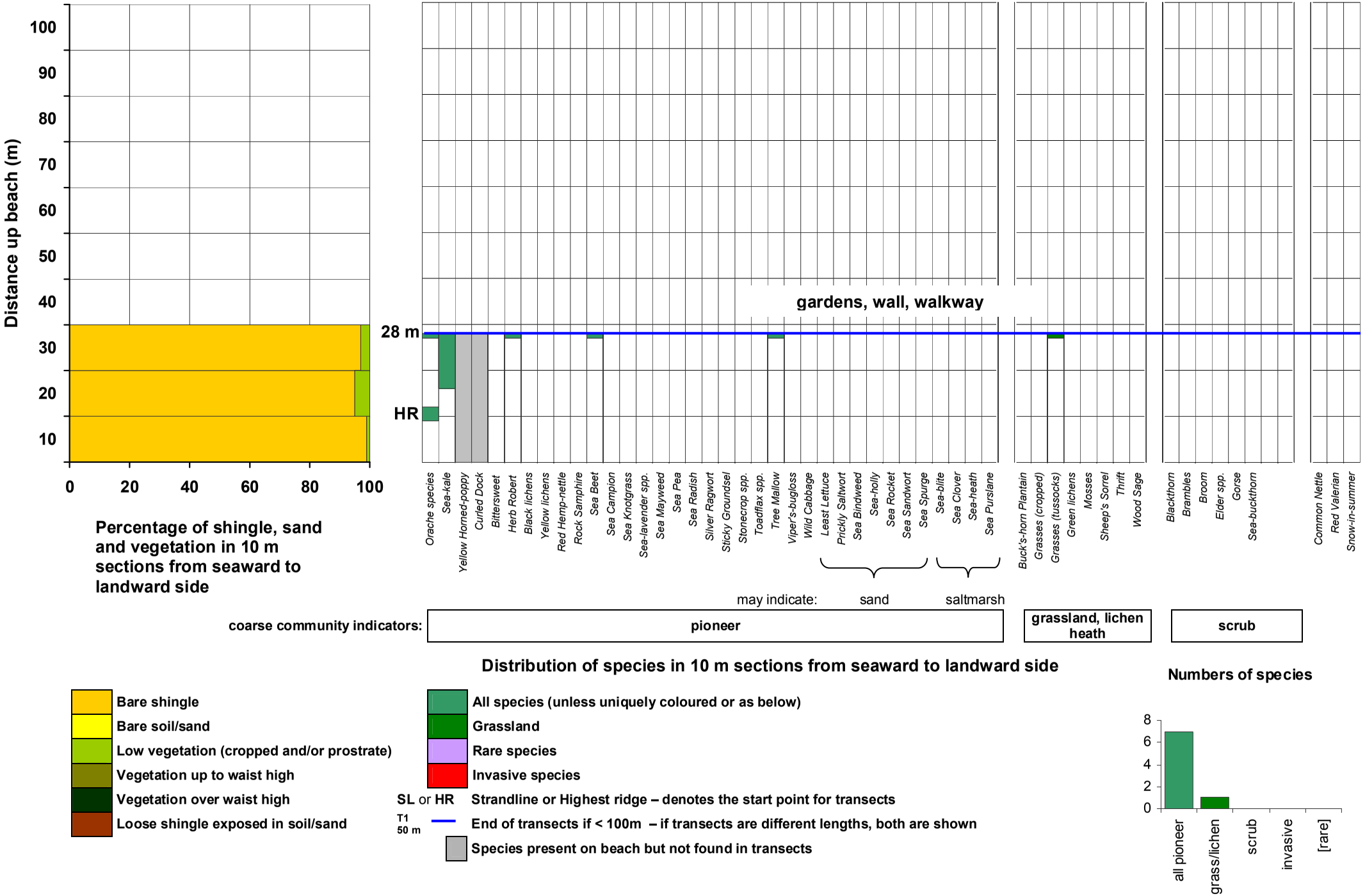
12 - Norman's Bay, east – 16/08/06



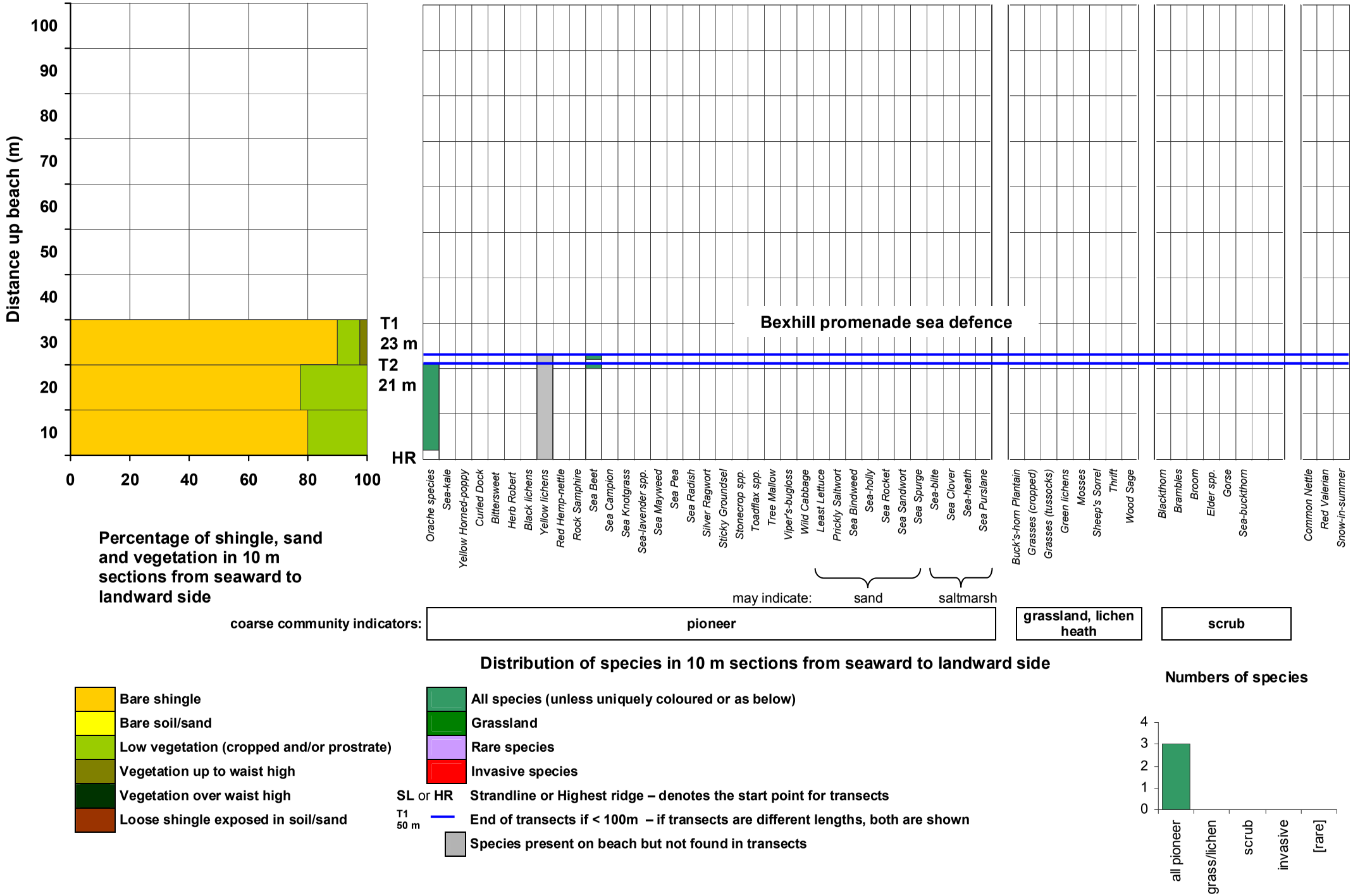
13 - Coodens, west – 22/08/06



14 - Coodens, east – 29/08/06



15 - Veness Gap, Southcliff, Bexhill – 29/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

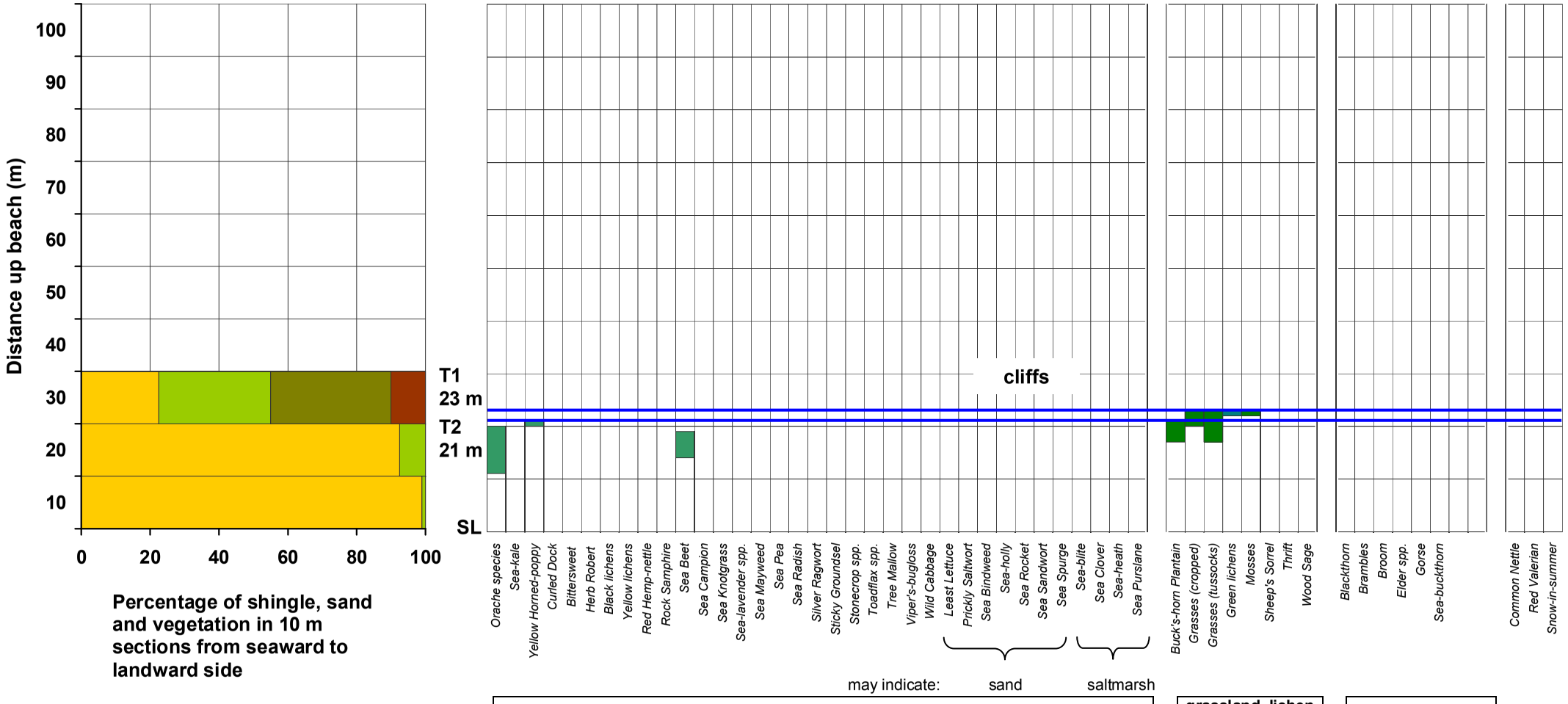
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 / 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

18 - Bexhill, east – 06/09/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
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- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
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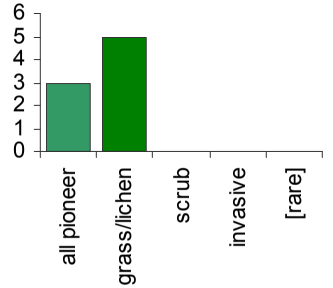
SL or HR — Strandline or Highest ridge – denotes the start point for transects

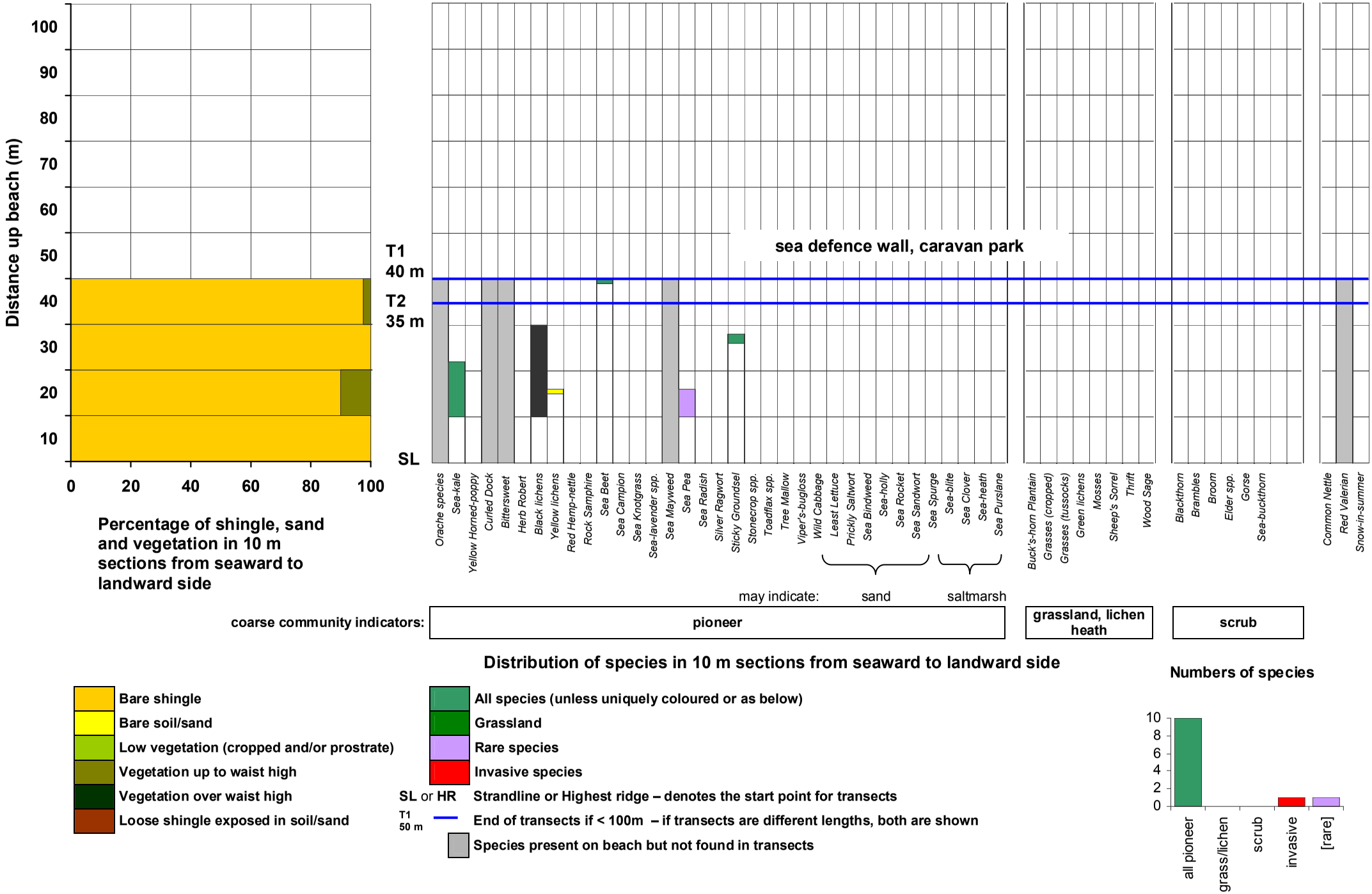
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

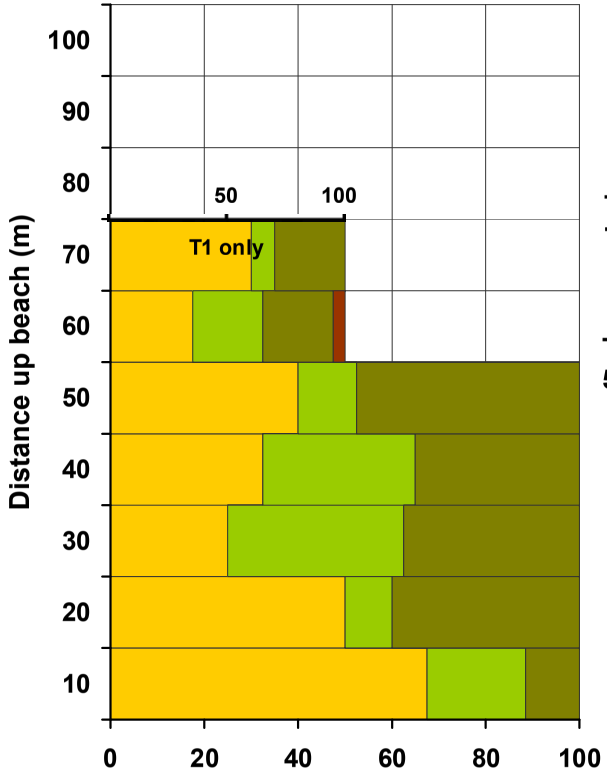
Numbers of species



19 - Winchelsea – 08/08/06



20 - Rye Harbour NR, west – 16/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

road, shingle extends inland up to 1 km

T1
70 m

T2
50 m

SL

Orache species, *Sea-kale*, *Yellow Horned-poppy*, *Curled Dock*, *Bittersweet*, *Herb Robert*, *Black lichens*, *Yellow lichens*, *Red Hemp-nettle*, *Rock Samphire*, *Sea Beet*, *Sea Campion*, *Sea Knotgrass*, *Sea-lavender spp.*, *Sea Mayweed*, *Sea Pea*, *Sea Radish*, *Silver Ragwort*, *Sticky Groundsel*, *Stonecrop spp.*, *Toadflax spp.*, *Tree Mallow*, *Viper's-bugloss*, *Wild Cabbage*, *Least Lettuce*, *Prickly Saltwort*, *Sea Bindweed*, *Sea-holly*, *Sea Rocket*, *Sea Sandwort*, *Sea Spurge*, *Sea-blite*, *Sea Clover*, *Sea-heath*, *Sea Purslane*, *Buck's-horn Plantain*, *Grasses (cropped)*, *Grasses (tussocks)*, *Green lichens*, *Mosses*, *Sheep's Sorrel*, *Thrift*, *Wood Sage*, *Blackthorn*, *Brambles*, *Broom*, *Elder spp.*, *Gorse*, *Sea-buckthorn*, *Common Nettle*, *Red Valerian*, *Snow-in-summer*

may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

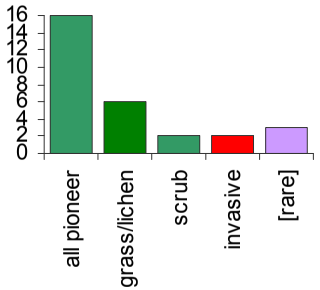
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

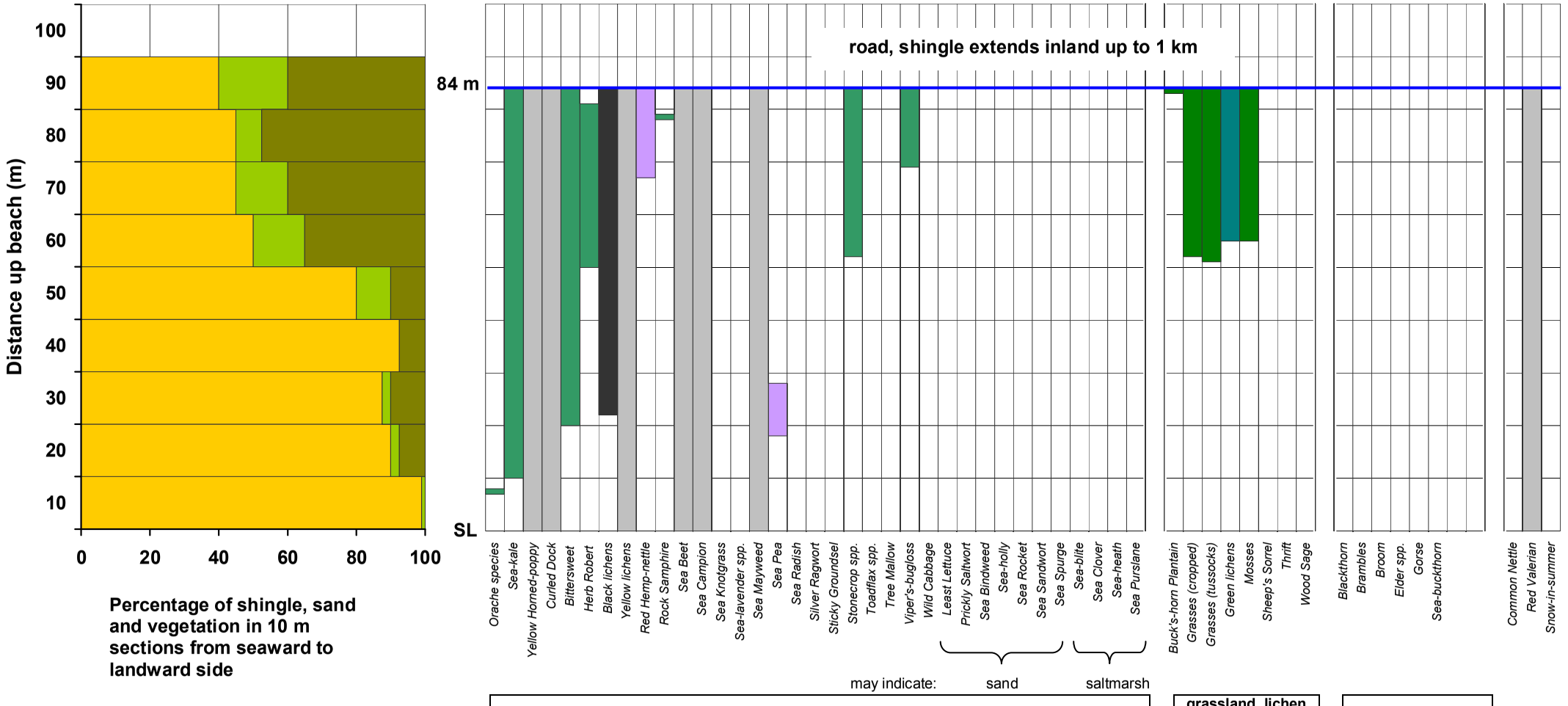
T1 / 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species



21 - Rye Harbour NR, east – 08/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
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- Vegetation over waist high
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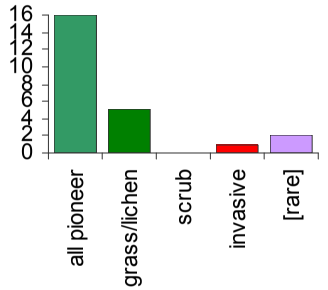
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

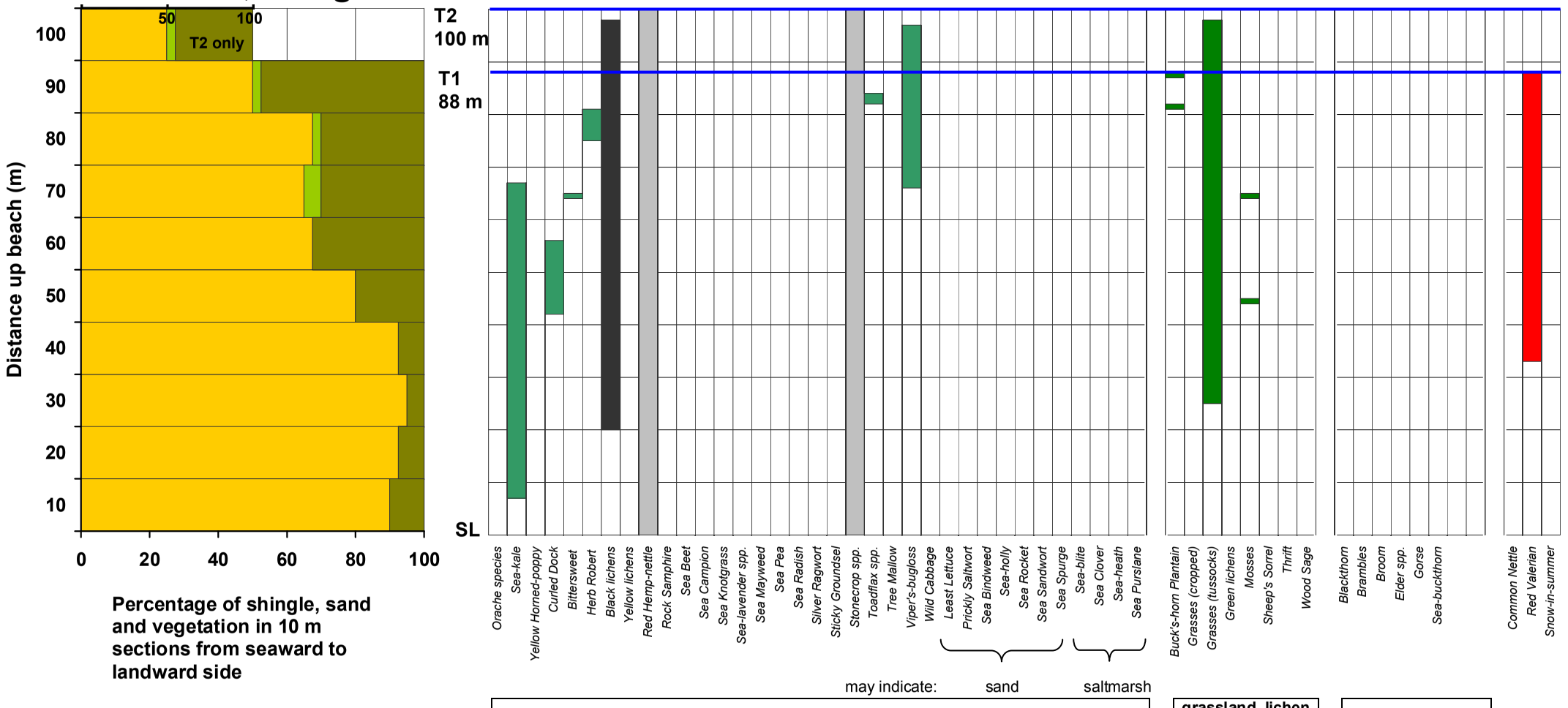
Species present on beach but not found in transects

Numbers of species



22 - Lade, Dungeness – 05/07/06

road, houses, shingle extends inland for several kilometres



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
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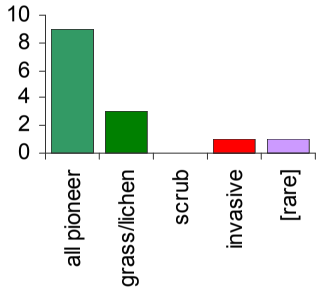
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

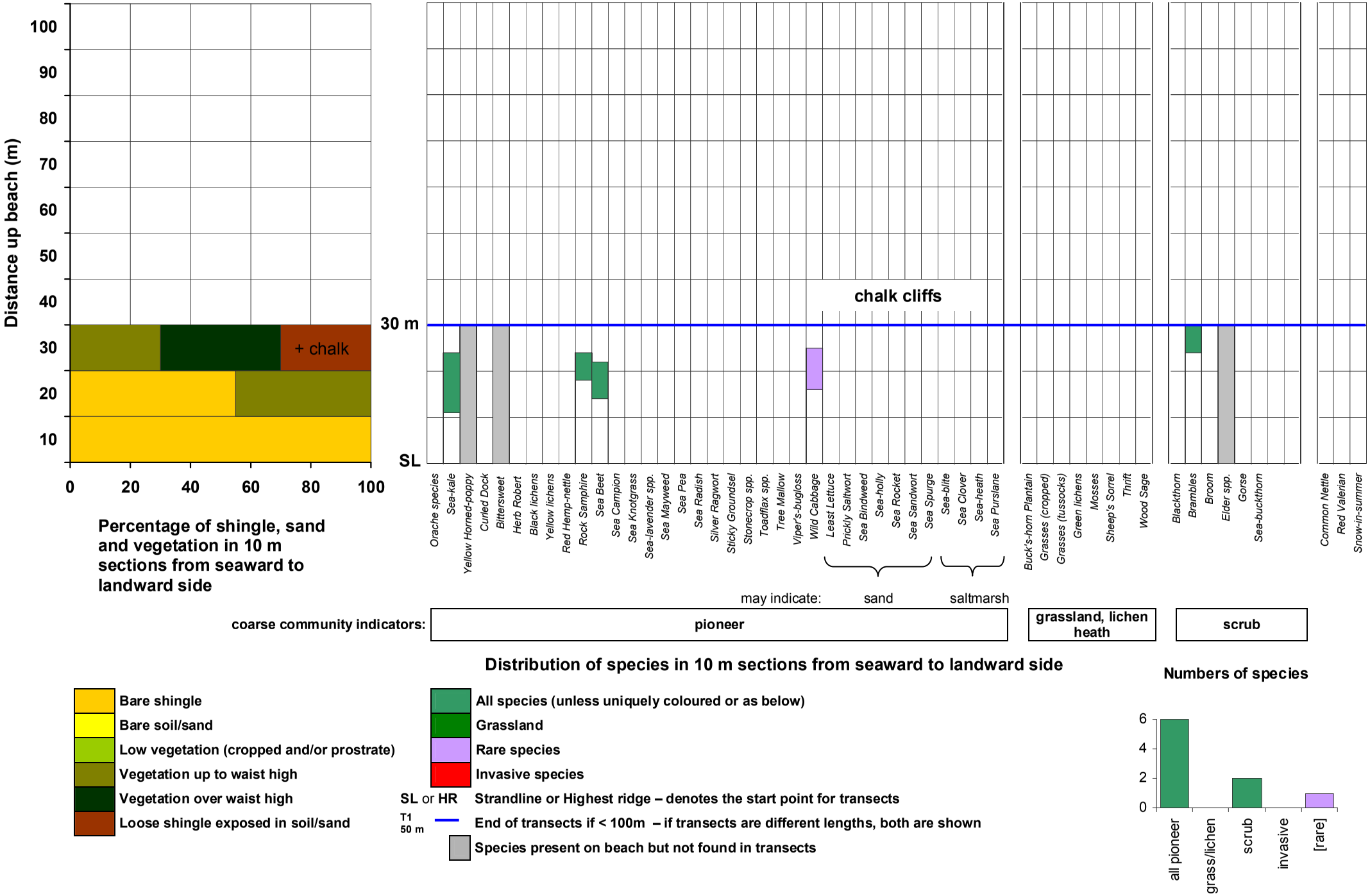
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

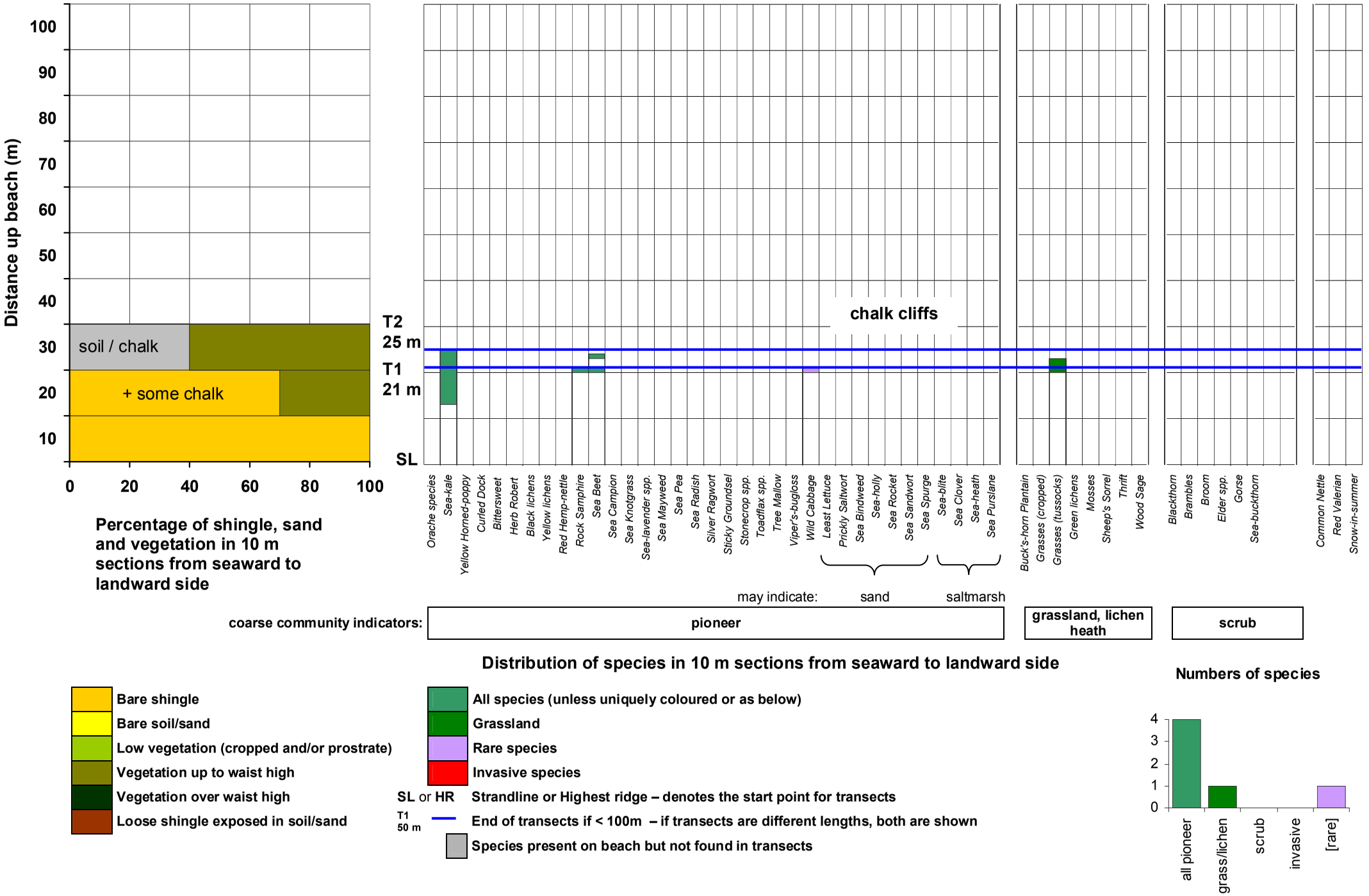
Numbers of species



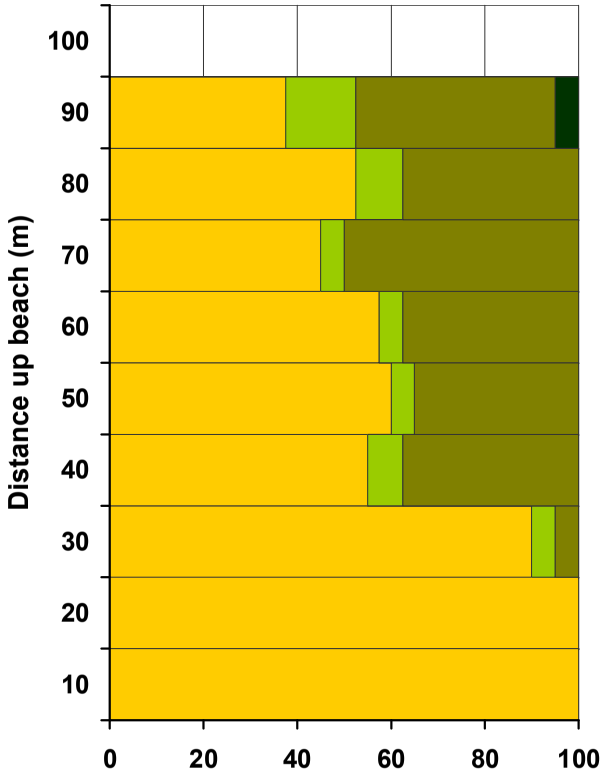
23 - Abbot's Cliff – 15/09/06

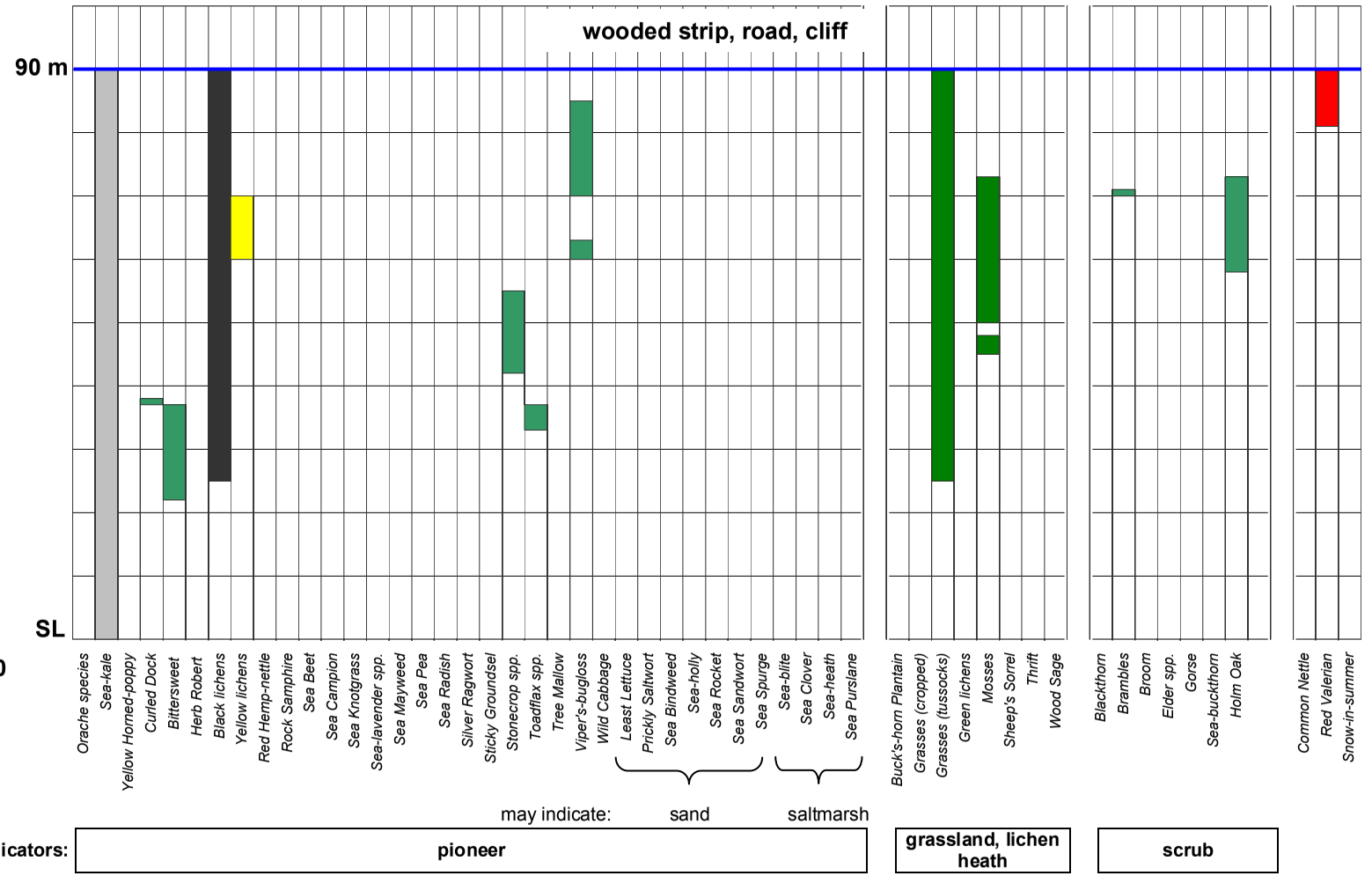


24 - Lydden Spout, Dover – 27/08/06



25 - Kingsdown beach – 09/07 & 22/07/00





Distribution of species in 10 m sections from seaward to landward side

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- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
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- Vegetation over waist high
- Loose shingle exposed in soil/sand

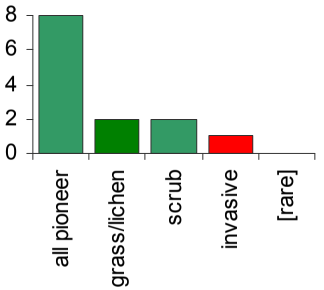
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

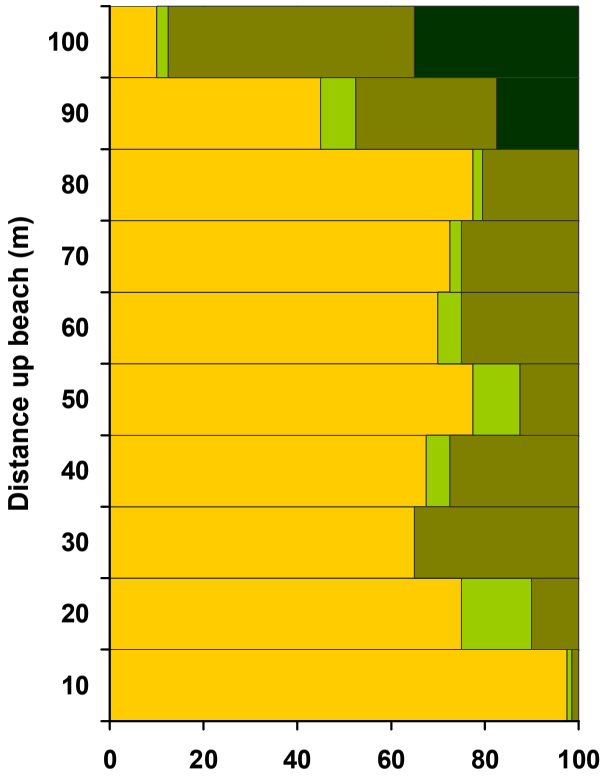
Species present on beach but not found in transects

Numbers of species

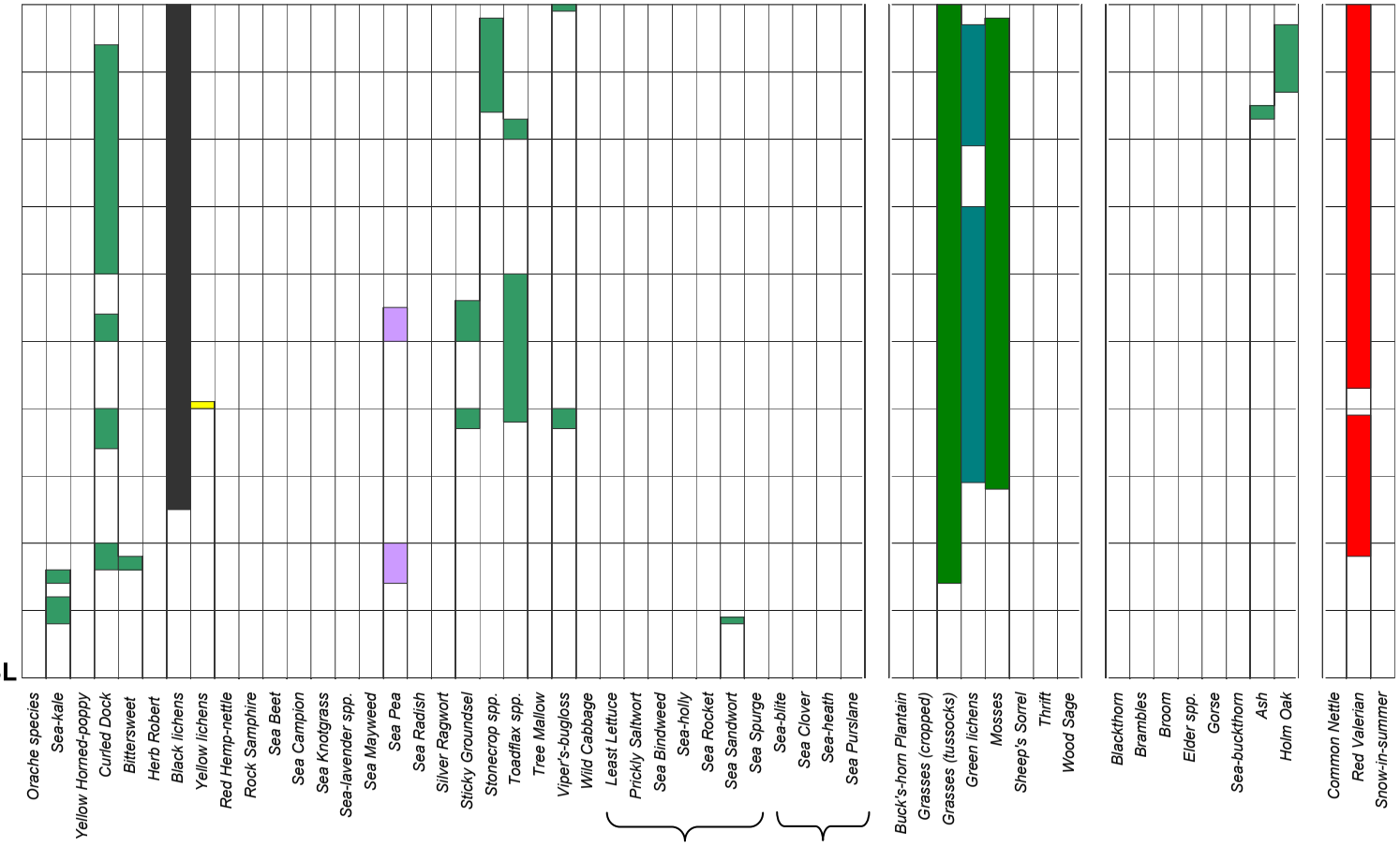


26 - Walmer Castle – 22/08/06

footpath, 20m shingle, road



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side



may indicate: sand saltmarsh

coarse community indicators: pioneer | grassland, lichen heath | scrub

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

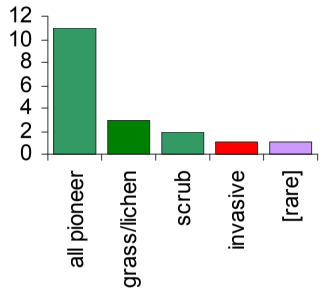
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

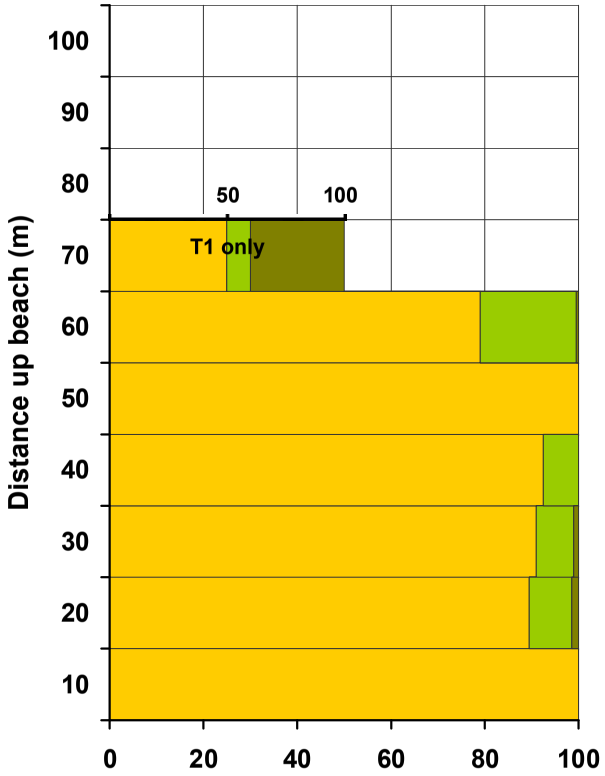
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species



27 - Marine Road, Deal – 15/08/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

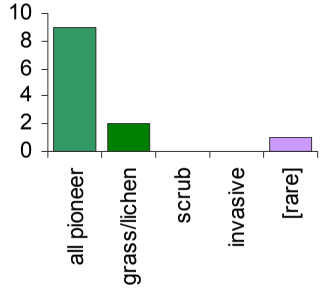
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

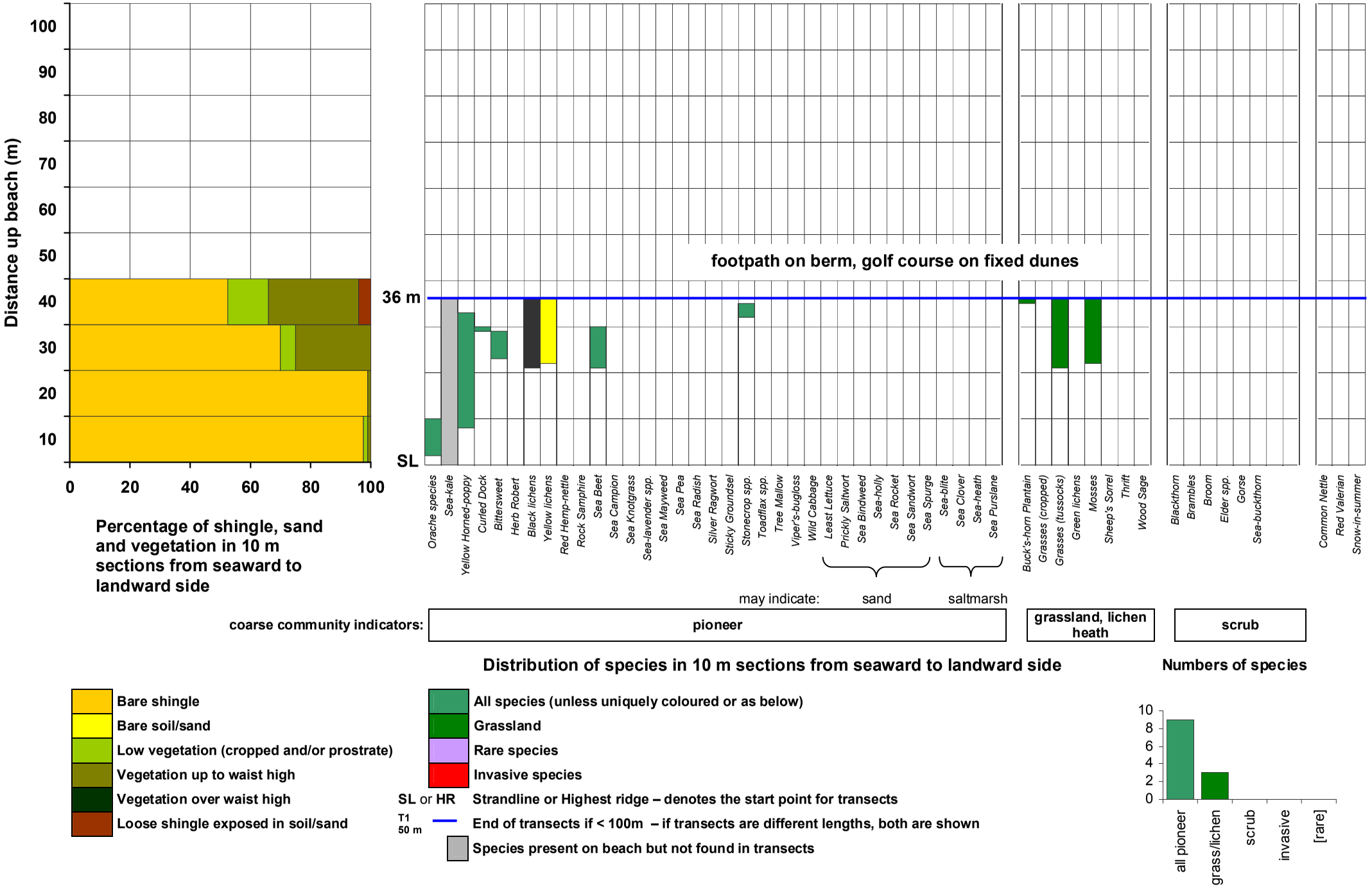
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

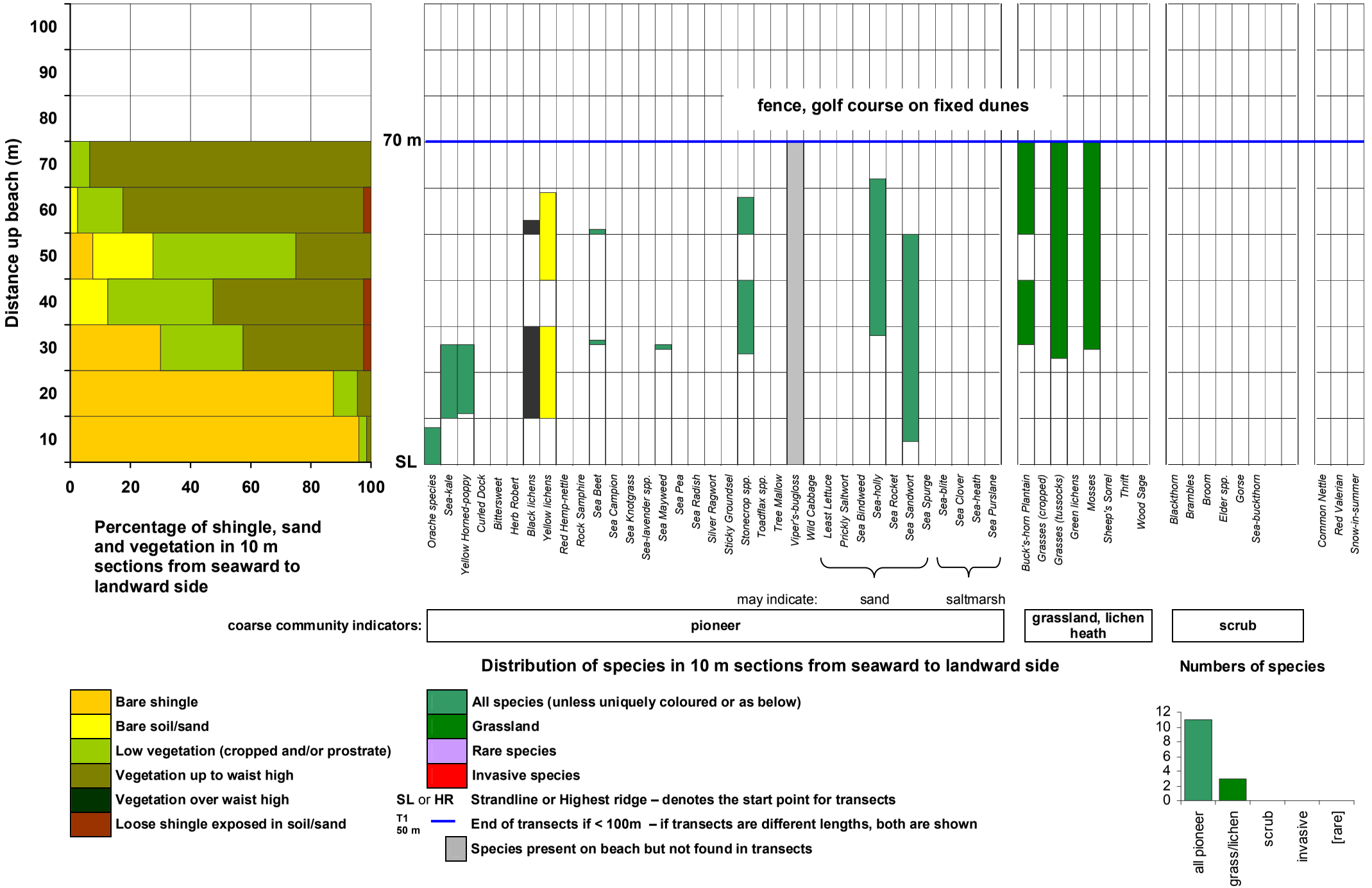
Numbers of species



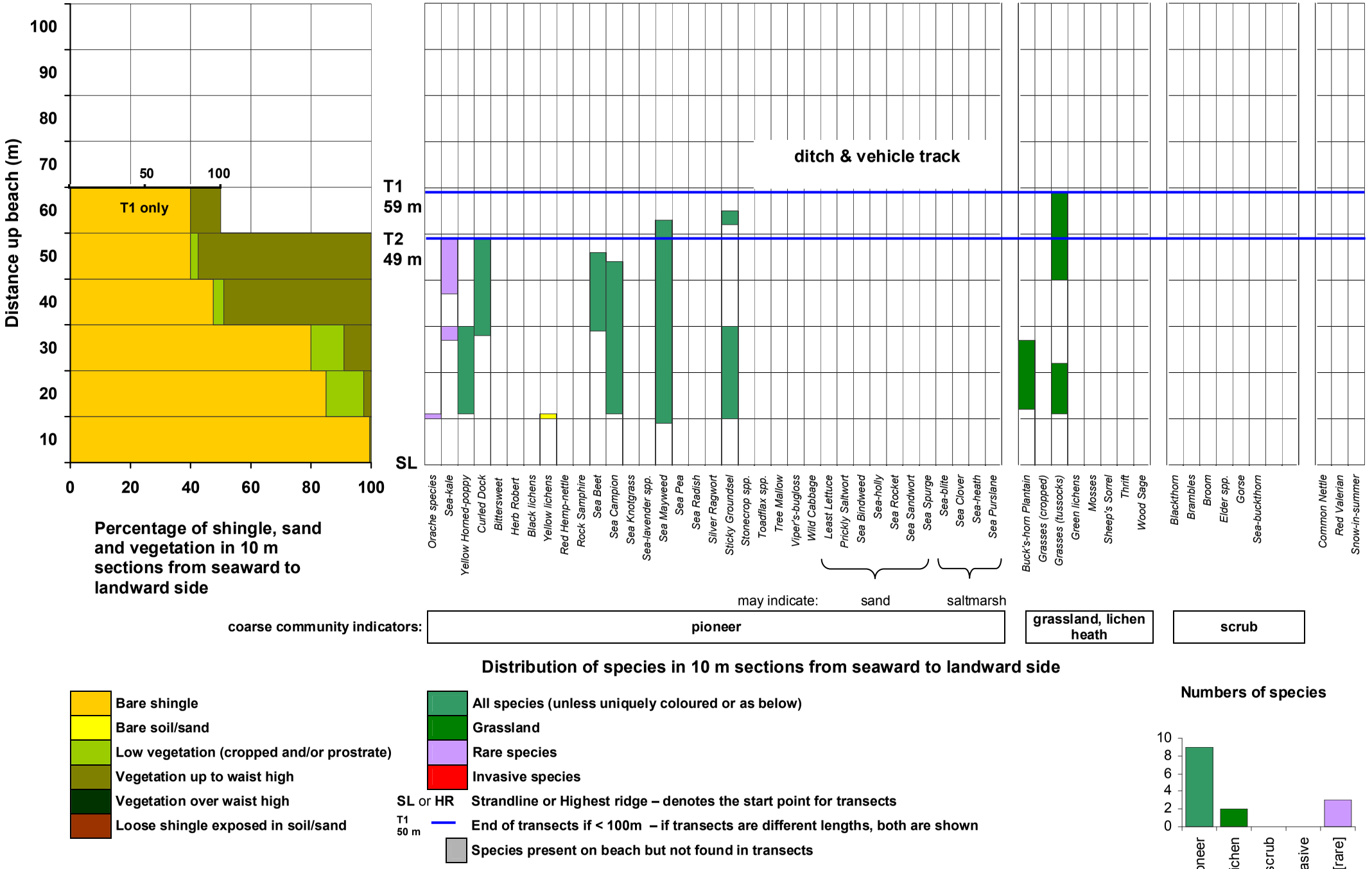
28 - Chequers PH, Sandwich Bay – 15/08/06



29 - Sandwich Bay – 15/08/06



30 - Ornival – 18/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

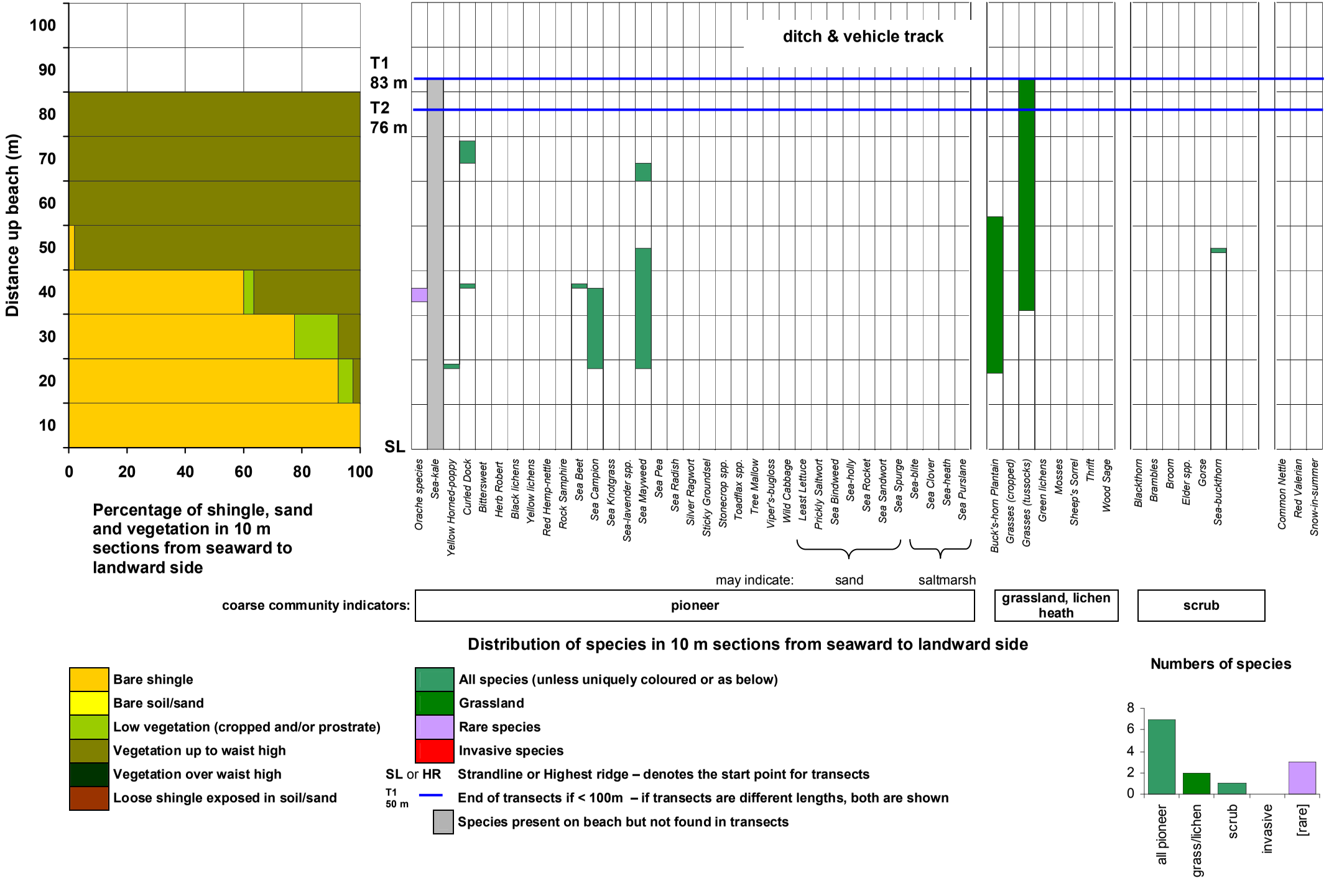
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

31 - Hâble d'Ault – 18/07/06



Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

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- Grassland
- Rare species
- Invasive species

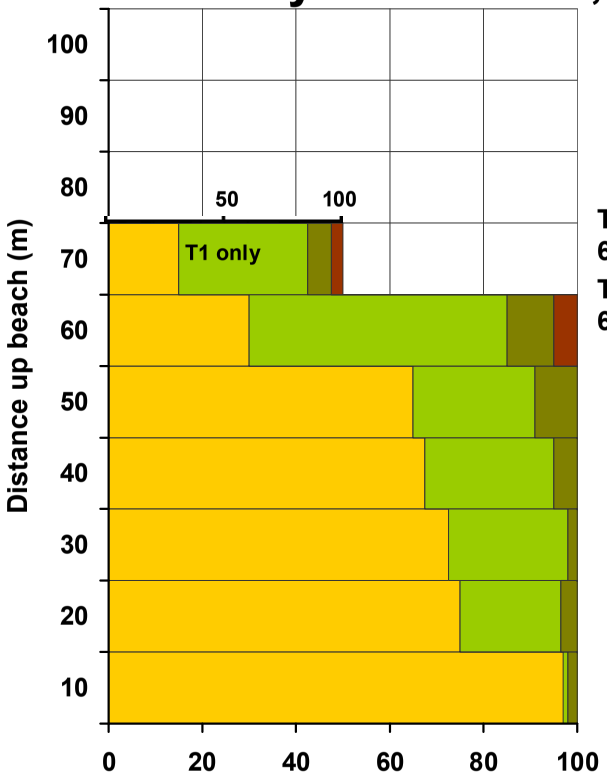
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

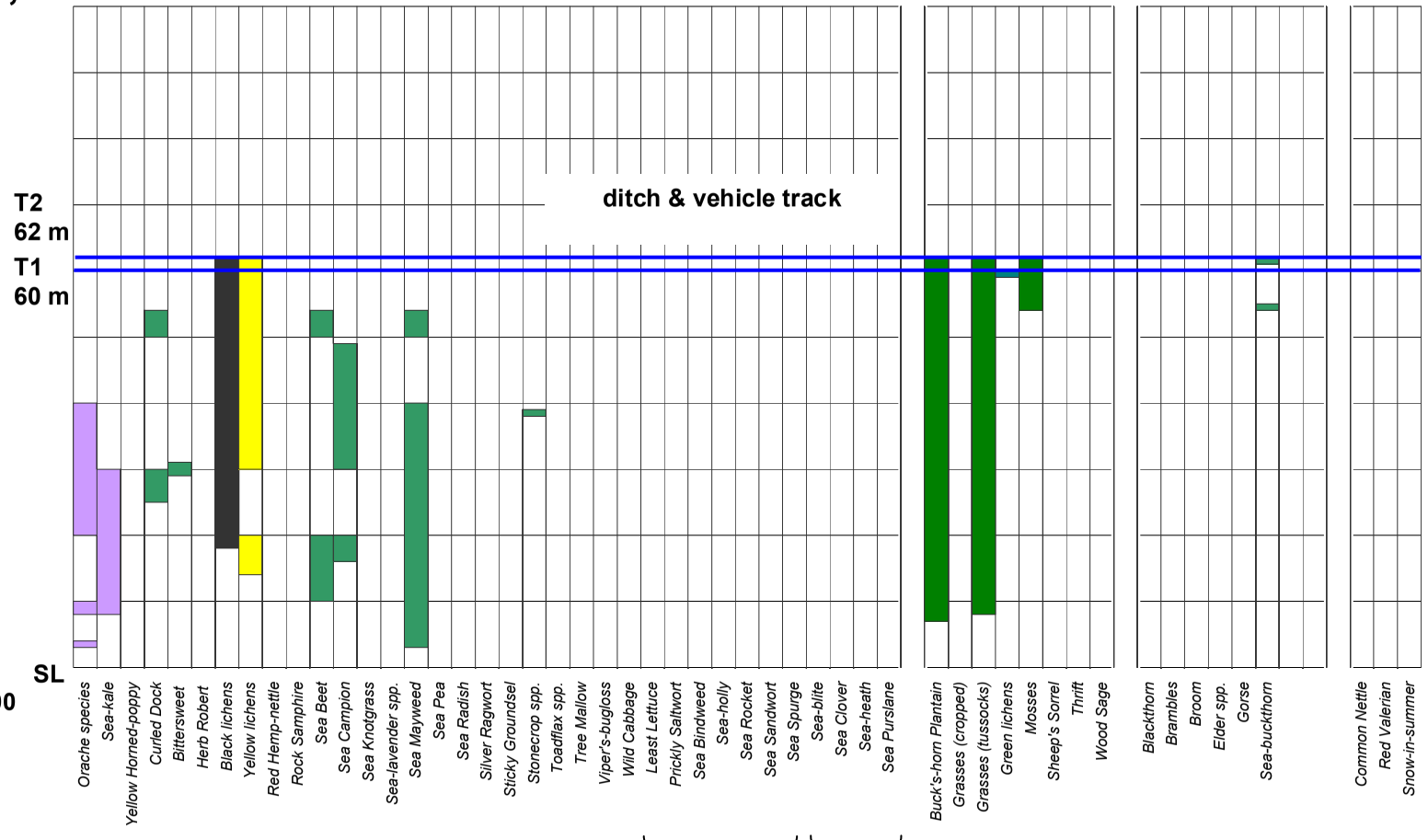
Species present on beach but not found in transects

Numbers of species

32 – Cayeux-sur-Mer, sud – 19 & 22/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side



Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

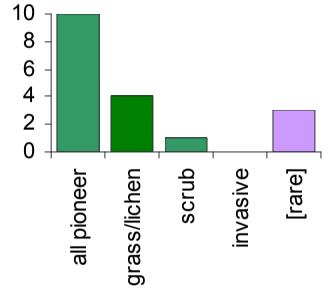
- All species (unless uniquely coloured or as below)
- Grassland
- Rare species
- Invasive species

SL or HR — Strandline or Highest ridge – denotes the start point for transects

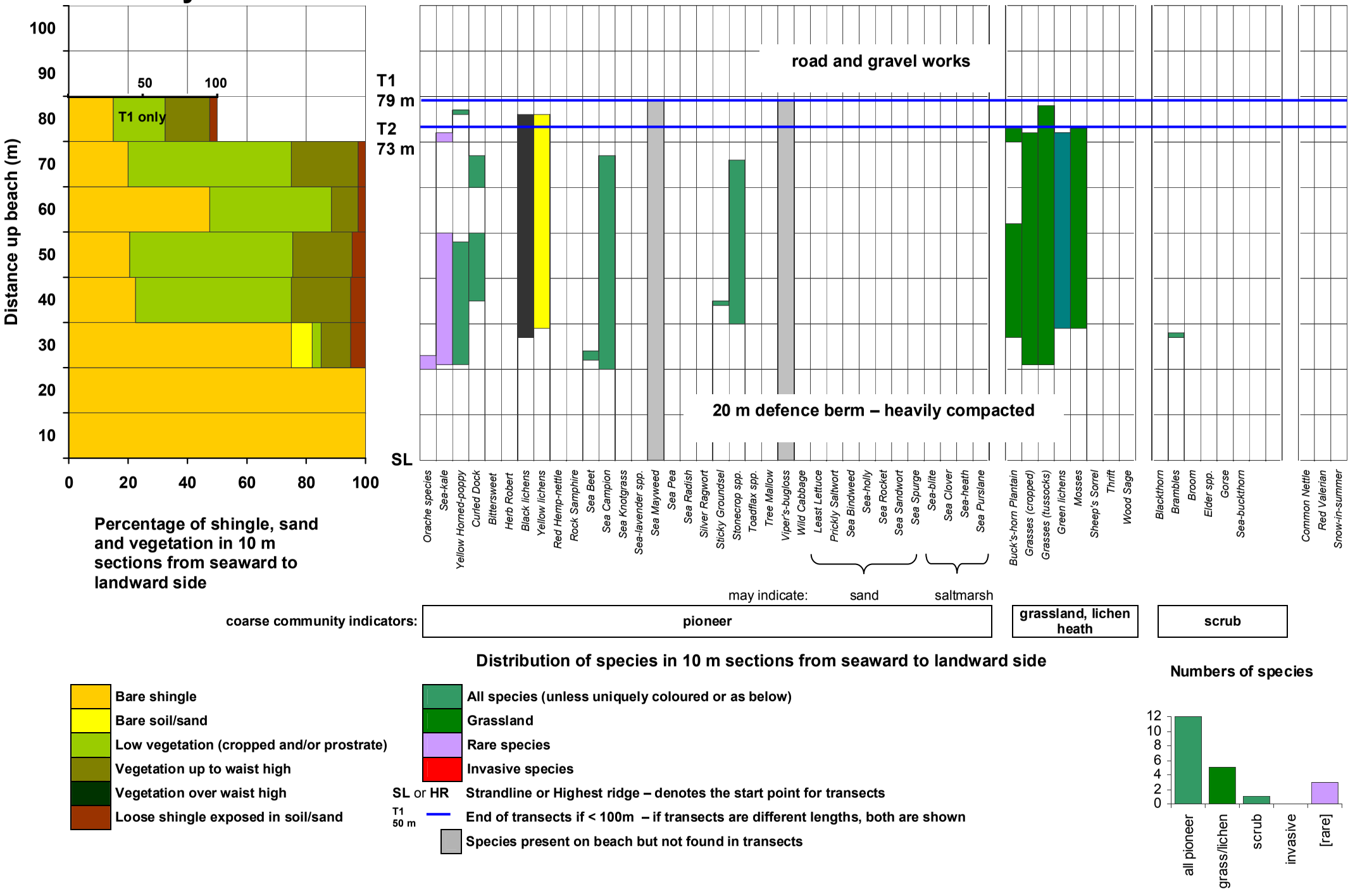
T1 / 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species



33 – Cayeux-sur-Mer – 24/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

- Bare shingle
- Bare soil/sand
- Low vegetation (cropped and/or prostrate)
- Vegetation up to waist high
- Vegetation over waist high
- Loose shingle exposed in soil/sand

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- Grassland
- Rare species
- Invasive species

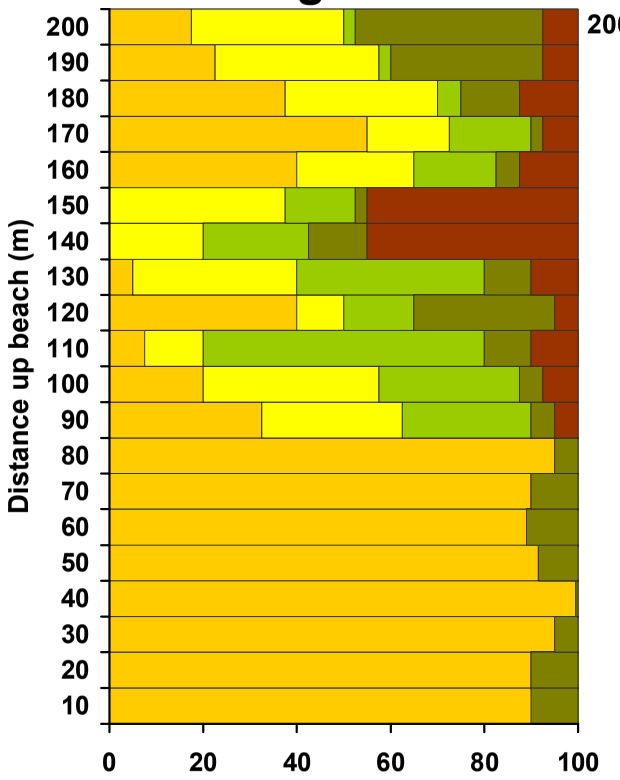
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

34 - Brighton-sur-Mer, sud – 21/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

grey dunes

200 m

SL

Orache species
Sea-kale
Yellow Horned-poppy
Curled Dock
Bittersweet
Herb Robert
Black lichens
Yellow lichens
Red Hemp-nettle
Rock Samphire
Sea Beet
Sea Campion
Sea Knotgrass
Sea-lavender spp.
Sea Mayweed
Sea Pea
Sea Radish
Silver Ragwort
Sticky Groundsel
Stonecrop spp.
Toadflax spp.
Tree Mallow
Viper's-bugloss
Wild Cabbage
Least Lettuce
Prickly Saltwort
Sea Bindweed
Sea-holly
Sea Rocket
Sea Sandwort
Sea Spurge
Sea-blite
Sea Clover
Sea-heath
Sea Purslane
Buck's-horn Plantain
Grasses (cropped)
Grasses (tussocks)
Green lichens
Mosses
Sheep's Sorrel
Thrift
Wood Sage
Blackthorn
Brambles
Broom
Elder spp.
Gorse
Sea-buckthorn
Common Nettle
Red Valerian
Snow-in-summer

may indicate: sand saltmarsh

coarse community indicators: **pioneer** | **grassland, lichen heath** | **scrub**

Distribution of species in 10 m sections from seaward to landward side

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- Vegetation up to waist high
- Vegetation over waist high
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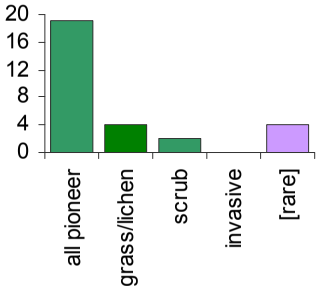
SL or HR — Strandline or Highest ridge – denotes the start point for transects

T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

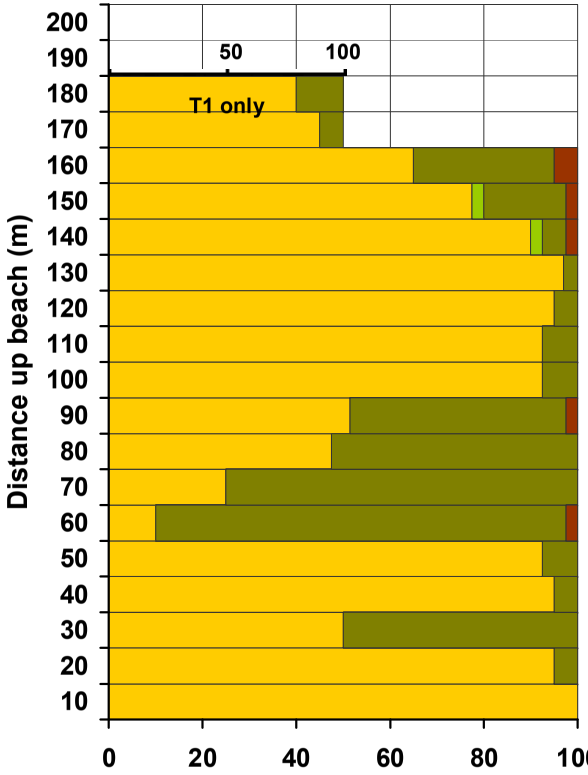
Species present on beach but not found in transects

Numbers of species

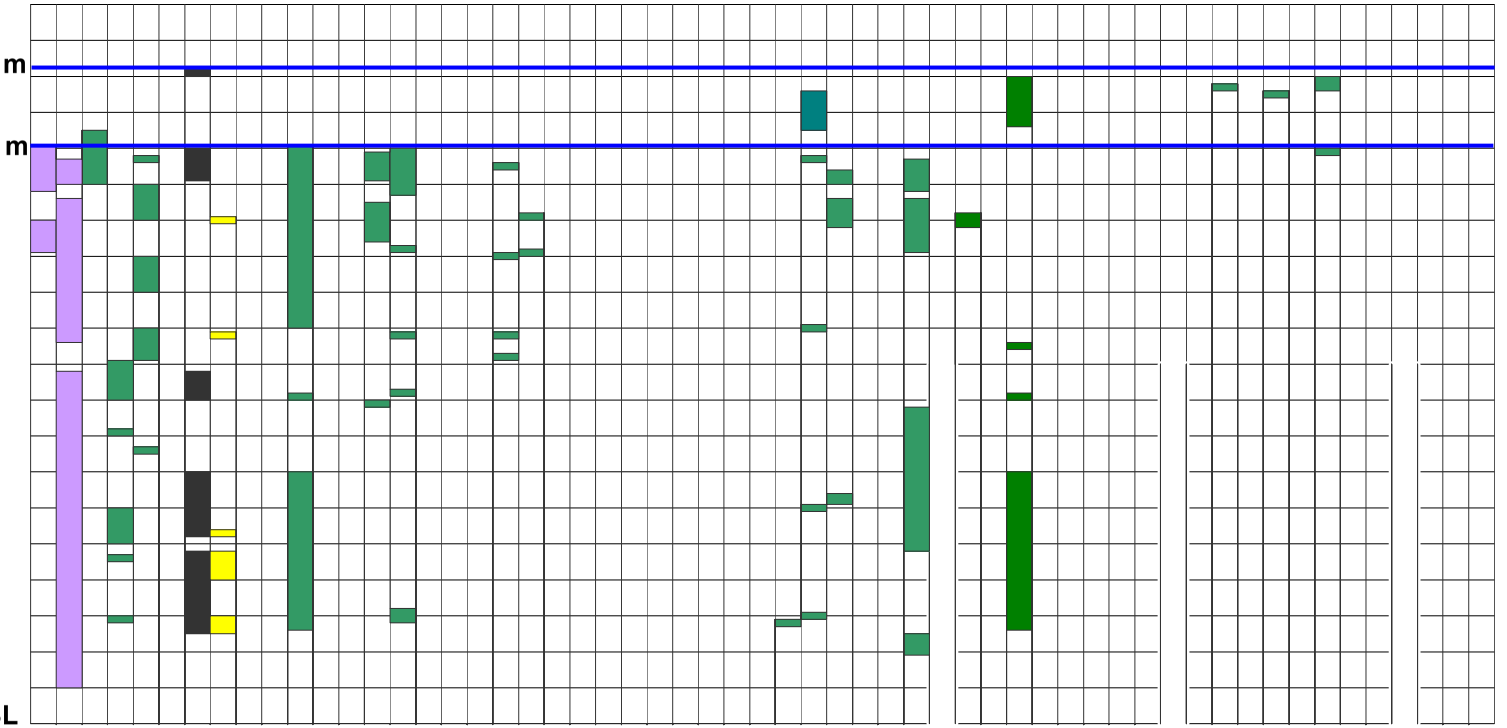


35 – Brighton-sur-Mer, nord – 24/07/06

grey dunes



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side



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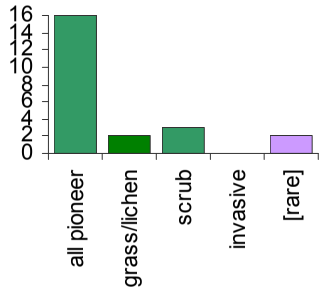
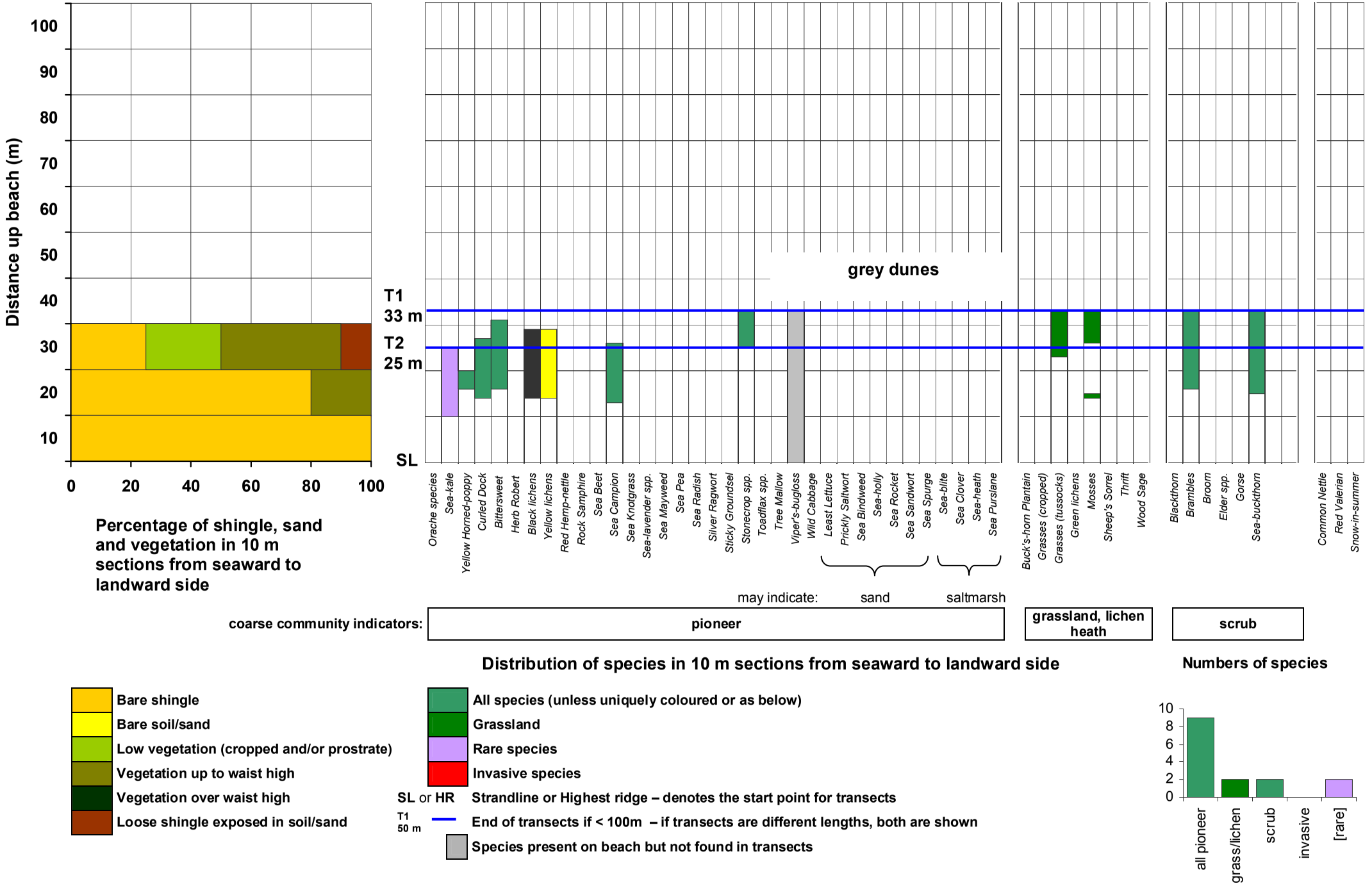
T1 / 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

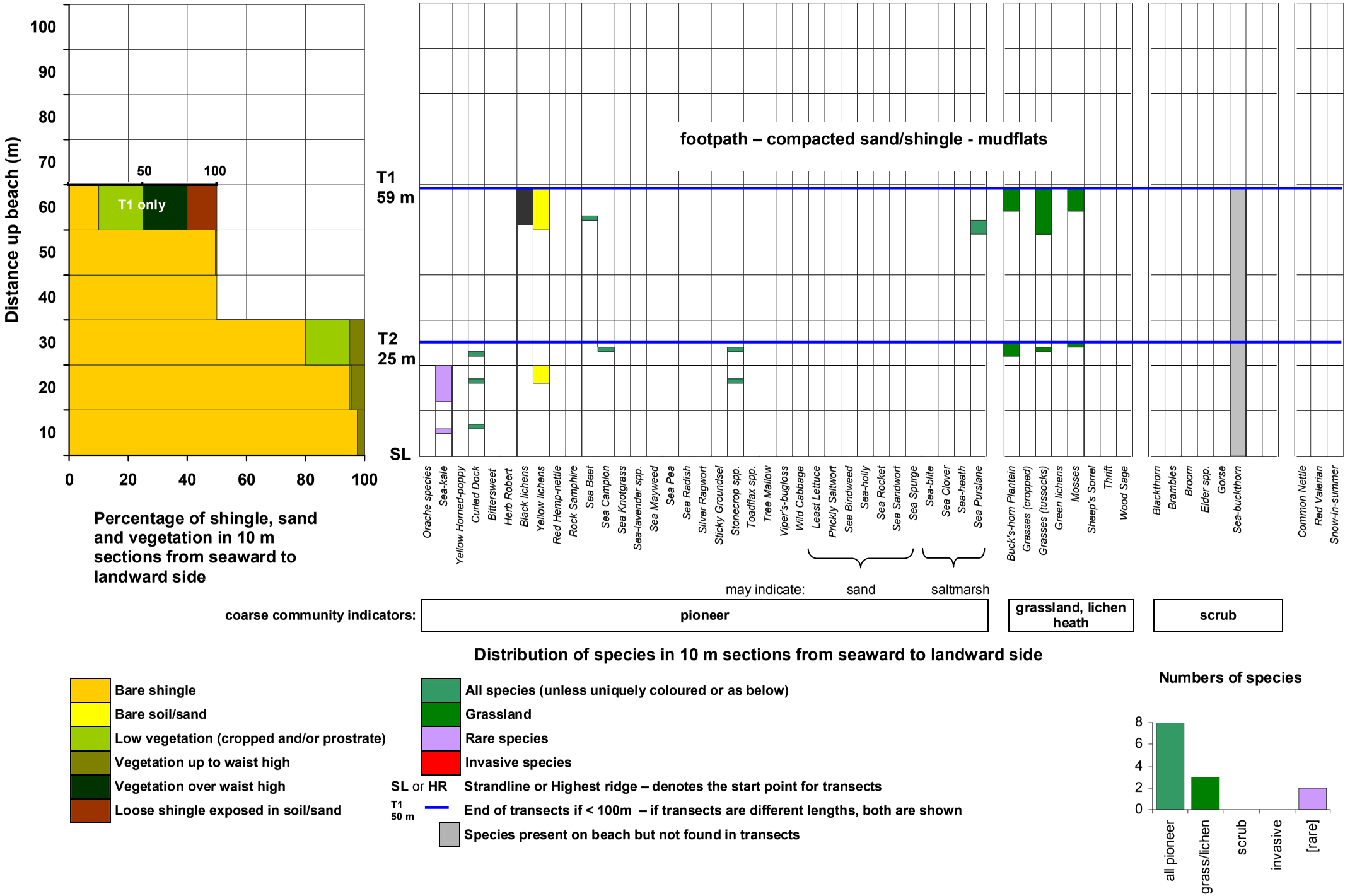
Numbers of species



36 - Le Hourdel, ouest – 20/07/06



37 - Le Hourdel, est – 20/07/06



Percentage of shingle, sand and vegetation in 10 m sections from seaward to landward side

Distribution of species in 10 m sections from seaward to landward side

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- Rare species
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SL or HR — Strandline or Highest ridge – denotes the start point for transects

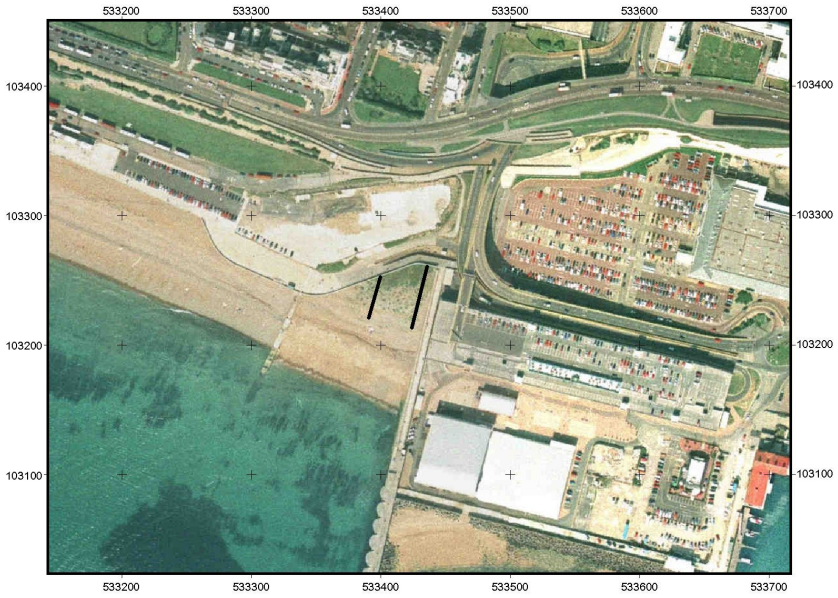
T1 50 m — End of transects if < 100m – if transects are different lengths, both are shown

Species present on beach but not found in transects

Numbers of species

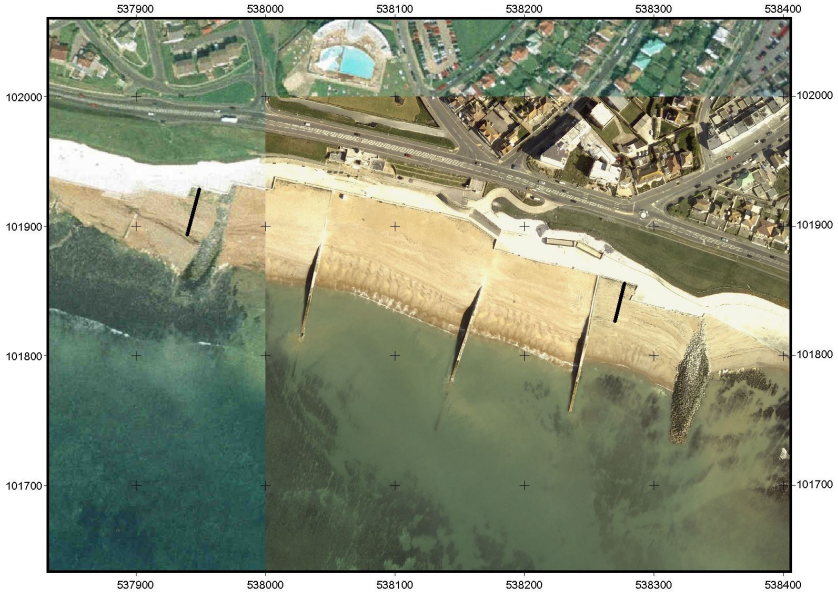
Appendix 5 – Aerial photographs of all sites surveyed

The following aerial photographs show all 37 sites and the locations of transects. Each photograph has a 100 meter grid superimposed on it. For each site the Biodiversity Value Category (Modal value(s) are in brackets) and any designation known of is cited (see Section 2, p 10 for details). All aerial photographs of English coast were provided courtesy East Sussex County Council (© ESCC). Use and reproduction of these data is not allowed without prior permission from the copyright holder. All aerial photographs of French coast were provided courtesy of "Système d'Information Géographique Interministériel" (© Ortholittorale 2000) at http://siglittoral.test.application.equipement.gouv.fr/ (accessed 2006-7).



01 – Black Rock beach, Brighton, England
(1999 aerial photographs)

Good



02 – Saltdean, England
(2006 and 1999 aerial photographs)

Good (Impoverished)
(Cliffs behind are SSSI)

03 - West beach, Newhaven, England

Good (Impoverished)
(Cliffs behind are SSSI)

04 – Tide Mills, west, England

Good (Excellent)

05 – Tide Mills, east, England

Good

06 – Tide Mills, Bishopstone, England

Good (Impoverished & Excellent)

07 – Cuckmere Haven, east, England

Good
SSSI

08 – Holywell, Eastbourne, England

Impoverished
(Cliffs behind are SSSI)

09 – Pevensey Bay, Sailing Club, England

Good

10 – Pevensey Bay, Martello estate, England

Good (Excellent)

11 – Norman's Bay, west, England

Good (Excellent)

12 – Norman's Bay, east, England

Good (Impoverished)

13 – Coodens, west, England

Impoverished
(Pevensey levels behind is SSSI)

14 – Coodens, east, England

Impoverished

15 – Veness Gap, England

Impoverished

16 – Bexhill, west, England

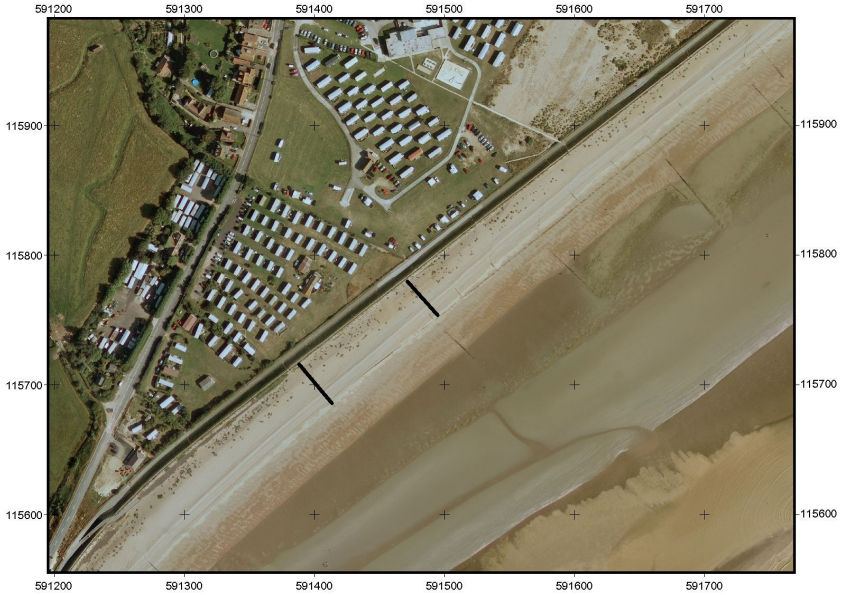
Impoverished

17 – Bexhill, central, England

Impoverished

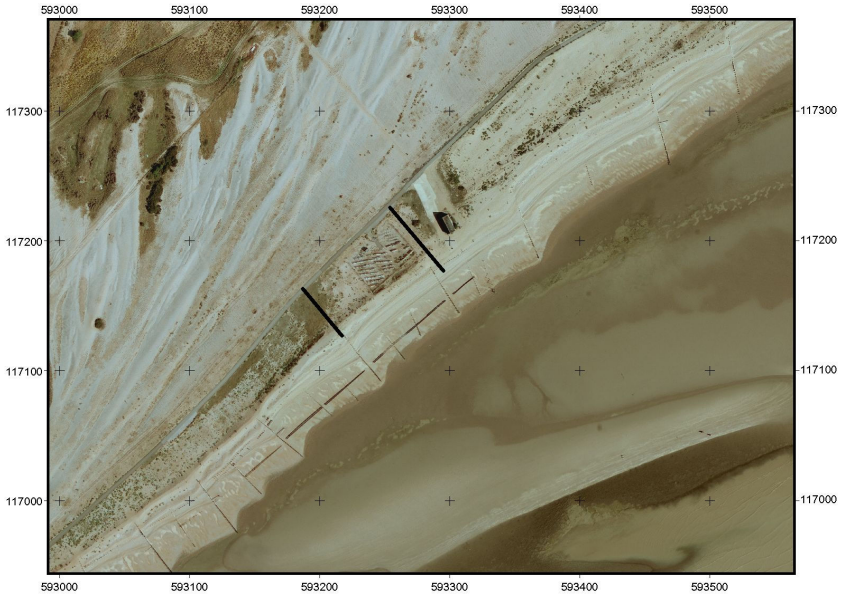
18 – Bexhill, east, England

Impoverished



19 – Winchelsea, England

Good (Impoverished)



20 – Rye Harbour Nature Reserve, west, England

Excellent
SSSI

21 – Rye Harbour Nature Reserve, east, England

Excellent
SSSI

22 – Dungeness, Lade, England

Good (Excellent)
SSSI

23 – Abott's Cliff, England

Impoverished
(Cliffs behind are SSSI)

24 – Lydden Spout, England

Impoverished
(Cliffs behind are SSSI)

25 – Kingsdown beach, England

Good (Impoverished)
SSSI

26 – Walmer Castle, England

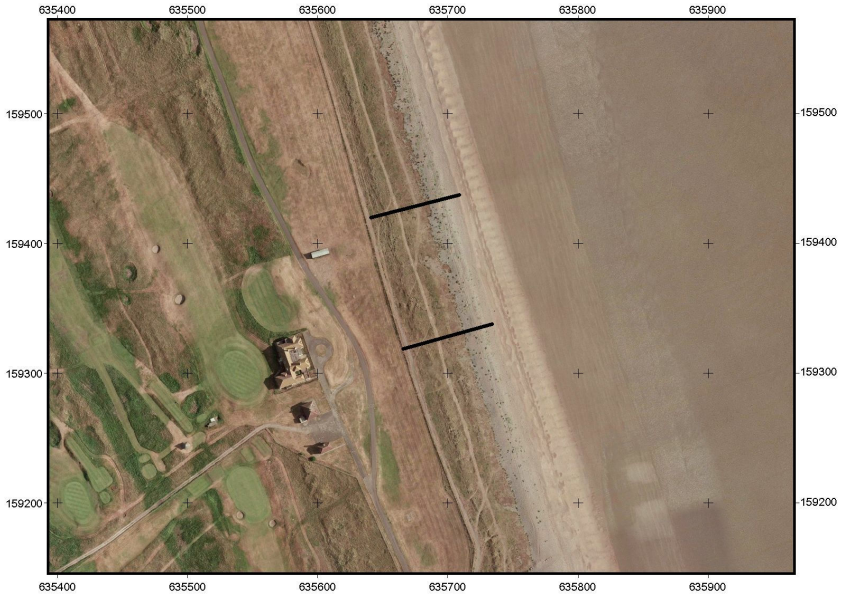
Good (Excellent)

27 – Marine road, Deal, England

Good (Impoverished)

28 – Chequers PH, England

Good (Impoverished)
SSSI, SAC, SPA

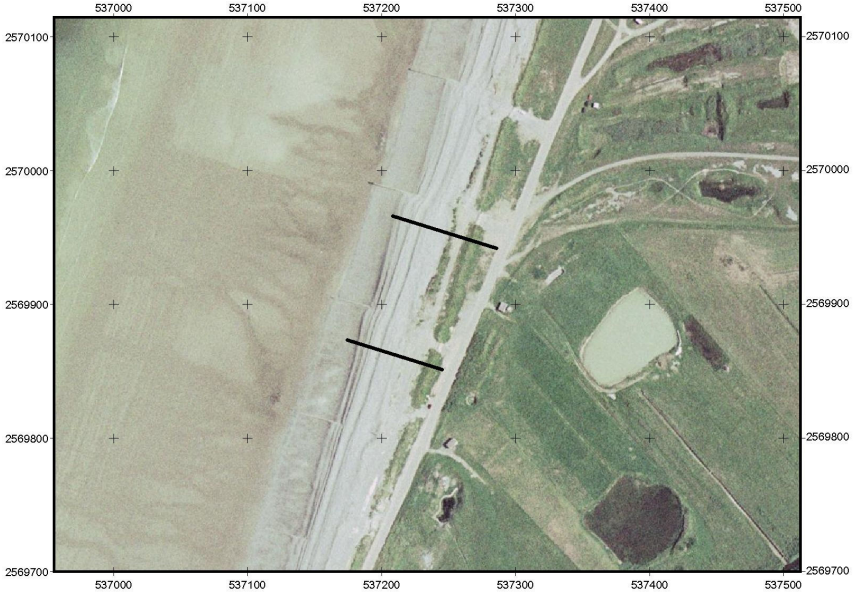


29 – Sandwich Bay, England

Good (Impoverished)
SSSI, SAC, SPA

30 – Ornival, France

Good (Excellent)
ZSC, ZPS



31 – Hâble d'Ault, France

Good (Excellent)
ZSC, ZPS

32 – Cayeux-sur-Mer, sud, France

Excellent
ZSC, ZP

33 – Cayeux-sur-Mer, France

Excellent
ZSC, ZPS

34 – Brighton-sur-Mer, sud, France

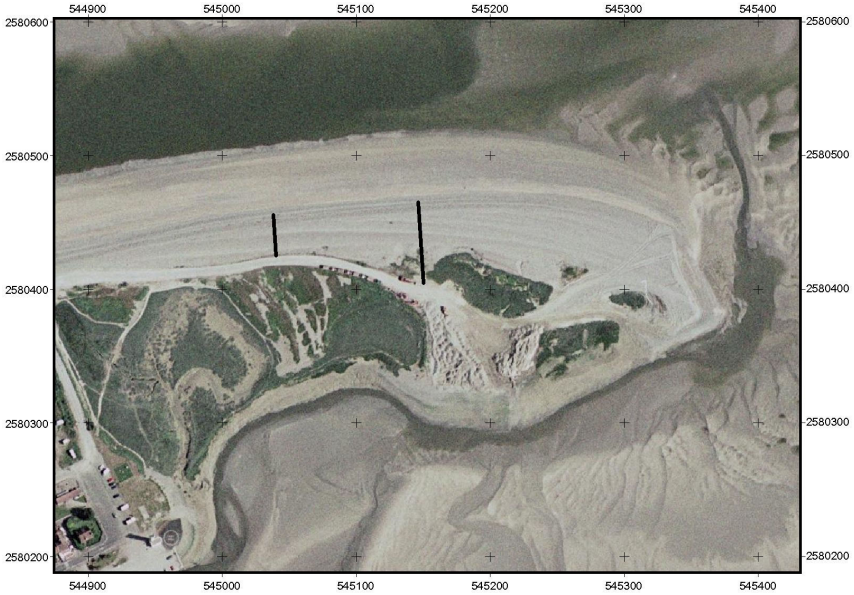
Excellent
ZSC, ZPS

35 – Brighton-sur-Mer, nord, France

Excellent
ZSC, ZPS

36 – Le Hourdel, ouest, France

Good (Impoverished)
ZSC, ZPS



37 – Le Hourdel, est, France

Good (Impoverished)
ZSC, ZPS