General biodiversity survey of the habitats of Shingle Street, East Suffolk

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Abstract:

The following document constitutes a report on the floral and faunal species found in the habitats of Shingle Street, East Suffolk. This report combined all available data sets and identified gaps in the data that needed addressing. These included terrestrial mollusc, aquatic invertebrate and an NVC survey of the areas outside the SSSI.

Prior to 2015 there had been 1,052 species identified from 5,064 records over 70 years. In 2015, 2,375 records were made of 737 species, this brought the total to 1,362 species of flora and fauna to date. This report provides an appraisal of these finds and includes three reports on areas lacking from the dataset.

This report has been commissioned by the residents of Shingle Street with support from the Heritage Lottery Fund through the Touching the Tide initiative, the Environment Agency, the Suffolk Coastal District Council, the Suffolk County Council and the Scarfe Charitable Trust.

Shingle Street BIODIVERSITY SURVEY

abrehart ecology

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1. INTRODUCTION

1.1 Background

Britain's wildlife is currently threatened as never before. Quantitative assessments of the population or distribution trends of 3,148 species were undertaken by the UK's wildlife organisations and presented in the 'State of Nature' report (Burns, et al., 2013). The report found that 60% of species have declined over the last 50 years and 31% have declined strongly. These statements are startling. However, the report concludes that through collaboration and public support we can reverse the decline. The report highlights the importance of dedicated volunteers who contribute to species monitoring and recording schemes. In this situation it is increasingly important to inspire local communities to document and celebrate the biodiversity of the areas in which they live.

Contributions to conservation efforts, no matter what the size, can increase the chances of our wildlife surviving into the future in our modern landscape. The flora and fauna of Shingle Street is known from years of recording by many different individuals and organisations to be diverse and abundant. As such the shingle beach and some associated coastal saline lagoon features have been designated as part of the Alde-Ore Estuary Site of Specific Scientific Interest (SSSI), please refer to Appendix A for a copy of the full citation.

However, an attempt to collate all of the information available for the area has not previously been undertaken. Therefore, on behalf of the residents of Shingle Street, Jeremy Mynott commissioned Abrehart Ecology to systematically and scientifically compile a comprehensive dataset of the flora and fauna of the Shingle Street area, with the help of local volunteers, to demonstrate its great biodiversity.

This report sets out the biodiversity of Shingle Street and its surrounding land, as recorded since the 1950s and updated by surveys in 2015.

It is hoped that the Shingle Street project is considered a successful step engaging the local community in recording and safeguarding their local biodiversity and it is also hoped that it might serve as a model for other coastal communities on the Suffolk coast.

1.2 Aim and Objectives

Aim

To systematically and scientifically compile a comprehensive dataset of the flora and fauna of the Shingle Street area, with the help of local volunteers.

Objectives

In order to achieve the primary aim of this project, a combination of local volunteer efforts, review of historical/existing datasets and collection of new, baseline datasets were required.

Various datasets were held by numerous private and public bodies for the habitats surrounding Shingle Street. Some datasets, e.g. ornithological, are long established and therefore, provided extensive information on use of the area by birds. However, the presence or distribution of some groups of animals and plants has not previously been fully documented. Therefore, the objectives of the project were to:

1. Evaluate existing datasets;
2. Complement and fill in gaps in existing datasets; and
3. Train and enthuse local volunteers in biological recording;

1.3 Location and history

Where is Shingle Street?

- East Suffolk
- Immediately south of the mouth of the Alde-Ore Estuary

Characteristics:

- On a low-lying coastline subject
- Constantly shifting…

The hamlet of Shingle Street lies adjacent to units 32 and 33 of the Alde-Ore Estuary Complex SSSI which are currently designated for shingle features and associated coastal lagoons features (Figure 1). The units extend from the northern end of the hamlet towards the hamlet of Bawdsey. Refer to Appendix A for the full SSSI and SAC citation.

Figure 1 Unit 32 and 33 of the Alde-Ore Estuary Complex SSSI

2. METHODS

2.1 Existing data sources

The first port of call for this project was an evaluation of the coverage and validity of existing datasets for Shingle Street and surrounding land.

As an independent repository for the collation, management and mobilisation of biological data, Suffolk Biological Records Centre (SBRC) was first on the list in the search for existing datasets. In addition, Natural England kindly allowed the use data collected in a vegetation survey of the Alde-Ore Estuary Complex SSSI in 2013 (Abrehart & Jackson, 2013). J. Mynott was also able to secure a number of other datasets and a summary of the datasets acquired is presented below (Table 1).

Table 1 Summary of existing datasets

Dataset	Author	Citation	Record keeper	Time period
Shingle vegetation surveys of Shingle Street beach	T. Abrehart			2012
Shingle vegetation survey and impact assessment of visitors	R. Jackson			2013
Complete data set from Suffolk Biological Records Centre	Various		SBRC	1953 to 2014

2.2 Evaluation of data sources and plan of action

Gaps in the available knowledge base were assessed early in the project to allow planning of field work and opportunities for community engagement (Table 3). For several groups, including birds and butterflies, no apparent gaps in knowledge were identified due to the amount of data which was already available. Conversely, the floral diversity of Shingle Street had been recorded many times in the past. However, the main product of these surveys were species lists rather than habitat maps, in terms of vegetation community, therefore, the need for an up to date vegetation community map of Shingle Street and its surrounding land was identified. This type of recording is more specialised and, for several groups, the need for completion by specialist surveyors was deemed most appropriate. These groups included aquatic invertebrates, molluscs, moths, grasshoppers and flora.

Opportunities for community engagement were identified and included surveying and data gathering for birds, small and large terrestrial mammals, moths, butterflies, reptiles and amphibians. Recording these groups of organisms can be achievable with a relatively short introduction and access to simple field guides. Therefore, workshops, training days and recording events for local volunteers were identified as starting point for community-led recording.

Each event involved learning about the ecology and survey techniques of each group. The volunteers were introduced to the species they were likely to encounter and species recorded elsewhere in the UK. The survey materials were provided at each event and the volunteers were guided through the survey

method and how to implement it in a hands-on way.

The following events were held prior to fieldwork:

- Small mammal identification and recording - held on 17th April 2015 and attended by 8 volunteer recorders, led by Toby Abrehart.
- Amphibian and reptile identification and recording – held on 24th April 2015 and attended by 8 volunteer recorders, led by Toby Abrehart and Rosie Jackson.
- Butterfly and dragonfly identification and recording - held on 30th June 2015 and attended by local volunteer recorders, led by Toby Abrehart.
- Moth trapping evenings -24 June 2015 and 31st July 2015, led by Nick Mason.
- Bird ringing demonstration - 16th August 2015, led by Mervyn Miller

Table 2: Table showing groups with number of records and number of species recorded across the entire recording period 1953 – 2015.

Group	Number of records	Number of species
Algae	5	2
Amphibian	17	2
Beetle (Coleoptera)	246	52
Bird	1339	249
Bony fish (Actinopterygii)	34	2
Butterfly	651	26
Crustacean	50	14
Dragonfly (Odonata)	132	16
Earwig (Dermaptera)	1	1
False scorpion (Pseudoscorpiones)	1	1
Flowering plant	1803	328
Fungi	0	0
Fungus	1	1
Harvestman (Opiliones)	2	2
Hymenopteran	37	12
Leech	4	3
Lichen	60	28
Marine mammal	13	4
Millipede	1	1
Mollusc	230	57
Moss	100	36
Moth	2290	379
Orthopteran	62	10
Reptile	18	4
Spider (Araneae)	79	63
Terrestrial beetle	0	0
Terrestrial mammal	97	20
True bug (Hemiptera)	116	34
True fly (Diptera)	55	4
Worm	1	1
Grand Total	7445	1352

Table 3 Summary of existing dataset review undertaken prior to planning field work.

Group	Existing data	Gaps in knowledge	Plan of action	Main data-gathering party
Birds	• 1101 historical bird records held by Suffolk Biological Records Centre (SBRC) for Shingle Street and Oxley Marshes, for the period 1992-2014, for a total of 168 species. • Also, suspect that local members of the community will also hold additional records.	No apparent gaps in knowledge other than the breeding birds on the site.	Collation of historical bird records.	Community
Flora	• Oxley Marsh was lightly surveyed during the NVC survey of the Alde-Ore Estuary SSSI (Abrehart & Jackson, 2013). Ten 2x2m quadrats, comprising approximately 100 plant records were collected; however, the marshes themselves were not surveyed extensively because they were beyond the remit of the survey. • Other records of plants within Oxley Marshes are limited, however, they do include records of sea clover *Trifolium squamosum* and grass vetchling *Lathyrus nissolia* from 1990 onwards.	The floral diversity of the marshes has not been fully documented to date.	Botanical surveys require more specialist identification skills, particularly for the rare species. We recommend that Abrehart Ecology carries out an NVC survey to fully assess the marshes and the dykes.	Abrehart Ecology
Reptiles and amphibians	• The historical records obtained from SBRC included three records of amphibians and reptiles. These are one record of common toad in the northern end of the marshes and two records of common lizard within the hamlet itself. • Both common toad and common lizard are UK Biodiversity Action Plan species and were recorded recently in 2010 and 2012.	It is entirely possible that reptiles and amphibians are more abundant across the site than the current data suggests. There is an overall lack of information on these groups of animals in the area.	Surveys in 2015 are required. Reptile survey techniques are fairly simple; therefore, we propose that a workshop/training day will be held to train members of the community in the surveying techniques. The gathering of data will be undertaken by trained members of the community only.	Community

Grasshoppers	• There are two records for grasshoppers at Shingle Street. One for the lesser marsh grasshopper in 1993 and one for Roesel's bush-cricket in 1998.	Data lacking.	Grasshoppers will be recorded by Toby Abrehart, an experienced grasshopper recorder, whilst undertaking other fieldwork activities.	Abrehart Ecology
Mammals	• SBRC holds 23 records of terrestrial mammals for Oxley Marshes and the Shingle Street hamlet. • These date from 1991-2013 and include interesting species such as brown hare *Lepus europaeus*, harvest mouse *Micromys minutus*, water vole *Arvicola terrestris* and otter *Lutra lutra*. • Harvest mouse in particular was recorded in 2010 in the northern side of the site towards the road.	Water vole and otter could be present across the whole site, however, their distribution/use of the site is not currently known.	Harvest mouse is particularly interesting UK Biodiversity Action Plan species and therefore, we recommend small mammal trapping carried out with the help of Abrehart Ecology. It is likely that many of the terrestrial mammals which have been historically recorded are still present on the site. However, mammal recording presents a great opportunity for community involvement as they are relatively easy to record and have greater public awareness. We recommend a system is set up to record casual sightings of terrestrial mammals and that a structured survey is undertaken for water vole, harvest mouse and otter. This could include wildlife camera use which records video and still images- media opportunity!	Community
Aquatic invertebrates	• There is evidence of some historical aquatic invertebrate sampling in the marshes. • There are records dating back to 1956 for interesting species such as water stick insect and many aquatic beetles. • In addition, there are records from the marshes for 1998 and 2002 which were also taken by Adrian Chalkley. These records include several for nationally scarce and notable aquatic bug species.	There is no data from 2002 onwards for aquatic invertebrates in the dykes of Oxley Marshes. The community of invertebrates is likely to have changed since the last sampling undertaken by Adrian Chalkley in 2002, especially considering the saline inundation of the marshes in winter 2013/14.	Abrehart Ecology to undertake a structured survey of the water bodies of the marshes for aquatic invertebrates and, in addition, aquatic macrophytes which are habitat quality indicators. Importantly, this will include salinity recording as 'transitional' saline conditions from saline to freshwater are rare.	Abrehart Ecology
Butterflies and Moths	• There are nearly 3000 records of butterfly and moths for Shingle Street, which date back 1975 and run to 2013. • This includes 27 species of butterfly and 375 species of moth. Both groups of insect include several UK BAP species.	No gaps in knowledge.	Although there are no gaps in knowledge butterflies are a good opportunity for the local community to get involved with recording biodiversity on Oxley Marshes. Typically surveys for butterflies are undertaken using a transect method and we propose that several members of the local community are assigned transects across the marshes on which to record butterflies. The method and	Community

identification skills may be aided by a workshop run by Abrehart Ecology. A system for recording causal sightings by the public could also be set up.

2.3 Fieldwork

Survey area

The additional surveys were focused on habitats outside of the current area of the SSSI. Therefore, it was proposed that the surveys focus on Oxley Marshes (landward of the hamlet) (figure 2), which is approximately 100ha in size. The grazing marshes here where inundated during the winter 2013/14 and it was possible that these events plus the seepage of saline water through the sea wall has turned the borrowdyke and adjacent dykes into strongly brackish transitional grazing marsh habitats. In addition, coastal grazing marsh features are spatially restricted throughout the UK coastline.

Figure 2 Survey area

Summary of fieldwork methods

The array of target groups for this project required the use of many survey methods. A summary of the survey methods is presented below (Table 4). As previously discussed, survey methods for groups such as small mammals, large terrestrial mammals, reptiles and amphibians are fairly easy for anyone with an interest in wildlife recording to understand and implement with good success. Therefore, residents and friends of Shingle Street were trained in the use of small number of survey methods and, with the guidance of trained ecologists, successfully recorded their findings.

For full details of the techniques carried out by Abrehart Ecology in the completion of the surveys on each group of organisms please refer to the full reports provided in Appendices A-D.

Table 4 Summary of field work methods

Group	Method	Survey timing	Surveyors	Data collation	Report
Vegetation surveys	National Vegetation Classification (NVC)	7th June 2015	Abrehart Ecology	Abrehart Ecology	Appendix D
Terrestrial molluscs	Grassland debris and hand netting of ditches	23rd July 2015	Abrehart Ecology	Abrehart Ecology	Appendix A
Reptiles	Artificial cover object	24th April 2015 – 30th September 2015	Local volunteers	Local volunteer	Section 3.20
Small terrestrial mammals	Footprint tubes and small mammal traps	17th April 2015 – 30th September 2015	Local volunteers	Local volunteer	Section 3.5
Large terrestrial mammals	Sightings and evidence of activity.	17th April 2015 – 30th September 2015	Local volunteers	Abrehart Ecology	Section 3.6
Moths	Overnight moth trapping using light trap.	24 June 2015 and 31st July 2015	Local volunteers	Local volunteers	Section 3.9
Aquatic invertebrates	Hand netting.	24th April 2015 and 7th September 2015	Abrehart Ecology	Abrehart Ecology	Appendix C
Butterflies	Transects	30th June 2015 – 30th September 2015	Local volunteers	Abrehart Ecology	Section 3.10
Grasshoppers, hoverflies, spiders and dragonflies	Sightings	24th April – 30th September 2015	Abrehart Ecology and local volunteers	Abrehart Ecology	Sections 3.11, 3.12 and 3.13

3. SUMMARY OF BIODIVERSITY

3.1 Vegetation and habitats

Shingle Street has a number of different botanical communities across the survey area. Some have been more intensely investigated than others, the most studied areas are those of the vegetated shingle in the SSSI. The majority of the plants recorded came from the vegetated shingle at the northern end of the survey area.

Bare and vegetated shingle.

This is the famous community for which Shingle Street is well known. There is an accumulation of shingle on the seaward side of the sea wall in the northern part of the hamlet, this extends south towards Bawdsey. There has been a recent increase in the accumulation in front of the hamlet in the past few years. It comprises a series of shingle ridges which have been deposited on top of London Clay forming an apposition beach which has enclosed several lagoons. At its northern end there is a shingle spit, which in the past four years has closed the developing saltmarsh off from the direct influence of the sea and formed a continuous bar to the mouth of Barthorp's Creek, swamping the saltmarsh as it progresses.

Northern section of the site: in the past there was gravel extraction at this northern end of the site which created many bare areas of shingle, much of this quarried area of shingle has now gone and moved south due to longshore drift. The remaining shingle has now become vegetated and contains a small number of coastal lagoons which are decreasing in size annually. This narrow band of vegetated shingle runs from the new mobile front shingle ridge to the sea wall. Within this section the main communities are mature shingle grasslands, with a very narrow section of pioneer shingle communities. Without the sea wall there would naturally be a more diverse set of communities developing here, so this wall forms a considerable barrier to the development of more shingle communities on the site. A natural feature of shingle ridges is for them to 'roll back', which opens up new areas to become colonised. At Shingle Street this ability is reduced by the sea walls present.

Within the grasslands present in the mature shingle are a large number of scarce and rare plants found mainly in coastal habitats, in particular rare trefoils and grasses, and here too is a small colony of extended sedge.

Central and southern section of the site: The shingle here forms an often wide uniform area. It is here that the main pioneer communities are present. The shingle here has recently accumulated at a great rate leaving a large expanse (of up to 200 metres) of open shingle in front of the houses of the hamlet. Within this habitat a number of species are present which are of conservation concern, including sea pea and sea kale in particular. This is a particularly fragile community, and when disturbed by human and animal intervention the plants very quickly disappear, leaving only bare shingle, which creates an unfavourable condition for this rare and internationally important community. Signs of this occurring are very noticeable at Shingle Street, in particular where there is considerable foot traffic to and from the car parks. It is along this section that the neophyte hoary mullein *Verbascum pulveluentum* occurs in dramatic stands. This said, the site as a whole holds a very large area of important habitat with very important examples of pioneer shingle community transition zones from the new shingle at the shore to developing mature shingle close to the houses. In the summer the display of flowering Sea Kale is a spectacular sight.

Coastal lagoons

Coastal lagoons are a rare habitat in the UK and globally. These are areas of shallow, coastal salt water either partially or entirely separated from the sea by a sand or shingle bank or ridge. At Shingle Street the lagoons are mainly the type known as percolation lagoons, where at high tides water enters through the shingle into the lagoons to keep them 'fresh' as opposed to stagnate, though over time due to the lack of mobility in the lagoons some are becoming 'isolated lagoons'. These are completely separated from the sea and have a widely fluctuating salinity and a limited life span. Unfortunately, many of the Shingle Street lagoons are becoming this type – 'unfortunately', because once these lagoons have lost their connectivity they start to lose the potential for any new sea water input, greatly reducing the ability of these lagoons to have new larval and planktonic input. Over time these lagoons decrease in quality of the designation feature species. At Shingle Street this is occurring in all the lagoons within the survey area. The main vegetation community present here is formed of tasselweed *Ruppia maritima* which currently is only found in the most northern lagoon. The overtopping of the shingle ridge or high spring tides often put new sea water into the lagoons, refreshing the systems, and though this is not as frequent as needed to create a healthy lagoon ecosystem, there are a small number of coastal lagoon present on the site. Only one is outside the SSSI and this is an ephemeral lagoon with little sea input. It is around these northern lagoons that small colonies of extended sedge *Carex extensa* exist.

These lagoons are currently in an unfavourable condition and have recently lost many of the rare species of importance. For example, the starlet sea anemone *Nematosella vectensis* was one of the most important species on this site and has now been lost from the survey area along with other small invertebrates.

Aquatic communities

Freshwater communities are restricted to the Inland Drainage Board (IDB) channel running along the western side of the survey area. This drain is fed from the output of the dykes from the arable lands to the south of the survey area. The drain has a well-vegetated channel that is maintained by the IDB, keeping the flow regular with a sluice at the northern end of the site, which discharges into Barthorp's Creek when the tide is low enough for the tidal flap to open. The botanical communities present along the drain area limited to A11b *Potamogeton pectinatus-Myriophyllum spicatum* community, *Elodea canadensis* sub-community; all these species were found throughout the drain. It was along this drain that most of the otter sightings were made.

Brackish water communities

These cover all the other water bodies present within the survey area and extend to 4.45 ha. This is the main aquatic community found within the survey area. Due to the proximity of the site to the coast there is inevitably going to be a moderate amount of saline influence in these dykes. Those closest to the sea will be the more saline, as is shown in the borrow dyke at the northern end of the site. Here the salinity was up to 15ppt, where the sea is 34ppt and freshwater is up to 2ppt. The ditches across most of the site had a salinity around 8ppt, indicating a brackish nature to all the ditches. The vegetation in these ditches was always fairly limited, with the borrow dyke holding horned pondweed *Zannichellia maritima* or *Ruppia maritima* with some small areas of fennel pondweed *Potamogeton pectinatus*. Most of the ditches across the site did not have any aquatic vegetation other than abundant filamentous algae. The margins of the ditches too held a limited flora, with common reed *Phragmites australis* and sea club rush *Bolboscheonus maritima* the dominant species present across the site. The sea wall was breached in December 2013 and flooded much of the grazing marshes, with a residual of saline water remaining in

the dykes. Though this was 18 months ago, after periods of heavy rain the salinity in the ditches remains relatively high. This shows that there are other factor influencing the site regarding its salinity. It is thought that as the sea wall was built over the shingle ridge that there may be some percolation under this and throughout into all of the marshes, especially with the increased sea levels and associated higher tides the salinity across the site is likely to only increase over the years as the ground water becomes more saline.

Mesotrophic grasslands

The majority of the new survey area is covered by a number of these communities, which form the habitat within the grazing marshes at Oxley Marshes and the surrounding area and the sea wall and rond [? word] grasslands along the IDB channel. They cover an area of 82 hectares and are predominantly species-poor agricultural improved lands.

Saltmarsh

The survey area has only a small amount of this habitat outside the SSSI. This is predominately along Barthorp's Creek to the north of the site, within the SSSI saltmarsh formed from the southern portion of unit 31. Here the saltmarsh is becoming smaller mainly due to erosion and to the shingle bar running north at this point pushing inland swamping the saltmarsh as it goes. Once the saltmarsh is fully re-exposed to the river channel erosion occurs faster, especially at just to the south of Barthorp's Creek exit into the main River Ore. The main section of saltmarsh in Barthorp's Creek is of the very attractive thrift *Armeria maritima* and sea lavender *Limonium vulgare* community (SM13c saltmarsh). In June these species carpet the saltmarsh and give a stunning display. Here too are several small saltmarsh pools which hold important invertebrate communities. Very small areas of saltmarsh also exist around the coastal lagoons in the north of the SSSI (Unit 32) and very small amounts of saltmarsh are developing around the southern coastal lagoon south of the Martello Tower. In all these three areas of saltmarsh one species in particular is if interest. Shingle Street is the only place in Suffolk where extended sedge *Carex extensa* grows in a very critical narrow habitat at the top of the saltmarsh (for full analysis see section 3.11 in the NVC report in Appendix D).

Acid Grasslands

These were found in the land to the west of the houses either side of the road leading to the south. These late succession shingle communities have over time developed into an acid grassland. These are generally species poor habitats with mainly red fescue *Festuca rubra* and sheep's fescue *Festuca ovina* being the dominant species. To the south of the Martello tower is another area of this grassland, though here there is a slight brackish influence into the community due to its low-lying nature. These grasslands are an important area for the reptiles on the site and hold a constant though small population of common lizards. Yellow vetch *Vicia lutea* was found scattered in a low density across the grasslands to the rear of the house.

Woodlands and scrub

These communities were limited to the areas along the roadside, the allotments and the area to the west of the Martello tower. Most of this was blackthorn scrub *Prunus spinosa* with areas of sycamore *Acer pseudoplatanus* developing in the allotment section. There were small sections of hawthorn scrub along the banks along the sides of the IDB channel.

Swamp

This vegetation community was very limited in extent and was limited to the common reed *Phragmites australis* areas adjacent to the borrow dyke; along the sides of many of the ditches there were also small amounts of sea club-rush *Bolboscheonus maritima*.

Open vegetation

This type of vegetation develops where there is disturbance of a habitat, and accordingly this was found in the car park areas of the site and areas where trampling had an effect of the vegetation. This community, though, was often species rich and held several rare and uncommon species. Along the trackway at the north of the site bulbous meadow-grass *Poa bulbosa* was recorded growing in the joints of the concrete along with several of the rare trefoils, in particular suffocated clover *Trifolium suffocatum.*

Individual plant records

1,803 plant records have been made within the Shingle Street survey area since 1984, covering 328 species. The main recorders are shown below (Table 5)

Table 5 Summary of plant records

Recorder	Time period	Number of records	Number of species
T. Abrehart	2013-2015	971	208
D.C. Woods and M. Woods	2014	416	108
L. Forsyth and J. Forsyth	2015	197	197
T. Smith	1999	150	45
M. Crewe	1992-1993	36	27

The remaining 46 records were made by 16 others.

The following species are of conservation concern, though only one of these (Mousetail) was found outside the SSSI boundary:

Mousetail *Myosurus mimima*— has been recorded twice in the gateways at Oxley Marsh. This is an uncommon wintergreen annual that is found mainly in gateways where cattle cross. It was thought that the very hard seeds needed to be broken by the cattle's hooves before being able to germinate. There are only a few Suffolk sites for this species, though where it is found it is often in great abundance in an amazing density.

Yellow vetch *Vicia lutea*— this uncommon species is found across the vegetated shingle at Shingle Street. This was first recorded in 1984 by Peter Lawson, followed by three records in the 1990's and one before 2013. After which there were 17 records across the whole coastal strip, though none were found away from the vegetated shingle. The Alde-Ore is the only place in Suffolk where this species occurs and Shingle Street holds very important populations of this within Suffolk. It is found all the way from close to Bawdsey to the American Wall on Orford Ness.

Hoary cinquefoil *Potentilla argentea*—this scarce Suffolk plant was found only on small sections of

the grazed vegetated shingle. It is a species found scattered across the sandlings and coastal grasslands of Suffolk.

Bur medick ***Medicago mimima*** — this uncommon species was only found in the north of the site in the short turf of the vegetated shingle. It has its stronghold in these coastal grasslands and within the Brecks in West Suffolk.

Smooth cat's-ear ***Hypochaeris glabra*** — this species was scattered only on the short turf of the vegetated shingle.

Borrer's saltmarsh-grass ***Puccinellia fasciculata*** — this estuarine grass was only found twice in 1998 by D. Strauss and in 2013 TRA. This species occurs only as occasional plants and was never in any density where found.

Stiff saltmarsh-grass ***Puccinellia rupestris*** — this rare grass was only recorded twice in 2013 at the edge of drying lagoons, where only a very small number of plants were found. This is a rare grass in Suffolk.

Spiral tasselweed ***Ruppia cirrhosa*** — was recorded in the saline lagoons at the north of the survey area. This species is rare and scattered down the coast and can often only appear for a few years before conditions change and other species can develop in its place.

Whorled water-milfoil ***Myriophyllum verticillatum*** — recorded once in 1992, within the IDB channel.

Small rare trefoils (*Trifolium suffocatum, glomeratum, subterraneum, ornithopodioides* and *micranthum* and Bulbous meadow grass—*Poa bulbosa*). These coastal specialties are found across the vegetated shingle areas of the site only.

Mosses—Bryophytes

There are 103 records of mosses from the Shingle Street survey area covering 36 species. The records collated start from November 1989 (R. Fisk), who made 24 records covering 24 species. In 1999 T. Smith recorded six species. In 2001 R. Fisk returned and recorded 29 species. Finally, T. Abrehart made 22 records of six common species during botanical survey work for Natural England.

Of the species recorded none were of conservation concern. *Tortella flavovirens* has only been recorded in 11 tetrads in Suffolk three of which cover Shingle Street. This is an exclusively maritime species in Britain and Ireland, common in short dune grassland, typical on the grazed sections of Shingle Street's vegetated shingle. Here it too forms a turf adjacent to the coastal lagoons. Other typically coastal species present include, *Hennediella heimii, Tortula acaulon* var. *pilifera* and *Tortula modica.*

Lichens

There are 60 records for lichens at Shingle Street with a total of 28 species. The first records are from 1992 by C. Hitch who recorded 19 species. T. Smith made 11 records in 1999 of five species. In 1999 C. Hitch and M.E. Bennett recorded five species. C. Hitch returned in 2004 and recorded a further six records of six species. Finally, T. Abrehart made 19 records of six species.

Of the 29 species recorded at Shingle Street none were of conservation concern.

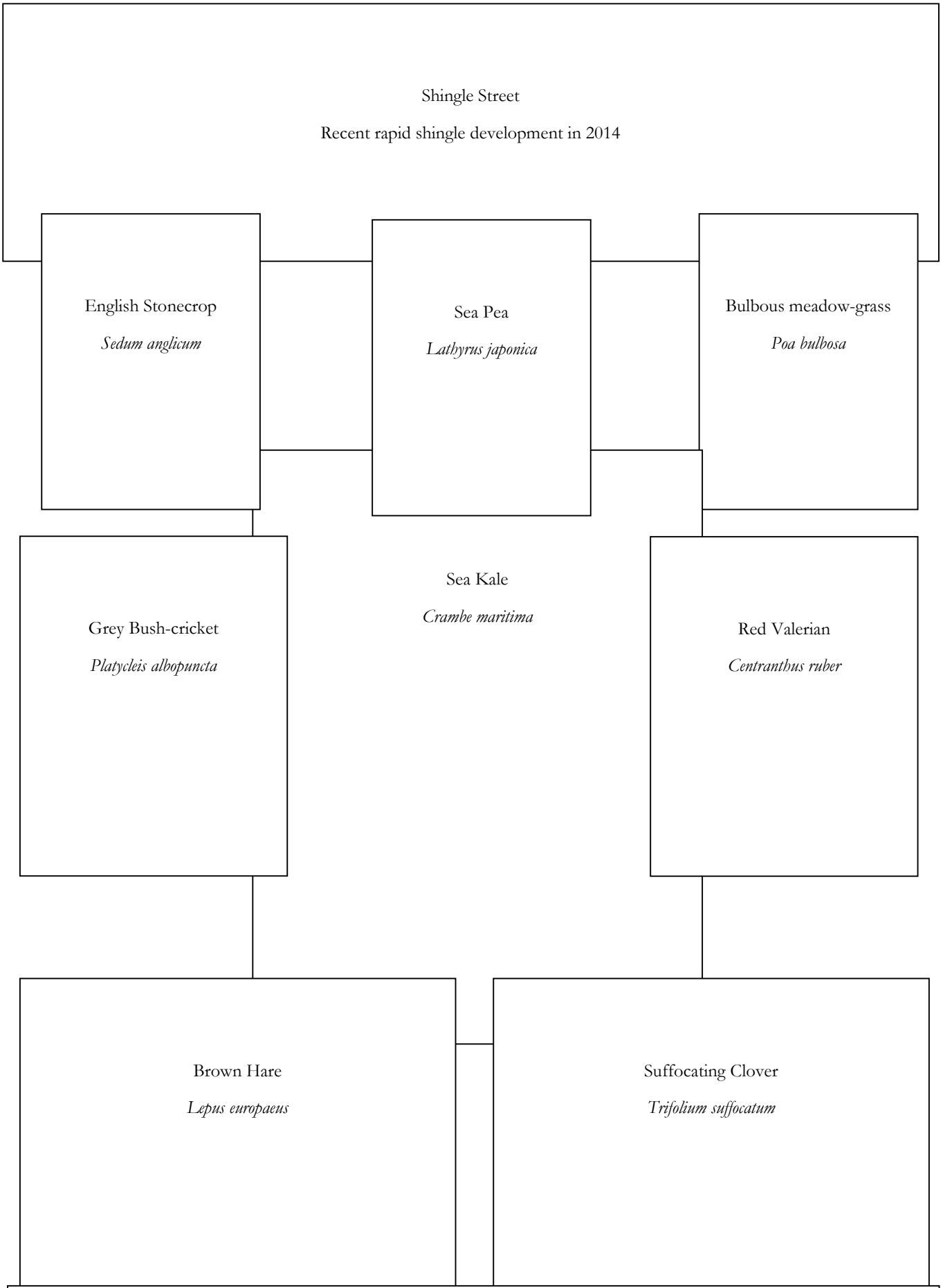


Plate 1: Pioneer and vegetated shingle species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016

Plate1: Pioneer and vegetated shingle species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016

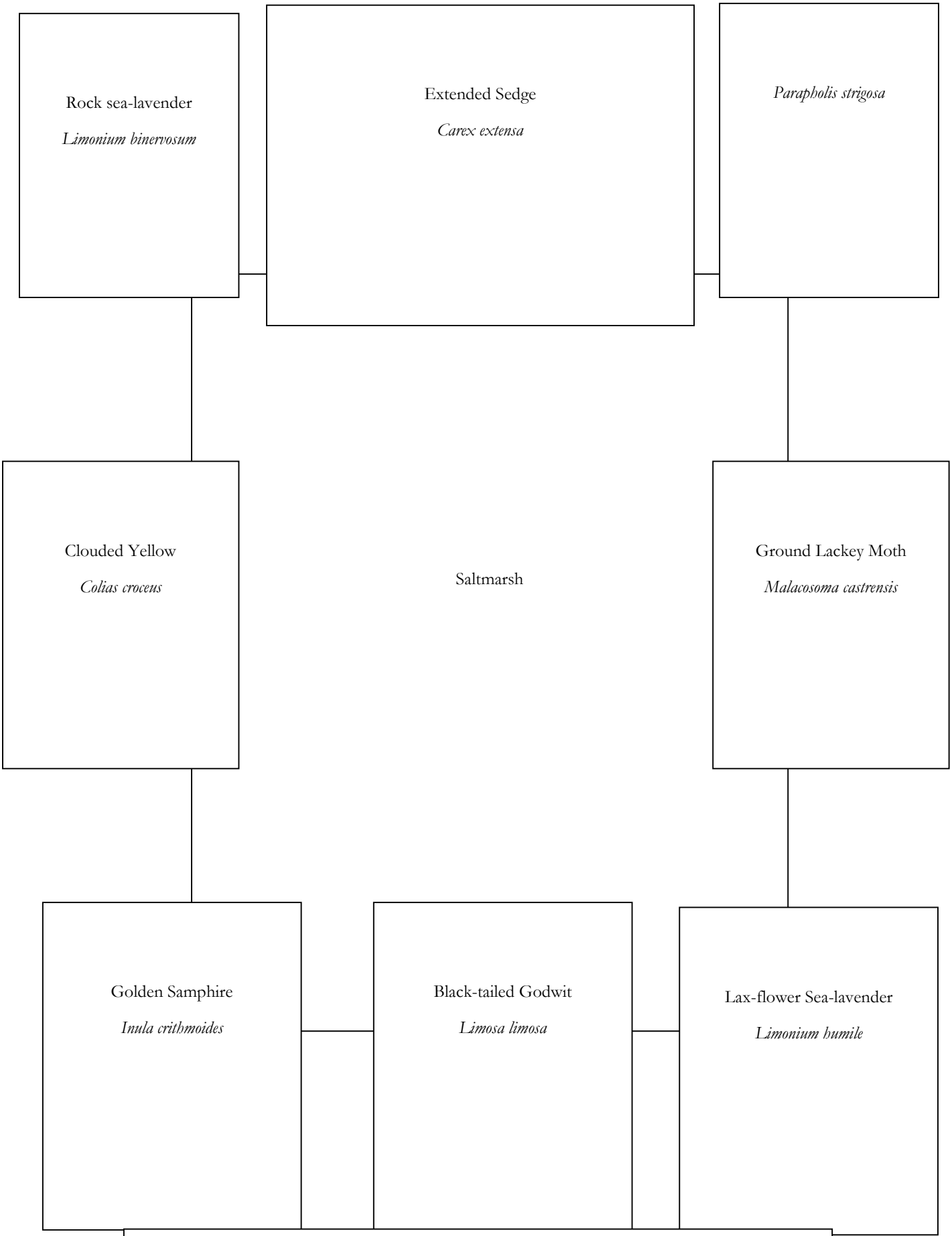


Plate 2: Saltmarsh species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016.

Plate 2: Saltmarsh species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016.

3.2 Birds

There have been many individuals who have recorded the birds at Shingle Street over the years, as it is a popular migrant hotspot, with 249 species seen in total. The majority of the records available here have come from J. Mynott who in compiling the list in Appendix F has records of 206 species in the last 13 years. There have been many notable species found over the years and the site has a number of uncommon species that are breeding or are regular visitors during the winter. Each group of birds has been well recorded with very few gaps in them. Obviously woodland species are limited as there are only two small areas of trees in the survey area. This said, most woodland species have occurred as passage migrants for which the site has been very productive over the years.

With no scrapes or pools in the site (that are not dog accessible) the list of water birds is impressive though limited.

Many species breed here, with some specialities including stonechats, barn owl, corn bunting and grasshopper warblers. Many warblers make Shingle Street their home especially in the reed margins of the dykes and ditches. On the shingle itself little terns attempt to breed sporadically, though disturbance often means they are unsuccessful. In the lagoons to the south of the study area avocet have bred and fledged young in 2015.

A number of rare and scarce migrants have been recorded, with notable species including, bee-eater, hoopoe, wryneck, barred, yellow browed, Radde's and dusky warblers, red-backed shrike, red-breasted flycatcher and lesser grey shrike.

Wintering birds include regular short-eared owls and hen harriers, occasional ravens and small flocks of snow bunting along the shingle.

Some species that used to be breed here have sadly now gone. These include turtle doves, tree sparrows, grey partridge and turtle dove, for example, though Cetti's warbler now are commonly heard around the site.

The majority of the birds seen at Shingle Street are migrants moving up and down the coast, with always lots to search for and gaps in the list to try and fill.

3.3 Reptiles

In the spring of 2015 a recording session was carried out with funding from Touching the Tide. This was to enable the local residents to recognise all possible species that may have been present of the site and to enable them to carry out a survey to help in trying to record reptiles across the survey area.

Prior to this survey there were two records of reptiles for the site. These were both for common lizard *Zootoca vivipara* in 2010 and 2012, on the sea wall and by the car park. In 2015 16 records were made of four species, with the majority of records being of common lizard. There was one record each of slow-worm *Anguis fragilis,* adder *Vipera berus* and grass snake *Natrix natrix*.

The grass snake record was seen in a greenhouse close to the coastguard cottages in the summer, and was duly removed and placed in a safe haven. Grass Snakes are uncommon on the coast, though do exist in moderate numbers on the sea walls leading inland around the estuaries in Suffolk. These animals can travel for miles in search of food and with the amount of suitable habitat on the site there

is no doubt that a slightly higher population is present than the single record indicates. A single adder too was found in this area

The slow worm record was from the sea wall to the east of the Barthorp's Creek sluice. It was only recorded once and as such this species may only be present in a very low density on the site and most probably on the sea wall only. This species too is rare on the coast, though the sea wall grasslands are not an uncommon habitat for this species slightly further inland from the coast.

The common lizards on the site were found scattered across the longer grassland habitat and were found in the gardens of many of the houses at Shingle Street. It was never found with any great frequency or in any large numbers, so is considered to be present in a low density across the site.

Amphibians

There have only been 16 records of any amphibian at Shingle Street and these were all in 2015.

There were only three common frog *Rana temporaria* records and 13 common toad *Bufo bufo* records. The majority of the records are from people's gardens, from under logs or other garden material. A small number were recorded under the artificial cover objects used to attract reptiles for easy observation. The largest numbers though were found along the edges of the IDB drain running through the west of the site. Here up to 10 toads were found at a time, these though were dead and appeared to have been killed and left in the common reed vegetation margins to the drain. The cause of death is unknown, but there are several possible culprits: the 'toad fly', fungus, herpes, rats or otter.

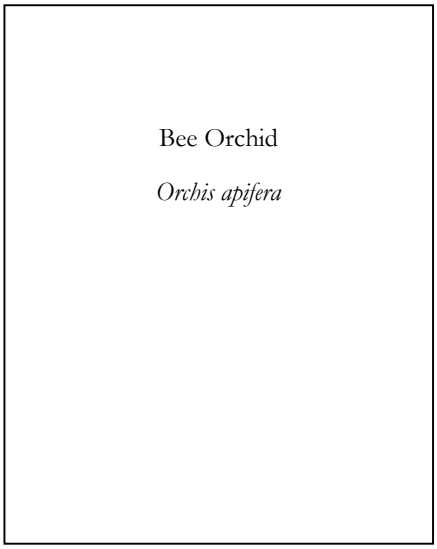
These species will no doubt be more commonly found across the site with continued recording and searching. The general brackish nature to the majority of the site may preclude newts from the site, with no records of any species.

Shingle Street has a considerable amount of suitable habitat for amphibians. There are numerous dykes (4,010m long to the west of the road and 2,350m to the east of the road), the main IDB drain (2,085m long) and several small garden ponds. The main IDB channel and the ponds would be suitable to support a number of these species. The terrestrial habitat too is extremely good, with a large number of gardens with spoil heaps and piles of loose rubble. The long grasses and scrubby nature of much of the site also provides an abundant amount of feeding habitat.

With all this, it was surprising how few records there were for this group in the survey area. Even if the breeding sites are limited, due to increased salinity for example, toads can live to be 40 years old so at some point if there was suitable habitat again they may increase. Putting in more garden ponds may be a good start here.

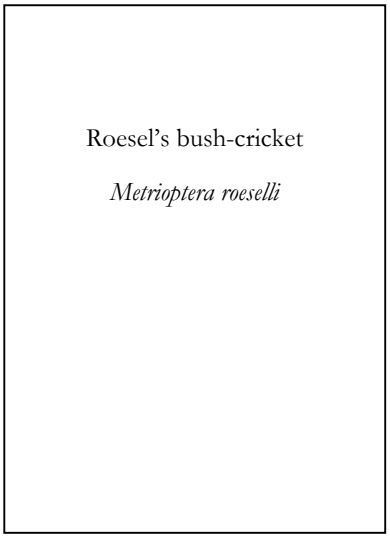
Amphibians at Shingle Street have rarely been recorded, so this will be an underestimation of what is present within the recording area.

Grasslands



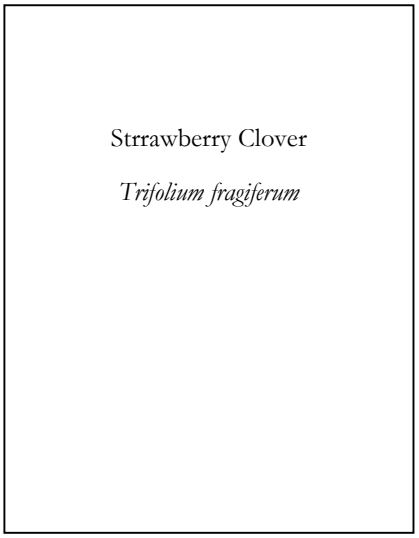
Bee Orchid

Orchis apifera



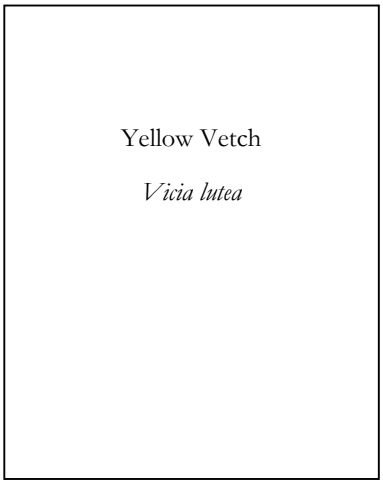
Roesel's bush-cricket

Metrioptera roeselli



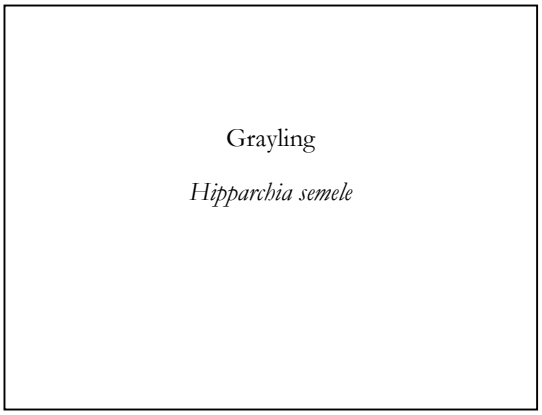
Strrawberry Clover

Trifolium fragiferum



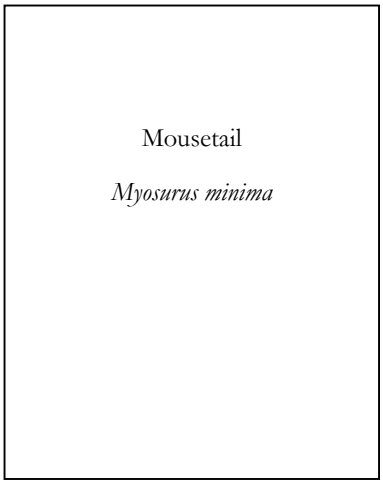
Yellow Vetch

Vicia lutea



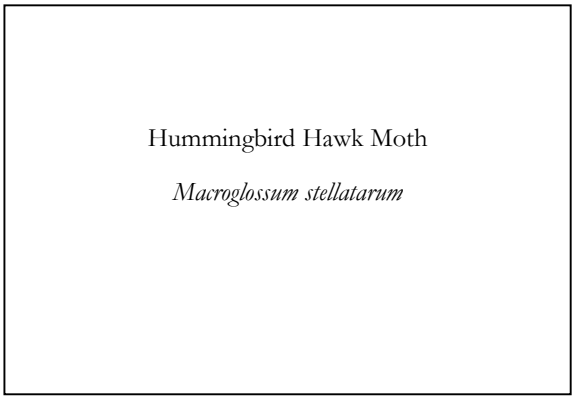
Grayling

Hipparchia semele



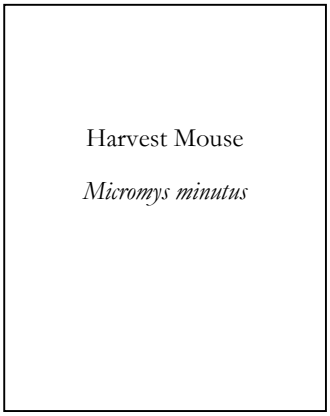
Mousetail

Myosurus minima



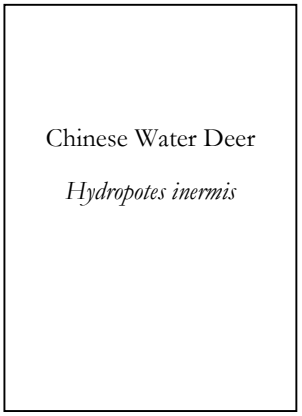
Hummingbird Hawk Moth

Macroglossum stellatarum



Harvest Mouse

Micromys minutus



Chinese Water Deer

Hydropotes inermis

Plate 3: Grassland species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016.

Plate 3: Grassland species at Shingle Street, 2015. All photos copyright Abrehart Ecology 2016.

3.4 Molluscs

Prior to these surveys there were very few records of molluscs from the site. With only three records prior to 2003. In 2003 the first records of narrow-mouthed whorl snail *Vertigo angustior* were made making this an important southern extension to the known range at that time. Following from these surveys in 2015 the total number of all mollusc species recorded for Shingle Street is 57 species, which is a third of the number of species found in Suffolk and a quarter of the species found in the UK. Please refer to Appendix B for full report.

A total of 26 species of mollusc were recorded during this terrestrial mollusc survey. This is a moderate number of species for a very dry coastal habitat, considering what little variation in habitat there was across the site.

The terrestrial survey focussed on the known population of the narrow-mouthed whorl snail *Vertigo angustior*. The distribution and numbers of narrow-mouthed whorl snail *V. angustior* fluctuate considerably from year to year, depending on the weather conditions. In dry years their numbers are very low, though in 2015 the weather had been damp not wet, so these were moderate conditions for this rare mollusc. It was found across the survey area concentrated to the east of the Shingle Street road. It was most abundant in the grasslands along the sea wall, especially in the vegetation of the North East sea wall. The density in this section of the site was the highest found anywhere in Suffolk in 2015, which in turn will be the highest density recorded in the UK in 2015. Although it does not cover a large area the number of this species can reach hundreds of thousands. The main area of high density covers 5000m² with a possible density of 800m², giving a basic population guestimate of over 4 million animals at Shingle Street.

Other than the headline species—*Vertigo angustior* - all other terrestrial species were typical for a coastal site in Suffolk, with *Vertigo substriata* and moss chrysalis snail *Pupilla muscorum* among the interesting species found on the sea wall.

Coastal lagoonal species were noted during 2015 and in 2013, and a total of 14 species of mollusc strongly associated with lagoons were recorded. Of these species eight are uncommon in the UK. Two were brackish water pulmonate species, mouse-eared snail *Myosotella myosotis* and *Leucophytia bidentata*, the later recorded fewer than 20 times in Suffolk. *Hydrobia neglecta* RDB3 is rare in coastal lagoons in Suffolk, It has been recorded eight times at Shingle Street and always in the lagoons or the more saline borrow dyke in the northern and eastern sections of the site.

Other notable species at Shingle Street include pointed cingula *Onoba aculeus* and *Onoba semicostata*. No other records of these species are found for terrestrial Suffolk. They were found by sieving deep, slightly muddy shingle on the landward side of the shingle ridge at a lagoons edge. These species are more rarely recorded in off-shore samples and rarely from East Anglia. Only small samples were taken and high numbers were recoded for these species. It was within this habitat that *Leucophytia bidentata* was recorded too. All the lagoonal species mentioned here are very small species. None grow longer than 3.5mm in height and some are considerably smaller.

Whilst carrying out the botanical survey for Shingle Street the saltmarsh pools were looked at and a second county record of the sea slug *Limapontia depressa* was made.

Duck mussel *Anodonta anatina* was found only in the IDB drain and was found predated on the sides of the bank, possibly eaten by the local otters or by herons and little egrets that frequent the area.

Hydrobia neglecta, this was found in two sample locations at the southern end of the site in the coastal lagoon and nearby brackish dyke. It was found in enormous numbers with upwards of 2,500 in a sample, indicating at least 10,000 per metre.

Bithynia leachii, only two specimens were located. They were in the IDB drain as opposed to the brackish grazing marshes.

New Zealand mud snail -*Potamopyrgus antipodarum*, this was found in 13 samples scattered across the site. This introduced species is common within Suffolk.

So, although there was not a very high number of species recorded for the site, what was found was of great significance for the fauna of Suffolk.

3.5 Mammals

In the early summer of 2015, a mammal trapping and recording day was carried out for the residents of Shingle Street to enable them to carry out their own live trapping to help with this survey work and to enhance their own interest in the wildlife in their area.

Mammals have been recorded since 1997 when three stoats were seen R. Stewart.

Since then there have been 113 records made of terrestrial and marine mammals. Of these 80 were made in 2015, showing how much important information can be gained simply in a year.

Of the 20 species of terrestrial mammal recorded at Shingle Street six are of conservation importance as discussed below:

Water vole *Arvicola amphibius*—has only been recorded twice once in 2007 by P. Hemphill with two seen and in 2015, where a small number of active burrows were seen on the edge of a recently cleared dyke near to the IDB drain.

West European Hedgehog *Erinaceus europaeus*— this mammal has only been seen twice at Shingle Street, in 1995 and in 2012.

Brown Hare *Lepus europaeus*—this obvious species was recorded 12 times at Shingle Street with the first record in 1994 by J. Daws. The largest number of animals seen at any one time was seven in the March of 2010. This species is often seen in almost every section of the site though the number of records does not demonstrate this.

European Otter *Lutra lutra*—has been recorded five times since 2007, but most of the records are from 2015. There is a known holt on the side of the IDB drain where a new man made holt was created during restoration work on the nearby sluice. This had to be re-built after badgers took it over in the summer of 2015. Signs of otter presence were recorded all along the IDB drain and along the sea wall to the east of the road. Otters used several routes to get to and from the estuary, an area they obviously spend time feeding in. A maximum of two animals were seen by J. Mynott playing in the IDB drain in April 2015. A camera trap was placed on the edge of the IDB drain in the summer of 2015 and otters were seen on several occasions here.

Badger ***Meles meles***—this species is well known at Shingle Street. There are three known setts holding an unknown number of animals, though evidence of their activities is seen all around the footpath and allotment area of the survey area.

Harvest Mouse ***Micromys minutus***— has been recorded only four times, three times by M. Meek during the Suffolk Wildlife Trust Harvest Mouse project and once during this survey when a freshly dead adult was found on the sea wall footpath running parallel to the coast. During the survey they were heard on three occasions within the reedbeds along the side of the borrow dyke. Despite live mammal trapping in this habitat none were caught, though many Pygmy Shrews were.

Pygmy shrew ***Sorex minutus***—this tiny mammal was caught several times during the live mammal trapping (under licence). It was only caught in the elevated reedbed traps showing the importance of this habitat for this species.

Bats are known to use the area around Shingle Street though as yet have not been identified to species, though many species could occur including migrants from the continent.

3.6 Marine mammals

All marine mammals are protected, so all of the four species recorded are of significance.

Fin Whale ***Balaenoptera physalus***—a young 20-foot animal was found washed up on the beach on 30th September 2012. It was still alive when initially stranded though died within an hour.

Grey Seal ***Halichoerus grypus***— has been recorded only five times, though this species is often likely to be seen feeding in the mouth of the river along with Common Seals. This species is probably very under- recorded at Shingle Street, as they are fairly common, but up to 20 were seen on the emergent shingle in the summer of 2014.

Common Seal ***Phoca vitulina***— Occasionally seen offshore with a record of 11 animals on 5th March 2013 by N. Mason.

Harbour/Common Porpoise ***Phocoena phocoena***— there was only one record for this species in the survey area. One was found dead on the beach in November 2011. This species is well known off the Suffolk coast with increasing number in recent years. Several are frequently seen off Orford Ness and these will no doubt occasionally be passing Shingle Street during the year.

3.7 Aquatic invertebrates

Summary of diversity

Ten sampling sites were sampled three times across the summer to complete this aquatic invertebrate survey of Shingle Street Marshes. A total of 13,385 aquatic invertebrates were recorded from 140 taxa, consisting of 18 higher taxonomic groups. A list of all invertebrate taxa and species identified across the Shingle Street site, along with their associated status classification can be found in Appendix E. A total of 109 taxa were identified to species level.

The most diverse major taxonomic groups were Coleoptera (43 taxa, 32% of total taxon count) followed

by Hemiptera (20 taxa, 15% total taxon count), Gastropoda (17 taxa, 13% of total taxon count), Diptera (17 taxa, 13% of total taxon count), and Bivalva (3 taxa, 2% of total taxon count) (figure 2). The remaining 13 taxonomic groups were less diverse and ranged from 1 to 5 taxa, equating to approximately 1 to 3% of the total taxon count (figure 4).

The most abundant taxonomic groups were Gastropoda (54.4%) followed by Ostracoda (11.6%), Amphipoda (10.1%), Isopoda (7%), Cladocera (4.5%) and Hemiptera (2.746%) (figure 3). The remaining 22 major taxonomic groups were less abundant and ranged from 0.003% to 1.187% of all aquatic invertebrates identified.

Noteworthy species

A number of macroinvertebrates identified in this survey have current conservation status classifications, and any notable species are presented in table 2 and figure 8 in Appendix C.

Species highlighted in bold are in the major taxonomic group Coleoptera (beetles). These species have been further investigated to determine their habitat classifications. The 'broad assemblage type' (BAT) designation of M3: Saltmarsh, estuary and mud flat, has been designated to the beetle species *Enrochus halophilus, Agabus conspersus,* the tiny *Ochthebius marinus* as well as the water boatman species *Corixa affinis* and the abundant gammarid *Gammarus deubeni.* The BAT designation of W3: Permanent wet mire, has been designated to the species, *Enochrus quadripunctatus* and *Rhantus frontalis.* The BAT designation of W2: Open water on disturbed mineral sediments, and litter-rich fluctuating marsh, has been designated to the species *Helochares lividus, Dytiscus circumcintus* and *Peltodytes caesus,* as well as the pondweed bug species *Mesovelia furcata*.

Hygrotus parallelogrammus - This small black and yellow water beetle *Hygrotus (Coelambus) parallelogrammus* is most frequently recorded in the coastal marshes of the south-east, though records range to Durham and Cheshire. It is found in brackish dykes and ponds.

Hydrochus brevi*s* - This Hydrochid beetle is a sluggish crawling water beetle with coarse punctures over the thorax resembling dents. *H. brevis* is 3mm long and black, being slightly bulbous in shape and found in brackish water sites.

Enochrus halophilus - this beetle was found abundantly across the site in the more brackish water dykes.

Ochthebius marinus - A clearly halophilic species, but it apparently tolerates very low salinity and may occasionally be found in fresh water far from the coast.

Corixa affinis - this backswimmer was found scattered across the site though in low densities and always in the brackish water habitats here.

Sigara selecta - recorded on two occasions, once in 2013 and again in 1954 at the same location at the edge of a coastal lagoon.

Please refer to full report in Appendix C.

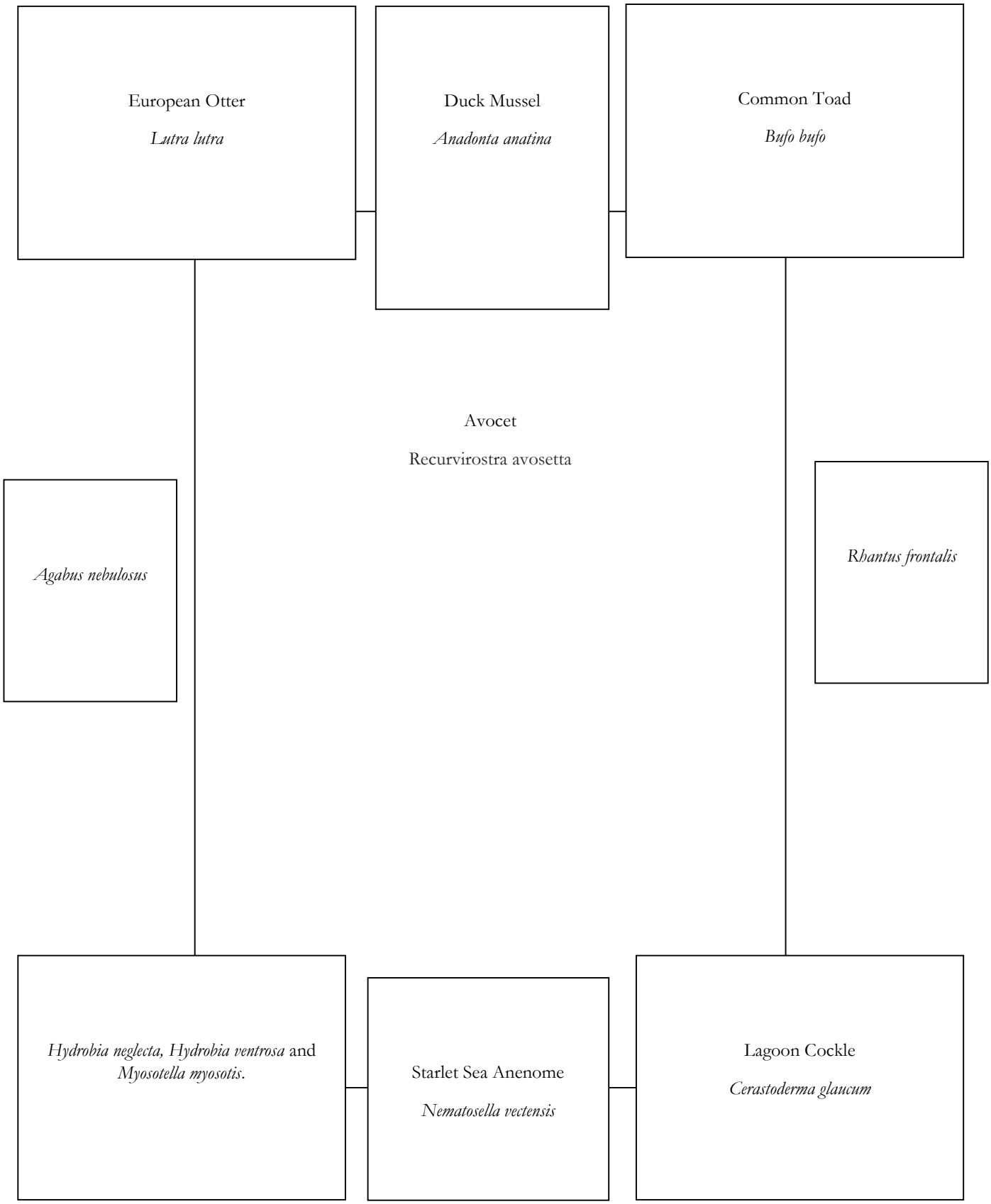


Plate 4: Freshwater, brackish and lagoon species at Shingle Street. All photos copyright Abrehart Ecology 2016.

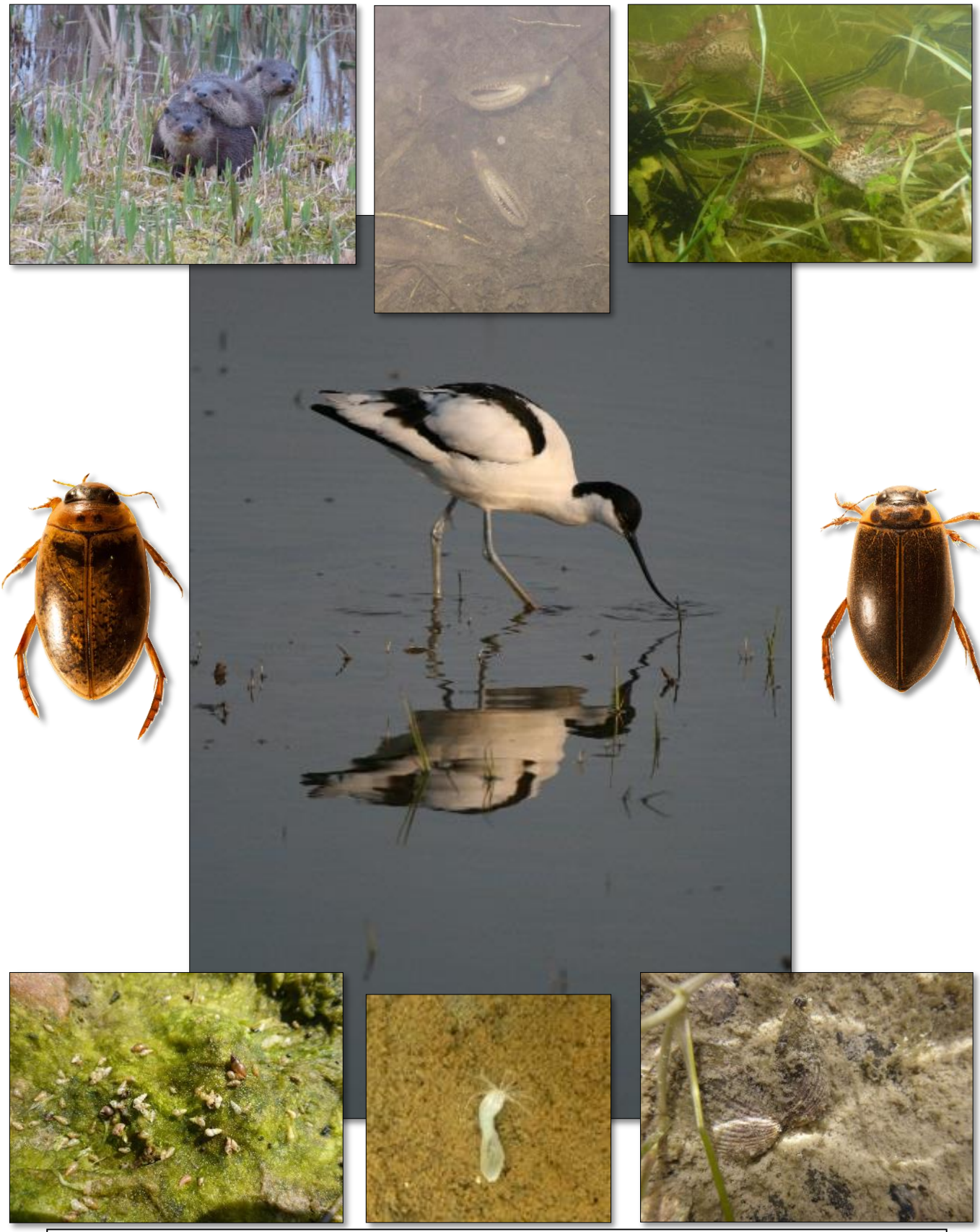


Plate 4: Freshwater, brackish and lagoon species at Shingle Street. All phots copyright Abrehart Ecology 2016.

3.8 Moths

Summary of diversity

A large number of species of moth have been identified form the Shingle Street survey area. 379 species have been recorded from 2290 records (Table 6). This is the most diverse group recorded on the site. Many of those species found are migrants which is unsurprising considering the site, which is good for migrant birds and butterflies and so too for moths.

The majority of the records were made by Nick Mason and the Suffolk Moth Group lead by T. Prichard.

Table 6 Summary of moth records

Recorder	Time period	Number of records
N. Mason	2004 to 2015	1402
T Prichard, G. Bull and N. Sherman	1998 to 2009	657
A. Watchman	1980's and 1990's	175
A. Watchman and M. Wise	1975	63

Notable species

There were 54 notable species recorded at Shingle Street over the Period 1975 to 2015. Below are descriptions of a number of the rare, vulnerable and notable B species found at Shingle Street. For full list refer to Appendix F

Synaphe punctalis—Wingspan 22-27 mm. In Britain this species is restricted to the southern coastal counties, where it is locally common, occupying shingle, sand-dunes as well as chalky and other dry areas. The females are darker than the males, and both sexes exhibit a rather long-legged appearance. The flight period is June to August, and the males especially can be sometimes found flying in daytime, as well as at night. The larvae feed on various mosses on the ground.

Schoenobius gigantella—Wingspan 25-46 mm. Sexually dimorphic, the females being generally much larger and plainer in appearance than the males. It is locally distributed in the southern half of England, occupying coastal reedbeds. The moths fly in July and sometimes in August, and can be attracted to light, though the males are quite sedentary. The larvae feed internally on the stems of common reed (*Phragmites australis*) and reed sweet-grass (*Glyceria maxima*)

Pediasia contaminella—Wingspan 20-30 mm. Distributed mainly in the southern counties, this rather local species prefers dry grassy habitats. It flies during July and August and is attracted to light. The larvae feed in a silken tube amongst grasses such as sheep's fescue (*Festuca ovina*).

Malacosoma castrensis*-Ground Lackey-* Stronghold on Suffolk, Essex coasts. Wingspan 31-41. A very local species in the British Isles, restricted to parts of the south-eastern coastal counties. The moths fly in July and August, but are only infrequently encountered, usually by light-trapping. The colourful

larvae are showier, sometimes basking in the sunshine. They feed on a range of saltmarsh plants such as sea wormwood (*Artemisia maritima*) and sea-lavender (*Limonium vulgare*). Tents of this species are often found across the saltmarshes at Shingle Street.

Heliothis viriplaca– Wingspan 30 to 36mm. This moth is a resident, being found in the Brecks of East Anglia. It is also thought possibly to be an immigrant as occasional moths are found in southern and eastern counties, but these may be remnants of small populations. The moth is univoltine, being found on the wing from mid-June to mid-July, visiting flowers such as viper's bugloss (*Echium vulgare*). The larva feeds on wasteland plants.

Gymnancyla canella– Wingspan c. 23 mm. A very local species, occurring on the sandy coastlines of south and south-east England. The adults resemble *Phycitodes* species, but have longer labial palps which project forward instead of upward. The typical flight period is July and August. The larvae feed on prickly saltwort (*Salsola kali*), and sometimes orache (*Atriplex*). When young, the larvae feed internally in the stems or shoots, but later can be found feeding externally from a silken web containing trapped grains of sand.

Evergestis extimalis– *Marbled Yellow Pearl*—Wingspan 25-31mm. This species is a scarce resident in parts of south-east England, but otherwise is only found as an occasional migrant to the south. It prefers dry chalky habitats, and the adult moths fly in June and July, though migrants are sometimes found later in the autumn. The larval foodplants are various plants of the Cruciferae, the seed-heads being preferred.

Ethmia bipunctella—*Suffolk coast stronghold also found on Kent coast* Wingspan 19-28 mm. In Britain, this species is restricted to a few areas of coastal shingle in the south-east of England. There are some older records from more inland localities which may refer to migrants. The main flight period is May and June, but there is also a partial second generation in the autumn. Viper's bugloss (*Echium vulgare*) is the larval foodplant in this country, both flowers and leaves being consumed.

Cynaeda dentalis– *rare on south and east coasts* Wingspan 22-28 mm. A highly distinctive moth, this species is restricted in Britain to a few coastal localities in the south-east of England, where its preferred seaside habitats such as shingle beaches occur. The single generation flies in July, and comes to light. The larval foodplant is viper's bugloss (*Echium vulgare*).

Calamotropha paludella– Wingspan 22-33 mm. Sexually dimorphic, the males are slightly smaller and darker than the females. Both sexes have bright white hindwings. Scarce and locally distributed in marshes, fens and other wet habitats in south and south-east England, with some records as far north as Cheshire and Lancashire. The adults fly in July and August and are attracted to light. The slender larva mines the leaves, stems and upper rootstock of bulrush (*Typha* spp.) from September to May, pupating there in June and July.

Archanara neurica– *White Mantled Wainscot—only found in coastal Suffolk, small areas of the broads and the Cambridgeshire fens.* Wingspan 26-29 mm. A rare and local species, occurring only in a relatively small number of reedbeds in coastal Suffolk, though previously it also occurred in East Sussex. The "white mantle" referred to in the name is very difficult to see, and is a pale fringe along the front edge of the thorax. There is a single generation, flying in July and August, when the adults are attracted to light. The larvae feed internally in the stems of common reed (*Phragmites australis*).

Aphomia zelleri– Wingspan 20-37 mm. This moth is extremely local, found on coastal sandhills in Norfolk, Suffolk and East Kent. The larvae feed on a moss found in such locations and feed from a vertical tube in the sand. The larva is full-fed by May and pupates within this tube about 3-4cm below

the surface. Adults fly from June to August and are hidden by day amongst vegetation, becoming active at night and running about on the sand. The female may make short flights; the males, much smaller than the females, do little more than flutter their wings.

Anania verbascalis—Wingspan 22-26 mm. Locally distributed in the southern half of England, this species inhabits open heathland and shingle areas. The larvae feed mainly on wood sage (*Teucrium scorodonia*), overwintering in a state of diapause. The flight period is June and July, and the species is single-brooded.

All of the above descriptions were taken from the UK moths website—http://ukmoths.org.uk/

3.9 Butterflies

26 species of butterfly have been recorded at Shingle Street. This is the most frequently recorded group after plants and birds with 651 records, which started in 1994 with a grayling seen. Five species of conservation concern have been recorded, mentioned below with the inclusion of large tortoiseshell *Nymphalis polychloros* as a species of great interest. Clouded yellow *Colias croceus* are now breeding locally and are often noted nectaring around the gardens. It is a frequent migrant here.

Holly Blue ***Celastrina argiolus***— this delicate butterfly was recorded 18 times since 2003. It is a bi-volutine species that lived up to its habit and was found in two distinct seasons, the spring from March to early June, then again in September. Always seen in small numbers with a maximum of three in 2012 (N. Mason).

Small Heath ***Coenonympha pamphilus***— this is a common species at Shingle Street with 51 records made since 2002. This species is most frequent in the short turf grasslands behind the houses where it is found flitting about all over the place, never seen in great densities, though up to 10 have been seen is small areas around flowering plants.

Grayling ***Hipparchia semele*** - has been recorded only 15 times since [should this be 'before'?] 1995. This species, though cryptically camouflaged on the shingle and short turf vegetation when it lands, is a large obvious insect when nectaring on flowering plants in the late summer. Over half the records were made in 2015, where up to seven were seen in a single occasion.

Wall ***Lasiommata megera***— has been recorded 37 times at Shingle Street with up to eight seen in a single date. They were recorded from May to October

Swallowtail ***Papilio Machaon***—this beautiful butterfly was only recoded once and was most likely the continental race of the well-known Norfolk species. This species occurs every few years in Suffolk and mainly in east Suffolk, demonstrating that this species is probably a continental migrant.

Large Tortoiseshell ***Nymphalis polychloros***—this butterfly has only been recorded once, in 2007, a year when many Clouded Yellows were recorded in Suffolk, indicating that this may have been of continental origin as opposed to an escaped individual from a private collection.

3.10 Grasshoppers

There have been 62 records of ten species of grasshopper from the Shingle Street survey area. There are only two pre 2015 records, these are of Roesel's Bush cricket in 1998 (S. Ling) and of a Lesser Marsh grasshopper in 1993 (A. Watchman).

All the other records were made during this survey (T. Abrehart). This covered nine species of which one is rare in Suffolk—Grey bush cricket *Platycleis albopunctata*. This was only recorded once on the sea kale *Crambe maritima* on the beach to the east of the coastguard cottages. Only one animal was seen though this will no doubt be an underestimation of the presence of this species on the site. It is a well-known species from around the lighthouse on Orford Ness where it has been present since 1996 (Sutton 2004). In the summer of 2013 it was recorded in several new areas of Suffolk, notably in the upper Alde-Ore complex at Blackheath and Iken; a new population was also discovered in the Deben estuary too (Abrehart 2013).

The only other notable species was the slender ground hopper *Tetrix subulata*. This was recorded once during the survey, in the damp hollow near the tennis court where a small area of developing saltmarsh is present in this low damp section of an otherwise very dry part of the site. Only a few were noted during the botanical phase of this work. This species is often found at the upper edge of the saltmarshes in Suffolk estuaries and this is typical habitat along the coast.

Roesel's bush cricket was the most frequently recorded species with 30 records. This species is always easy to pick up (hear) due to its very distinctive call, sounding like a buzzing overhead electricity cable. Most commonly found on the sea walls and in the longer grasslands on the site.

The two species of cone heads – short-winged and long-winged – were often found close to the saltmarshes with short-winged often found in the saltmarsh at low tide and long-winged with Lesser marsh grasshopper found on the upper tide line and on and over the sea walls.

The records made during this survey were in no way systematic, but were more casual observations whilst carrying out additional surveys. Nonetheless, this has shown how much is present on the site and how much more there is to find across the site for this interesting group.

3.11 Dragonflies

There have been 84 records of dragonflies for the survey area. This covered a total of 16 species. The recording period for this group started in 1989 with a record of blue-tailed damselfly, common blue damselfly and a record of migrant hawker. Since then the number of records has increased with some years showing notable increases, which tend to be due to recorder effort rather than actual species abundance. The main recorders of this group have been Nick Mason with 54 records and T. Abrehart with 56 records.

Of the species recorded there have only been a small number of the more uncommon species for Suffolk.

Small red-eyed damselfly *Erythromma viridulum* was recorded in 2006-8 with counts of 1 to 20 animals.

This was seven years after the first records of this species in the UK (first recorded in 1999 and proven breeding in Essex in 2002.) It was first recorded in 2001 in Suffolk and has rapidly expanded across the country since that time, often not staying at a breeding site for very many years, as was possible here at Shingle Street.

Hairy dragonfly *Brachytron pratense* has been recorded six times at Shingle Street. Never in any numbers, but only ever as a single or pair of the animals.

Blue-tailed damselfly *Ischnura elegans* was the most often recorded species and is unlikely to be mis-identified with anything else. There were 25 records.

Common darter *Sympetrum striolatum* was also frequently recorded, with 18 records.

Banded demoiselle *Calyopteryx splendens* and *Sympetrum sanguinium* have only been recorded once each. Both are species which roam widely from their breeding areas and it is surprising that so few have been seen in the recording area.

There is an astonishing record of 2210 *Aeshna mixta* recorded on 15th August 2006 by Nick Mason, when there must have been a phenomenal influx of this species along the coast and quite a sight.

3.12 Other groups including false scorpions, harvestmen, earwigs, hymenoptera, millipedes and spiders

Harvestman have only been recorded once back in 1948 when two species, *Phalangium opilio* and *Opilio saxatilis* by J. Sankey. It appears no-one else has been looking.

The same appears to be true for millepedes, false scorpions and earwigs with only one record for each: *Cylindroiulus punctatus* the beautifully named Blunt-tailed Snake Millipede, *Chthonius (Chthonius) ischnocheles* and *Forficula auricularia* all by P. Lee in 1991.

Bees have been looked at in 2003 and 2008, mainly by H. Paxman who made 15 records of six species.

P. Lee made 22 records of ant in 2008. These are the only records for this group on the site and covered five species.

A. Watchman made three records for true bugs in 1998 which covered two species *Chorosoma schillingi* and *Picromerus bidens.*

B. Fountain recorded three species of fly in 2004, *Episyrphus balteatus, Eupeodes corolla* and *Scaeva pyrastri.* The latter species is often found on the coast in Suffolk and also within the Brecklands in western Suffolk.

Of the 58 [check] species of spider recorded from 1953 to 2014, only two species of spider are of conservation concern. Though some have great English names like the whelk shell jumper *Pseudeuophrys obsolete* [check sense] which is found rarely on the east coast.

Only one species of ant was recorded that was of conservation concern, the Indolent Ant *Ponera coarctata.*

These are all groups that need much more investigation.

3.13 Beetles

This group was first recorded in 1957 by K.A. Joysey who recorded *Hygrotus (Coelambus) parallelogrammus* in a lagoon. In 1960 C.L. Hopkins recorded *Berosus (Enoplurus) fulvus* and in 1964 Garth Foster came and surveyed the lagoons and some of the borrow dykes, where he recorded six species of beetle. A total of 14 records were made in this period of eight species, all of which were aquatic species. All other records were made during the aquatic invertebrate survey in 2015.

In 2015 as part of this survey a total of 41 species of aquatic beetle were recorded from 232 records, as discussed in Appendix C. Many of these species have restricted distribution on the UK and in Suffolk. These are species associated with brackish water communities, which only occur in the transitional coastal grazing marshes. The dykes within these systems hold a large continuous series of mixed salinity water bodies and hold an important resource for this group.

For many years the FSC from Flatford Mill have been coming and recording on the site, though none of their records were provided, but there would have been some additional records made.

There are no records of terrestrial beetles for Shingle Street! Though cockchafers and ladybirds must be common here. No specific records have been made as yet.

4. CONCLUSIONS

4.1 Biodiversity of Shingle Street and surrounding land

4.2 Success of the project

This is an important resource that can be periodically updated and will serve as a benchmark for monitoring changes to this rich but sensitive environment. It should become a point of reference for all future discussions of the conservation and protection of this area. There are also opportunities to derive from the project various more accessible and popular local publications for residents and visitors alike, such as information booklets of walks, species lists, and local cultural and natural history.

4.3 Future opportunities

There is still so much to discover at Shingle Street and this is the exciting thing with recording wildlife. One you never know what you might find, which is always exciting. You never know what discoveries you might make – changes in distribution through coastal changes can tell you so much about the local situation in these times of change.

There are a number of groups for which there are no proper records – especially fungi, algae, terrestrial beetles and bugs for a start.

This report sets out what has been recorded so far and is a baseline of all the data available, but as with any wildlife recording it never stops. Despite various gaps and absences, there is a great deal still here well worth preserving and protecting, which justifies all the conservation monikers Shingle Street has (and indeed this report!).

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6. WORKS CITED

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