Invertebrate survey of the soft-rock cliffs of Yorkshire

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Dr. Mark G. Telfer
10, Northall Road
Eaton Bray
DUNSTABLE
Bedfordshire
LU6 2DQ

Contents

0. Summary

- An invertebrate survey was undertaken in summer 2006 of the Yorkshire soft-rock cliffs between Flamborough Head and Scarborough. Three sites were chosen: Speeton, Cayton Bay and Frank Cliff.
- 273 species of invertebrate were recorded across a wide range of taxonomic groups.
- 11 Red Data Book or Nationally Scarce species were found: 4.0% of the total.
- The rarest invertebrate found, the water-penny beetle *Eubria palustris* was associated with seepage habitat on the cliffs, as were three of the other scarce species. The remaining scarcities were associated with bare ground, ruderal vegetation, flowery grassland and woodland.
- Dedicated nocturnal survey for the soft-rock cliff specialist beetle *Nebria livida* failed to locate it at any of the sites despite using a tried-and-tested survey technique.
- Speeton, the largest and most varied site, supported the largest invertebrate assemblage. Cayton Bay supported a smaller but equally valuable assemblage, while Frank Cliff was relatively poor.
- The impacts of land-use, hydrology and sea defences on the cliffs are discussed in relation to invertebrates.

1. Introduction

In 2006, the author was commissioned by Buglife to undertake invertebrate surveys of the soft-rock cliffs of the north Norfolk and east Yorkshire coasts. This report contains the results of the Yorkshire survey, while the results of the Norfolk survey can be found in a sibling report (Telfer, 2006). These reports are a component of Buglife's project on "Sustainable Management of Soft Rock Cliffs and their Invertebrate Biodiversity".

Soft-rock cliff is one of those habitats that supports relatively little non-invertebrate biodiversity and has been consequently rather neglected by British conservationists until recently. Soft-rock cliffs are now included within the UK Habitat Action Plan (HAP) for "Maritime cliff and slopes" (www.ukbap.org.uk/UKPlans.aspx?ID=27) where they are referred to as simply "soft cliffs".

The HAP offers the following description of the habitat:
"Soft cliffs are formed in less resistant rocks such as shale or in unconsolidated materials such as boulder clay; being unstable they often form less steep slopes and are therefore more easily colonised by vegetation. Soft cliffs are subject to frequent slumping and landslips, particularly where water percolates into the rock and reduces its effective shear strength."
"…they are particularly important for invertebrates as they provide a suite of conditions which are rarely found together in other habitats. The combination of friable soils, hot substrates and open conditions maintained by cliff slippages offer a continuity of otherwise very restricted microhabitats and these support many rare invertebrates which are confined to such sites."

The reasons why soft-rock cliffs make good invertebrate habitat are discussed by Howe (2003). Bare ground is the key factor on soft-rock cliffs, in combination with a profusion of ruderal plants, and suitable soil conditions for burrowing. Bare ground is an important invertebrate micro-habitat within heathlands, arable margins and 'brownfield sites' but in all these situations, the processes creating bare ground are unpredictable and short-lived. The natural erosion of soft-rock cliffs means that bare ground is reliably present year-in year-out, allowing important invertebrate assemblages to develop. Seepages and trickles also support important assemblages of invertebrates, particularly flies and beetles, on soft-rock cliffs. Typically these are also species that require early-successional conditions, with little or no vegetation. Soft-rock cliffs are some of the few, or for some species the only, places that perennially and reliably provide suitable habitat.

Soft-rock cliffs can sometimes seem like true wilderness - a rare commodity in southern Britain. Though they are far from being immune to man's influence, those influences are seldom direct. Most visitors to the coast prefer to spend their time either on the beach or on the cliff-top. This survey covered the sector between the top of the beach and the lip of the cliff-top.

Pye & French (1993) estimated that 33 km of the Yorkshire coastline was unprotected soft-rock cliff: 12.9% of England's 255.6 km of soft-rock coastline (Howe, 2003). This survey considered a potential survey area stretching from South Landing, Flamborough Head in the south, to Rosedale Cliffs (Port Mulgrave) in the north.

Entomologists have been interested in the soft-rock cliffs on this coastline for at least 150 years. The mud cliffs around Bridlington and Scarborough were well-known to Dawson (1854) as a site for the soft-rock cliff specialist beetle *Nebria livida*. This beetle is a speciality of the Yorkshire soft-rock cliffs, known elsewhere in Britain from the Norfolk soft-rock cliffs. Subsequent generations of entomologists have worked various soft-rock cliff sites along this coast, including surveys by the National Trusts' Biological Survey Team. Archer (2002) conducted some intensive recording of Cornelian and Cayton Bays and Osgodby Point for wasps and bees (aculeate Hymenoptera). However, for most groups and most sites there has been no formal entomological survey.

The aims of this survey were:

- to gather new data on the invertebrate communities of selected sites on the soft rock cliffs of the Yorkshire coast,
- to contribute data to Buglife's UK wide study into the sustainable management of maritime soft-rock cliffs and their invertebrate ecology, and
- to develop recommendations for the future management of the Yorkshire coast and identify opportunities for enhancing biodiversity.

2. Methods

Reconnaissance visits were made to various potential survey sites between South Landing, Flamborough Head and Scarborough on the evening of 10th July and throughout 11th July. In company with Andrew Whitehouse, Buglife's project officer for the "Sustainable Management of Soft Rock Cliffs and their Invertebrate

Biodiversity" project, three survey sites were chosen. Survey sites and sampling areas were chosen to (i) encompass the range of habitat variation present on this stretch of Yorkshire's soft-rock cliffs, whilst (ii) focussing effort on the (micro-)habitats likely to be most important, (iii) targeting sites with quick and easy access, and (iv) including at least one site known to support *Nebria livida*.

At each site, a brief habitat description was compiled and digital photographs were taken.

The sites selected for survey were at Speeton (between Reighton Gap and Black Cliff), Cayton Bay and Frank Cliff (Table 1). In addition to a limited amount of survey during the reconnaissance on 10th and 11th July, two days of survey were spent at Speeton, and two half-days each at Cayton Bay and Frank Cliff. Extra nocturnal survey time, specifically targeted at the ground-beetle *Nebria livida*, was carried out over three nights (Table 2).

The diurnal field survey time was divided between the three sites as shown in Table 1. Speeton is in South-east Yorkshire (VC61); Cayton Bay and Frank Cliff are in North-east Yorkshire (VC62).

Survey site	**Survey dates**	**Site details**
Speeton, TA1--7--, VC 61	12th July, 31st August	Between the Reighton Gap access at TA139762 up to and including the stream at the chalk/clay boundary with the Black Cliff at TA154754.
Cayton Bay, TA07-84-, VC62	13th July, 30th August	South Cliff, south of the access to the beach, in TA06-84- but predominantly in TA07-84-.
Frank Cliff, TA05-86-, VC62	13th July, 30th August	More commonly known as Cornelian Bay. Access from pumping station at TA057860, surveying cliffs to the south, mostly at a flush at TA058860.

Table 1: Dates and details of sites surveyed by day for invertebrates.

The ground-beetle *Nebria livida* can be very difficult to find by day, when it is best searched for by pulling large blocks of clay away from the foot of the cliff to reveal the adult beetles sheltering deep in the cracks between blocks. After dark, survey work in Norfolk has shown that the active adult beetles can be found much more easily and without any habitat destruction, by torchlight searching along the foot of the cliff and the top of the beach. Survey work by torchlight, specifically targeting *Nebria livida* was carried out over three nights as detailed in Table 2. Other beetles (predominantly other carabids) were also recorded during the nocturnal fieldwork.

Survey site	**Survey dates**	**Survey times**
Speeton	12th July, 31st August	2230 - 0000, 2112 - 2245
Cayton Bay	30th August	2119 - 2220
Frank Cliff	30th August	2235 - 2320

Table 2: Sites, dates and times of nocturnal survey work for *Nebria livida*. The survey times given are for time spent actually in suitable habitat and on survey.

The entire first fieldwork session from 10th to 13th July was in company with Andrew Whitehouse who carried out valuable supplementary collecting, passing on his observations and specimens to the author.

Invertebrates were recorded using the techniques detailed in Table 3.

Technique	**Target groups**	**Target habitats**
grubbing at ground level, turning over stones, etc	Ground-living invertebrates: Coleoptera, ants (Hymenoptera: Formicidae), spiders, woodlice (Isopoda) and millipedes (Diplopoda).	Bare ground, ephemeral vegetation, grassland and seepages.
sieving	A useful supplement to grubbing in denser vegetation. Handfuls of vegetation are sieved over a white tray to reveal a range of ground-living invertebrates, notably weevils, ground beetles and staphylinids (*Stenus*).	Mossy ground, fen, grassland.
sweep-netting (canvas bag)	Spiders and phytophagous beetles in taller vegetation. Also some flies and aculeate Hymenoptera.	Ruderal vegetation, grassland, fen, paying particular attention to foodplants and to nectar and pollen sources.
netting (butterfly net)	Flies (Diptera), bees and wasps (aculeate Hymenoptera).	All habitats, paying particular attention to nectar and pollen sources, and to aculeate nesting habitats.
pan trapping	Bees and wasps, flies.	All habitats.
digging for *Bledius*	*Bledius* species and their specialist carabid associates (*Dyschirius*)	Bare, consolidated substrates, including vertical faces.
direct observation	Bees and wasps, flies (especially Stratiomyidae and Syrphidae), grasshoppers and crickets (Orthoptera), spiders.	All habitats, paying particular attention to nectar and pollen sources.

Table 3: Invertebrate survey techniques.

Fig. 1: A yellow cat litter tray in service as a pan trap.

Yellow pan-traps (also known as water traps) were used on diurnal surveys except when weather was totally unsuitable for aculeate activity. Traps were either left for the day or collected a day later. An assortment of large and small all-yellow containers was used (e.g. Fig. 1). Traps were filled with water to which a few drops of washing-up liquid were added. The catches by these traps were mostly very poor and an inefficient use of survey time.

The weather conditions during 10th-13th July were generally excellent for invertebrate survey. The 12th was a particularly hot day with light wind. The 13th was cooler due to a light north-westerly. The weather conditions during 30th - 31st August were not ideal for invertebrate survey. The 30th was a cloudy day (6/8 cloud cover) and quite windy, though dry all day, reaching a comfortable temperature with intermittent sunshine at Frank Cliff in the afternoon. Temperatures did not fall much after dark and nocturnal fieldwork started at 14 ºC with light rain, falling to 12 ºC at the end. The 31st was a day of strong westerlies and 7/8 cloud cover, though more sheltered on the cliff-face. Torching that night was conducted in drizzle and a long-shore south-easterly wind. Overall, the weather conditions did not have much effect on the survey for most groups but they certainly reduced the ability to record bees, wasps and flies on the August visits, and occasionally made even the use of a canvas sweep-net difficult. Under these circumstances, effort was diverted to grubbing and sieving.

The survey focussed on the target groups specified by the contract (Table 4).

Major group	**Subgroup**	**Principal identifier**
terrestrial Isopoda (woodlice)		MGT
Araneae (spiders)		PRH
Diplopoda (millipedes)		MGT
Orthoptera	grasshoppers and bush-crickets	MGT
Diptera	Stratiomyidae (soldier-flies (including larvae and pupae))	MGT
	Syrphidae (hoverflies)	MGT
	crane-flies, picture-winged flies and dolichopodids	DG
Hymenoptera	ants (Formicidae) and bumblebees	MGT
	other aculeates (solitary bees and wasps)	DG

Coleoptera	Carabidae (including larvae)	MGT
	Staphylinidae (*Bledius* and *Stenus*)	MGT
	Curculionoidea (weevils and bark-beetles)	MGT
	chrysomelids (Megalopodidae, Orsodacnidae and Chrysomelidae (including bruchids))	MGT

Table 4: The target taxonomic groups for this survey and the principal identification personnel for each group, identified by their initials as follows: DG = David Gibbs, PRH = Peter R. Harvey, MGT = Mark G. Telfer.

Several additional groups were also covered, over and above the requirements of the contract (Table 5).

Major group	**Subgroup**	**Principal identifier**
Odonata	adults only	MGT
Dermaptera		MGT
Heteroptera	a selection of the more distinctive species	MGT
Lepidoptera	butterflies and selected moths (adults and caterpillars)	MGT
Diptera	a few additional species	DG
Hymenoptera: Symphyta	a few sawflies	DG
Coleoptera	all other families except for Ptiliidae, Atomariinae, and all but a selection of the staphylinid subfamilies Aleocharinae, Oxytelinae, Paederinae, Omaliinae, Tachyporinae and Staphylininae.	MGT
Molluscs		MGT

Table 5: The additional taxonomic groups covered by this survey and the principal identification personnel for each group, identified by their initials as follows: DG = David Gibbs, MGT = Mark G. Telfer.

Where practical, invertebrates were identified in the field but wherever the slightest doubt existed, one or more specimens were collected for more detailed scrutiny, or for despatch to other experts, as detailed in Tables 4 and 5 above. Specimens retained by the author were identified using his own library and entomological collections, aiming to achieve rigorously accurate identifications. Selected specimens have been retained in the author's personal collection as vouchers.

3. Study sites

Speeton

Fig. 2: Speeton, looking ESE.

The soft-rock cliffs between Reighton Gap and Black Cliff (Fig. 2) form the largest and most varied of the three sites surveyed. Only the section south of Reighton Gap was surveyed but the habitat stretches northwards to Filey. There is considerable bare ground on these cliffs from active erosion, as well as areas of sparse ruderal vegetation, established grassland and patches of scrub and woodland further inland. There are many flushes creating a variety of wetland habitats from bare, wet sediments to well-established ponds with dense emergent vegetation. A stream at the junction between clay and chalk geology marks the southern boundary of the survey area

Cayton Bay

Fig. 3: The base of the main flush at Cayton Bay.

The cliffs surveyed in Cayton Bay form part of a smaller section than at Speeton. The cliff grassland was floristically diverse with calcicolous plants such as Pyramidal Orchid *Anacamptis pyramidalis* and *Briza media*. Although not as active as the cliffs at Speeton, there was still a substantial amount of bare or sparsely-vegetated ground. A single flush, emerging from the virgin cliff-face had a range of habitats below it including bare mossy calcareous seepages, *Typha*-choked pools and a wet cracked-clay toe (Fig. 3). Grass-of-Parnassus *Parnassia palustris* was frequent here. To the north of Cayton Bay (beyond the area surveyed) the cliffs were covered with scrub and woodland in parts.

Frank Cliff

Fig. 4: The Frank Cliff survey focussed on this area.

This was the smallest of the three sites. The main feature of interest here was a fresh slippage with a flat under-cliff of hard-baked silt pans (Fig. 4). Small flushes flowing across this bare surface provided good habitat for some specialist insects. In general, Frank Cliff had more features of active erosion than Cayton Bay, with more raw cliff. However, the dominance of scrub on the cliff-slopes (Fig. 4) was in contrast to the other sites.

4. Results

The survey identified 273 species of invertebrate (Appendix 2).

The survey identified 11 species that are either Red Data Book or Nationally Scarce species (Table 6). This is 4.0 % of the total species list.

Conservation Status	Taxon	Howe grade	Speeton	Cayton Bay	Frank Cliff	All sites
RDB3	*Eubria palustris*	3		✓		✓
Nationally Scarce (Na)	*Longitarsus parvulus*		✓			✓
	Georissus crenulatus		✓		✓	✓
Nationally Scarce (Nb)	*Priocnemis schioedtei*		✓			✓
	Nysson trimaculatus			✓		✓
	Bembidion saxatile	2		✓		✓
	Adonia variegata		✓			✓
	Grypus equiseti		✓			✓
	Chaetarthria seminulum sens. str.			✓		✓
	Scaphidema metallicum		✓			✓
Nationally Scarce	*Xanthandrus comtus*				✓	✓
Not scarce	*Bembidion stephensii*	3	✓	✓	✓	✓
	Total rare and scarce species		6	4	2	11
	Total species		180	116	85	273
	% rare and scarce		3.3	3.4	2.4	4.0

Table 6: Rare, scarce and soft-rock cliff specialist species recorded by this survey. The 'Howe grade' indicates soft-rock cliff specialists, with species strongly associated

with soft-rock cliff graded 2 and less strongly associated species graded 3. Grade 1 is applied to species which are restricted to soft-rock cliff in Britain. See Appendix 3 for full definitions.

None of the species found are listed under the UK Biodiversity Action Plan.

KEY INVERTEBRATES

Each of the Red Data Book and Nationally Scarce species recorded by this survey, as well as other significant records, are described below. A species account is also provide for one species which was looked for but NOT found (*Nebria livida*).

Eubria palustris (Coleoptera: Psephenidae) water-penny beetle, RDB3

Fig. 5: The water-penny from Cayton

Britain's sole representative of the family Psephenidae has a resemblance, as an adult, to scirtid beetles. The larvae however, have a strong resemblance to woodlice (Fig. 5), though more flattened. They are known as water-pennies, being predominantly aquatic. The beetles are associated with wetlands, fens, and wet flushes on soft-rock cliffs. Their distribution is widely scattered in England north to Durham. Hyman and Parsons (1992) knew it from only three vice-counties since 1970 (Dorset, Caernarvonshire and Anglesey). At the time of writing, the NBN Gateway holds records from 26 British 10-km squares, 12 with records since 1970, including a cluster of Yorkshire records. A single larva was collected at Cayton Bay on 30th August by sieving moss in a calcareous flush, along with *Chaetarthria seminulum sens. str.* (*q.v.*).

Nebria livida (Coleoptera: Carabidae) a ground-beetle, Nationally Scarce (Na) (NOT recorded on this survey!)

This is a large and distinctive predatory ground-beetle (Fig. 9); no other British beetle shares the pattern of black and yellow markings. It is a specialist of soft-rock cliffs with records throughout the Norfolk soft-rock coastline, and a second cluster of records from Cleethorpes, North Lincs northwards to Saltburn, Yorkshire. Inland records are very occasional. It is a Grade 2 soft-rock cliff species (Howe, 2002).

Fig. 6: *Nebria livida* active at night in Norfolk in 2006.

All three survey sites were visited on the nights of 30th and 31st August (Table 2), following successful nocturnal survey work for this species on the soft-rock cliffs of Norfolk earlier in the month (Telfer, 2006). Using the Norfolk experience, all three sites were judged to have suitable habitat. Frank Cliff and Cayton Bay both have potential habitat on their low wave-washed toes. The fresh slippage at Frank Cliff (Fig. 4) also appears to be suitable for *N. livida*. It was disappointing not to locate *N. livida* at either Cayton Bay or Frank Cliff, particularly as there has been a recent record of *N. livida* from Cayton Bay (5th September 1985, Dr Roger S. Key). There is a far greater amount of suitable habitat for *N. livida* at Speeton but again there was no sign of active adults on the cliffs on the night of 31st. *N. livida* appears not to have been recorded from Speeton though there is a record for the same 10-km square (TA1--7--) for 'Filey Bay' in June 1952 by J.H. Flint.

The failure to find *N. livida* may have been due to the poor weather on the August survey but it seems equally likely that *N. livida* does not occur (any more) at these sites.

Longitarsus parvulus (Coleoptera: Chrysomelidae) a flea-beetle, Nationally Scarce (Na)

This flea-beetle is associated with flax. It had declined and Hyman and Parsons (1992) knew of it from only four vice-counties between 1970 and their publication. Subsequently, linked to the increased popularity of flax as a crop, this has become a common and ubiquitous beetle that occurs almost anywhere and everywhere, at least in southern England. It no longer deserves its official Na status. On the current survey, a single individual was recorded at Speeton on 12th July.

Georissus crenulatus (Coleoptera: Hydrophilidae) a hydrophilid beetle, Nationally Scarce (Na)

A small, rounded beetle that disguises itself with a thick covering of the silt upon which it lives. By close scrutiny of suitable habitat, the beetles can be spotted as small

blobs of paler dry silt slowly creeping over areas of darker damp silt. It can be found beside rivers, pools and cliff seepages. It has been recorded from a wide scatter of sites across Britain north to central Scotland, predominantly from inland sites. There are only 16 Yorkshire records, some coastal, some inland, with a spate of records since 2000 (Bob Marsh, pers. comm.). Recorded in numbers at Speeton on 12th July and at Frank Cliff on 13th.

Priocnemis schioedtei (Hymenoptera: Aculeata: Pompilidae) a spider-hunting wasp, Nationally Scarce (Nb)

This species is a subterranean nester, usually found in open situations on sandy soils but also known from limestone grassland. The nest-chamber is provisioned with spiders. This species has a wide but patchy distribution. It shows a strong tendency to occur inland with very few coastal records (Edwards & Telfer, 2002). *P. schioedtei* was recorded by Archer (2002) in his survey of the aculeates of Cornelian and Cayton Bays and Osgodby Point. On the current survey, this wasp was not recorded at Cayton Bay or Frank Cliff (within Archer's survey area) but a single individual was recorded at Speeton on 12th July.

Nysson trimaculatus (Hymenoptera: Aculeata: Sphecidae) a digger wasp, Nationally Scarce (Nb)

This wasp is a cleptoparasite of *Gorytes quadrifasciatus* in the north of its range. The wasps occur in a variety of open situations on light soils. One was recorded at Cayton Bay on 13th July from a Colt's-foot leaf with a male *Crossocerus dimidiatus*. Neither *N. trimaculatus* nor *G. quadrifasciatus* were recorded by Archer (2002) in his survey of the aculeates of Cornelian and Cayton Bays and Osgodby Point. This record represents a slight northward extension of the known range of this species and probably the first record for North-east Yorkshire (VC62). It is still within the range of *G. quadrifasciatus*

Adonia variegata (Coleoptera: Coccinellidae) Adonis' Ladybird, Nationally Scarce (Nb)

Fig. 7: Adonis' Ladybird, an individual with nine black spots, a not infrequent variation.

A smallish ladybird with (typically) seven black spots on its red wing-cases. The arrangement of the spots and the white rim to the black pronotum make this an instantly recognisable species. Until recently, this species was known as *Hippodamia variegata*. The species feeds on aphids, typically on weedy plants of disturbed or cultivated ground. This species is widespread but scarce in England and Wales with most records in the south-east or on the coast. It has increased in range and abundance, at least in London and the surrounding counties, since the late 1980s. On the current survey, a single individual was found on the cliff-top at Speeton on 1st September, while the author was packing up his tent!

Grypus equiseti (Coleoptera: Erirhinidae) Horsetail Weevil, Nationally Scarce (Nb)

An attractive but secretive weevil, feeding as a larva on horsetails *Equisetum*. Widespread in Britain and recorded from a wide range of habitats (Hyman & Parsons, 1992) but in the author's experience, most frequently recorded from coastal soft-rock cliffs. Singles were recorded at Speeton on both 12th July (dead from a spider's web) and 31st August (sweeping in fen vegetation).

Chaetarthria seminulum sens. str. (Coleoptera: Hydrophilidae) a hydrophilid beetle, Nationally Scarce (Nb)

It has only recently been recognised that British coleopterists have been confusing two species (*C. seminulum sens. str.* and *C. simillima*) under the name '*C. seminulum*' (Levey, 2005). *C. seminulum sens. lat.* is known as a small black beetle that lives in shallow water with sand, mud or moss or on wet margins. It occupies a wide range of microhabitats and is widespread across Britain (Foster, in press). Any differences in the habitats or microhabitats of the two segregate taxa are not yet known. *C. seminulum sens. str.* appears to be rarer than *C. simillima* (Levey, 2005) and so it may merit a higher conservation status than Nationally Scarce (Nb).

Five specimens of *Chaetarthria* were collected at Cayton Bay on 30th August, of which one was a male and could be confirmed as *C. seminulum sens. str.* The beetles were collected by sieving moss in a calcareous flush, along with *Eubria palustris* (*q.v.*).

Scaphidema metallicum (Coleoptera: Tenebrionidae) a darkling beetle, Nationally Scarce (Nb)

This metallic bronze beetle has been found in a wide variety of habitats, including broad-leaved woodland, allotments, estuarine beaches and coastal shingle (Hyman & Parsons, 1992) to which the author can add records from soft-rock cliffs on the Isle of Wight and inland gravel-pits. It is associated with dead wood, driftwood and with living trees of a range of broad-leaved species, often occurring under bark.

On the current survey, three individuals were found by torchlight searching of sycamore trunks in the wooded glen at Reighton Gap on 31st August. It is arguable whether a record from this wooded valley should be attributed to the soft-rock cliff habitat or not.

Bembidion andreae (Coleoptera: Carabidae) a ground-beetle

B. andreae has no official conservation status but deserves mention as it has been recorded from only 105 British 10-km squares, just outside the threshold for Nationally Scarce (Nb) status (100 squares). It has a dual distribution in Britain, being commoner on exposed riverine sediments in northern and western Britain. A much smaller portion of the range is on coastal soft-rock cliff where it is associated with bare, damp sediments by seepages. Recorded on the reconnaissance of Frank Cliff on 11th July and in numbers on both 13th July and 30th August. A single was recorded by torchlight searching at Speeton on 31st August.

Bembidion saxatile (Coleoptera: Carabidae) a ground-beetle, Nationally Scarce (Nb)

B. saxatile has been recorded from 109 British 10-km squares, making it slightly more widespread than either *B. andreae* or *B. stephensii*. This is a predominantly coastal

species occurring at the interface between cliffs and beach, usually only loosely associated with streams or seepages. It is thinly distributed around the English and Welsh coasts, reaching the Dumfries-shire coast in the west. There are very few Yorkshire records, widely scattered through all five vice-counties (Bob Marsh, pers. comm.). A single individual was recorded at Cayton Bay on 13th July.

Bembidion stephensii (Coleoptera: Carabidae) a ground-beetle

B. stephensii has no official conservation status but deserves mention as it has been recorded from only 105 British 10-km squares, just outside the threshold for Nationally Scarce (Nb) status (100 squares). It is a rather large *Bembidion*, with a strong tendency to be nocturnal and to spend the day in cracks in the habitat. It is widespread on soft-rock cliffs throughout Britain north to the Scottish border. It also occurs on bare clayish soil by rivers inland, northwards to southern Scotland. It is a Grade 3 soft-rock cliff species (Howe, 2002). On the current survey, this species was recorded at all three survey sites. At Frank Cliff, single teneral specimens were found by day on 11th and 13th July. At Speeton, a single individual was found at the stream on the boundary with Black Cliff by day on 11th July. A further individual was found at Speeton by torchlight on the night of the 12th July. At Cayton, a single adult was found by torchlight on 30th August.

Dyschirius aeneus (Coleoptera: Carabidae) a ground-beetle

This is a small, shiny, bronze, cylindrical ground-beetle, clearly adapted for a tunnelling lifestyle. It is locally distributed in southern and eastern Britain on mud and sand near water, usually in fen conditions. This species was found at Frank Cliff on both 11th (3 individuals) and 13th (2 individuals) July. It is near to its northern limit within Britain at Frank Cliff: there are recent records for two 10-km squares in Teesside and an old record from the Solway Firth.

Xanthandrus comtus (Diptera: Syrphidae) a hoverfly, Nationally Scarce

A distinctive hoverfly whose larvae prey on the gregarious caterpillars of yponomeutid and tortricoid moths. It is usually found on woodland edges, visiting flowers. It has a scattered distribution in Britain, concentrated in the south. Its occurrence is rather erratic, suggesting that at least a proportion of records are of migrants, and this may account for its occurrence on this survey at Frank Cliff, where a singleton was found on 30th August.

5. Discussion

SITE ASSESSMENTS

Speeton

Speeton was the most species-rich site surveyed, with 180 species recorded. This was to be expected given the more extensive and varied habitats present at Speeton, as well as the fact that twice as much survey effort was spent here compared to the other two sites.

Six Nationally Scarce species were recorded at Speeton, 3.3 % of the total. The most significant find was *Georissus crenulatus* (Nationally Scarce (Na)) associated with seepages. The other scarcities included the spider-hunting wasp *Priocnemis schioedtei*, the horsetail-weevil *Grypus equiseti* and Adonis' Ladybird *Adonia variegata*. In addition, the no-longer-scarce flax flea-beetle *Longitarsus parvulus* was recorded and the darkling beetle *Scaphidema metallicum* was recorded in woodland on the cliffs. In common with Cayton Bay and Frank Cliff, the near-scarce *Bembidion stephensii*, a Grade 3 soft-rock cliff specialist, was found at Speeton. Torchlight survey found the near-scarce *Bembidion andreae*, the noteworthy ground-beetle *Pterostichus macer*, near the northern edge of its British range, and the ground-beetle *Chlaenius vestitus* with only three other Yorkshire records (Bob Marsh, pers. comm.). Speeton is a known site for the rare cranefly *Symplecta chosenensis*. This is one of the 29 species listed by Howe (2003) as being restricted to soft-rock cliffs in Britain (see also Howe *et al*. (2006)). It was first recorded here by Alan E. Stubbs in 1988, and has been recorded in 2001 and 2002 by Roy Crossley with dates spanning 20th July to 17th August (Howe *et al*., 2006). It was not recorded on the current survey.

The survey appears to show that Speeton is the better of the three sites visited. It was also the distinct impression gained during fieldwork that Speeton was a more productive entomological hunting-ground. It is to be expected that such a large and varied site would support both more species and more rarities.

Cayton Bay

Cayton Bay was the second most species-rich of the three sites, with 116 species recorded. This is difficult to compare to Speeton which benefited from twice the survey effort, However, Cayton Bay was significantly richer than Frank Cliff, with 85 species.

The only Red Data Book species of the survey *Eubria palustris* was found at Cayton in a seepage. In addition, three Nationally Scarce species were found. With four (3.4 %) of the 116 species either rare or scarce, Cayton Bay scored very slightly better than Speeton on this statistic. Like *Eubria palustris*, two of the Nationally Scarce species are also associated with flushes. The remaining species is the sphecid wasp *Nysson trimaculatus*.

Cayton Bay appears to be of a very similar quality for invertebrates to Speeton and it is probable that further survey at this site would uncover a similar diversity of species, rare, scarce and common. It is interesting to note that none of the four rare or scarce species at Cayton Bay were found at either of the other sites. This may imply that Cayton has a different assemblage to the other sites, perhaps because of its more calcareous soils.

Frank Cliff

Frank Cliff was the least species-rich site surveyed, with 85 species. This was to be expected given the limited variety of habitats present at Frank Cliff, where ruderal and established grassland was of very limited extent, sandwiched between bare ground features and scrub.

Frank Cliff also produced the lowest proportion of rare and scarce species with two of 85 (2.4 %) being Nationally Scarce. These were *Georissus crenulatus* and the hoverfly *Xanthandrus comtus* which may be only a migrant here. Two other noteworthy beetles were found in the seepage habitat with *Georissus*, namely *Dyschirius aeneus* and *Bembidion andreae*.

The habitat at Frank Cliff appeared to be of good quality with potential for rare and scarce invertebrates of bare ground and seepages. However, the invertebrates found were a little below expectation, by comparison to Speeton and Cayton Bay. Frank Cliff is a relatively small site, and perhaps the silty wet slippage conditions are of quite recent origin; both factors which could limit the invertebrate assemblage.

General comments

This limited survey has added to knowledge of the invertebrates of Yorkshire's soft-rock cliffs. However, more detailed survey work is still needed if we are to fully appreciate the importance of Yorkshire's soft-rock cliffs for invertebrates. Further survey work should aim to spend more time at each site, covering a longer season, and covering a wider geographical range of sites. Diptera and Hymenoptera were covered less thoroughly by this survey than the Coleoptera, due in part to the poor weather on the August visit, and this needs to be taken into account in planning future work.

It is seldom possible to guarantee finding a beetle but reliable survey techniques for *Nebria livida*, developed in Norfolk, failed to yield any sightings in Yorkshire. This suggests that it may be absent from the sites surveyed. More detailed survey work is needed to establish the current status and distribution of the important populations of this species on the Yorkshire coast, with a view to future monitoring.

6. Management issues and recommendations

Soft-rock cliffs, unlike most British nature reserves, need no direct habitat management. Non-intervention has been, and remains, the best course of action. However, soft-rock cliffs are vulnerable from land-use inland and from coastal defence works.

Seepages, trickles and flushes (water flowing down the cliff) support an important part of the invertebrate interest of soft-rock cliffs in general. They are probably the most important, and most vulnerable features of the cliffs at Speeton, Cayton Bay and Frank Cliff. Drainage, abstraction and other hydrological changes inland of the soft-rock cliffs should take into account the potential impact on the cliff habitats and species. It would be advisable to monitor the presence and flow of water on the cliffs, or to monitor the presence and abundance of seepage-dependent invertebrates.

It is detrimental to soft-rock cliffs if large quantities of construction materials slip down onto the face. In those unfortunate cases where the lip of the cliff erodes back towards buildings, it is important to attempt to demolish and remove the building and its foundations before it falls over the edge of the cliff. Similarly, it is also detrimental to the habitat for large quantities of trees and bushes to slip onto the face. This is an

issue at all sites but particularly at Frank Cliff where the existing seepage is eroding backwards into a very scrubby cliff-face.

Of lesser impact on invertebrates is general litter. Litter often creates useful shelter for invertebrates, though discarded containers sometimes create death-traps (e.g. a discarded yellow washing-up bowl at Speeton). The Speeton site, being directly below the Reighton Sands holiday complex is particularly bad for litter, indicative of the general public's lack of interest in and appreciation for soft-rock cliffs. An incident on the night of 31st August was the worst symptom of this attitude. One of the flushes at Speeton, the only one at which the ground-beetle *Chlaenius vestitus* was recorded, turned blue during the nocturnal survey and this was traced to a couple of chemical toilets in the Reighton Sands holiday complex which had been up-ended into the channel. A programme of education and interpretation could help to reduce this sort of casual environmental damage.

For many soft-rock cliffs, coastal defence works are the most serious and the most thorny issue. However, at these sites, coastal defences appear to be very limited with only a few lines of concrete anti-tank blocks offering any protection from the sea. Nevertheless, Cayton Bay at least would be a better invertebrate site with a little more erosion. This applies to the area surveyed but more particularly to the scrubby/ wooded cliff-slopes in the north of the bay. Scrub and woodland was a feature of Speeton and Frank Cliff too, suggesting that these cliffs have become less active in recent decades.

7. Acknowledgements

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Appendix 1: British conservation status categories – definitions.

Red Data Book category 3, Rare

Definition Species which occur in small populations and although not currently either Endangered or Vulnerable are at risk. Rare species exist in 15 or fewer 10-km squares, or are more widespread than this but dependent on small areas of especially vulnerable habitat.

Nationally Scarce Category A, Na.

Definition Species which do not fall within Red Data Book categories but which are nonetheless uncommon in Great Britain and thought to occur in 30 or fewer (typically between 16 and 30) 10-km squares of the National Grid, or for less well-recorded groups, in seven or fewer vice-counties.

Nationally Scarce Category B, Nb.

Definition Species which do not fall within Red Data Book categories but which are nonetheless uncommon in Great Britain and thought to occur in between 31 and 100 10-km squares of the National Grid, or for less well-recorded groups, between eight and twenty vice-counties.

Nationally Scarce, N.

Definition Species which do not fall within Red Data Book categories but which are nonetheless uncommon in Great Britain. This status category has been used where information has not been sufficient to allocate a species to either Na or Nb. These species are thought to occur in between 16 and 100 10-km squares of the National Grid.

Appendix 2: List of invertebrates recorded on Yorkshire soft-rock cliffs between 10th July and 31st August 2006 by Mark G. Telfer.

The occurrence of each species at Speeton, Cayton Bay and Frank Cliff is indicated by a '1'. Key species are listed in red text.

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Malacostraca	Isopoda	Armadillidiidae	*Armadillidium vulgare*	Common pill woodlouse	None	1	1	1
Malacostraca	Isopoda	Ligiidae	*Ligia oceanica*	Common sea-slater	None			1
Malacostraca	Isopoda	Oniscidae	*Oniscus asellus*	Common shiny woodlouse	None	1	1	1
Malacostraca	Isopoda	Philosciidae	*Philoscia muscorum*	Common striped woodlouse	None	1	1	1
Malacostraca	Isopoda	Porcellionidae	*Porcellio scaber*	Common rough woodlouse	None		1	
Malacostraca	Isopoda	Trichoniscidae	*Androniscus dentiger*	Rosy woodlouse	None	1		
Malacostraca	Isopoda	Trichoniscidae	*Trichoniscus pusillus*	Common pygmy woodlouse	None	1	1	1
Arachnida	Araneae	Araneidae	*Araneus diadematus*		None	1	1	1
Arachnida	Araneae	Araneidae	*Araneus quadratus*		None		1	
Arachnida	Araneae	Araneidae	*Larinioides cornutus*		None		1	
Arachnida	Araneae	Araneidae	*Nuctenea umbratica*		None	1		
Arachnida	Araneae	Dictynidae	*Dictyna latens*		None	1		1
Arachnida	Araneae	Linyphiidae	*Dismodicus bifrons*		None		1	
Arachnida	Araneae	Linyphiidae	*Diplocephalus cristatus*		None	1		1
Arachnida	Araneae	Linyphiidae	*Erigone atra*		None	1		
Arachnida	Araneae	Linyphiidae	*Erigone promiscua*		None			1
Arachnida	Araneae	Linyphiidae	*Lepthyphantes tenuis*		None	1		
Arachnida	Araneae	Lycosidae	*Pardosa amentata*		None			1
Arachnida	Araneae	Lycosidae	*Pardosa nigriceps*		None	1		
Arachnida	Araneae	Lycosidae	*Trochosa terricola*		None		1	
Arachnida	Araneae	Lycosidae	*Pirata piraticus*		None	1		
Arachnida	Araneae	Philodromidae	*Philodromus cespitum*		None	1		
Arachnida	Araneae	Theridiidae	*Theridion melanurum*		None	1		
Arachnida	Araneae	Theridiidae	*Neottiura bimaculata*		None			1
Arachnida	Araneae	Theridiidae	*Enoplognatha ovata sens. str.*		None		1	

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Arachnida	Araneae	Thomisidae	*Xysticus cristatus*		None	1		
Arachnida	Araneae	Thomisidae	*Ozyptila trux*		None	1		
Diplopoda	Glomerida	Glomeridae	*Glomeris marginata*	Pill Millipede	None	1		
Diplopoda	Julida	Julidae	*Ommatoiulus sabulosus*	Striped Millipede	None		1	
Diplopoda	Julida	Julidae	*Tachypodoiulus niger*	White-legged Snake-millipede	None	1	1	1
Diplopoda	Julida	Julidae	*Julus scandinavius*	a millipede	None		1	
Diplopoda	Polydesmida	Polydesmidae	*Polydesmus angustus*	Common Flat-backed Millipede	None		1	
Diplopoda	Polydesmida	Polydesmidae	*Polydesmus coriaceus*	a flat-backed millipede	None		1	
Insecta	Odonata	Aeshnidae	*Aeshna cyanea*	Southern Hawker	None			1
Insecta	Odonata	Libellulidae	*Sympetrum striolatum*	Common Darter	None			1
Insecta	Orthoptera	Acrididae	*Omocestus viridulus*	Common Green Grasshopper	None	1	1	
Insecta	Orthoptera	Acrididae	*Chorthippus brunneus*	Common Field Grasshopper	None	1	1	1
Insecta	Orthoptera	Tetrigidae	*Tetrix undulata*	Common Ground Hopper	None	1		
Insecta	Dermaptera	Forficulidae	*Forficula auricularia*	Common Earwig	None		1	
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Cymus glandicolor*		None	1		
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Cymus melanocephalus*		None	1		
Insecta	Hemiptera: Heteroptera	Miridae	*Leptopterna dolabrata*		None		1	
Insecta	Hemiptera: Heteroptera	Nabidae	*Himacerus major*		None		1	
Insecta	Hemiptera: Heteroptera	Nabidae	*Nabis flavomarginatus*		None	1	1	1
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Pentatoma rufipes*		None			1
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Picromerus bidens*		None		1	
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Zicrona caerulea*		Local		1	
Insecta	Lepidoptera	Arctiidae	*Tyria jacobaeae*	Cinnabar	None	1		
Insecta	Lepidoptera	Coleophoridae	*Coleophora discordella*		None		1	
Insecta	Lepidoptera	Hesperiidae	*Thymelicus sylvestris*	Small Skipper	None	1	1	1
Insecta	Lepidoptera	Hesperiidae	*Ochlodes faunus*	Large Skipper	None		1	
Insecta	Lepidoptera	Lasiocampidae	*Euthrix potatoria*	Drinker	None	1	1	
Insecta	Lepidoptera	Lycaenidae	*Polyommatus icarus*	Common Blue	None	1	1	1
Insecta	Lepidoptera	Noctuidae	*Nonagria typhae*	Bulrush Wainscot	None			1

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Lepidoptera	Noctuidae	*Autographa gamma*	Silver Y	Migrant	1	1	1
Insecta	Lepidoptera	Nymphalidae	*Vanessa cardui*	Painted Lady	Migrant	1		1
Insecta	Lepidoptera	Nymphalidae	*Aglais urticae*	Small Tortoiseshell	None	1	1	1
Insecta	Lepidoptera	Nymphalidae	*Inachis io*	Peacock	None	1		
Insecta	Lepidoptera	Pieridae	*Pieris brassicae*	Large White	None	1		
Insecta	Lepidoptera	Pieridae	*Pieris rapae*	Small White	None	1		
Insecta	Lepidoptera	Satyridae	*Lasiommata megera*	Wall	None	1		
Insecta	Lepidoptera	Satyridae	*Melanargia galathea*	Marbled White	None	1		
Insecta	Lepidoptera	Satyridae	*Maniola jurtina*	Meadow Brown	None	1	1	1
Insecta	Lepidoptera	Satyridae	*Coenonympha pamphilus*	Small Heath	None	1	1	
Insecta	Lepidoptera	Satyridae	*Aphantopus hyperantus*	Ringlet	None	1	1	1
Insecta	Lepidoptera	Sphingidae	*Macroglossum stellatarum*	Humming-bird Hawk-moth	Migrant	1		
Insecta	Lepidoptera	Zygaenidae	*Zygaena filipendulae*	Six-spot Burnet	None		1	
Insecta	Lepidoptera	Zygaenidae	*Zygaena trifolii*	Five-spot Burnet	Local	1	1	
Insecta	Diptera	Anthomyiidae	*Pegoplata aestiva*		None		1	
Insecta	Diptera	Dolichopodidae	*Argyra argyria*		None	1		1
Insecta	Diptera	Dolichopodidae	*Dolichopus brevipennis*		None	1		
Insecta	Diptera	Dolichopodidae	*Dolichopus plumipes*		None	1		
Insecta	Diptera	Dolichopodidae	*Dolichopus trivialis*		None	1		
Insecta	Diptera	Dolichopodidae	*Dolichopus ungulatus*		None	1		
Insecta	Diptera	Dolichopodidae	*Poecilobothrus nobilitatus*		None	1		
Insecta	Diptera	Dolichopodidae	*Liancalus virens*		None			1
Insecta	Diptera	Dolichopodidae	*Sciapus longulus*		None		1	
Insecta	Diptera	Limoniidae	*Molophilus obscurus*		None		1	
Insecta	Diptera	Limoniidae	*Neolimnomyia nemoralis*		None	1		
Insecta	Diptera	Opomyzidae	*Opomyza florum*		None	1	1	
Insecta	Diptera	Opomyzidae	*Opomyza germinationis*		None	1		
Insecta	Diptera	Rhagionidae	*Chrysopilus cristatus*		None	1	1	
Insecta	Diptera	Rhagionidae	*Rhagio tringarius*		None		1	
Insecta	Diptera	Sciomyzidae	*Trypetoptera punctulata*		None	1		

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Diptera	Stratiomyidae	*Oxycera trilineata*		None	1		
Insecta	Diptera	Stratiomyidae	*Chloromyia formosa*		None	1		
Insecta	Diptera	Syrphidae	*Baccha elongata*		None	1		
Insecta	Diptera	Syrphidae	*Melanostoma scalare*		None			1
Insecta	Diptera	Syrphidae	*Platycheirus manicatus*		None	1	1	
Insecta	Diptera	Syrphidae	*Platycheirus peltatus*		None	1		
Insecta	Diptera	Syrphidae	*Xanthandrus comtus*		Nationally Scarce			1
Insecta	Diptera	Syrphidae	*Paragus haemorrhous*		None	1		
Insecta	Diptera	Syrphidae	*Dasysyrphus tricinctus*		None	1		
Insecta	Diptera	Syrphidae	*Epistrophe grossulariae*		None		1	1
Insecta	Diptera	Syrphidae	*Episyrphus balteatus*		None	1	1	1
Insecta	Diptera	Syrphidae	*Eupeodes corollae*		None	1		
Insecta	Diptera	Syrphidae	*Eupeodes luniger*		None	1		1
Insecta	Diptera	Syrphidae	*Melangyna umbellatarum*		None	1		
Insecta	Diptera	Syrphidae	*Syrphus ribesii*		None	1	1	1
Insecta	Diptera	Syrphidae	*Syrphus torvus*		None			1
Insecta	Diptera	Syrphidae	*Syrphus vitripennis*		None	1		1
Insecta	Diptera	Syrphidae	*Cheilosia illustrata*		None		1	
Insecta	Diptera	Syrphidae	*Cheilosia proxima*		None			1
Insecta	Diptera	Syrphidae	*Cheilosia vernalis*		None		1	
Insecta	Diptera	Syrphidae	*Eristalis pertinax*		None	1		
Insecta	Diptera	Syrphidae	*Eristalis tenax*		None		1	1
Insecta	Diptera	Syrphidae	*Helophilus pendulus*		None	1	1	
Insecta	Diptera	Syrphidae	*Syritta pipiens*		None	1	1	1
Insecta	Diptera	Tephritidae	*Trupanea stellata*		Local	1		
Insecta	Diptera	Tephritidae	*Chaetorellia jaceae*		Local	1		
Insecta	Diptera	Tipulidae	*Nephrotoma flavescens*		None	1		
Insecta	Diptera	Tipulidae	*Tipula fulvipennis*		None		1	
Insecta	Diptera	Tipulidae	*Tipula oleracea*		None	1		
Insecta	Diptera	Tipulidae	*Tipula paludosa*		None	1	1	

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Diptera	Ulidiidae	*Herina frondescentiae*		None		1	
Insecta	Diptera	Ulidiidae	*Herina nigrina*		None	1		
Insecta	Diptera	Ulidiidae	*Herina lugubris*		None		1	
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena bicolor*	Gwynne's Mining Bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena semilaevis*	a mining bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Apis mellifera*	Honey Bee	None			1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus barbutellus*	a bumblebee	None		1	
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus hortorum*	Small Garden Bumble Bee	None		1	
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus lapidarius*	Large Red Tailed Bumble Bee	None		1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus lucorum*	White-tailed Bumble Bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus pascuorum*	Common Carder Bee	None	1	1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus terrestris*	Buff-tailed Bumble Bee	None	1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus vestalis*	a bumblebee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Halictus rubicundus*	a mining bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Hoplitis spinulosa*	a solitary bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum fratellum*	a mining bee	None	1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum punctatissimum*	a mining bee	None			1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum smeathmanellum*	a mining bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Megachile willughbiella*	Willughby's Leaf-cutter Bee	None			1
Insecta	Hymenoptera: Aculeata	Apidae	*Sphecodes geoffrellus*	a cuckoo bee	None	1		
Insecta	Hymenoptera: Aculeata	Apidae	*Sphecodes hyalinatus*	a cuckoo bee	None	1		
Insecta	Hymenoptera: Aculeata	Chrysididae	*Chrysis angustula*	a cuckoo wasp	None	1		
Insecta	Hymenoptera: Aculeata	Chrysididae	*Chrysis viridula*	a cuckoo wasp	None		1	
Insecta	Hymenoptera: Aculeata	Eumenidae	*Ancistrocerus gazella*	a mason wasp	None	1		
Insecta	Hymenoptera: Aculeata	Eumenidae	*Odynerus spinipes*	Spiny Mason Wasp	None	1	1	
Insecta	Hymenoptera: Aculeata	Formicidae	*Formica fusca*	an ant	None		1	
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius alienus sens. str.*	an ant	None	1		
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius flavus*	an ant	None	1		
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica rubra*	an ant	None	1	1	1
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica ruginodis*	an ant	None	1		1

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica scabrinodis*	an ant	None		1	
Insecta	Hymenoptera: Aculeata	Pompilidae	*Priocnemis schioedtei*	a spider-hunter wasp	Nationally Scarce (Nb)	1		
Insecta	Hymenoptera: Aculeata	Sphecidae	*Crossocerus dimidiatus*	Blunt Tailed Digger Wasp	None		1	
Insecta	Hymenoptera: Aculeata	Sphecidae	*Mellinus arvensis*	Field Digger Wasp	None	1		
Insecta	Hymenoptera: Aculeata	Sphecidae	*Nysson trimaculatus*	a digger wasp	Nationally Scarce (Nb)		1	
Insecta	Hymenoptera: Aculeata	Sphecidae	*Tachysphex pompiliformis*	a digger wasp	None	1		
Insecta	Hymenoptera: Aculeata	Sphecidae	*Trypoxylon attenuatum*	Slender Wood Borer Wasp	None	1		
Insecta	Hymenoptera: Aculeata	Tiphiidae	*Myrmosa atra*	Black Headed Velvet Ant	None			1
Insecta	Hymenoptera: Symphyta	Tenthredinidae	*Dolerus aericeps*	a sawfly	None	1		
Insecta	Hymenoptera: Symphyta	Tenthredinidae	*Ametastegia glabrata*	a sawfly	None	1		
Insecta	Coleoptera	Apionidae	*Exapion ulicis*	Gorse Weevil	None	1		
Insecta	Coleoptera	Apionidae	*Protapion apricans*		None	1	1	
Insecta	Coleoptera	Apionidae	*Protapion fulvipes*	White Clover Seed Weevil	None			1
Insecta	Coleoptera	Apionidae	*Ischnopterapion loti*		None	1		1
Insecta	Coleoptera	Apionidae	*Oxystoma subulatum*		None	1		
Insecta	Coleoptera	Apionidae	*Eutrichapion ervi*		None	1		
Insecta	Coleoptera	Bruchidae	*Bruchus loti*		None	1		
Insecta	Coleoptera	Cantharidae	*Cantharis cryptica*		None			1
Insecta	Coleoptera	Cantharidae	*Rhagonycha fulva*		None	1	1	1
Insecta	Coleoptera	Cantharidae	*Malthodes minimus*		None	1		
Insecta	Coleoptera	Carabidae	*Carabus problematicus*		None	1		
Insecta	Coleoptera	Carabidae	*Carabus violaceus*	Violet Ground Beetle	None	1		
Insecta	Coleoptera	Carabidae	*Nebria brevicollis*		None			1
Insecta	Coleoptera	Carabidae	*Nebria salina*		None	1	1	
Insecta	Coleoptera	Carabidae	*Notiophilus biguttatus*		None			1
Insecta	Coleoptera	Carabidae	*Notiophilus palustris*		None	1		1
Insecta	Coleoptera	Carabidae	*Cicindela campestris*	Green Tiger Beetle	None	1	1	1

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Coleoptera	Carabidae	*Elaphrus cupreus*		None	1		
Insecta	Coleoptera	Carabidae	*Dyschirius aeneus*		None			1
Insecta	Coleoptera	Carabidae	*Clivina fossor*		None			1
Insecta	Coleoptera	Carabidae	*Trechus quadristriatus*		None		1	
Insecta	Coleoptera	Carabidae	*Bembidion biguttatum*		None	1		
Insecta	Coleoptera	Carabidae	*Bembidion lunulatum*		None	1		1
Insecta	Coleoptera	Carabidae	*Bembidion lampros*		None	1		1
Insecta	Coleoptera	Carabidae	*Bembidion properans*		None	1		
Insecta	Coleoptera	Carabidae	*Bembidion andreae*		None	1		1
Insecta	Coleoptera	Carabidae	*Bembidion deletum*		None	1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion saxatile*		Nationally Scarce (Nb)		1	
Insecta	Coleoptera	Carabidae	*Bembidion stephensii*		None	1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion tetracolum*		None		1	1
Insecta	Coleoptera	Carabidae	*Bembidion genei*		None	1	1	1
Insecta	Coleoptera	Carabidae	*Pterostichus madidus*		None	1		
Insecta	Coleoptera	Carabidae	*Pterostichus macer*		None	1		
Insecta	Coleoptera	Carabidae	*Pterostichus niger*		None		1	
Insecta	Coleoptera	Carabidae	*Abax parallelepipedus*		None	1		
Insecta	Coleoptera	Carabidae	*Olisthopus rotundatus*		None	1	1	1
Insecta	Coleoptera	Carabidae	*Paranchus albipes*		None	1	1	
Insecta	Coleoptera	Carabidae	*Agonum fuliginosum*		None	1		
Insecta	Coleoptera	Carabidae	*Curtonotus aulicus*		None		1	
Insecta	Coleoptera	Carabidae	*Harpalus rufipes*		None	1		
Insecta	Coleoptera	Carabidae	*Stenolophus mixtus*		None	1		
Insecta	Coleoptera	Carabidae	*Chlaenius vestitus*		None	1		
Insecta	Coleoptera	Chrysomelidae	*Cassida rubiginosa*	Thistle Tortoise Beetle	None	1		
Insecta	Coleoptera	Chrysomelidae	*Phaedon cochleariae*		None	1		
Insecta	Coleoptera	Chrysomelidae	*Aphthona euphorbiae*		None	1		
Insecta	Coleoptera	Chrysomelidae	*Longitarsus parvulus*		Nationally Scarce	1		

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status (Na)	Speeton	Cayton Bay	Frank Cliff
Insecta	Coleoptera	Chrysomelidae	*Longitarsus suturellus*		None			1
Insecta	Coleoptera	Chrysomelidae	*Altica lythri*		None		1	
Insecta	Coleoptera	Chrysomelidae	*Neocrepidodera transversa*		None	1	1	
Insecta	Coleoptera	Chrysomelidae	*Derocrepis rufipes*		None	1		
Insecta	Coleoptera	Chrysomelidae	*Hippuriphila modeeri*		None	1	1	1
Insecta	Coleoptera	Chrysomelidae	*Sphaeroderma rubidum*		None		1	
Insecta	Coleoptera	Coccinellidae	*Rhyzobius litura*		None	1		
Insecta	Coleoptera	Coccinellidae	*Coccidula rufa*		None			1
Insecta	Coleoptera	Coccinellidae	*Psyllobora vigintiduopunctata*	22-spot Ladybird	None		1	
Insecta	Coleoptera	Coccinellidae	*Propylea quattuordecimpunctata*	14-spot Ladybird	None	1	1	
Insecta	Coleoptera	Coccinellidae	*Coccinella septempunctata*	7-spot Ladybird	None	1	1	1
Insecta	Coleoptera	Coccinellidae	*Adonia variegata*	Adonis' Ladybird	Nationally Scarce (Nb)	1		
Insecta	Coleoptera	Cryptophagidae	*Micrambe vini*		None	1		1
Insecta	Coleoptera	Curculionidae	*Liophloeus tessulatus*		None	1		
Insecta	Coleoptera	Curculionidae	*Sitona hispidulus*		None			1
Insecta	Coleoptera	Curculionidae	*Sitona lineatus*		None	1		1
Insecta	Coleoptera	Curculionidae	*Sitona puncticollis*		None			1
Insecta	Coleoptera	Curculionidae	*Sitona regensteinensis*		None	1		
Insecta	Coleoptera	Curculionidae	*Sitona sulcifrons*		None		1	1
Insecta	Coleoptera	Curculionidae	*Ceutorhynchus obstrictus*		None	1		
Insecta	Coleoptera	Curculionidae	*Gymnetron pascuorum*		None	1	1	
Insecta	Coleoptera	Elateridae	*Hemicrepidius hirtus*		None	1	1	
Insecta	Coleoptera	Elateridae	*Adrastus pallens*		None	1		
Insecta	Coleoptera	Elateridae	*Agriotes obscurus*		None	1	1	
Insecta	Coleoptera	Erirhinidae	*Grypus equiseti*	Horsetail Weevil	Nationally Scarce (Nb)	1		
Insecta	Coleoptera	Hydrophilidae	*Helophorus grandis*		None		1	
Insecta	Coleoptera	Hydrophilidae	*Helophorus brevipalpis*		None	1	1	

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Insecta	Coleoptera	Hydrophilidae	*Georissus crenulatus*		Nationally Scarce (Na)	1		1
Insecta	Coleoptera	Hydrophilidae	*Chaetarthria seminulum sens. str.*		Nationally Scarce (Nb)		1	
Insecta	Coleoptera	Hydrophilidae	*Hydrobius fuscipes*		None		1	
Insecta	Coleoptera	Hydrophilidae	*Anacaena globulus*		None	1	1	
Insecta	Coleoptera	Hydrophilidae	*Laccobius bipunctatus*		None	1	1	
Insecta	Coleoptera	Kateretidae	*Kateretes rufilabris*		None	1		
Insecta	Coleoptera	Lathridiidae	*Corticarina fuscula*		None		1	
Insecta	Coleoptera	Nitidulidae	*Meligethes aeneus*	Common Pollen Beetle	None	1		
Insecta	Coleoptera	Nitidulidae	*Meligethes carinulatus*		None			1
Insecta	Coleoptera	Nitidulidae	*Meligethes nigrescens*		None		1	
Insecta	Coleoptera	Psephenidae	*Eubria palustris*		RDB3		1	
Insecta	Coleoptera	Salpingidae	*Rhinosimus planirostris*		None			1
Insecta	Coleoptera	Scarabaeidae	*Aphodius rufipes*		None	1		
Insecta	Coleoptera	Scirtidae	*Cyphon phragmiteticola*		None	1		
Insecta	Coleoptera	Scolytidae	*Hylastinus obscurus*	Gorse Bark Beetle	None	1		
Insecta	Coleoptera	Scydmaenidae	*Stenichnus scutellaris*		None	1		
Insecta	Coleoptera	Silphidae	*Silpha atrata*		None	1		
Insecta	Coleoptera	Staphylinidae	*Aleochara lanuginosa*		None	1		
Insecta	Coleoptera	Staphylinidae	*Drusilla canaliculata*		None		1	
Insecta	Coleoptera	Staphylinidae	*Bledius gallicus*		None	1		1
Insecta	Coleoptera	Staphylinidae	*Stenus guttula*		None	1		1
Insecta	Coleoptera	Staphylinidae	*Stenus brunnipes*		None	1		
Insecta	Coleoptera	Staphylinidae	*Stenus nitidiusculus*		None		1	
Insecta	Coleoptera	Staphylinidae	*Stenus ossium*		None	1		
Insecta	Coleoptera	Tenebrionidae	*Scaphidema metallicum*		Nationally Scarce (Nb)	1		
Gastropoda	Basommatophora	Ancylidae	*Ancylus fluviatilis*	River Limpet	None	1		
Gastropoda	Stylommatophora	Agriolimacidae	*Deroceras reticulatum*	Field Slug	None		1	1

Classification 1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Speeton	Cayton Bay	Frank Cliff
Gastropoda	Stylommatophora	Cochlicopidae	*Cochlicopa lubrica*	Slippery Moss Snail	None	1	1	
Gastropoda	Stylommatophora	Discidae	*Discus rotundatus*	Rounded Snail	None	1	1	
Gastropoda	Stylommatophora	Enidae	*Ena obscura*	Lesser Bulin	None		1	
Gastropoda	Stylommatophora	Helicidae	*Candidula intersecta*	Wrinkled Snail	None		1	
Gastropoda	Stylommatophora	Helicidae	*Cernuella virgata*	Striped or Zoned Snail	None		1	
Gastropoda	Stylommatophora	Helicidae	*Monacha cantiana*	Kentish Snail	None		1	
Gastropoda	Stylommatophora	Helicidae	*Trichia striolata*	Strawberry Snail	None	1	1	
Gastropoda	Stylommatophora	Helicidae	*Trichia hispida*	Hairy Snail	None	1		
Gastropoda	Stylommatophora	Helicidae	*Arianta arbustorum*	Copse Snail	None	1	1	1
Gastropoda	Stylommatophora	Helicidae	*Cepaea nemoralis*	Brown-lipped Snail	None	1	1	1
Gastropoda	Stylommatophora	Helicidae	*Cepaea hortensis*	White-lipped Snail	None		1	
Gastropoda	Stylommatophora	Helicidae	*Helix aspersa*	Garden Snail	None	1	1	
Gastropoda	Stylommatophora	Limacidae	*Limax maximus*	Great Grey Slug	None	1		
Gastropoda	Stylommatophora	Milacidae	*Tandonia budapestensis*	Budapest Slug	None	1		
Gastropoda	Stylommatophora	Pupillidae	*Lauria cylindracea*	Common Chrysalis Snail	None	1	1	
Gastropoda	Stylommatophora	Succineidae	*Oxyloma pfeifferi*	Pfeiffer's Amber Snail	None			1
Gastropoda	Stylommatophora	Vertiginidae	*Vertigo pygmaea*	Common Whorl Snail	None	1		
Gastropoda	Stylommatophora	Vitrinidae	*Vitrina pellucida*	Pellucid Glass Snail	None	1		
Gastropoda	Stylommatophora	Zonitidae	*Aegopinella nitidula*	Smooth Glass Snail	None	1	1	1

Appendix 3: Definitions used by Howe (2002) to determine the fidelity of invertebrate species associated with coastal soft cliff in the UK.

Grade 1 species are restricted to coastal soft cliff in the UK and dependent, for at least some stage of their life cycle, on soft cliff habitats. These include species which have always been restricted to coastal soft cliff and others which were once more widespread but are now confined to this habitat.

Grade 2 species are strongly associated with coastal soft cliff in the UK, for at least some stage of their life cycle, with the majority of populations or the strongest populations occurring at such localities. However, they can also be found in other habitat types where extensive areas of bare ground and pioneer vegetation, or seepages and fen vegetation occur, such as sand dunes, dry sandy heathland, coastal grassland, sand or gravel pits, inland seepages and reedbeds.

Grade 3 species are associated with coastal soft cliff in the UK, at least in some part of their geographic range, but also occur in a wide range of habitat types where the presence of bare ground, pioneer vegetation, seepages or fen vegetation is of fundamental importance for some of their life cycle.