

INVERTEBRATES OF SLAPTON LEY NATIONAL NATURE RESERVE (FSC)
AND PRAWLE POINT (NATIONAL TRUST)

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In 2014 the Natural History Museum, London organised a field trip to Slapton. These field notes report on the trip, giving details of methodology, the species collected and those of notable status.

INTRODUCTION

Objectives

A field trip to Slapton was organised, funded and undertaken by the Natural History Museum, London (NHM) in July 2014. The main objective was to acquire tissues of UK invertebrates for the Molecular Collections Facility (MCF) at the NHM. The other objectives were to:

1. Acquire specimens of hitherto under-represented species in the NHM collection;
2. Provide UK invertebrate records for the Field Studies Council (FSC), local wildlife trusts, Natural England, the National Trust and the National Biodiversity Network (NBN) Gateway;
3. Develop a partnership between these organisations and the NHM;
4. Publish records of new/under-recorded species for the area in *Field Studies* (the publication of the FSC).

Background to the NHM collections

The NHM is home to over 80 million specimens and objects. The Museum uses best practice in curating and preserving specimens for perpetuity. In 2012 the Molecular Collections Facilities (MCF) was opened at the NHM. The MCF houses a variety of material including botanical, entomological and zoological tissues in state-of-the-art freezers ranging in temperature from -20°C and -80°C to -150°C (Figs. 1). As well as tissues, a genomic DNA collection is also being developed. Collecting fresh UK material from a variety of species is also a high priority for the facility. Scientists are welcome to visit the MCF and use the samples *in situ*, whilst collections data are available via the Global Genome Biodiversity Network (GGBN).



FIGURE 1. Molecular Collections Facilities freezers at the Natural History Museum, London.

Background to collecting sites

Slapton Ley

Slapton Ley National Nature Reserve is situated on the South Devon coast, along Start Bay (Figure 2). It is designated as a Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Area of Outstanding Natural Beauty (AONB) and Heritage Coast, plus has part designation as a Statutory Bird Sanctuary. The reserve covers 214.7 hectares (Field Studies Council, 2010). There are seven major habitats in total: shingle ridge (coastal barrier), freshwater lagoon (the Lower Ley), rich fen and reed bed (the Ley), wet woodland (Slapton Wood and Higher Ley), grazed marsh (the Ley), scrub (the Ley) and agricultural grassland (Field Studies Council, 2010). This diverse habitat has made Slapton Ley the home or migratory stop for many rare and significant species (Mercer 1966), particularly breeding birds such as the Bittern, Bullfinch, Song Thrush and Reed Bunting which are on the Red List (Field Studies Council,

2010). Mammals found at Slapton include eight species of bat - e.g. Daubentons, greater horseshoe and barbastelle. The otter and common dormouse are the only other mammalian species present with conservation protected status (Field Studies Council, 2010).



FIGURE 2. Slapton Ley National Nature Reserve

Prawle Point

Prawle Point is located approximately in the centre of the Prawle Point–Start Bay Site of Special Scientific Interest with a range of habitats, including cliff edge, scrub, farmed fields and grazed grassland (Stubbs, 1994). Prawle Point SSSI has protected coastal heathland and is in part under the ownership of the National Trust (Dixon, 1998).



FIGURE 3. Prawle Point.

Start Bay Centre

The Start Bay Centre was originally Slapton School and is now used by the FSC as an educational centre. It is located at the north of the Slapton village. It is not a part of the National Nature Reserve or Slapton Ley SSSI.

LACK OF RELEVANT LITERATURE FOR SLAPTON LEY AND PRAWLE POINT

Slapton Ley

Although Slapton Ley SSSI has been well-recorded for birds, bats and other mammals, the invertebrates have been under-recorded (Riley, 1996; Field Studies Council, 2010). The FSC collects 'casual' records, which are dependent on enthusiasts who visit Slapton Ley. This means there are some groups more thoroughly recorded than others, with the most extensively recorded group being the Lepidoptera (Riley, 1996; Field Studies Council, 2010). In 1987, the Nature Conservancy Council (now Natural England) compiled the Invertebrate Site Register (ISR), which described Slapton Ley as important for a range of invertebrates, listing 88 species including: 1 vulnerable, 7 rare, 2 notable A, and 39 nationally scarce species (Field Studies Council, 2010). Although there are a several papers on Lepidoptera, a few papers on invertebrates including a new species of Diplopoda (Gregory, *et al.*, 1993), aquatic Diptera (Ruse, 2013), and a few on parasites found on organisms at Slapton (e.g. Canning *et al.*, 1973; Kirk *et al.*, 2000; Stevens, 2003), there is a

general lack of papers on invertebrates at Slapton Ley and Slapton Wood. Indeed, there are only two papers published in *Field Studies* (the journal of the Field Studies Council) that is specifically on invertebrates – non-marine molluscs by Chatfield (1972) and oribatid mites by Monson (1998).

Prawle Point

The literature for Prawle Point is very limited. Currently, there are very few published surveys on the invertebrates of this area (i.e. Mitson, 2017; Stubbs, 1994). Other taxonomic groups have been recorded within the SSSI including nationally scarce plants, lichens, breeding birds, invertebrates (Dixon, 1998). Rare invertebrates include *Nomada sexfasciata* (Cuckoo Bee) and *Eucera longicornis* (Long-horned Bee) (Natural Devon, 2014).

DIGITAL RECORDS

National Biodiversity Network (NBN) Gateway

The NBN is the UK's largest partnership for nature. The NBN Gateway is a database which currently holds over 130 million biodiversity records (including plants, mammals, birds and invertebrates) that can be quickly and easily accessed to understand the distribution of particular species in the UK and Ireland. Different types of data can be accessed at many different levels, as the Gateway allows the viewing of distribution maps and the downloading of data by using a variety of interactive tools. For example, users can look at a specific area at Ordnance Survey grid map level or select at vice-county level. All records are available to at least at 10 km scale and many at 2 km or 1 km. Some are also available at 100m resolution although only registered and logged-in users can usually see these. The maps can be customised by date range and can show changes in a species' distribution (NBN, 2017). The invertebrate records of interest for this paper were retrieved at area level: Slapton Ley SSSI (which includes Slapton Woods), the FSC Start Bay Centre (which is not within the Slapton Ley SSSI) (accessed on 9/12/16) and Prawle Point/Start Point SSSI (accessed on 3/2/2017). At present, 140 public and voluntary organisations provide the data and anyone can view the information for free. It is estimated that up to 60,000 people routinely record biodiversity information in the UK and Ireland and most of this effort is voluntary. The UK government through its agencies also collects biodiversity data and one of the principal elements for the collation and interpretation of this data is the network of Local (Biological) Records Centres (NBN, 2017).

Spider and Harvestmen Recording Scheme

Where there is a lack of data for certain areas on the NBN Gateway, it cannot be assumed that these data do not exist. Indeed, some data sets have not been uploaded to the NBN Gateway, such as those from the Spider and Harvestmen Recording Scheme (SRS). The SRS has been run by the British Arachnological Society (BAS) since 1987 and provides up-to-date data on the distribution and autecology of spiders and harvestmen via its website (BAS SRS, 2017a).

METHODOLOGY

TARGET GROUPS AND FIELD SAMPLING METHODS

A variety of invertebrate groups were sampled, which reflected the interest and expertise of the expedition members - i.e. Insecta: Lepidoptera, Orthoptera, Hymenoptera and Diptera; Arachnida: Araneae and Opiliones; Crustacea using a range of seven collecting methods depending on the taxonomic group (Table 1).

TABLE 1. Sampling methods used to target different taxonomic groups.

Taxonomic Groups		Ground Sampling	Light Traps	Malaise Traps	Light sheet	Sweep Netting	Yellow Pan Traps
Arachnida	Araneae	✓				✓	
	Opiliones	✓				✓	
Myriapoda	Chilopoda	✓					
	Diplopoda	✓					
Crustacea	Isopoda	✓				✓	
Insecta	Diptera		✓	✓		✓	✓
	Hymenoptera		✓	✓	✓	✓	✓
	Lepidoptera		✓			✓	
	Orthoptera			✓		✓	✓

There were three sampling sites within the Slapton Ley NNR and two within the Prawle Point site (National Trust). The Start Bay Centre is not located within a protected site. In total seven different sampling methods were used for a range of taxonomic groups across eight sampling sites (Table 2).

TABLE 2. Sampling methods used at the eight sample sites.

	Ground Sampling	Light Traps	Malaise Traps	Screen Sweep Netting	Sweep Netting	Yellow Pan Traps
Lower Ley				✓	✓	
Outer Shore			✓			
Single Ridge					✓	✓
Slapton Woods	✓		✓	✓	✓	✓
Southground Cliff	✓				✓	✓
Southground Shore						✓
Start Bay Centre	✓	✓			✓	✓
Prawle Point	✓				✓	

Slapton Ley SSSI Locations

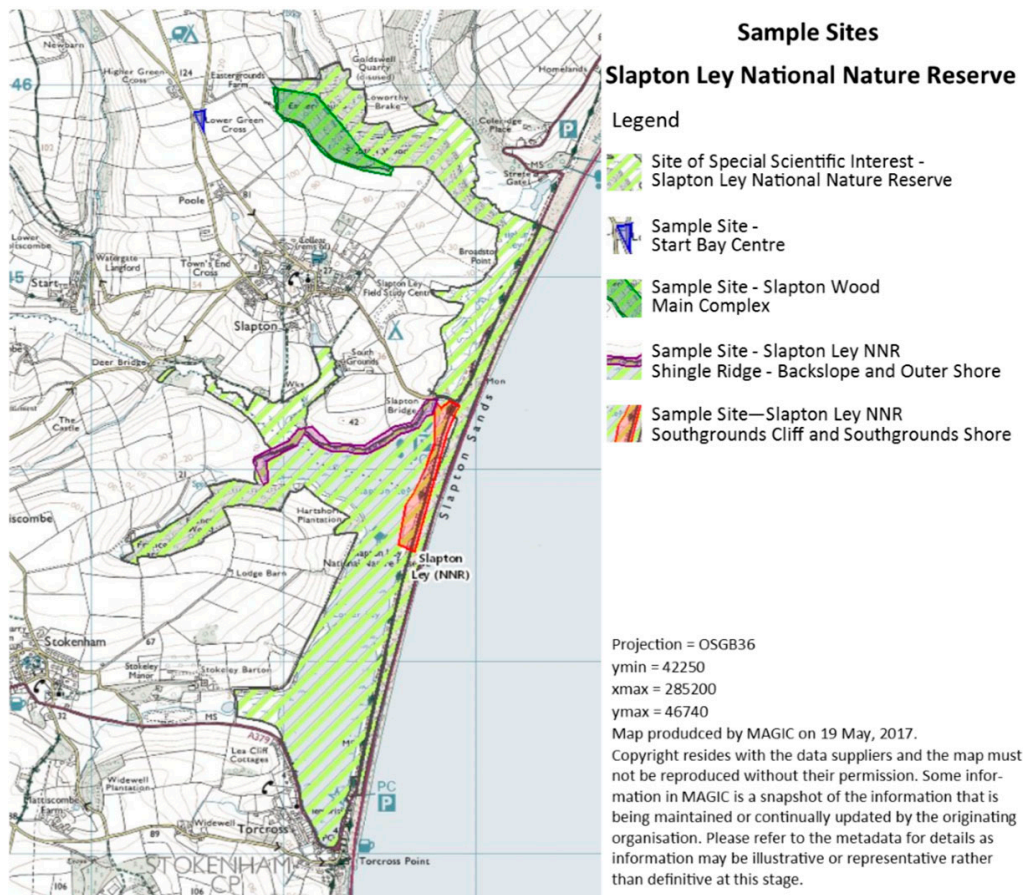


FIGURE 4. Map showing the sample sites within Slapton Ley NNR and the Start Bay Centre .
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Slapton Wood

Slapton Wood is ancient woodland dating back to the Domesday Book in 1086 (Field Studies Council , 2012). Mercer (1966) described it as a complex broken up in to five areas. The section sampled was described as the main woodland accessed by the Easterground entrance (Mercer, 1966). Slapton Wood is an acid and nutrient-poor woodland

(Trudgill, 1983) with Slapton Wood Stream running through the woodland valley. The stream, which is stony and surrounded by scrubs, is a small tributary of the River Gara (Mercer, 1966). The Wood has been mainly unmanaged with only the footpaths and steps being maintained for health and safety reasons (Field Studies Council, 2012). Along the ridge and the main descent to the Stream, the flora includes: canopy vegetation: *Castanea sativa* (sweet chestnut), *Quercus robur* (oak), *Fraxinus excelsior* (ash), *Fagus Sylvatica* (beech). Understory vegetation includes: *Corylus avellana* (hazel) and *Ilex aquifolium* (holly) (Field Studies Council, 2012). *C. sativa* was introduced to Slapton Woods during planting of an old field according to historic maps (Trudgill, 1983). There was little direct sunlight penetrating through the canopy within the Wood overall. Where sunlight did occur, it was mainly along the main path. (Figure 5).

Slapton Lower Ley

The Lower Ley is around 180 acres in area, with a range of habitats surrounding the Ley including: woodland, reed beds and scrub. The predominate flora includes: *Quercus robur* (oak), *Fraxinus excelsior* (ash), *Sambucus nigra* (elder), *Acer pseudoplatanus* (sycamore), *Crataegus monogyna* (hawthorn), *Rubus fruticosus* (bramble), *Urtica sp.* (nettle), *Pteridium aquilinum* (bracken) and *Poaceae sp.* (tussock). Overall, the weather conditions at the Ley in July 2014 during sampling were sunny and the ground at the Ley was mainly dry. A number of locations within the Slapton Lower Ley region (classified by Mercer, 1966) were sampled.

Shingle Ridge – Back slope:

The back slope runs from the road edge (by the coast) down to the Ley itself. It is mainly covered by thick grassland and scrub/thicket comprised mainly of blackthorn, bracken, brambles and elder (Mercer, 1966).

Outer Shore:

The outer shore continues from the back slope to the Ley, located to the south of the Ley and is the closest region to the sea shore, over the road from the Ley. The shore is predominately covered by swathes of reed beds, mainly *Phragmites australis* (Common Reed) (Mercer, 1966).

Southgrounds cliff:

The Southgrounds cliff starts at the entrance to the Lower Ley from Slapton Bridge, round to the Lower Ley marshland and Ireland Bay. The cliff consists of exposed slate, up to around 35 feet from the Ley's shoreline. Predominate flora includes: oak, elder, sycamore, blackthorn and bramble.

Southgrounds shore:

The Southgrounds shore begins at Slapton Bridge, curving round to Ireland Bay. The shore flora mainly consists of rushes such as *Eleocharis palustris* (common spike-rush) (Figure 5).



FIGURE 5. Slapton Ley, Southgrounds Shore (left) and Slapton Wood (right).

Start Bay Centre

The centre is located on a triangle of land between roads and arable wheat fields on the main road into Slapton from the north. The centre has a garden which is protected from the road by high deciduous hedges and trees. The garden also has a play area covered in bark and an educational pond with a decked walkway around the water's edge. (Figure 6).



FIGURE 6. Start Bay Centre, the sampling team (left) and the Centre grounds (right).

Prawle Point

Sampling took place in two places at Prawle Point – on the south and east-facing cliff (Figure 7) with cliff top pasture, arable and scrub (especially common gorse (*Ulex europaeus*) and blackthorn (*Prunus spinosa*)) (Dimond *et al.*, 2014), plus along a small section of the coastal path running east (Figure 3).



FIGURE 7. Prawle Point, sampling along the cliff top (left); map of Prawle Point, sampling range in red (right).
Map: Crown copyright Ordnance Survey. All rights reserved.

MOLECULAR SAMPLING METHODOLOGY

Larger specimens of all orders listed above (except Crustacea) were collected singly into tubes/plastic tubs and kept alive in a dark, cool environment until tissue sampling commenced. The tissue sampling was undertaken by two groups of four people, with a ninth person identifying species where possible. Each of the four people in a group had a task allocated to them to optimise time and reduce mistakes (based on Beccaloni & Beccaloni, 2012). When the first person completed their task, the specimen was passed to the second person, and so on. Each separate task is numbered below. The fourth team member coordinated all activities. The methodology used is considered to yield the best DNA extraction results (Simmons, 2014).

1. *Euthanasia*: The specimen was placed in 100% ethanol immediately before tissue sampling, ensuring that it was fresh and no DNA degradation took place.
2. *Tissue sampling*: Two or three legs were removed by being pulled off using forceps or cut off using a scalpel /scissors. To avoid cross-contamination, each separate sample was placed on a new disposable paper plate and the scalpel blade/scissors/forceps flamed over a tea light candle between each specimen.
3. *Storage*: The legs were placed in a Cryo tube (specialist tube for storage in the MCF – Fig. 7) and the voucher specimen (from which the legs were removed) was placed in a tube of 100% ethanol (except Lepidoptera).

4. *Labelling*: Both the Cryo tube and the specimen tube were labelled with the same number (in sequence) to allow cross-referencing. The labels were made from high wet strength paper (Resistall) and written with an alcohol-proof pen. Each tube was stored temporarily in a plastic jug. Periodically, when enough tubes accumulated, they were poured from the jug into a dry shipper – essentially a very large thermos flask which contained liquid nitrogen vapour, which rapidly freezes the specimens (Fig. 8).
5. Pouring the tubes from a jug greatly reduced the risk of tipping them into the gap between the inner metal canister and outer case. The tubes were transferred approximately every 30 minutes. If done more often, the dry shipper would have begun to heat up due to the lid being removed so often, and less often, the DNA in the legs would have started to deteriorate.

SORTING, IDENTIFICATION AND STORAGE AT THE NHM

Curation and storage of MCF voucher specimens

A 'morphological voucher' is a specimen serving as the basis for taxonomic identification. A 'molecular voucher' is a sample (i.e. tissue) that is preserved and curated in a way that will conserve its molecular properties for analysis. A molecular voucher should always be linked to a morphological voucher (Astrin, et al., 2013). Morphological voucher specimens were sorted to order before being stored in large clip-top jars filled with 75% pure ethanol. The exception to this protocol was the storage of Lepidoptera specimens, which were housed in acid-free archival quality specimen envelopes and stored in boxes for pinning. Each morphological voucher specimen was labelled with the NHM accession number BMNH(E) 2014-120 and a BMNH(E) barcode number consisting of seven digits (e.g. BMNH(E) 1038685), date of collection, location including grid reference or GPS coordinates and a reference number to the molecular voucher in matrix boxes in the MCF. The following orders have been identified: Araneae, Blattodea, Dermaptera, Hymenoptera, Lepidoptera, Opiliones and Orthoptera (identifiers listed in acknowledgments). Araneae, Dermaptera, Hymenoptera and Opiliones have been retained as spirit collections, while Blattodea, Orthoptera and Lepidoptera are scheduled to be pinned. The dry shipper was emptied and the Cryo tubes placed into matrix boxes (Fig. 14) and placed in a -80°C freezer in the MCF. Each Cryo tube was assigned a unique letter and number combination, as shared by the morphological vouchers. Each of the three matrix boxes was then mapped on spreadsheets to allow correlation with the morphological voucher specimens.

Curation and storage of non-molecular specimens

The majority of the specimens collected during sampling were non molecular specimens and initially stored in 100% ethanol. While sorting the samples to main taxonomic group the specimens were reoused in 80% IDA (Industrial Denatured Alcohol). A more dilute mixture preserves specimens but does not distort the morphology due to dehydration (Simmons, 2014; Carter & Walker, 1999). The exception was Hymenoptera, kept in 100% ethanol as requested by the department's Hymenoptera experts. The majority of the specimens will be kept as spirit collections within the Darwin Centre – a building containing state-of-the-art temperature-regulated collections stores. Some orders will be pinned for identification and kept as dry collections. During the non-selective sampling (malaise traps and yellow pan traps) a range of by-catch was obtained, which were included in the collection after approval from the relevant bodies (FSC and National Trust).

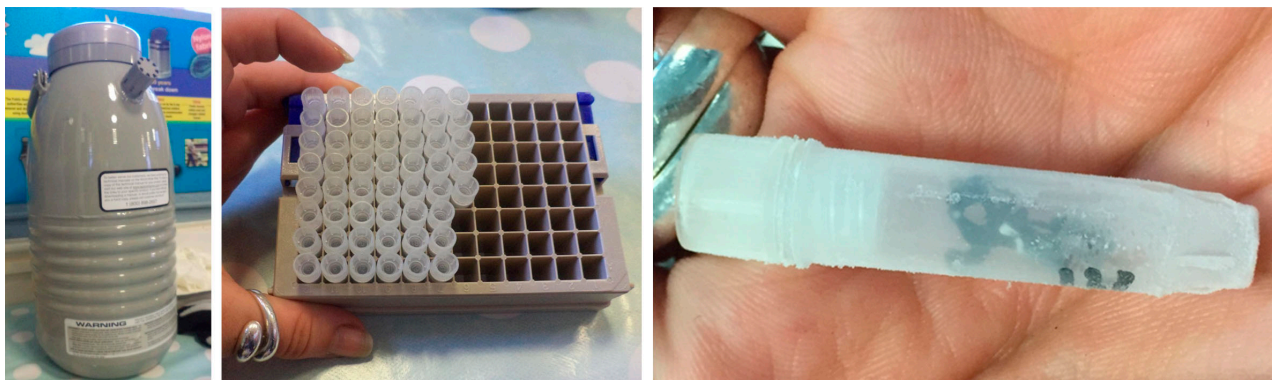


FIGURE 8. ~Storage tissue samples: Dry shipper (left), matrix box (centre), and Cryo tube with tissue sample (right).

RESULTS

SPECIES LIST

Key to Species Status:

A – Abundant	LC - Locally Common	NS – Nationally Scarce
C – Common	M – Migrant	NS B – Nationally Scarce B
L – Local	NA - Notable A	R – Rare
LA – Locally Abundant	NN – Nationally Notable	UC – Uncommon

Notes: The nomenclature of species has been taken from Global Biodiversity Information Facility (GBIF) (accessed January 2017). Those taxa labelled as 'NEW' are the first record for that species at the area level (i.e. Slapton Ley SSSI) on the NBN Gateway. The NHM has tissues samples in the Molecular Collection Facility of those species labelled 'MCF'.

Start Bay Centre

Class Insecta Linnaeus, 1758		
Order Hymenoptera Linnaeus, 1758		
Family Apidae Latreille, 1802		
Genus Bombus Latreille, 1802		
NEW, C, MCF	Species <i>Bombus hypnorum</i> Linnaeus, 1758	
Order Lepidoptera Linnaeus, 1758		
Family Arctiidae Leach, 1815		
Genus Phragmatobia Stephens, 1828		
C, MCF	Species <i>Phragmatobia fuliginosa</i> Linnaeus, 1758	
Family Geometridae Leach, 1815		
Genus Abraxas Leach, 1815		
C, MCF	Species <i>Abraxas grossulariata</i> Linnaeus, 1758	
Genus Biston Leach, 1815		
C, MCF	Species <i>Biston betularia</i> Linnaeus, 1758	
Genus Hydriomena Hübner, 1825		
C, MCF	Species <i>Hydriomena furcata</i> Thunberg, 1784	
Family Hepialidae Stephens, 1829		
Genus Hepialus Fabricius, 1775		
C, MCF	Species <i>Hepialus humuli</i> Zincken, 1817	
Family Lasiocampidae Harris, 1841		
Genus Euthrix Meigen, 1830		
C, MCF	Species <i>Euthrix potatoria</i> Linnaeus, 1758	
Genus Malacosoma Hübner, 1820		
C, MCF	Species <i>Malacosoma neustria</i> Linnaeus, 1758	
Family Noctuidae Latreille, 1809		
Genus Amphipoea Billberg, 1820		
C, MCF	Species <i>Amphipoea oculea</i> (Linnaeus, 1761)	
Genus Eilema Hübner, 1819		
C, MCF	Species <i>Eilema lurideola</i> Zincken, 1817	
Genus Mythimna Ochsenheimer, 1816		
L, MCF	Species <i>Mythimna straminea</i> (Treitschke, 1825)	
Genus Noctua Linnaeus, 1758		
C, MCF	Species <i>Noctua comes</i> Hübner, 1813	
C, MCF	Species <i>Noctua pronuba</i> Linnaeus, 1758	
Family Notodontidae Stephens, 1829		
Genus Phalera Hübner, 1819		
C, MCF	Species <i>Phalera bucephala</i> (Linnaeus, 1758)	
Family Sphingidae Latreille, 1802		
Genus Deilephila Laspeyres, 1809		
C, MCF	Species <i>Deilephila elpenor</i> Linnaeus, 1746	
Genus Laothoe Fabricius, 1807		
C, MCF	Species <i>Laothoe populi</i> Linnaeus	
Order Orthoptera Latreille, 1793		
Family Acrididae MacLeay, 1819		
Genus Chorthippus Fieber, 1852		
C, MCF	Species <i>Chorthippus brunneus</i> (Thunberg, 1815)	

Slapton Woods

Class Arachnida Lamarck, 1801	
Order Araneae Clerck, 1757	
Family Linyphiidae Blackwall, 1859	
	Genus Gnathonarium Karsch, 1881
NEW, C	Species <i>Gnathonarium dentatum</i> (Wider, 1834)
	Genus Linyphia Latreille, 1804
NEW, C	Species <i>Linyphia triangularis</i> (Clerck, 1757)
	Genus Neriene Blackwall, 1833
NEW, C	Species <i>Neriene peltata</i> (Wider, 1834)
	Genus Tenuiphantes Saaristo & Tanasevitch, 1996
NEW, C	Species <i>Tenuiphantes zimmermanni</i> (Bertkau, 1890)
Family Tetragnathidae Menge, 1866	
	Genus Metellina Chamberlin & Ivie, 1941
NEW, C	Species <i>Metellina mengei</i> (Blackwall, 1870)
NEW, C	Species <i>Metellina merianae</i> (Scopoli, 1763)
Family Theridiidae Sundevall, 1833	
	Genus Enoplognatha Pavesi, 1880
NEW, C	Species <i>Enoplognatha ovata</i> (Clerck, 1757)
	Genus Rugathodes Archer, 1950
NEW, NS	Species <i>Rugathodes instabilis</i> (O. P.-Cambridge, 1871)
Order Opiliones Sundevall, 1833	
Family Phalangidae Latreille, 1802	
	Genus Leiobunum C.L. Koch, 1839
C	Species <i>Leiobunum rotundum</i> (Latreille, 1798)
	Genus Mitopus Thorell, 1876
NEW, C	Species <i>Mitopus morio</i> (Fabricius, 1779)
	Genus Oligolophus Koch, 1871
NEW, C	Species <i>Oligolophus tridens</i> (Koch, 1836)
Class Insecta Linnaeus, 1758	
Order Hymenoptera Linnaeus, 1758	
Family Apidae Latreille, 1802	
	Genus Bombus Latreille, 1802
C, MCF	Species <i>Bombus terrestris</i> (Linnaeus, 1758)
C, MCF	Species <i>Bombus lucorum</i> (Linnaeus, 1761)
C, MCF	Species <i>Bombus lapidarius</i> (Linnaeus, 1758)
C, MCF	Species <i>Bombus hortorum</i> (Linnaeus, 1761)
Order Lepidoptera Linnaeus, 1758	
Family Arctiidae Leach, 1815	
	Genus Panaxia Tams, 1939
NS B, MCF	Species <i>Euplagia quadripunctaria</i> (Poda, 1761)
Family Lycaenidae Leach, 1815	
	Genus Lycaena Fabricius, 1807
C, MCF	Species <i>Lycaena phlaeas</i> (Linnaeus, 1761)
	Genus Polyommatus Latreille, 1804
C, MCF	Species <i>Polyommatus icarus</i> (Rottemburg, 1775)
Family Nymphalidae Rafinesque , 1815	
	Genus Aphantopus Wallengren, 1853
C, MCF	Species <i>Aphantopus hyperantus</i> Linnaeus, 1761
	Genus Argynnis Fabricius, 1807
L, MCF	Species <i>Argynnis paphia</i> (Linnaeus, 1758)
	Genus Maniola Schrank, 1801
C, MCF	Species <i>Maniola jurtina</i> Linnaeus, 1758
	Genus Nymphalis Kluk, 1802
NEW, C, MCF	Species <i>Inachis io</i> (Linnaeus, 1758)
	Genus Pararge Hübner, 1819
C, MCF	Species <i>Pararge aegeria</i> Linnaeus, 1758
C, MCF	Species <i>Pararge megera</i> Linnaeus, 1767
	Genus Polygonia Hübner, 1819
C, MCF	Species <i>Polygonia c-album</i> Linnaeus, 1758
	Genus Vanesa Fabricius, 1807
M, MCF	Species <i>Vanesa atalanta</i> Linnaeus, 1758
Family Pieridae Swainson, 1820	
	Genus Pieris Schrank, 1801

C, MCF	Species <i>Pieris napi</i> (Linnaeus, 1758)
C, MCF	Species <i>Pieris rapae</i> (Linnaeus, 1758)
	Order Orthoptera Latreille, 1793
	Family Acrididae MacLeay, 1819
	Genus <i>Chorthippus</i> ????
C, MCF	Species <i>Chorthippus parallelus</i> (Zetterstedt, 1821)

Slapton Lower Ley

	Class Arachnida Lamarck, 1801
	Order Araneae Clerck, 1757
	Family Araneidae Clerck, 1757
	Genus Araneus Clerck, 1757
C, MCF	Species <i>Araneus diadematus</i> Clerck, 1757
	Genus Larinioides Caporiacco, 1934
C, MCF	Species <i>Larinioides cornutus</i> (Clerck, 1757)
	Family Clubionidae Wagner, 1887
	Genus Clubiona Latreille, 1804
NEW, LC, MCF	Species <i>Clubiona pallidula</i> (Clerck, 1757)
	Family Linyphiidae Blackwall, 1859
	Genus Gnathonarium Karsch, 1881
NEW, C, MCF	Species <i>Gnathonarium dentatum</i> (Wider, 1834)
	Genus Kaestneria Wiehle, 1956
LC	Species <i>Kaestneria dorsalis</i> (Wider, 1834)
	Genus Maso Simon, 1884
NEW, LC	Species <i>Maso sundevalli</i> (Westring, 1851)
	Genus Tenuiphantes ???
LC	Species <i>Tenuiphantes flavipes</i> (Blackwall, 1854)
	Family Philodromidae Thorell, 1870
	Genus Philodromus Walckenaer, 1825
NEW, LC, MCF	Species <i>Philodromus cespitum</i> (Walckenaer, 1802)
	Family Tetragnathidae Menge, 1866
	Genus Metellina Chamberlin & Ivie, 1941
NEW, C, MCF	Species <i>Metellina merianae</i> (Scopoli, 1763)
	Genus Tetragnatha Latreille, 1804
C, MCF	Species <i>Tetragnatha extensa</i> (Linnaeus, 1758)
C, MCF	Species <i>Tetragnatha montana</i> Simon, 1874
	Family Theridiidae Sundevall, 1833
	Genus Enoplognatha Pavesi, 1880
NEW, C, MCF	Species <i>Enoplognatha ovata</i> (Clerck, 1757)
	Genus Theridion Walckenaer, 1805
LC, MCF	Species <i>Theridion pictum</i> (Walckenaer, 1802)
	Order Opiliones Sundevall, 1833
	Family Phalangidae Latreille, 1802
	Genus Mitopus Thorell, 1876
NEW, C	Species <i>Mitopus morio</i> (Fabricius, 1779)
	Genus Phalangium Linnaeus, 1758
NEW, C	Species <i>Phalangium opilio</i> Linnaeus, 1758
	Class Insecta Linnaeus, 1758
	Order Dermaptera De Geer, 1773
	Family Forficulidae Latreille, 1810
	Genus Forficula Linnaeus, 1758
C, MCF	Species <i>Forficula auricularia</i> Linnaeus, 1758
	Order Hymenoptera Linnaeus, 1758
	Family Apidae Latreille, 1802
	Genus Bombus Latreille, 1802
C, MCF	Species <i>Bombus lapidarius</i> (Linnaeus, 1758)
C, MCF	Species <i>Bombus pascuorum</i> (Scopoli, 1763)
	Genus Ichneumonidae Latreille, 1802
NEW, R, MCF	Species <i>Goedartia alboguttata</i> (Gravenhorst, 1829)
	Genus Heteropelma Wesmael, 1849

NEW, C, MCF Species *Heteropelma amictum* (Fabricius, 1775)

	Order Lepidoptera Linnaeus, 1758
	Family Arctiidae Leach, 1815
	Genus Miltochrista Hübner, 1819
L, MCF	Species <i>Miltochrista miniata</i> Forster, 1771
	Family Lasiocampidae Harris, 1841
	Genus Euthrix Meigen, 1830
C, MCF	Species <i>Euthrix potatoria</i> Linnaeus, 1758
	Family Lycaenidae Leach, 1815
	Genus Celastrina Tutt, 1906
C, MCF	Species <i>Celastrina argiolus</i> (Linnaeus, 1758)
	Genus Polyommatus Latreille, 1804
C, MCF	Species <i>Polyommatus icarus</i> (Rottemburg, 1775)
	Family Nymphalidae Rafinesque , 1815
	Genus Polygonia Hübner, 1819
C, MCF	Species <i>Polygonia c-album</i> Linnaeus, 1758
	Order Orthoptera Latreille, 1793
	Family Acrididae MacLeay, 1819
	Genus Chorthippus Fieber, 1852
C	Species <i>Chorthippus parallelus</i> (Zetterstedt, 1821)
	Family Tettigoniidae Kraus, 1902
	Genus Conocephalus Thunberg, 1815
NEW, C, MCF	Species <i>Conocephalus fuscus</i> (Fabricius, 1793)
	Genus Pholidoptera Wesmaël, 1838
C, MCF	Species <i>Pholidoptera griseoptera</i> (De Geer, 1773)

Prawle Point

	Class Arachnida Lamarck, 1801
	Order Araneae Clerck, 1757
	Family Araneidae Clerck, 1757
	Genus Araneus Clerck, 1757
C, MCF	Species <i>Araneus diadematus</i> Clerck, 1757
	Genus Neoscona Simon, 1864
UC, MCF	Species <i>Neoscona adianta</i> (Doleschall, 1857)
	Family Linyphiidae Blackwall, 1859
	Genus Diplostyla Emerton, 1882
NEW, C	Species <i>Diplostyla concolor</i> (Wider, 1834)
	Family Tetragnathidae Menge, 1866
	Genus Tetragnatha Latreille, 1804
NEW, C	Species <i>Tetragnatha montana</i> Simon, 1874
	Family Theridiidae Sundevall, 1833
	Genus Enoplognatha Pavesi, 1880
NEW, LA, MCF	Species <i>Enoplognatha latimana</i> Hippa & Oksala, 1982
NEW, C, MCF	Species <i>Enoplognatha ovata</i> (Clerck, 1757)
	Order Opiliones Sundevall, 1833
	Family Phalangiidae Latreille, 1802
	Genus Mitopus Thorell, 1876
NEW, C	Species <i>Mitopus morio</i> (Fabricius, 1779)
	Class Insecta Linnaeus, 1758
	Order Blattodea Wattenwyl , 1882
	Family Ectobiidae Wattenwyl , 1865
	Genus Ectobius Stephens, 1835
NS, MCF	Species <i>Ectobius panzeri</i> Stephens, 1835
	Order Hymenoptera Linnaeus, 1758
	Family Apidae Latreille, 1802
	Genus Bombus Latreille, 1802
C, MCF	Species <i>Bombus lapidarius</i> (Linnaeus, 1758)
	Genus Eucera Scopoli, 1770

N A, MCF	Species <i>Eucera longicornis</i> (Linnaeus, 1758)
	Family Colletidae le Peletier, 1841
	Genus Colletes Latreille, 1802
C, MCF	Species <i>Colletes similis</i> Schenck, 1853
	Family Sphecidae (Latreille, 1802)
	Genus Ammophila Kirby, 1798
C, MCF	Species <i>Ammophila sabulosa</i> (Linnaeus, 1758)
	Order Orthoptera Latreille, 1793
	Family Acrididae MacLeay, 1819
	Genus Chorthippus Fieber, 1852
C, MCF	Species <i>Chorthippus brunneus</i> (Thunberg, 1815)
	Family Tettigoniidae Kraus, 1902
	Genus Platycleis Fieber, 1853
NN, MCF	Species <i>Platycleis albopunctata</i> (Goeze, 1778)

DISCUSSION

Species new to the NBN Gateway

Twenty two species are new to the NBN Gateway at the area level of Slapton Ley SSSI and Prawle Point/Start Point. There are fifteen species of Araneae, three species of Hymenoptera, two species of Opiliones and one species of Orthoptera. Within the twenty two species, there six species with a special status - three locally common, one locally abundant, one nationally scarce and one rare species (Table 3).

Lepidoptera: *Euplagia quadripunctaria* (Poda, 1761).

This day-flying moth was rarely seen in the British Isles in Victorian times (South, 1920) but since then it has spread more widely across Devon and Cornwall (Skinner, 1984) and has recently been seen more frequently in southern England. It has been seen regularly and in numbers every year in London since 2004, so it is probable that it has established a breeding colony (Bradley, 2015). It is currently recorded as Nationally Scarce B, since 1980 only 3.5% of the land area of Britain has had this species recorded (recorded from 31 to 100 10km squared) (Manley, 2008).

Hymenoptera: *Goedartia alboguttata* (Gravenhorst, 1829).

There is little information on this wasp species. It was considered rare by Perkins (1959), who noted that it had been reared in captivity in Britain from the host species *Dasychira pudibunda*. Broad *et al.* (in press) also stated that *G. alboguttata* has been reared in the UK, confirming there is little information available and that it is the only representative of the Hymenoptera tribe Goedatiini.

Hymenoptera: *Eucera longicornis* (Linnaeus, 1758).

This bee species is very local but is sometimes numerous where found in southern England and south Wales. Habitat: coastal grasslands (including cliffs and landslips), open rides in deciduous woodland and occasionally heathlands (BWARS, 2012).

Blattodea: *Ectobius panzeri* Stephens, 1835. Nationally Scarce

This cockroach species is native to the UK, central and southern Europe. Habitat: Mainly coastal -occurring on sea cliffs, sand dunes and shingle beaches. There has been an increase in inland records (dry heathland, chalk grassland and occasionally woodland) over the last 20 years (Biological Records Centre, 2017a).

Orthoptera: *Platycleis albopunctata* (Goeze, 1778)

This grasshopper species is native to the British Isles. Habitat: Coastal – coarse grass and rough vegetation on sand dunes, shingle banks and south-facing cliffs (Biological Records Centre, 2017b).

Notable species added to the main collection

In addition to the 14 notable species added to the MCF collections, a nationally scarce species of spider was acquired - *Rugathodes instabilis* (O. P.-Cambridge, 1871). The species is widespread in East Anglia and south-eastern England but is much more locally distributed elsewhere in southern Britain. This species builds its webs on low vegetation in wetland habitats including saltmarsh, reed fen, sedge marsh and carr woodland. It is generally uncommon but most frequent in south-eastern England (BAS SRS, 2017b).

TABLE 3: The 22 species new to the NBN (as of January 2018), along with UK status and collecting localities.

Species	Order	Status	Collecting localities			
			Start Bay	Slapton Wood	Slapton Lower Ley	Prawle Point
<i>Gnathonarium dentatum</i>	Araneae	Common		✓		
<i>Linyphia triangularis</i>	Araneae	Common		✓		
<i>Neriene peltata</i>	Araneae	Common		✓		
<i>Tenuiphantes zimmermanni</i>	Araneae	Common		✓		
<i>Metellina mengei</i>	Araneae	Common		✓		
<i>Metellina merianae</i>	Araneae	Common		✓	✓	
<i>Enoplognatha ovata</i>	Araneae	Common		✓	✓	
<i>Rugathodes instabilis</i>	Araneae	Nationally Scarce		✓		
<i>Clubiona pallidula</i>	Araneae	Locally Common			✓	
<i>Gnathonarium dentatum</i>	Araneae	Common			✓	
<i>Maso sundevalli</i>	Araneae	Locally Common			✓	
<i>Philodromus cespitum</i>	Araneae	Locally Common			✓	
<i>Diplostyla concolor</i>	Araneae	Common				✓
<i>Tetragnatha montana</i>	Araneae	Common				✓
<i>Enoplognatha latimana</i>	Araneae	Locally Abundant				✓
<i>Bombus hypnorum</i>	Hymenoptera	Common	✓			
<i>Goedartia alboguttata</i>	Hymenoptera	Rare			✓	
<i>Heteropelma amictum</i>	Hymenoptera	Common			✓	
<i>Inachis io</i>	Lepidoptera	Common		✓		
<i>Mitopus morio</i>	Opiliones	Common		✓		✓
<i>Oligolophus tridens</i>	Opiliones	Common		✓		
<i>Conocephalus fuscus</i>	Orthoptera	Common			✓	

Species new to the MCF

In total there were 59 species deposited in the MCF, of which 14 have notable status (Table 4).

TABLE 4. Species of notable status deposited in the MCF.

Status	Number of species	Species	Order
Uncommon	1	<i>Neoscona adianta</i>	Araneae
Local	3	<i>Mythimna straminea</i>	Lepidoptera
		<i>Argynnis paphia</i>	Lepidoptera
		<i>Milochrista miniara</i>	Lepidoptera
Locally Common	3	<i>Clubiona pallidula</i>	Araneae
		<i>Philodromus cespitum</i>	Araneae
		<i>Theridion pictum</i>	Araneae
Locally Abundant	1	<i>Enoplognatha latimana</i>	Araneae
Migratory	1	<i>Vanesa atalanta</i>	Lepidoptera
Nationally Notable	1	<i>Platycleis albopunctata</i>	Orthoptera
Notable A	1	<i>Eucera longicornis</i>	Hymenoptera
Nationally Scarce	1	<i>Ectobius panzeri</i>	Blattodea
Nationally Scarce B	1	<i>Euplagia quadripunctaria</i>	Lepidoptera
Rare	1	<i>Goedartia alboguttata</i>	Hymenoptera

Note: Due to the large number of common species placed in the MCF, individual specimens are not included.

FUTURE WORK

Once the remaining material has been identified, a second paper with a main emphasis on Diptera as well as Isopoda, Diplopoda and Chilopoda will be published.

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