Invertebrate survey of the soft-rock cliffs of Norfolk

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Buglife - The Invertebrate Conservation Trust

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Contents

0. Summary

- An invertebrate survey was undertaken in summer 2006 of the Norfolk soft-rock cliffs, focussing on Overstrand, Trimingham and West Runton.
- 374 species of invertebrate were recorded across a wide range of taxonomic groups.
- 17 species were Red Data Book, Nationally Scarce or equivalent: 4.5% of the total.
- Two species restricted to soft-rock cliffs in Britain were recorded: the beetle *Bledius filipes* in good numbers, and the cranefly *Symplecta chosenensis*, both at West Runton.
- Dedicated nocturnal survey for the soft-rock specialist beetle *Nebria livida* found it at West Runton, Overstrand, and in good numbers at Trimingham, and helped to elucidate its habitat requirements.
- West Runton supports the most important invertebrates from a national perspective. Overstrand and Trimingham each support much more diverse invertebrate assemblages, of equal overall conservation value.
- The undefended cliff at Trimingham supports a richer and better quality assemblage of invertebrates than the defended cliff.
- The impacts of coastal defences and of land-use and hydrology inland of 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 Norfolk survey, while the results of the Yorkshire 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 offers 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 12.7 km of the Norfolk coastline was unprotected soft-rock cliff: 5% of England's 255.6 km of soft-rock coastline (Howe, 2003). The cliffs rise out of the shingle at Weybourne in the west and carry on eastwards past Sheringham, West Runton, East Runton, Cromer, Overstrand, Trimingham and Mundesley in turn. Within this stretch of coastline there are heavily defended sections around the settlements and other sections of coast with just a few breakwaters. Beyond Mundesley the coast appears to be completely stabilised by revêtements and concrete.

It would probably not be accurate to describe the invertebrates of the Norfolk soft-rock cliffs as poorly-known. One of the two main beetle specialities of the Norfolk cliffs, the carabid *Nebria livida*, was known from Cromer by Fowler (1887), though Dawson (1854) was only aware of its presence on the Yorkshire cliffs. The other main beetle speciality, the tunnelling rove-beetle *Bledius filipes*, was described new to science from Norfolk by Sharp in 1911. The Norfolk cliffs have remained on the 'entomological map' ever since and to 3 July 2002, Martin Collier (Norfolk beetle recorder) had amassed records of 142 species of beetle for the cliffs between West Runton and Overstrand. However, there has never been a published account of the entomological interest of these cliffs and until recently they have not been subject to any detailed entomological survey.

The Overstrand Cliffs SSSI and cSAC[1] was surveyed for invertebrates during 27th to 29th August 2003 (Ellis *et al*., 2004) and 92 species were recorded across a wide range of invertebrate groups giving a useful overview of invertebrates at this site.

The aims of this survey were:

- to gather new data on the invertebrate communities of selected sites on the soft-rock cliffs of the Norfolk coast,

[1] Site of Special Scientific Interest (SSSI) and candidate Special Area for Conservation (cSAC)

- 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 Norfolk coast and identify opportunities for enhancing biodiversity.

2. Methods

One complete day (9th June) was spent on a reconnaissance of the soft-rock cliffs of Norfolk, in company with Andrew Whitehouse, Buglife's project officer for the "Sustainable Management of Soft Rock Cliffs and their Invertebrate Biodiversity" project. Survey sites and sampling areas were chosen to (i) encompass the range of habitat variation present on Norfolk'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 sites known to support each of *Nebria livida* and *Bledius filipes*.

At each site, a brief habitat description was compiled, digital photographs were taken and an aspect bearing was taken using a precision compass.

The sites selected for survey were at Overstrand, Trimingham and West Runton (Table 1). In addition to a limited amount of survey during the reconnaissance on 9th June, a nominal three days of survey were spent at Overstrand (over four dates), and two days each at Trimingham and West Runton. A subsequent extension to the contract added extra nocturnal survey time specifically targeted at the ground-beetle *Nebria livida* (Table 2).

The diurnal field survey time was divided between three sites, all in Vice-county 27 (East Norfolk) (Table 1).

Survey site	Survey dates	Site details
Overstrand	10th June 14th (& 16th) June 23rd & 24th August	Cliffs west of Overstrand (towards Cromer), TG24-41-.
Trimingham	15th June 21st August	Cliffs accessed at TG277390, the north-western extremity of the revêtements. Survey effort was divided equally between the defended and undefended cliffs either side of the access track, all within TG27-39-.
West Runton	16th June 22nd August	Surveyed as two sites (both in TG18-43-): • west of the slipway, concentrating on the vertical faces for *Bledius filipes*, and • east of the slipway, concentrating on the seepages.

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, 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 four nights as detailed in Table 2. Other beetles (predominantly other carabids) were also recorded during the nocturnal fieldwork.

Survey site	**Survey dates**	**Survey times**
Overstrand	20th - 21st August 22nd August	2130 - 0010 0015 - 0115
West Runton	21st August	2205 - 2355
Trimingham	22nd August	2130 - 2300
East Runton (TG20-42-), either side of the slipway	22nd - 23rd August	2345 - 0037
Weybourne, the two outlying sections of cliff west of the car park, to TG10794371, and to TG10054386, plus the cliffs east of the car park (TG11-43-).	24th August	2120 - 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.

Much of the fieldwork was in company with Andrew Whitehouse who carried out valuable supplementary collecting, passing on his observations and specimens to the author. The dates when AW assisted with diurnal fieldwork were: 9th & 10th June, 21st & 22nd August. AW also assisted with the nocturnal fieldwork on 20th-21st, 21st-22nd & 22nd-23rd August.

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: Yellow 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 up to two days later. On the 14th - 16th June surveys, yellow-lined containers were used (Fig. 1). On the August surveys, smaller all-yellow containers were used. Both types of trap 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.

Weather conditions during the survey were rarely ideal though probably entirely typical of these coastal sites. Only one day was described as still, two as breezy and the remainder ranged from light wind to strong and gusty wind. All the June survey dates had sunshine, though the 14th started with a thick 7/8 overcast and the 15th with 4/8 cloud cover. The weather conditions in August were poorer, and followed some exceptionally heavy localised downpours in the Sheringham area on 19th which flooded several homes in the town. There was light rain at intervals during 21st, rain curtailed survey on 23rd at 16.40 and 24th was a day of showers. In between, the weather was typically mild, warm at best, with sunshine in short supply. Night-time minima were of the order of 10-12 ºC. 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, 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 and Auchenorrhyncha	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

Fig. 2: Much of the recording at Overstrand was concentrated on the area pictured here.

Overstrand

The cliffs from Overstrand towards Cromer provide an excellent variety of habitats for invertebrates (Fig. 2). Rotational slumping is frequent here, far more so than anywhere else on the Norfolk coast. This has created a broad under-cliff, with occasional ponds or patches of fen vegetation including common reed *Phragmites australis*: a habitat not found elsewhere on the Norfolk cliffs. The rather large volume of water, responsible for the rotational slumping, manifests as a large number of flushes or seepages: approximately one for every 10 metres of cliff.

In between the wetland habitats, Overstrand has an excellent mix of bare ground features, including virgin faces and loose fallen material, with ruderal vegetation and mature herb-rich grassland. There is evidence of calcareous influence, both in the presence of calcicolous plants and tufa-depositing seepages.

Towards Cromer, the cliffs become increasingly dominated by scrub, much of it as a completely closed layer. Scrub was not surveyed.

The aspect of the cliffs here was measured as 30 ºE.

Trimingham

The Trimingham cliffs were accessed from TG277390, the north-western extremity of the revêtements. Survey effort was divided equally between the defended and undefended cliffs either side of the access track in order to judge the effects of the defences on the invertebrate assemblages.

Fig. 3: Much of the undefended cliff at Trimingham is subject to rapid erosion and is devoid of vegetation. However, this survey concentrated on a more accessible and less steeply eroded section.

Fig. 4: Along most of its length, the defended cliff has flowed out to meet the revêtements but this picture shows an area of accessible toe habitat that was surveyed - a habitat feature absent from the adjacent undefended section.

These cliffs are higher than at Overstrand and appear to be drier. On the undefended section (Fig. 3), the cliffs are much steeper than at Overstrand and in large sections are subject to rapid erosion by the sea, to the extent that they are largely devoid of vegetation and difficult to climb. The section of undefended cliff chosen for survey was that nearest to the access track, where it was possible to survey some seepages, the virgin cliff-face, and a range of ruderal and more established vegetation.

The contrast between the photographs of the defended (Fig. 4) and undefended sections (Fig. 3) is stark. However, at a much smaller scale - the scale of invertebrate habitats - they appear to share most of the same habitat features, just in different proportions. So, the undefended cliff also has virgin cliff-face, seepages, and the same range of ruderal and more established vegetation, with the same plant species. The main difference was the much reduced proportion of bare ground and the much greater proportion of closed grassland. A few patches of pioneer scrub were noted on the defended cliff, as well as a single small pond: features absent on the undefended cliff. Particular attention was paid to the toe habitats (Fig. 4), absent from the undefended cliff due to erosion by the sea.

The flush beside the access track was perhaps the most interesting flush at Trimingham. Lying as it did on the boundary between defended and undefended cliffs, it was not thoroughly covered by this survey.

The aspect of the cliffs here was measured as 37 ºE.

West Runton

Fig. 5: West Runton, looking west of the slipway.

At West Runton, the survey treated the cliffs either side of the slipway as two separate sites. These cliffs are much lower than at either Overstrand or Trimingham. They also appear to be sandier, still with a calcareous influence, typified perhaps by common restharrow *Ononis repens*, a plant not seen at the other sites. To the west of the slipway (Fig. 5) the cliffs are almost entirely dry and consequently very steep. Virgin cliff-face predominates here and provides the main entomological interest, being riddled by colonies of thousands of *Bledius*, a diverse genus of burrowing rove-beetles. This is a well-known site for the Red Data Book *Bledius filipes*, known in Britain only from the soft-rock cliffs of Norfolk.

Fig. 6: The flush at West Runton, east of the slipway, presumably at the site of the excavation of the West Runton mammoth.

To the east of the slipway (Fig. 6), the profile of the cliffs is much the same but they support a few flushes which were the primary focus of survey effort. The best of these, at TG1878743094 flows into a rectangular excavation in the cliff, presumably the site from which the West Runton mammoth (a Steppe Mammoth *Mammuthus trogontherii*) was excavated in 1995. A seemingly unique feature of the cliffs east of the slipway is a dark, fossiliferous stratum intermittently exposed above the beach. However, this was not particularly productive for invertebrates.

The aspect of the cliffs here was measured as 11 ºW to the west of the slipway, and 15 ºW to the east of the slipway.

4. Results

The survey identified 374 species of invertebrate (Appendix 2).

The survey identified 17 species that are either Red Data Book species, Nationally Scarce species or have no official status but deserve one (Table 6). This is 4.5% of the total species list.

Status	Species	Howe grade	Overstrand	Trimingham	West Runton	All sites
RDB1	*Bledius filipes*	1			✓	✓
RDBK	*Symplecta chosenensis*	(1)			✓	✓
Nationally Scarce (Na)	*Argogorytes fargei*	3		✓		✓
	Nebria livida	2	✓	✓	✓	✓
	Hypera meles			✓		✓
	Limnichus pygmaeus		✓	✓		✓
Nationally Scarce (Nb)	*Nabis pseudoferus*			✓		✓
	Andrena humilis	3	✓			✓
	Asaphidion pallipes		✓	✓	✓	✓
	Dyschirius thoracicus		✓	✓	✓	✓
	Stenolophus teutonus		✓			✓
	Psylliodes chalcomera		✓			✓
	Tanymecus palliatus			✓		✓
	Crypticus quisquilius					✓
Nationally Scarce (N)	*Vanoyia tenuicornis*		✓			✓
	Stratiomys potamida		✓			✓
suggested Nationally Scarce (Na)	*Geomyza nartshukae*		✓			✓
None	*Bembidion stephensii*	3		✓		✓
	Total rare and scarce species		10	8	5	17
	Total species		231	192	94	374
	% rare and scarce		4.3	4.2	5.3	4.5

Table 6: Rare, scarce and soft-rock cliff specialist species recorded by this survey. The 'Howe grade' indicates soft-rock cliff specialists, with species restricted to soft-rock cliff graded 1, strongly associated species graded 2 and associated species graded 3. 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, as well as other significant records, are described below.

Bledius filipes (Coleoptera: Staphylinidae) a rove-beetle, RDB1

Like other members of the genus *Bledius*, adults and larvae of *B. filipes* live in burrows in moist sand or clay where they probably feed on algae and detritus. This species is known to prefer to burrow in vertical surfaces, presumably because the

consolidation of the virgin cliff suits its requirements for burrowing substrate better than fallen material. It was described in 1911 and has only ever been known from the north Norfolk cliffs within Britain. In recent years it has been recorded quite regularly from West Runton as well as from the cliffs between Overstrand and Cromer (Martin Collier, 29th May 1988) and from the cliffs west of Sheringham (G. Wildridge, det. M. Collier, 26th August 1983). In earlier decades it has been recorded more widely from the Norfolk soft-rock cliffs (Hyman & Parsons, 1994; Peter M. Hammond, pers. comm.). This is one of the 29 species listed by Howe (2003) as confined to coastal soft-rock cliffs in the UK, and one of the 27 Grade 1 species listed in the earlier treatment of Howe (2002).

Fig. 7: The trowel indicates the spot where a single *B. filipes* was found on 16th June.

Fig. 8: The arrow indicates the area occupied by a colony of *B. filipes* estimated to contain 100 - 200 individuals on 22nd August.

On the current survey, a single specimen was found west of the slipway on 16th June at TG1833343192 (Fig. 7). It was dug from a grey, clayish horizon, about 4 m above the base of the cliff, together with *B. atricapillus/praetermissus* (a very common species at West Runton), *Dyschirius thoracicus* and *Carpelimus* sp., as well as springtails. No further individuals could be found.

On 22nd August, 10 specimens were recorded east of the slipway at TG18864306 (Fig. 8) near where an iron pipe spills out onto the top of the beach. They were burrowing in fine sand of a bright sandy-orange colour, mixed with clay particles. They were dug out of a colony, estimated to contain c. 100 - 200 individuals.

Symplecta chosenensis (Diptera: Limoniidae) a cranefly, RDBK

The very first fly recorded by this survey was *Symplecta chosenensis*. A male and female were collected at West Runton, east of the slipway, at the mammoth excavation seepage (Fig. 6) at TG1878743094 during the reconnaissance visits of 9th June. No further specimens were found. This species was added to the British list by Chandler & Crossley (2003) after some initial confusion with *Symplecta novaezemblae scotica*. The references by Howe (2002) and Howe (2003) to *S.*

novaezemblae scotica as one of the species confined to coastal soft-rock cliffs in the UK (Grade 1 species) should actually refer to *S. chosenensis*. It specialises on seepages on soft-rock cliffs. *S. chosenensis* has been recorded from nine British 10-km squares: five in Wales, one in Cumberland, two in Yorkshire and one in Norfolk (Howe *et al*., 2006). The sole previous Norfolk record is of two males from Overstrand Cliffs (TG250410) on 24th July 2003 by M.A. & E.A. Howe (Howe *et al*. 2006).

Argogorytes fargei (Hymenoptera: Aculeata: Sphecidae) a digger wasp, Nationally Scarce (Na)

This wasp has been found in a variety of open habitats on light soils, including heaths, quarries and gravel pits, river corridors featuring clay or sandy river banks, fixed coastal dunes and soft-rock cliffs. Within these it requires features such as vertical earth banks or sparsely-vegetated dry ground for nesting, in combination with areas of tall grass or herbs for hunting (Edwards & Telfer, 2001). It is very thinly distributed in southern England, northwards to the Bridlington coast, Yorkshire. There are clusters of records from the south coast of the Isle of Wight and the Cromer area of the Norfolk coast. It is a Grade 3 soft-rock cliff species (Howe, 2002).
This species was encountered in numbers at Trimingham on 15th June. Four were collected for identification but a total of four were seen on the defended cliff and five on the undefended cliff, all by examining Hogweed umbels (a plant it is known to visit).

Nebria livida (Coleoptera: Carabidae) a ground-beetle, Nationally Scarce (Na)

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. 9: *Nebria livida* active at night. If anyone were to invent an English name for this species, it ought to be the Cliff-comber.

Survey site	Survey dates	Survey times	Number recorded	Comments
Overstrand	20th - 21st August	2130 - 0010	0	
West Runton	21st August	2205 - 2355	7	2 on the concrete, plus 5 east of the slipway (2 at head height, 2 at base, 1 on flush)
Overstrand	22nd August	0015 - 0115	4	All at base of cliff. Defended cliff.
Trimingham	22nd August	2130 - 2300	16	13 on the undefended cliff, 3 on the defended cliff
East Runton	22nd - 23rd August	2345 - 0037	0	
Weybourne	24th August	2120 - 2320	0	

Table 7: Summary of records of *Nebria livida* made by the nocturnal survey.

On 8th August 1993, the author discovered that *N. livida* was fairly easy to find by torchlight searching at Overstrand. It was therefore surprising not to record any *N. livida* using the same technique on the night of 20th - 21st August 2006 (Table 7). However, torching at West Runton on the following night eventually yielded two individuals actually on the concrete structure of the slipway. None were found to the west but a further five were found to the east of the slipway. Returning to Overstrand later on the second night, a few *N. livida* were successfully located on the defended section of cliff nearest Overstrand. After further survey, it seemed fairly clear that *N. livida* was absent from the undefended section.

After two night's torching, it seemed that defended cliff was producing many more *N. livida* than undefended cliff. This could have been a temporary effect of the high tides during the preceding week which had reached the toe of the cliffs and eroded away quite a lot of material. This was particularly noticeable at the undefended section of Overstrand which appeared to have lost 2-3 metres of toe, as well as suffering heavy rainwater erosion and gullying from recent downpours. At West Runton, the cliffs to the east of the slipway may be a little less prone to erosion thanks to the harder, dark, fossiliferous basal stratum.

On the third night, Trimingham was discovered to be a very good site for *N. livida*, and certainly the best found by this survey. 14 live individuals were seen by two observers searching for 39 minutes. Two recently dead individuals were also recorded, apparently trodden on.

Typically, the spots at West Runton and Overstrand where *N. livida* was recorded (i) were entirely bare of vegetation, (ii) had fairly clean surfaces, not cluttered with rubble, (iii) had fairly uniform clayish substrates with cracks and crevices, and few stones or flints, and (iv) were often damp, sometimes but not always actually wet. At Trimingham, this describes almost the whole cliff-face on the undefended side, not just a few spots. The undefended cliff at Trimingham should be regarded as ideal habitat for *N. livida*.

Nine of the 14 *N. livida* at Trimingham were associated with either silt fans on the upper beach (8 individuals) or with a trickle in a channel on the cliff (1 individual). It is probably of some importance to *N. livida* that there is flowing water on the cliffs and that the upper beach is of the sort of substrate that allows fans of sediment to form.

Hypera meles (Coleoptera: Curculionidae) a weevil, Nationally Scarce (Na)

A weevil that feeds on white clover *Trifolium repens* and possibly other Fabaceae in grassland, roadsides and field margins. Locally distributed in southern England northwards to Mid-west Yorkshire. Doubtfully recorded from Wales and not recorded from Scotland. A single individual was swept on the undefended cliffs at Trimingham on 21st August in a sample which also included *H. venusta* and *H. nigrirostris*.

Limnichus pygmaeus (Coleoptera: Limnichidae) a limnichid beetle, Nationally Scarce (Na)

A small beetle strongly resembling a pill-beetle (Byrrhidae) but the sole British member of the family Limnichidae. It may be found crawling on damp ground with a thin crust of moss, on which it probably feeds. It has been recorded from fens and bogs as well as coastal wetlands (Hyman & Parsons, 1992). It has been recorded from most coastal counties from South Devon to Mid-west Yorkshire. This species was recorded at Overstrand on 10th and 14th June and 23rd August. At Trimingham it was recorded from both the defended (15th June) and undefended (21st August) sections.

Nabis pseudoferus (Hemiptera: Heteroptera: Nabidae) a damsel-bug, Nationally Scarce (Nb)

This damsel-bug is locally distributed in south and east England, north to Norfolk. It is associated with sandy, grassy habitats, including dunes and is predominantly coastal (Southwood & Leston, 1959). A single female was found on the defended cliffs at Trimingham on 21st August.

Andrena humilis (Hymenoptera: Aculeata: Apidae) a mining bee, Nationally Scarce (Nb)

An oligolectic species, specialized on Asteraceae Cichorioideae (e.g. *Crepis*, *Hieracium* and other yellow composites). Nests in burrows which it excavates in compacted sand or soil. It is a Grade 3 soft-rock cliff species (Howe, 2002). Univoltine, flying from April to June. This bee has a scattered distribution across the whole of England but appears not to have been recorded from Scotland or Wales, according to information available on the NBN Gateway. A single male was collected in a yellow pan-trap set at Overstrand between 14th and 16th June.

Asaphidion pallipes (Coleoptera: Carabidae) a ground-beetle, Nationally Scarce (Nb)

This is a smallish predatory carabid with a distinctive velvet pattern on the upper surface. It occupies two habitats in Britain and is more widespread on fine bare sand or silt beside rivers and streams, predominantly in northern England and Scotland. On

soft-rock cliffs, it is known from the Norfolk cliffs, the Lyme Regis area and a scatter of coastal localities in Wales and western Scotland.
This species was recorded on every visit to Overstrand, no matter how brief: 9th, 10th and 14th June, and 20th (1 by torchlight) and 23rd August. Likewise, it was recorded on both diurnal visits to Trimingham, each time from both the defended and undefended sections. At West Runton, singles were recorded on the flushes west of the slipway on both diurnal visits, and a single was recorded east of the slipway on the 16th June visit. One was recorded by the Mundesley lifeboat station (TG317364) on 22nd August during a reconnaissance.

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).
The three records on this survey were all by torchlight searching. One was on the very wet steep face of the defended cliff at Trimingham between 0015-0115 on 22nd August. A single teneral example was found at East Runton Gap (TG20-42-) on fine chalk rubble, west of the slipway, between 2349 (22nd August) and 0023 (23rd August). On the night of 24th August, one was on the second set of cliffs west of the Weybourne car park (TG10-43-).

Dyschirius thoracicus (Coleoptera: Carabidae) a ground-beetle

D. thoracicus has no official conservation status but deserves mention as it has been recorded from only 64 British 10-km squares, well within the threshold for Nationally Scarce (Nb) status (100 squares). The range extends around most of the British coastline, north to Kirkcudbrightshire on the west and Angus on the east coast. It is entirely coastal but occurs on a range of sandy coastal habitats as well as soft-rock cliffs.
This species was found at Overstrand on 14th June only. At Trimingham it appeared to be restricted to the undefended cliff, where it was found on both diurnal visits. It was common, or very common at West Runton, on both sides of the slipway, in association with both *Bledius atricapillus/ praetermissus* and with *B. filipes*, and it can be assumed to prey on these species.

Stenolophus teutonus (Coleoptera: Carabidae) a ground-beetle, Nationally Scarce (Nb)

The third record for Norfolk of this black-and-orange wetland beetle. It inhabits wetland situations typified by bare wet sandy ground, on soft-rock cliffs on the Isle of Wight for example, as well as in man-made habitats such as sand pits and brownfield sites. Previous Norfolk records come from Gayton Thorpe Common (Andy Foster, 26 Mar 1988) and Lopham Fen (Derek Lott, 10 Jun 2000). This species appears to have been expanding its geographical range in recent years. 10 were found at a flush on the Overstrand cliffs on 14th June, and another at the same place on 23rd August.

Psylliodes chalcomera (Coleoptera: Chrysomelidae) a flea-beetle, Nationally Scarce (Nb)

This flea-beetle is associated with thistles (*Carduus* and possibly also *Cirsium*) in grassland, disturbed ground, riverside vegetation and coastal sites. It has a scattered distribution in southern England, north to East Lothian in Scotland. One was found by sweeping vegetation composed of only Creeping Thistle *Cirsium arvense*, Colt's-foot *Tussilago farfara* and Field Horsetail *Equisetum arvense* at Overstrand on 23rd August.

Tanymecus palliatus (Coleoptera: Curculionidae) a weevil, Nationally Scarce (Nb)

This largish broad-nosed weevil is polyphagous on a wide range of herbs, perhaps with a slight preference for Asteraceae (e.g. thistles and *Centaurea* spp.) (Morris, 1997). It occurs in grassy and open situations, including under-cliffs, roadsides and grazing land. It is generally local and rather scarce but widely distributed throughout southern England, though less common to the north. A pair were found *in copula* on *Centaurea nigra* on the undefended cliff at Trimingham on 15th June.

Crypticus quisquilius (Coleoptera: Tenebrionidae) a darkling beetle, Nationally Scarce (Nb)

An almost exclusively coastal beetle of sandy habitats. It is widespread but local along the coasts of England, Wales and south-west Scotland. It may be declining. One was observed at West Runton on 16th June while having lunch at the café, a short distance away from the soft-rock cliff habitat, amidst disturbed sandy coastal grassland.

Vanoyia tenuicornis (Diptera: Stratiomyidae) Long-horned Soldier, Nationally Scarce

This small soldierfly is very thinly scattered in southern and eastern England and south Wales, northwards on the east coast to the Humber estuary (Drake, 1991). Most localities where it occurs are fens or wet meadows (usually with seepages but sometimes with just ditches or ponds), seepages on coastal landslips, or wet dune slacks (Stubbs & Drake, 2001). Two adults were collected at Overstrand on 10th June.

Stratiomys potamida (Diptera: Stratiomyidae) Banded General, Nationally Scarce

This is a striking black and yellow fly, with a widespread but scattered distribution across most of England and Wales, mostly in southern England (Drake, 1991). Larvae are aquatic and are typically found in ditches, streams, springs or seepages. These can be in open habitats such as fens and meadows but also in lightly wooded places. Adults are typically found close to the larval habitat (Stubbs & Drake, 2001). Several larvae were found at Overstrand on 9th June in a tufa-depositing seepage at TG2425341260. One of these (perhaps having already pupated within its larval skin) emerged as a male on 17th June. Other larvae of *Stratiomys* sp., probably *potamida* (since *longicornis* would be unlikely) were found on the undefended cliffs at Trimingham on 15th June and 21st August.

Bruchidius varius (Coleoptera: Bruchidae) a seed-beetle, New to Norfolk

This beetle was added to the British list by Hodge (1997) who found it in East Sussex in 1994 and 1996, probably associated with Red Clover *Trifolium pratense*. It has been spreading ever since and Cox (2001) mapped it as occurring over much of south-east England including the Isle of Wight, Hampshire, Sussex, Kent, Surrey, Middlesex, Berkshire, Hertfordshire and South Essex. It was recorded new to Suffolk in 2004 (Nash, 2005) and its arrival in Norfolk had been anticipated (M. Collier, pers. comm.). Two females were swept on the undefended cliffs at Trimingham on 15th June and a further two females on 21st August. In both cases, the area swept was dominated by Red Clover. This species must be assumed to be established at Trimingham.

Geomyza nartshukae (Diptera: Opomyzidae) an opomyzid fly

This fly was added to the British list by Van Zuijlen (1999) from specimens collected in Somerset. Martin Drake (2001) brought this addition to the wider attention of British dipterists and added three more records, two from Norfolk and one from Essex. It is still regarded as a rarity though information on its true status, or indeed on its ecological requirements, is sparse. Howe (2002) suggested this fly may have a strong affiliation with soft-rock cliffs as the only Welsh records then known were from a survey of soft-rock cliff sites in Carmarthenshire and Pembrokeshire. It may be best regarded as a Nationally Scarce (Na) species though it has no official conservation status as yet. On the current survey, one was found at Overstrand on 14th June.

Aleochara cuniculorum (Coleoptera: Staphylinidae) a rove-beetle

This small aleocharine staphylinid is widely distributed throughout the British Isles as far north as the Outer Hebrides. It is typically found in rabbit burrows but is also known from the underground nests of other mammals and birds, e.g. Badger and Sand Martin (Welch, 1997). It has only been recorded from one other site in Norfolk (Stanford, in Breckland, twice by Martin Collier (pers. comm.)). On the current survey, a single female was found at arm's length down a rabbit burrow in the second block of sandy cliffs west of Weybourne car park (to TG10054386) during nocturnal survey on 24th August. The same burrow contained the local ground-beetle *Laemostenus terricola*.

5. Discussion

SITE ASSESSMENTS

Overstrand

Overstrand was the most species-rich site surveyed, with 231 species recorded. This was to be expected given the greater diversity of habitats present on the Overstrand cliffs, as well as the greater amount of survey effort spent at Overstrand.

10 Nationally Scarce species were recorded at Overstrand, 4.3% of the total. Four of these scarce species were also found at Trimingham, three being found at both Trimingham and West Runton. However, six species were apparently restricted to

Overstrand. These six included the Grade 3 soft-rock bee *Andrena humilis*, three species associated with seepages, a thistle-feeding beetle, and one species *Geomyza nartshukae* of uncertain habitat affinities. Other Nationally Scarce beetles recorded here in the recent past include the seed-feeding ground-beetle *Amara praetermissa*, the ground-beetle *Platyderus ruficollis*, the click-beetle *Athous campyloides*, and the horsetail-weevil *Grypus equiseti*. The local ground-beetle *Bradycellus sharpi* was recorded at Overstrand for the first time on this survey, and is otherwise known in Norfolk from the Dersingham Bog/ Sandringham Warren area, a distribution pattern exactly mirroring that of *Amara praetermissa*.

The invertebrate survey by Ellis *et al*. (2004), also for three days (from 27th to 29th August 2003) recorded 92 species of which two were rare or scarce: the ground-beetle *Asaphidion pallipes* and the bee-wolf *Philanthus triangulum*, only the former of which was recorded by this survey. Both the Grade 1 soft-rock cliff species recorded by this survey at West Runton have also been recorded at Overstrand in recent years: *Bledius filipes* in 1988 and *Symplecta chosenensis* in 2003.

Overall, the seepages at Overstrand are probably the most important feature for invertebrates but the bare ground and ruderal vegetation also make an important contribution to a diverse site.

Trimingham

Trimingham was the second richest site surveyed with 192 species recorded, though close to the 231 species recorded from Overstrand.

8 Nationally Scarce species were recorded at Trimingham, 4.2% of the total, equivalent to the 4.3% recorded at Overstrand. Immature larvae, probably of the soldierfly *Stratiomys potamida*, were also recorded: a possible ninth scarcity. Four of those species were exclusive to Trimingham, including the Grade 3 soft-rock wasp *Argogorytes fargei*, two plant-feeding weevils and a predatory bug. Trimingham also yielded the plant-feeding beetle *Bruchidius varius* new to Norfolk. A single male of the seed-feeding ground-beetle *Ophonus puncticeps* was found at Trimingham by torchlight. This is a local species with most previous Norfolk records from the Brecks, though it has also been recorded at Overstrand.

Overall, Trimingham is notable as the best site in Norfolk, probably in Britain, for *Nebria livida*. Its seepages share many of the scarcities present at Overstrand. The bare ground, ruderal vegetation and grassland habitats support a valuable assemblage of invertebrates, surprisingly different to Overstrand.

Trimingham: undefended versus defended

The undefended cliffs at Trimingham yielded 136 species, compared to 119 from the defended cliff. 64 species were recorded from the undefended cliff only, compared to 48 found only on the defended cliff (Appendix 4). The Nationally Scarce weevils *Tanymecus palliatus* and *Hypera meles* were recorded only from the undefended cliff, along with several other noteworthy species including *Dyschirius thoracicus*, *Bruchidius varius*, Green Tiger-beetle *Cicindela campestris*, *Ophonus puncticeps*, and three species of *Bledius*. Of the 48 recorded only from the defended cliff, the most noteworthy species is the scarce bug *Nabis pseudoferus*. *Nebria livida* was recorded

from both defended and undefended sections but in much greater abundance on the undefended cliff.

The habitats of the undefended cliff support a richer and better quality assemblage of invertebrates than the defended cliff. The reduced erosion of the defended cliff has lead to a reduction in bare ground, open flushes and early-successional vegetation. This has in turn been reflected in a smaller invertebrate assemblage containing fewer scarce and habitat-specialist invertebrates.

West Runton

West Runton was poorer than the other sites in terms of species numbers with only 94 species recorded, compared with 231 at Overstrand and 192 at Trimingham. This was to be expected given the relatively simple habitats present at West Runton and the fact that survey at this site was focussed on sampling specific sub-habitats (virgin cliff and flushes).

West Runton yielded the highest quality invertebrate assemblage of any of the survey sites, with five RDB or Nationally Scarce species, 5.3% of the total. This is probably not significantly higher than the 4.3% and 4.2% figures for Overstrand and Trimingham respectively. However, the five species at West Runton includes both of the RDB species recorded by this survey, *Bledius filipes* and *Symplecta chosenensis*, neither of which was recorded at the other sites. These two species are also the only two species restricted to soft-rock cliffs (Grade 1 species of Howe (2002)) found by this survey. West Runton also supported *Nebria livida*, a Grade 2 soft-rock cliff species also found at Overstrand and Trimingham. The other two Nationally Scarce species, *Asaphidion pallipes* and *Dyschirius thoracicus* were found at all three sites. Overstrand was the only site where the weevil *Holotrichapion ononis* was found. This species, as the name suggests, feeds on Restharrow *Ononis repens* and in Norfolk is known only from here and at Cranwich in the Brecks.

General comments

Each of Overstrand, Trimingham and West Runton makes a unique contribution to the invertebrate biodiversity of the Norfolk soft-rock cliffs. Whilst West Runton has the assemblage of greatest national importance, Overstrand and Trimingham each support much more diverse invertebrate assemblages, of equal overall conservation value. In general, differences in topography (themselves due to differences in geology and hydrology), aspect, erosion rates, soil chemistry and hydrology are all linked to differences in invertebrate assemblages. The soft-rock cliffs of Norfolk show considerable variation in these physical and chemical parameters and this is mirrored in the variation of invertebrate assemblages.

6. 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, and this is true at Overstrand, Trimingham, West Runton and elsewhere on the Norfolk cliffs. Water flow is also important in the process of rotational slumping which creates the unique habitat diversity at Overstrand. 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 immediate concern at Trimingham where the valuable flush alongside the access track lies below a sycamore wood that is beginning to fall over the edge.

Coastal defence works are the most serious and the most thorny issue for soft-rock cliffs. This survey has found evidence for the detrimental effect that coastal defence and cliff stabilisation has had on the invertebrates at Trimingham. However, the true picture is more complex. The greater part of the undefended cliff at Trimingham appears to be extremely poor habitat for invertebrates due to excessively rapid erosion (Fig. 3). Optimum conditions for invertebrates would be provided by natural rates of erosion on a natural coastline. To reduce or stop erosion is detrimental to soft-rock cliff invertebrates but so equally is to speed up rates of erosion. It appears that much of the undefended cliff at Trimingham is suffering from more rapid erosion due to man's manipulation of the coastal environment, to the detriment of the invertebrates. Any plan to reduce or remove coastal defences from soft-rock cliff would need to be done in such a way to gradually increase rates of erosion. Any sudden change would be catastrophic.

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Appendix 1: British conservation status categories – definitions.

Red Data Book category 1, Endangered

Definition Species in danger of extinction and whose survival is unlikely if causal factors continue to operate. Endangered species either (a) occur as only a single population within one 10-km square, or (b) only occur in especially vulnerable habitats, or (c) have been declining rapidly or continuously for twenty years or more to the point where they occur in five or fewer 10-km squares, or (d) may already have become extinct.

Red Data Book category K, Insufficiently Known

Definition Species suspected to merit either Endangered, Vulnerable, Rare or Indeterminate status but lacking sufficient information. Species included in this category may have only recently been discovered in Britain, or may be very poorly recorded for a variety of reasons.

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 Norfolk soft-rock cliffs between 9 June and 24 August 2006 by Mark G. Telfer.

The occurrence of each species at Overstrand, Trimingham and West Runton is indicated. A few of the species recorded by this survey were not recorded from any of the three main survey sites (e.g. found during reconnaissance or nocturnal fieldwork at other sites): they will have a '1' in the 'All sites' column only. Key species are listed in red text.

Classification1	Classification2	Classification3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Malacostraca	Isopoda	Armadillidiidae	*Armadillidium vulgare*	Common pill woodlouse	None	1	1	1	1
Malacostraca	Isopoda	Cylisticidae	*Cylisticus convexus*		None		1	1	1
Malacostraca	Isopoda	Ligiidae	*Ligia oceanica*	Common sea-slater	None	1	1	1	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	Platyarthridae	*Platyarthrus hoffmannseggi*	Ant woodlouse	None	1	1		1
Malacostraca	Isopoda	Porcellionidae	*Porcellio scaber*	Common rough woodlouse	None	1	1	1	1
Malacostraca	Isopoda	Trichoniscidae	*Androniscus dentiger*	Rosy woodlouse	None	1			1
Malacostraca	Isopoda	Trichoniscidae	*Trichoniscus pusillus*	Common pygmy woodlouse	None	1	1		1
Arachnida	Araneae	Agelenidae	*Agelena labyrinthica*		None		1		1
Arachnida	Araneae	Araneidae	*Araneus diadematus*		None	1	1		1
Arachnida	Araneae	Araneidae	*Larinioides cornutus*		None	1	1	1	1
Arachnida	Araneae	Araneidae	*Agalenatea redii*		None	1	1		1
Arachnida	Araneae	Clubionidae	*Clubiona reclusa*		None		1	1	1
Arachnida	Araneae	Clubionidae	*Clubiona subtilis*		None		1		1
Arachnida	Araneae	Clubionidae	*Cheiracanthium erraticum*		None	1	1		1
Arachnida	Araneae	Gnaphosidae	*Zelotes latreillei*		None	1			1
Arachnida	Araneae	Gnaphosidae	*Micaria pulicaria*		None		1		1
Arachnida	Araneae	Linyphiidae	*Dismodicus bifrons*		None		1		1
Arachnida	Araneae	Linyphiidae	*Gonatium rubens*		None	1			1
Arachnida	Araneae	Linyphiidae	*Micrargus subaequalis*		None		1		1
Arachnida	Araneae	Linyphiidae	*Savignia frontata*		None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Arachnida	Araneae	Linyphiidae	*Erigone dentipalpis*		None		1		1
Arachnida	Araneae	Linyphiidae	*Erigone atra*		None	1			1
Arachnida	Araneae	Linyphiidae	*Prinerigone vagans*		None	1		1	1
Arachnida	Araneae	Linyphiidae	*Bathyphantes gracilis*		None		1		1
Arachnida	Araneae	Linyphiidae	*Diplostyla concolor*		None	1	1		1
Arachnida	Araneae	Linyphiidae	*Lepthyphantes tenuis*		None	1	1	1	1
Arachnida	Araneae	Lycosidae	*Pardosa prativaga*		None	1			1
Arachnida	Araneae	Lycosidae	*Pardosa amentata*		None		1		1
Arachnida	Araneae	Lycosidae	*Pardosa nigriceps*		None	1			1
Arachnida	Araneae	Lycosidae	*Trochosa ruricola*		None		1		1
Arachnida	Araneae	Lycosidae	*Arctosa perita*		None	1	1		1
Arachnida	Araneae	Philodromidae	*Philodromus cespitum*		None	1			1
Arachnida	Araneae	Pisauridae	*Pisaura mirabilis*		None		1		1
Arachnida	Araneae	Salticidae	*Salticus scenicus*		None	1	1		1
Arachnida	Araneae	Tetragnathidae	*Tetragnatha extensa*		None	1	1		1
Arachnida	Araneae	Tetragnathidae	*Pachygnatha clercki*		None	1			1
Arachnida	Araneae	Tetragnathidae	*Pachygnatha degeeri*		None	1	1		1
Arachnida	Araneae	Tetragnathidae	*Metellina segmentata sens. str.*		None	1	1		1
Arachnida	Araneae	Theridiidae	*Neottiura bimaculata*		None	1			1
Arachnida	Araneae	Theridiidae	*Enoplognatha ovata sens. str.*		None		1		1
Arachnida	Araneae	Theridiidae	*Enoplognatha thoracica*		None	1			1
Arachnida	Araneae	Thomisidae	*Xysticus cristatus*		None	1	1	1	1
Arachnida	Araneae	Thomisidae	*Ozyptila sanctuaria*		None	1			1
Diplopoda	Glomerida	Glomeridae	*Glomeris marginata*	Pill Millipede	None	1	1		1
Diplopoda	Julida	Julidae	*Ommatoiulus sabulosus*	Striped Millipede	None	1			1
Diplopoda	Julida	Julidae	*Tachypodoiulus niger*	White-legged Snake-millipede	None	1	1		1
Diplopoda	Julida	Julidae	*Cylindroiulus latestriatus*	a millipede	None			1	1
Diplopoda	Julida	Julidae	*Julus scandinavius*	a millipede	None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Diplopoda	Julida	Julidae	*Brachyiulus pusillus*	a millipede	None			1	1
Diplopoda	Polydesmida	Polydesmidae	*Polydesmus angustus*	Common Flat-backed Millipede	None	1	1		1
Insecta	Odonata	Coenagriidae	*Pyrrhosoma nymphula*	Large Red Damselfly	None	1			1
Insecta	Odonata	Coenagriidae	*Enallagma cyathigerum*	Common Blue Damselfly	None		1		1
Insecta	Odonata	Libellulidae	*Libellula depressa*	Broad-bodied Chaser	None	1			1
Insecta	Orthoptera	Acrididae	*Chorthippus albomarginatus*	Lesser Marsh Grasshopper	None	1	1		1
Insecta	Orthoptera	Acrididae	*Chorthippus brunneus*	Common Field Grasshopper	None	1	1	1	1
Insecta	Orthoptera	Conocephalidae	*Conocephalus dorsalis*	Short-winged Conehead	None	1	1		1
Insecta	Orthoptera	Tetrigidae	*Tetrix subulata*	Slender Ground Hopper	None	1	1		1
Insecta	Orthoptera	Tettigoniidae	*Pholidoptera griseoaptera*	Dark Bush Cricket	None				1
Insecta	Dermaptera	Forficulidae	*Forficula auricularia*	Common Earwig	None	1	1	1	1
Insecta	Hemiptera: Auchenorrhyncha	Cercopidae	*Cercopis vulnerata*		None		1		1
Insecta	Hemiptera: Heteroptera	Coreidae	*Coriomerus denticulatus*		None		1		1
Insecta	Hemiptera: Heteroptera	Hydrometridae	*Hydrometra stagnorum*		None	1			1
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Cymus claviculus*		None	1	1		1
Insecta	Hemiptera: Heteroptera	Lygaeidae	*Cymus melanocephalus*		None		1		1
Insecta	Hemiptera: Heteroptera	Nabidae	*Nabis flavomarginatus*		None		1		1
Insecta	Hemiptera: Heteroptera	Nabidae	*Nabis pseudoferus*		Nationally Scarce (Nb)		1		1
Insecta	Hemiptera: Heteroptera	Nabidae	*Nabis rugosus*		None		1		1
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Dolycoris baccarum*		None	1			1
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Palomena prasina*		None	1			1
Insecta	Hemiptera: Heteroptera	Pentatomidae	*Piezodorus lituratus*		None		1		1
Insecta	Hemiptera: Heteroptera	Tingidae	*Acalypta parvula*		None	1			1
Insecta	Lepidoptera	Arctiidae	*Tyria jacobaeae*	Cinnabar	None		1		1
Insecta	Lepidoptera	Geometridae	*Scotopteryx chenopodiata*	Shaded Broad-bar	None		1		1
Insecta	Lepidoptera	Geometridae	*Ematurga atomaria*	Common Heath	None	1	1		1
Insecta	Lepidoptera	Hepialidae	*Hepialus lupulinus*	Common Swift	None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Lepidoptera	Lasiocampidae	*Euthrix potatoria*	Drinker	None	1			1
Insecta	Lepidoptera	Lycaenidae	*Polyommatus icarus*	Common Blue	None	1	1		1
Insecta	Lepidoptera	Noctuidae	*Melanchra pisi*	Broom Moth	None	1			1
Insecta	Lepidoptera	Noctuidae	*Luperina testacea*	Flounced Rustic	None				1
Insecta	Lepidoptera	Noctuidae	*Autographa gamma*	Silver Y	Migrant	1	1	1	1
Insecta	Lepidoptera	Nymphalidae	*Vanessa atalanta*	Red Admiral	Migrant			1	1
Insecta	Lepidoptera	Nymphalidae	*Vanessa cardui*	Painted Lady	Migrant	1	1	1	1
Insecta	Lepidoptera	Pieridae	*Pieris brassicae*	Large White	None	1			1
Insecta	Lepidoptera	Pyralidae	*Nomophila noctuella*	Rush Veneer	Migrant		1		1
Insecta	Lepidoptera	Satyridae	*Pararge aegeria*	Speckled Wood	None		1		1
Insecta	Lepidoptera	Satyridae	*Lasiommata megera*	Wall	None	1			1
Insecta	Lepidoptera	Satyridae	*Pyronia tithonus*	Gatekeeper	None	1	1		1
Insecta	Lepidoptera	Satyridae	*Maniola jurtina*	Meadow Brown	None		1		1
Insecta	Lepidoptera	Sphingidae	*Macroglossum stellatarum*	Humming-bird Hawk-moth	Migrant			1	1
Insecta	Lepidoptera	Yponomeutidae	*Plutella xylostella*	Diamond-back Moth	Migrant		1		1
Insecta	Diptera	Asilidae	*Dioctria rufipes*		None	1			1
Insecta	Diptera	Campichoetidae	*Campichoeta obscuripennis*		None	1			1
Insecta	Diptera	Chloropidae	*Dicraeus vagans*		None		1		1
Insecta	Diptera	Dolichopodidae	*Argyra argyria*		None	1		1	1
Insecta	Diptera	Dolichopodidae	*Dolichopus brevipennis*		None	1			1
Insecta	Diptera	Dolichopodidae	*Dolichopus claviger*		None	1			1
Insecta	Diptera	Dolichopodidae	*Dolichopus longicornis*		None			1	1
Insecta	Diptera	Dolichopodidae	*Dolichopus subpennatus*		None		1		1
Insecta	Diptera	Dolichopodidae	*Dolichopus ungulatus*		None			1	1
Insecta	Diptera	Dolichopodidae	*Liancalus virens*		None			1	1
Insecta	Diptera	Dolichopodidae	*Sciapus zonatulus*		None			1	1
Insecta	Diptera	Dolichopodidae	*Syntormon pumilum*		None	1			1
Insecta	Diptera	Drosophilidae	*Scaptomyza pallida*		None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Diptera	Ephydridae	*Hyadina guttata*		None	1			1
Insecta	Diptera	Hybotidae	*Tachydromia aemula*		None	1			1
Insecta	Diptera	Limoniidae	*Erioptera lutea*		None	1			1
Insecta	Diptera	Limoniidae	*Molophilus obscurus*		None	1			1
Insecta	Diptera	Limoniidae	*Symplecta chosenensis*		RDBK			1	1
Insecta	Diptera	Limoniidae	*Symplecta stictica*		None	1		1	1
Insecta	Diptera	Limoniidae	*Neolimnomyia nemoralis*		None	1			1
Insecta	Diptera	Limoniidae	*Pseudolimnophila lucorum*		None	1			1
Insecta	Diptera	Limoniidae	*Pseudolimnophila sepium*		None	1			1
Insecta	Diptera	Limoniidae	*Dicranomyia modesta*		None	1			1
Insecta	Diptera	Lonchopteridae	*Lonchoptera lutea*		None			1	1
Insecta	Diptera	Micropezidae	*Micropeza corrigiolata*		None	1			1
Insecta	Diptera	Opomyzidae	*Geomyza nartshukae*		(Nationally Scarce (Na))	1			1
Insecta	Diptera	Opomyzidae	*Geomyza tripunctata*		None		1		1
Insecta	Diptera	Opomyzidae	*Opomyza petrei*		None	1			1
Insecta	Diptera	Pediciidae	*Tricyphona immaculata*		None	1			1
Insecta	Diptera	Platystomatidae	*Rivellia syngenesiae*		None	1	1		1
Insecta	Diptera	Rhagionidae	*Chrysopilus asiliformis*		None	1			1
Insecta	Diptera	Rhagionidae	*Chrysopilus cristatus*		None	1			1
Insecta	Diptera	Stratiomyidae	*Oxycera rara*		None	1	1		1
Insecta	Diptera	Stratiomyidae	*Oxycera trilineata*		None			1	1
Insecta	Diptera	Stratiomyidae	*Vanoyia tenuicornis*		Nationally Scarce	1			1
Insecta	Diptera	Stratiomyidae	*Stratiomys potamida*		Nationally Scarce	1			1
Insecta	Diptera	Syrphidae	*Platycheirus angustatus*		None	1	1		1
Insecta	Diptera	Syrphidae	*Platycheirus manicatus*		None	1	1		1
Insecta	Diptera	Syrphidae	*Platycheirus peltatus*		None		1		1
Insecta	Diptera	Syrphidae	*Chrysotoxum bicinctum*		None		1		1
Insecta	Diptera	Syrphidae	*Episyrphus balteatus*		None	1	1		1
Insecta	Diptera	Syrphidae	*Eupeodes corollae*		None		1		1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Diptera	Syrphidae	*Scaeva pyrastri*		None		1		1
Insecta	Diptera	Syrphidae	*Sphaerophoria scripta*		None		1		1
Insecta	Diptera	Syrphidae	*Syrphus ribesii*		None	1	1		1
Insecta	Diptera	Syrphidae	*Cheilosia bergenstammi*		None	1			1
Insecta	Diptera	Syrphidae	*Cheilosia griseiventris*		None			1	1
Insecta	Diptera	Syrphidae	*Anasimyia contracta*		None	1			1
Insecta	Diptera	Syrphidae	*Eristalinus sepulchralis*		None	1	1		1
Insecta	Diptera	Syrphidae	*Eristalis tenax*		None	1	1		1
Insecta	Diptera	Syrphidae	*Volucella bombylans*		None	1			1
Insecta	Diptera	Syrphidae	*Syritta pipiens*		None		1		1
Insecta	Diptera	Syrphidae	*Tropidia scita*		None	1			1
Insecta	Diptera	Tephritidae	*Chaetorellia jaceae*		Local		1		1
Insecta	Diptera	Tipulidae	*Nephrotoma flavescens*		None	1			1
Insecta	Diptera	Tipulidae	*Nephrotoma submaculosa*		None	1			1
Insecta	Diptera	Tipulidae	*Tipula maxima*		None				1
Insecta	Diptera	Tipulidae	*Tipula vernalis*		None	1			1
Insecta	Diptera	Tipulidae	*Tipula oleracea*		None		1		1
Insecta	Diptera	Tipulidae	*Tipula lateralis*		None	1	1	1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena barbilabris*	a mining bee	None	1			1
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena fulva*	a mining bee	None		1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena humilis*	a mining bee	Nationally Scarce (Nb)	1			1
Insecta	Hymenoptera: Aculeata	Apidae	*Andrena nigroaenea*	a mining bee	None			1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Apis mellifera*	Honey Bee	None		1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus hortorum*	Small Garden Bumble Bee	None	1	1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus lapidarius*	Large Red Tailed Bumble Bee	None	1		1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus lucorum/terrestris*	White-tailed/Buff-tailed Bumble Bee	None		1	1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus pascuorum*	Common Carder Bee	None	1	1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus pratorum*	Early Bumble Bee	None	1	1		1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Hymenoptera: Aculeata	Apidae	*Bombus terrestris*	Buff-tailed Bumble Bee	None	1	1		1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum leucozonium*	a mining bee	None		1	1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum minutissimum*	Least Mining Bee	None			1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum morio*	Brassy Mining Bee	None			1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum parvulum*	a mining bee	None	1		1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Lasioglossum villosulum*	Shaggy Mining Bee	None	1	1	1	1
Insecta	Hymenoptera: Aculeata	Apidae	*Nomada goodeniana*	Gooden's Nomad Bee	None	1			1
Insecta	Hymenoptera: Aculeata	Apidae	*Nomada panzeri*	a solitary bee	None	1			1
Insecta	Hymenoptera: Aculeata	Apidae	*Sphecodes geoffrellus*	a cuckoo bee	None	1			1
Insecta	Hymenoptera: Aculeata	Formicidae	*Formica fusca*	an ant	None	1	1		1
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius flavus*	an ant	None	1	1		1
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius fuliginosus*	an ant	None			1	1
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius niger sens. lat.*	an ant	None	1	1	1	1
Insecta	Hymenoptera: Aculeata	Formicidae	*Lasius niger sens. str.*	an ant	None	1	1		1
Insecta	Hymenoptera: Aculeata	Formicidae	*Leptothorax acervorum*	an ant	None	1			1
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica rubra*	an ant	None		1	1	1
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica ruginodis*	an ant	None		1		1
Insecta	Hymenoptera: Aculeata	Formicidae	*Myrmica scabrinodis*	an ant	None	1	1	1	1
Insecta	Hymenoptera: Aculeata	Pompilidae	*Anoplius nigerrimus*	a spider-hunter wasp	None	1			1
Insecta	Hymenoptera: Aculeata	Pompilidae	*Arachnospila trivialis*	a spider-hunter wasp	None	1			1
Insecta	Hymenoptera: Aculeata	Pompilidae	*Caliadurgus fasciatellus*	a spider-hunter wasp	None	1			1
Insecta	Hymenoptera: Aculeata	Pompilidae	*Evagetes crassicornis*	a spider-hunter wasp	None	1			1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Argogorytes fargei*	a digger wasp	Nationally Scarce (Na)		1		1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Crossocerus pusillus*	a digger wasp	None			1	1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Diodontus minutus*	Minute Black Wasp	None			1	1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Mellinus arvensis*	Field Digger Wasp	None	1	1		1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Oxybelus uniglumis*	Common Spiny Digger Wasp	None	1			1
Insecta	Hymenoptera: Aculeata	Sphecidae	*Trypoxylon attenuatum*	Slender Wood Borer Wasp	None	1			1
Insecta	Hymenoptera: Symphyta	Tenthredinidae	*Tenthredo brevicornis*	a sawfly	None		1		1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Hymenoptera: Symphyta	Cephidae	*Calameuta pallipes*	a sawfly	None		1		1
Insecta	Coleoptera	Anthicidae	*Omonadus formicarius*		None		1		1
Insecta	Coleoptera	Apionidae	*Ceratapion gibbirostre*		None	1	1		1
Insecta	Coleoptera	Apionidae	*Protapion apricans*		None		1		1
Insecta	Coleoptera	Apionidae	*Protapion assimile*		None		1		1
Insecta	Coleoptera	Apionidae	*Protapion nigritarse*		None		1		1
Insecta	Coleoptera	Apionidae	*Protapion trifolii*		None		1		1
Insecta	Coleoptera	Apionidae	*Catapion seniculus*		None		1		1
Insecta	Coleoptera	Apionidae	*Ischnopterapion loti*		None	1	1		1
Insecta	Coleoptera	Apionidae	*Holotrichapion ononis*		None			1	1
Insecta	Coleoptera	Apionidae	*Holotrichapion pisi*		None		1		1
Insecta	Coleoptera	Apionidae	*Eutrichapion ervi*		None	1			1
Insecta	Coleoptera	Bruchidae	*Bruchidius varius*		New to Norfolk		1		1
Insecta	Coleoptera	Bruchidae	*Bruchus loti*		None	1			1
Insecta	Coleoptera	Byrrhidae	*Byrrhus pilula*	Pill Beetle	None		1		1
Insecta	Coleoptera	Byrrhidae	*Simplocaria semistriata*		None	1			1
Insecta	Coleoptera	Byrrhidae	*Cytilus sericeus*		None	1	1		1
Insecta	Coleoptera	Cantharidae	*Cantharis nigricans*		None	1			1
Insecta	Coleoptera	Cantharidae	*Cantharis pallida*		None	1			1
Insecta	Coleoptera	Cantharidae	*Cantharis rustica*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Leistus rufomarginatus*		None			1	1
Insecta	Coleoptera	Carabidae	*Leistus spinibarbis*		None	1			1
Insecta	Coleoptera	Carabidae	*Leistus ferrugineus*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Nebria livida*		Nationally Scarce (Na)	1	1	1	1
Insecta	Coleoptera	Carabidae	*Nebria brevicollis*		None		1		1
Insecta	Coleoptera	Carabidae	*Notiophilus aquaticus*		None	1			1
Insecta	Coleoptera	Carabidae	*Notiophilus biguttatus*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Notiophilus germinyi*		None		1		1
Insecta	Coleoptera	Carabidae	*Notiophilus palustris*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Notiophilus substriatus*		None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Coleoptera	Carabidae	*Cicindela campestris*	Green Tiger Beetle	None	1	1		1
Insecta	Coleoptera	Carabidae	*Elaphrus cupreus*		None	1			1
Insecta	Coleoptera	Carabidae	*Elaphrus riparius*		None	1		1	1
Insecta	Coleoptera	Carabidae	*Dyschirius thoracicus*		(Nationally Scarce (Nb))	1	1	1	1
Insecta	Coleoptera	Carabidae	*Dyschirius aeneus*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Dyschirius politus*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Clivina fossor*		None		1		1
Insecta	Coleoptera	Carabidae	*Broscus cephalotes*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Trechus obtusus*		None		1		1
Insecta	Coleoptera	Carabidae	*Trechus quadristriatus*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Asaphidion curtum*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Asaphidion pallipes*		Nationally Scarce (Nb)	1	1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion lunulatum*		None			1	1
Insecta	Coleoptera	Carabidae	*Bembidion lampros*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion varium*		None			1	1
Insecta	Coleoptera	Carabidae	*Bembidion bruxellense*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Bembidion deletum*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Bembidion femoratum*		None				1
Insecta	Coleoptera	Carabidae	*Bembidion stephensii*		None	1			1
Insecta	Coleoptera	Carabidae	*Bembidion tetracolum*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion genei*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Bembidion articulatum*		None	1			1
Insecta	Coleoptera	Carabidae	*Bembidion obtusum*		None		1		1
Insecta	Coleoptera	Carabidae	*Ocys harpaloides*		None	1		1	1
Insecta	Coleoptera	Carabidae	*Pterostichus madidus*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Pterostichus niger*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Pterostichus melanarius*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Pterostichus nigrita*		None	1			1
Insecta	Coleoptera	Carabidae	*Pterostichus strenuus*		None		1		1
Insecta	Coleoptera	Carabidae	*Calathus rotundicollis*		None				1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Coleoptera	Carabidae	*Calathus cinctus*		None			1	1
Insecta	Coleoptera	Carabidae	*Calathus fuscipes*		None				1
Insecta	Coleoptera	Carabidae	*Calathus melanocephalus*		None				1
Insecta	Coleoptera	Carabidae	*Calathus mollis*		None			1	1
Insecta	Coleoptera	Carabidae	*Laemostenus terricola*		None				1
Insecta	Coleoptera	Carabidae	*Olisthopus rotundatus*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Paranchus albipes*		None	1	1	1	1
Insecta	Coleoptera	Carabidae	*Agonum viduum*		None	1			1
Insecta	Coleoptera	Carabidae	*Amara tibialis*		None			1	1
Insecta	Coleoptera	Carabidae	*Amara apricaria*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Curtonotus aulicus*		None			1	1
Insecta	Coleoptera	Carabidae	*Harpalus affinis*		None	1		1	1
Insecta	Coleoptera	Carabidae	*Harpalus rubripes*		None	1	1		1
Insecta	Coleoptera	Carabidae	*Harpalus tardus*		None			1	1
Insecta	Coleoptera	Carabidae	*Harpalus rufipes*		None		1	1	1
Insecta	Coleoptera	Carabidae	*Ophonus puncticeps*		None		1		1
Insecta	Coleoptera	Carabidae	*Anisodactylus binotatus*		None	1			1
Insecta	Coleoptera	Carabidae	*Stenolophus teutonus*		Nationally Scarce (Nb)	1			1
Insecta	Coleoptera	Carabidae	*Bradycellus sharpi*		None	1			1
Insecta	Coleoptera	Carabidae	*Bradycellus verbasci*		None	1			1
Insecta	Coleoptera	Carabidae	*Acupalpus dubius*		None	1			1
Insecta	Coleoptera	Carabidae	*Acupalpus meridianus*		None		1		1
Insecta	Coleoptera	Carabidae	*Badister bullatus*		None	1			1
Insecta	Coleoptera	Carabidae	*Chlaenius vestitus*		None	1		1	1
Insecta	Coleoptera	Carabidae	*Demetrias atricapillus*		None	1		1	1
Insecta	Coleoptera	Carabidae	*Dromius quadrimaculatus*		None				1
Insecta	Coleoptera	Carabidae	*Dromius melanocephalus*		None	1			1
Insecta	Coleoptera	Cerambycidae	*Agapanthia villosoviridescens*		None	1	1		1
Insecta	Coleoptera	Chrysomelidae	*Oulema melanopus*		None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Coleoptera	Chrysomelidae	*Cassida vibex*		None		1		1
Insecta	Coleoptera	Chrysomelidae	*Sermylassa halensis*		None			1	1
Insecta	Coleoptera	Chrysomelidae	*Phyllotreta diademata*		None		1		1
Insecta	Coleoptera	Chrysomelidae	*Aphthona euphorbiae*		None				1
Insecta	Coleoptera	Chrysomelidae	*Longitarsus suturellus*		None		1		1
Insecta	Coleoptera	Chrysomelidae	*Altica lythri*		None			1	1
Insecta	Coleoptera	Chrysomelidae	*Altica palustris*		None	1			1
Insecta	Coleoptera	Chrysomelidae	*Hippuriphila modeeri*		None	1	1		1
Insecta	Coleoptera	Chrysomelidae	*Chaetocnema hortensis*		None	1			1
Insecta	Coleoptera	Chrysomelidae	*Sphaeroderma rubidum*		None	1	1		1
Insecta	Coleoptera	Chrysomelidae	*Sphaeroderma testaceum*		None	1			1
Insecta	Coleoptera	Chrysomelidae	*Psylliodes chalcomera*		Nationally Scarce (Nb)	1			1
Insecta	Coleoptera	Chrysomelidae	*Psylliodes napi*		None	1			1
Insecta	Coleoptera	Coccinellidae	*Rhyzobius litura*		None	1	1		1
Insecta	Coleoptera	Coccinellidae	*Coccidula rufa*		None	1		1	1
Insecta	Coleoptera	Coccinellidae	*Propylea quattuordecimpunctata*	14-spot Ladybird	None	1			1
Insecta	Coleoptera	Coccinellidae	*Coccinella septempunctata*	7-spot Ladybird	None	1	1	1	1
Insecta	Coleoptera	Coccinellidae	*Tytthaspis sedecimpunctata*	16-spot Ladybird	None	1			1
Insecta	Coleoptera	Curculionidae	*Otiorhynchus ovatus*		None	1	1	1	1
Insecta	Coleoptera	Curculionidae	*Phyllobius roboretanus*	Small Green Nettle Weevil	None	1			1
Insecta	Coleoptera	Curculionidae	*Barypeithes pellucidus*		None	1			1
Insecta	Coleoptera	Curculionidae	*Philopedon plagiatum*	Marram Weevil	None			1	1
Insecta	Coleoptera	Curculionidae	*Tanymecus palliatus*		Nationally Scarce (Nb)		1		1
Insecta	Coleoptera	Curculionidae	*Sitona griseus*		None	1			1
Insecta	Coleoptera	Curculionidae	*Sitona humeralis*		None		1		1
Insecta	Coleoptera	Curculionidae	*Sitona lineatus*		None	1	1		1
Insecta	Coleoptera	Curculionidae	*Sitona sulcifrons*		None		1		1
Insecta	Coleoptera	Curculionidae	*Hypera meles*		Nationally Scarce (Na)		1		1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Coleoptera	Curculionidae	*Hypera nigrirostris*		None		1		1
Insecta	Coleoptera	Curculionidae	*Hypera punctata*		None	1			1
Insecta	Coleoptera	Curculionidae	*Hypera venusta*		None		1		1
Insecta	Coleoptera	Curculionidae	*Trichosirocalus troglodytes*		None	1	1		1
Insecta	Coleoptera	Curculionidae	*Tychius picirostris*		None	1		1	1
Insecta	Coleoptera	Curculionidae	*Mecinus pyraster*		None		1		1
Insecta	Coleoptera	Curculionidae	*Gymnetron pascuorum*		None	1	1		1
Insecta	Coleoptera	Dytiscidae	*Hygrotus impressopunctatus*		None		1		1
Insecta	Coleoptera	Dytiscidae	*Agabus bipustulatus*		None			1	1
Insecta	Coleoptera	Elateridae	*Agrypnus murinus*		None	1			1
Insecta	Coleoptera	Elateridae	*Kibunea minuta*		None	1			1
Insecta	Coleoptera	Elateridae	*Hemicrepidius hirtus*		None		1		1
Insecta	Coleoptera	Elateridae	*Agriotes obscurus*		None	1			1
Insecta	Coleoptera	Elateridae	*Agriotes pallidulus*		None			1	1
Insecta	Coleoptera	Histeridae	*Kissister minimus*		None			1	1
Insecta	Coleoptera	Hydrophilidae	*Helophorus brevipalpis*		None			1	1
Insecta	Coleoptera	Hydrophilidae	*Anacaena globulus*		None	1			1
Insecta	Coleoptera	Hydrophilidae	*Laccobius bipunctatus*		None		1		1
Insecta	Coleoptera	Hydrophilidae	*Megasternum concinnum*		None	1		1	1
Insecta	Coleoptera	Lathridiidae	*Aridius bifasciatus*		None	1	1		1
Insecta	Coleoptera	Lathridiidae	*Cortinicara gibbosa*		None	1	1		1
Insecta	Coleoptera	Limnichidae	*Limnichus pygmaeus*		Nationally Scarce (Na)	1	1		1
Insecta	Coleoptera	Nitidulidae	*Meligethes aeneus*	Common Pollen Beetle	None			1	1
Insecta	Coleoptera	Nitidulidae	*Meligethes carinulatus*		None	1			1
Insecta	Coleoptera	Oedemeridae	*Oedemera nobilis*	Swollen-thighed Beetle	None	1	1		1
Insecta	Coleoptera	Oedemeridae	*Oedemera lurida*		None	1	1		1
Insecta	Coleoptera	Phalacridae	*Olibrus aeneus*		None	1			1
Insecta	Coleoptera	Phalacridae	*Olibrus affinis*		None	1	1		1
Insecta	Coleoptera	Phalacridae	*Stilbus testaceus*		None	1			1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Insecta	Coleoptera	Scarabaeidae	*Phyllopertha horticola*	Bracken Chafer	None		1		1
Insecta	Coleoptera	Silphidae	*Silpha atrata*		None	1	1		1
Insecta	Coleoptera	Silphidae	*Silpha laevigata*		None				1
Insecta	Coleoptera	Staphylinidae	*Aleochara cuniculorum*		None				1
Insecta	Coleoptera	Staphylinidae	*Drusilla canaliculata*		None		1		1
Insecta	Coleoptera	Staphylinidae	*Bledius atricapillus/ praetermissus*		None		1	1	1
Insecta	Coleoptera	Staphylinidae	*Bledius filipes*		RDB1			1	1
Insecta	Coleoptera	Staphylinidae	*Bledius longulus*		None	1	1		1
Insecta	Coleoptera	Staphylinidae	*Bledius opacus*		None			1	1
Insecta	Coleoptera	Staphylinidae	*Bledius fergussoni*		None		1		1
Insecta	Coleoptera	Staphylinidae	*Stenus bimaculatus*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Stenus clavicornis*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Stenus guttula*		None	1	1	1	1
Insecta	Coleoptera	Staphylinidae	*Stenus juno*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Stenus pusillus*		None				1
Insecta	Coleoptera	Staphylinidae	*Stenus fulvicornis*		None	1	1		1
Insecta	Coleoptera	Staphylinidae	*Stenus impressus*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Platydracus stercorarius*		None			1	1
Insecta	Coleoptera	Staphylinidae	*Ocypus olens*	Devil's Coach-horse	None		1	1	1
Insecta	Coleoptera	Staphylinidae	*Tasgius ater*		None				1
Insecta	Coleoptera	Staphylinidae	*Tasgius morsitans*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Quedius fuliginosus*		None	1			1
Insecta	Coleoptera	Staphylinidae	*Quedius levicollis*		None			1	1
Insecta	Coleoptera	Tenebrionidae	*Crypticus quisquilius*		Nationally Scarce (Nb)				1
Insecta	Coleoptera	Tenebrionidae	*Isomira murina*		None	1			1
Gastropoda	Stylommatophora	Agriolimacidae	*Deroceras reticulatum*	Field Slug	None	1	1	1	1
Gastropoda	Stylommatophora	Clausiliidae	*Clausilia bidentata*	Two-toothed Door Snail	None	1	1		1
Gastropoda	Stylommatophora	Cochlicopidae	*Cochlicopa lubrica*	Slippery Moss Snail	None	1	1		1
Gastropoda	Stylommatophora	Discidae	*Discus rotundatus*	Rounded Snail	None	1	1		1

Classification1	Classification2	Classification 3	Taxon	Vernacular	Conservation Status	Overstrand	Trimingham	West Runton	All sites
Gastropoda	Stylommatophora	Helicidae	*Cernuella virgata*	Striped or Zoned Snail	None	1		1	1
Gastropoda	Stylommatophora	Helicidae	*Monacha cantiana*	Kentish Snail	None	1	1		1
Gastropoda	Stylommatophora	Helicidae	*Trichia striolata*	Strawberry Snail	None	1	1		1
Gastropoda	Stylommatophora	Helicidae	*Cepaea nemoralis*	Brown-lipped Snail	None	1	1		1
Gastropoda	Stylommatophora	Helicidae	*Helix aspersa*	Garden Snail	None	1	1	1	1
Gastropoda	Stylommatophora	Limacidae	*Lehmannia marginata*	Tree Slug	None		1		1
Gastropoda	Stylommatophora	Zonitidae	*Oxychilus cellarius*	Cellar Snail	None	1			1
Gastropoda	Stylommatophora	Zonitidae	*Oxychilus alliarius*	Garlic Snail	None	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.

Appendix 4: Species recorded at Trimingham only from the defended section, or only from the undefended section.

Scarce and otherwise noteworthy species are highlighted in red text.

Defended only			**Undefended only**	
Taxon	**Status**		**Taxon**	**Status**
Agelena labyrinthica			*Micaria pulicaria*	
Agalenatea redii			*Micrargus subaequalis*	
Clubiona subtilis			*Erigone dentipalpis*	
Bathyphantes gracilis			*Pardosa amentata*	
Diplostyla concolor			*Arctosa perita*	
Trochosa ruricola			*Pisaura mirabilis*	
Pachygnatha degeeri			*Enoplognatha ovata sens. str.*	
Calameuta pallipes			*Xysticus cristatus*	
Deroceras reticulatum			*Polydesmus angustus*	
Discus rotundatus			*Lehmannia marginata*	
Omonadus formicarius			*Protapion nigritarse*	
Ceratapion gibbirostre			*Protapion trifolii*	
Catapion seniculus			*Bruchidius varius*	New to Norfolk
Ischnopterapion loti			*Cytilus sericeus*	
Holotrichapion pisi			*Nebria brevicollis*	
Notiophilus germinyi			*Notiophilus palustris*	
Clivina fossor			*Cicindela campestris*	None
Bembidion bruxellense			*Dyschirius thoracicus*	(Nb)
Pterostichus madidus			*Dyschirius politus*	
Olisthopus rotundatus			*Broscus cephalotes*	
Otiorhynchus ovatus			*Trechus obtusus*	
Mecinus pyraster			*Asaphidion curtum*	

Hygrotus impressopunctatus	
Olibrus affinis	
Silpha atrata	
Drusilla canaliculata	
Geomyza tripunctata	
Chrysotoxum bicinctum	
Scaeva pyrastri	
Sphaerophoria scripta	
Syritta pipiens	
Tipula oleracea	
Nabis flavomarginatus	
Nabis pseudoferus	Nb
Nabis rugosus	
Apis mellifera	
Bombus terrestris	
Lasioglossum leucozonium	
Lasius flavus	
Myrmica rubra	
Tenthredo brevicornis	
Scotopteryx chenopodiata	
Ematurga atomaria	
Nomophila noctuella	
Maniola jurtina	
Chorthippus albomarginatus	
Conocephalus dorsalis	
Ligia oceanica	

Bembidion tetracolum	
Pterostichus strenuus	
Harpalus rubripes	
Ophonus puncticeps	None
Acupalpus meridianus	
Hippuriphila modeeri	
Sphaeroderma rubidum	
Tanymecus palliatus	Nb
Sitona humeralis	
Hypera meles	Na
Hypera nigrirostris	
Hypera venusta	
Hemicrepidius hirtus	
Laccobius bipunctatus	
Aridius bifasciatus	
Bledius atricapillus	
Bledius longulus	
Bledius fergussoni	
Stenus guttula	
Stenus fulvicornis	
Ocypus olens	
Forficula auricularia	
Dicraeus vagans	
Dolichopus subpennatus	
Rivellia syngenesiae	
Platycheirus angustatus	
Platycheirus peltatus	
Syrphus ribesii	
Tipula lateralis	
Cercopis vulnerata	
Coriomerus denticulatus	
Cymus claviculus	
Cymus melanocephalus	
Piezodorus lituratus	
Bombus hortorum	
Bombus pascuorum	
Bombus pratorum	
Lasius niger sens. lat.	
Myrmica scabrinodis	
Pyronia tithonus	
Plutella xylostella	
Cylisticus convexus	