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# Heteroptera and Diptera surveys on the Ainsdale and Birkdale Hills Local Nature Reserve

by

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## Abstract

This report provides the results of a series of heteroptera and diptera surveys carried out on the Ainsdale and Birkdale Hills local nature reserve. Seven visits were made between April 2017 and July 2019, resulting in 1109 individual records of the presence of a species in a 100m grid square on a specific date. This was part of a wider programme of surveys across a wide range of sites and habitats in Lancashire and Cheshire. A full list is given of the 367 species recorded and their distribution across four habitat zones defined by distance from the shore. Species recorded at this site and nowhere else during these surveys are highlighted and discussed. The species list is interpreted in terms of habitat assemblages using the PANTHEON software available on the website of the Biological Records Centre.

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## INTRODUCTION

This report presents the results of surveys of the Heteroptera (true bugs) and Diptera (true flies) carried out over three summer seasons from 2017 to 2019 at the Ainsdale and Birkdale Hills local nature reserve near Southport in Lancashire. These were part of a wider programme carried by the author from 2012 to 2019 over the whole extent of South Lancashire (VC59) and Cheshire (VC58) with some additional coverage of VC60 north of the Ribble. An overall aim of these surveys has been to assess and compare the biodiversity of the insect fauna across a representative range of habitats with at least a local level of nature conservation interest.

The recording methodology (sweep-netting, with field observation for a few species) and the geographic scope of this programme are described in Brighton (2020). The total number of records accumulated over the region now stands at 3744 for the Heteroptera and 20,249 for the Diptera. Here a record refers to the detection of the species in a 100m square (ie six-figure grid reference) on a specific day. The number of species recorded overall is 177 for the bugs and 1292 for the flies. These figures represent 34% and 39% respectively of the national numbers of species in the families covered in the surveys. For the Heteroptera these were all the terrestrial species plus the aquatic bug family Saldidae, most species of which have a terrestrial lifestyle, giving 521 species in all\*. For the Diptera the range of families covered is specified in Brighton (2020) and currently includes 3300 British species.

Brighton (2020) has analysed the whole dataset to provide various measures of the diptera diversity at 6 individual sites where most surveying has been done and across the whole region where the surveys have been less intensive. One of these is the Ainsdale and Birkdale Hills Local Nature Reserve (LNR), owned and managed by Sefton Metropolitan Borough Council. This is the northernmost portion of the Sefton Coast dune system adjoining the Ainsdale National Nature Reserve (NNR). The dune system is accreting leading to a seaward belt of low dunes and slacks some of which are only a decade or so old, leading to informal designations of these as the “New Green Beach” and the “Newest Green Beach”. There is a long belt mainly of alder separating this part from higher more established dunes with increasing scrub and woodland beyond the coastal road which traverses the whole site. The overall area of the LNR is 296 hectares mainly within the hectad SD31. The whole Sefton Coast is designated as a European Special Area of Conservation (SAC).

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\* [https://www.britishbugs.org.uk/systematic\\_het.html](https://www.britishbugs.org.uk/systematic_het.html)

## SPECIES RECORDED

Figure 1 shows the distribution of the 100m squares surveyed with the number of records in each, while Table 1 shows the dates of visits and numbers of records from four broad habitat subdivisions. While a generally similar itinerary was adopted on each visit, exact replication of the survey squares was not considered necessary. Figure 1 does show that attention was nevertheless focussed in areas with particularly distinctive features. The more southerly of the two red squares (B in Fig 1) covers an area of the New Green Beach around one of the natterjack toad breeding pools, and includes the start of the alder belt, and a fresh-water stream. The red square A at the north end of the survey area includes a tidal creek with salt-marsh vegetation (Figure 2). The cluster of yellow and green squares at C cover the extensive area of slack with early-succession vegetation behind incipient dunes on the Newest Green Beach.

While they were spread over three separate years, the visits were timed to give reasonably even coverage of the seasons, ie mid-April, early and late May, early and late July, mid-August and mid-September. The coverage is strongly biased to the seaward areas, but the more established dunes and slacks inland from the coastal road were also sampled.

Table 2 shows the overall breakdown of species by the broad groups defined in Brighton (2020). Table 3 shows the complete species list with numbers of records. Fifty-one species are marked with an asterisk in the latter, denoting that they have not been recorded anywhere else in the course of the present surveys. These and other features of the species list are discussed next for each group in turn.

All records are publicly available on IRECORD ([www.brc.ac.uk/irecord/](http://www.brc.ac.uk/irecord/)), but have not necessarily all been verified, mainly because of a lack of verifiers for certain families.

### Heteroptera

Hot dry environments are particularly favourable for the true bugs. The number of species recorded may have been limited by the use of sweep-netting alone, so that ground-dwelling species may have been largely missed. Illustrations of species in this section may be found at [www.britishbugs.org.uk](http://www.britishbugs.org.uk).

*Chlorosoma schillingi* is a large bug of the family Rhopalidae, well camouflaged by its elongated shape in the dune grasses on which it feeds. It is near the northern limit of its British species, which is mainly coastal but includes inland populations in Nottinghamshire and East Anglia.

*Gampsocoris punctipes* is a small delicate bug of the family Berytidae with strikingly black-banded legs. Another mainly coastal species, it feeds on rest-harrow (*Ononis repens*), as does the small mirid bug *Macrotylus paykullii*.

*Monosynamma sabulicola* is a nationally scarce grey-black mirid species associated with the widespread creeping willow on the dune system. It is largely confined to the North-West coasts of England and Wales.

The ground-bug *Trapezonotus arenarius* (family Lygaeidae) is regarded as common nationally, and again a mainly coastal species in view of its preference for sandy habitats.

During the 2019 surveys, plant-hoppers and the other families of the Auchenorrhynca were added to the taxonomic scope of these surveys on a trial basis. Several species associated with willow have been found at Birkdale. These are common ones apart from *Sagatus punctifrons*, known from only a few other British locations and with a Red Data Book designation of RDB K, indicating a deficiency of data. This was found in good numbers in 3 separate 100m squares on dwarf willow around the dune slacks. Identification was from keys in the RES handbook (le Quesne, 1969), confirmed by comparison with the le Quesne collection in Liverpool Museum.

### Craneflies

Craneflies are more associated with damp, muddy and swampy habitats, and particularly woodland, than with dry sandy areas, so the Birkdale species list is relatively short. Nevertheless several

characteristic species have been recorded in these surveys. Comprehensive information on habitats and distribution can be found in the Crane-fly Catalogue of the World ([ccw.naturalis.nl](http://ccw.naturalis.nl)).

*Dicranomyia sera* is definitely a salt-marsh species, while *D. ventralis* is more associated with inland water margins. The two black and yellow “tiger crane-fly” *Nephrotoma* species *quadristriata* and *submaculosa* are sand-dune specialists. The first has a national rarity designation, but has been recorded on several occasions on these surveys, so the population appears to be well-established. The identification of *Pilaria decolor* is not entirely certain, but the location of capture in the alder scrub belt is consistent with its documented habitat.

Although the small yellow Limoniid crane-fly *Gonomyia tenella* is not unique to Birkdale in these surveys, it is notable that it was found repeatedly in the early-stage slack of the Newest Green beach, including a mixed swarm (10 males and 8 females) in the early May visit. Isolated males were caught in both the July visits. This is a nationally scarce species, favouring the coast in Wales, but mostly inland locations in England.

### Hoverflies

Amongst the 6 sites analysed by Brighton (2020), Birkdale was the one with the lowest proportion of hoverfly records. None of the species recorded here is unusual or has a coastal preference, with the partial exception of *Tropidia scita* which is associated with reed-beds and has a certain coastal tendency. The reasons for this lack are not clear, given the variety of flowering plants at the site, though during the surveys I encountered no significant patches of hogweed or other Apiaceae that are usually the best place to find hoverflies.

### Empidoidea

This is a large superfamily of flies, mostly quite small and predatory as adults. Of the component families, the Dolichopodidae are particularly noted for being specific to various wetland habitats including many coastal species. *Dolichopus acuticornis*, *D. notatus*, *D. sabinus*, *Hydrophorus oceanus* and *Tachytrechus insignis* appear on Plant and Drake’s (2013) list of 27 dolichopodids almost or entirely restricted to coastal habitat in Britain. The Empididae and Hybotidae by contrast have relatively few coastal species. Amongst these is the large genus *Platypalpus* of particularly small flies, often swept from the leaves of scrub where they run around in search of prey. The species highlighted in Table 4 are generally scarce but with no special coastal affiliation apart from the sand-dune specialist *P. strigifrons*.

### Calyptrates

This is the group of the most highly evolved flies, and also the largest considered in this report with over 1000 species nationally. They are typified by the common house-fly (family Muscidae) and the blue-bottle (family Calliphoridae) in being generally stout and bristly, mostly grey or brown, though a few display metallic colours. There is a large range of life-styles including parasitism of other invertebrates in the Rhinophoridae and Tachinidae, and some of the Sarcophagidae. The Scathophagidae includes the common yellow dung-fly, *Scathophaga stercoraria*, the most frequently recorded of all flies in these surveys. Yet this family, as well as the Anthomyiidae, includes many whose larvae attack live plants, often producing leaf-mines or other signs of their activity. Finally, the Fanniidae are the lesser house-flies, many associated with bird-nests.

The Anthomyiidae include many very common species but have been little recorded recently because of a lack of reliable identification resources. The *Delia* species highlighted in Table 3 are all coastal species. The genus *Egle* are associated with willow species as pollinators whose larvae consume the developing seeds in what is possibly a symbiotic relationship. It appears that it is quite common for several species to co-exist in the same stand of willows (Jones, 2018), though records are limited as the taxonomy of the group has only recently been clarified. However, *E. brevicornis* appears to be more limited in its habitats in being mainly confined to creeping willow, mostly in coastal locations (Bratton & Ackland, 2015). It was given a national provisional conservation status of “near

threatened” by Falk and Pont (2017). It appears that the species has not been recorded previously on the Lancashire coast.

*Fucellia* species frequent seaweed on beaches and the two species listed in Table 4 are found all around the British coast. *Heterostylodes* species are small and black and can be abundant, as here, in sandy places where their larvae are to be found in the flowerheads of Asteraceae. *Zaphne* species are large and black and are found rather infrequently in wet or marshy places, though not specifically coastal.

None of the Calliphoridae or Fanniidae found at Birkdale have any preferences for coastal locations. Amongst the Muscidae, members of the large genus *Coenosia* are mostly swept from short vegetation, though that may be because the small size of most species means that they keep close to the ground in lush surroundings. The larvae of some species have been shown to be predators of other fly larvae in the soil. *C. minutalis* is a coastal species listed as near threatened by Falk and Pont (2017), and the same applies to *C. verralli*.

The genus *Helina* also has many species of a typical house-fly size. *H. confinis* seems to be mainly coastal in Wales and western England, though occurring inland in the east. Falk and Pont (2017) have given conservation designations to the coastal species *H. parcepilosa* (near-threatened) and *H. protuberans* (nationally scarce). The world-wide distribution and habitats of *H. parcepilosa* have been recently documented by Harris and Gloaguen (2019). The ovipositor of *H. protuberans* is equipped with spines for digging in the sand.

*Limnophora nigripes* is a small muscid associated with sand and gravel banks around inland waters, given a provisional status of “near threatened” by Falk and Pont (2017). They list *Lispocephala rubricornis* as a nationally scarce species of coastal slacks and salt marshes: this small fly has not been recorded previously on the Lancashire coast. *Spilogona veterrima* is another nationally scarce species confined to the western coasts.

The Rhinophoridae are parasites of wood-lice, so the fair number of records of the common *Rhinophora lepida* may indicate a sizeable population of the hosts.

The family of flesh-flies Sarcophagidae is mainly tropical (Pape, 1987), and British members are particularly noticeable when resting on tarmac or rocks under a hot sun. They are very alert and hard to catch in such situations. The larvae pursue various parasitoid life-styles, as well as being found in dung and carrion, where they may be predators. The nationally scarce *Sarcophila latifrons* is a coastal species, possibly parasitising grass-hoppers.

The five *Scathophaga* species recorded are all dung-flies, with *S. litorea* being a purely coastal species not straying far from the beach. The other Scathophagid *Delina nigrita* is a leaf-miner on orchids.

The Tachinidae are parasitoids on other insects, mostly Lepidoptera (Belshaw, 1993). The *Macquartia* species attack Chrysomelid beetles. *Siphona geniculata* attacks Tipulid craneflies, and is often numerous on Asteraceae probing for nectar with its long hinged proboscis. The main known host of *Triarthria setipennis* is the common earwig.

#### Other Diptera

As this group includes a large number of diverse families, only those highlighted in Table 3 as unique to Birkdale in these surveys will be mentioned here.

The large family Chloropidae have received rather little attention in these surveys, and are outside the taxonomic scope as defined in Brighton (2020). They are mostly small species in the short vegetation attacked by their larvae. Suction-sampling is a favoured technique for collecting them. A complete identification guide to British species is not yet available. However, I swept an unusual fly from by the tidal creek near the north end of the site (point A in Figure 1) which turned out to be *Eurina lurida*, the largest British member of the family (see Figure 2). This species is known to cause galls in sea club-rush (*Bolboschoenus maritimus*), though this has been recorded only in Israel (Redfern *et al*, 2002).

The species has been provisionally designated as near-threatened (Falk *et al* 2016) and this is the first record for the North-West England (Brighton 2018).

Surprisingly few mosquitoes were encountered on this site, given the extent of standing waters. The records of *Culiseta litorea* are uncertain, this being a coastal species, but previously recorded only in southern England and Wales.

The Heleomyzidae and Lauxaniidae are two of the more easily identifiable families amongst the Acalyptrate division of the Diptera. In the former most species have a row of strong spines along the leading edge of the wing (the costa). The latter family includes many species associated with fungi in woods, but Ball (2012) notes that some species of *Homoneura*, *Minettia* and *Calliopum* are adapted to drier, more open habitats like dunes and grasslands, as is seen in the Table 3. *Minettia fasciata* is amongst the 96 commonest species accounting for over 50% of the records the overall survey, but the number of records shows that it has a particular affinity for the coastal environment (see Table 5 in Brighton, 2020). The Psilidae are an Acalyptrate family with phytophagous larvae such as *Chamaepsila rosae* which is the notorious carrot fly. The other *Chamaepsila* species from Birkdale seem to have a preference for the coast.

The Sciomyzidae are the snail-killing flies, which have been found to be rather abundant at Birkdale, indicating a high population of the molluscs on which the larvae feed. *Pherbellia cinerella* is another species in the top 96 of the overall survey which a highly significant concentration of records at Birkdale, though also widespread at inland sites. Three of the 18 species listed for Birkdale in Table 3 are unique to the site in these surveys, though only *Pherbellia nana* has a national conservation designation. *P. dubia* was particularly numerous all along the open areas of the Green Beach on 31 May 2018, though Ball (2017) describes it as common in damp, shaded woodlands.

The site list for the Tephritidae has a particularly large proportion of species recorded only from this site during these surveys. This is a family in which the adults mostly have bold patterns of stripes or spots on the wings, so that they are often called “picture-wing” flies. The larvae develop in the flowers, seeds, fruits, leaves, stems or roots of plants. Ball (2012) describes the family as “good fliers” and several species have been spreading northwards over the past few decades. For instance, White (1988) described *Acanthiophilus helianthi* as very rare and recorded recently only from Hampshire, Kent, London and Pembrokeshire. The Birkdale records from 2019 appear to be the first for Lancashire and Cheshire. *Tephritis matricariae* is also new to the region, having been first reported in Britain only twenty years ago (Clemons, 2000).

Most of the species listed have a range of common food-plants, particularly in family Asteraceae. White (1988) has *Campiglossa plantaginis* as limited to sea aster (*Aster tripolium*), but I have also found it at Martin Mere and Wigan Flashes. *Rhagoletis alternata* attacks roses and so may have been attracted by the *Rosa rugosa* present on the site just inland from the alder scrub line: its contribution to the control of this invasive plant may be modest, though it was tested as a biocontrol agent in New Zealand.

So apart from *C. plantaginis*, the number of species appearing at this coastal location may be attributed to the relatively warm and dry conditions, as is also indicated by the spread of several species across the country from the south-east.

Finally, the list of stiletto-flies Therevidae includes three species associated with specific to sand dunes. *Dialineura analis* has been designated as nationally scarce. *Thereva nobilitata* is the commonest and most widespread of its genus, but nevertheless described as elusive by Stubbs and Drake (2014).

## PANTHEON ANALYSIS

In view of the complexity in interpreting the data on individual species, it has been found more informative to assess the results in terms of the ecological characteristics of groups of species using

the PANTHEON software. This is based on a database relating invertebrate species to their associated feeding characteristics as larvae and adults, habitats, conservation status and other ecological associations: it was originally developed as a tool for assessing SSSI quality in the Invertebrate Species-habitat Information System (ISIS) of English Nature (Webb & Lott, 2007), but in 2018 it was made publicly available for wider use by the Biological Record Centre under the new name with a user-friendly web-based interface at [www.brc.ac.uk/pantheon](http://www.brc.ac.uk/pantheon).

PANTHEON currently contains data for about 13,000 of the 37,000 species of the macro-invertebrate fauna of England. All British heteroptera species are covered. 3597 diptera species are included, just over half the British list. The analysis for this report uses simply the species lists in Table 3: it should be noted that the numbers of records are not used in the analysis, so each species has equal weight.

PANTHEON provides a variety of ways of analysing the data and presenting the results, from which a selection has been used for this report, as follows.

Figure 3 shows the breakdown of the combined species list across the sites by feeding guild\*. For both larvae and adults predators are the largest category. Larvae feeding on decaying matter and herbivores on live plants each contribute around a quarter. For adults nectar-feeding species contribute over a quarter, while non-feeders, herbivores and saprophagous species are also significant proportions. The nectar-feeding adult species include Muscidae (houseflies), Syrphidae (hoverflies) and other smaller fly families, showing the importance of this resource. These charts also illustrate the point that species generally require different food resources as larvae and adults.

Table 4 shows the results from PANTHEON for the number of species associated with each habitat represented in the data. As some species have multiple associations, some habitats appearing on the Table, such as peatland, are not directly relevant. The figure for representation is the number of species recorded as a proportion of the total number in the PANTHEON database for that habitat. The guidance states that 10-20% may indicate good quality while 21% or more certainly suggests a good proportion of characteristic species. As these surveys cover species constituting only about a third of the PANTHEON data, it is considered that 7% be taken as this threshold for a significant representation. This figure is reached for brackish pools and ditches and rather anomalously for rocky shores under the coastal biotope, but this is quite a small minority of the total number of species recorded: most have associations with inland habitats.

Each species in the PANTHEON database is assigned a species quality score (SQS) according to their conservation status. Non-designated species score 1 while the SQS increases from 4 to 32 as one progresses from the nationally scarce or notable to the rarest categories such as critically endangered. The SQI is 100 times the sum of the scores divided by the number of species, so that 100 indicates a lack of any designated species. Scores of over 200 are reached for short sward and bare ground, for salt-marsh, for brackish pools and ditches, and for sandy beach. These are the habitats most characteristic of the site, but there are significant numbers of designated species with non-coastal habitat associations.

Brighton (2020) discusses the proportions of the habitat associations further in a comparison with 5 other major sites. That report also includes the estimation of alpha and beta diversity measures based on the numbers of records for each Diptera species. The broad outcome of this analysis is that although the Birkdale site did not provide an exceptionally large number of diptera species, the species assemblage at the site was the most distinct from the others, both in terms of pairwise comparisons and in comparison with the total composition of the regional dataset for diptera. These differences are only partly attributable to the presence of purely coastal species, and reflect varying degrees of tolerance to coastal conditions amongst the more common and widespread species.

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\* Out of the 367 species recorded from Birkdale in this survey, 318 have data entries in PANTHEON.



An interesting further insight from the review of the species list in this report is the almost complete absence from the dataset of hoverfly (Syrphidae) and soldierfly (Stratiomyiidae) species with strong coastal associations. Conversely, coastal species of Anthomyiidae and Muscidae seem particularly well represented.

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## TABLES

**Table 1:** numbers of heteroptera and diptera records by date and area

Date	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
04/07/2017	1		108		109
15/04/2018		2	42	19	63
31/05/2018	37	45	78	35	195
17/08/2018		26	145		171
17/09/2018	38	49	29	28	144
07/05/2019		37	64	83	184
30/07/2019		82	161		243
<b>Totals</b>	<b>76</b>	<b>241</b>	<b>627</b>	<b>165</b>	<b>1109</b>

**Table 2:** numbers of species recorded by area

Group	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Whole site
HETEROPTERA	9	20	29	11	42
CRANEFLIES	4	16	17	9	29
HOVERFLIES	0	10	15	5	19
EMPIDOIDEA	9	26	34	15	53
CALYPTRATES	21	36	76	28	102
OTHER DIPTERA	15	50	79	41	122
<b>Totals</b>	<b>58</b>	<b>158</b>	<b>250</b>	<b>109</b>	<b>367</b>

**Table 3:** count of records for individual species by area. \* denotes species not found at any other sites in the present series of surveys (Brighton, 2020)

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<b>HETEROPTERA</b>					
PLANT BUGS & ALLIES					
<i>Adelphocoris lineolatus</i>			1		1
<i>Anthocoris nemoralis</i>		2	3		5
<i>Anthocoris nemorum</i>	1	2	3		6
<i>Berytinus minor</i>		1			1
<i>Blepharidopterus angulatus</i>		3			3
* <i>Chorosoma schillingi</i>			2		2
<i>Closterotomus norwegicus</i>		1	4		5
<i>Corizus hyoscyami</i>	2	2	1	1	6
<i>Cymus glandicolor</i>		1	5	1	7
<i>Deraeocoris flavilinea</i>			1		1
<i>Dicyphus epilobii</i>		3			3
* <i>Gampsocoris punctipes</i>	2			1	3
<i>Heterotoma planicornis</i>		1	1		2
* <i>Himacerus major</i>		1			1
<i>Kleidocerys resedae</i>				1	1
<i>Lopus decolor</i>			1		1
<i>Lygocoris pabulinus</i>		1			1
<i>Lygus maritimus</i>	1				1
<i>Lygus rugulipennis</i>			1		1
* <i>Macrotylus paykullii</i>			3		3
* <i>Monosynamma sabulicola</i>			3		3
<i>Myrmus miriformis</i>		2	5		7
<i>Nabis flavomarginatus</i>			1		1
<i>Notostira elongata</i>	1		3		4
<i>Orius majusculus</i>				1	1
<i>Orius niger</i>				1	1
<i>Orthops campestris</i>		4	1		5
<i>Phytocoris varipes</i>			3		3
<i>Pinalitus cervinus</i>		1			1
<i>Plagiognathus arbustorum</i>		3	2		5
<i>Plagiognathus chrysanthemi</i>		1	2	1	4
<i>Scolopostethus thomsoni</i>			1		1
<i>Stenodema calcarata</i>	1	1	5		7
<i>Stenodema laevigata</i>				1	1
<i>Teratocoris saundersi</i>			1		1
<i>Tingis ampliata</i>			1	1	2
* <i>Trapezonotus arenarius</i>	1		1		2
<i>Trigonotylus ruficornis</i>			3		3

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<b>SHIELDBUGS &amp; ALLIES</b>					
<i>Aelia acuminata</i>	1		2	1	4
<i>Dolycoris baccarum</i>	2	2	5	2	11
<i>Palomena prasina</i>		1	1		2
<i>Picromerus bidens</i>		1			1
<b>Count of records (Heteroptera)</b>	<b>12</b>	<b>34</b>	<b>66</b>	<b>12</b>	<b>124</b>
<b>CRANEFLIES</b>					
<i>Cheilotrichia cinerascens</i>				1	1
<i>Dicranomyia autumnalis</i>			1		1
<i>Dicranomyia chorea</i>				1	1
<i>Dicranomyia modesta</i>	2	1	1		4
<i>Dicranomyia sera*</i>			1		1
<i>Dicranomyia ventralis*</i>			1		1
<i>Dicranophragma adjunctum</i>		1	1		2
<i>Gonomyia tenella</i>			4		4
<i>Helius longirostris</i>		1			1
<i>Limonia flavipes</i>				1	1
<i>Molophilus appendiculatus</i>			1		1
<i>Molophilus griseus</i>	1	1			2
<i>Molophilus obscurus</i>		4	4	3	11
<i>Nephrotoma appendiculata</i>			1		1
<i>Nephrotoma quadristriata*</i>			5		5
<i>Nephrotoma submaculosa*</i>		1	1		2
<i>Ormosia hederæ</i>				3	3
<i>Phylidorea ferruginea</i>		2	3	1	6
<i>Pilaria decolor*</i>		1			1
<i>Prionocera turcica</i>			1		1
<i>Ptychoptera albimana</i>		2			2
<i>Ptychoptera contaminata</i>		1			1
<i>Symplecta hybrida</i>			2		2
<i>Symplecta stictica</i>		2	12		14
<i>Tipula lateralis</i>		1			1
<i>Tipula oleracea</i>	1	4	6	1	12
<i>Tipula paludosa</i>	1	3			4
<i>Tipula vernalis</i>		1		2	3
<i>Tricyphona immaculata</i>		1	1	2	4
<b>Count of records (Craneflies)</b>	<b>5</b>	<b>27</b>	<b>46</b>	<b>15</b>	<b>93</b>
<b>HOVERFLIES</b>					
<i>Baccha elongata</i>		1			1
<i>Cheilosia bergenstammi</i>		1	2		3

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Cheilosia illustrata</i>		1	1		2
<i>Cheilosia pagana</i>			2		2
<i>Dasysyrphus albostriatus</i>			2		2
<i>Episyrphus balteatus</i>		3	6		9
<i>Eristalis pertinax</i>		1			1
<i>Eumerus strigatus</i>			1		1
<i>Eupeodes corollae</i>		1			1
<i>Helophilus pendulus</i>		1	1		2
<i>Melanogaster hirtella</i>			1		1
<i>Melanostoma mellinum</i>			4	2	6
<i>Melanostoma scalare</i>		1	2	1	4
<i>Neoscia tenur</i>			1	2	3
<i>Platycheirus angustatus</i>				1	1
<i>Platycheirus clypeatus</i>		1	1		2
<i>Platycheirus fulviventris</i>			1		1
<i>Sphaerophoria scripta</i>			8	1	9
<i>Tropidia scita</i>		1	1		2
<b>Count of records (Hoverflies)</b>	<b>0</b>	<b>12</b>	<b>34</b>	<b>7</b>	<b>53</b>
<b>EMPIDOIDEA</b>					
<b>DOLICHOPODIDAE</b>					
<i>Argyra leucocephala</i>		1			1
<i>Campsicnemus curvipes</i>		1	2		3
<i>Campsicnemus scambus</i>	1	2	2		5
<i>Chrysotus pulchellus*</i>		1			1
<i>Dolichopus acuticornis*</i>			1		1
<i>Dolichopus claviger</i>				1	1
<i>Dolichopus longicornis</i>			1		1
<i>Dolichopus notatus</i>		1	3		4
<i>Dolichopus nubilus</i>			3		3
<i>Dolichopus plumipes</i>		1		1	2
<i>Dolichopus sabinus</i>			1		1
<i>Dolichopus simplex</i>			1		1
<i>Dolichopus unguatus</i>	1	2	2		5
<i>Hercostomus aerosus</i>		1			1
<i>Hercostomus assimilis*</i>				1	1
<i>Hercostomus nigripennis</i>		1	1		2
<i>Hydrophorus oceanus</i>			2		2
<i>Medetera saxatilis*</i>			1		1
<i>Rhaphium appendiculatum</i>		1	1		2
<i>Sybistroma obscurellum</i>		1			1
<i>Sympycnus desoutteri</i>	2	3	11	5	21

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Syntormon denticulatum</i>				1	1
<i>Syntormon pallipes</i>			4	1	5
<i>Tachytrechus insignis*</i>			3		3
<i>Tachytrechus notatus</i>			1		1
<i>Xanthochlorus galbanus</i>			1		1
<b>EMPIDIDAE</b>					
<i>Dolichocephala oblongoguttata</i>		1			1
<i>Empis nigripes</i>			1		1
<i>Empis opaca</i>			1		1
<i>Empis punctata</i>	2	3	2		7
<i>Empis tessellata</i>		2		2	4
<i>Empis trigramma</i>				1	1
<i>Hilara litorea</i>			1		1
<i>Hilara lundbecki</i>		2	6		8
<i>Hilara maura</i>			1	2	3
<i>Rhamphomyia geniculata</i>			1	1	2
<i>Rhamphomyia maculipennis</i>			1		1
<i>Rhamphomyia tarsata</i>				2	2
<i>Rhamphomyia tibiella</i>			1		1
<i>Rhamphomyia variabilis</i>	1	1			2
<b>HYBOTIDAE</b>					
<i>Bicellaria vana</i>	1			2	3
<i>Hybos culiciformis</i>		1	8		9
<i>Hybos femoratus</i>		2	1		3
<i>Platypalpus annulipes</i>		1			1
<i>Platypalpus excisus*</i>	1		1		2
<i>Platypalpus longicornis</i>			1	1	2
<i>Platypalpus longiseta</i>		1	1		2
<i>Platypalpus minutus</i>	1	1			2
<i>Platypalpus niger*</i>		1			1
<i>Platypalpus notatus</i>			1	1	2
<i>Platypalpus pallidiventris</i>		1			1
<i>Platypalpus strigifrons</i>	1	2	1		4
<i>Trichina elongata</i>		1		1	2
<b>Count of records (Empidoidea)</b>	<b>11</b>	<b>36</b>	<b>70</b>	<b>23</b>	<b>140</b>
<b>CALYPTRATES</b>					
<b>ANTHOMYIIDAE</b>					
<i>Anthomyia confusanea</i>	1				1
<i>Anthomyia liturata</i>	1	1	2		4
<i>Anthomyia procellaris</i>		2			2
<i>Botanophila fugax</i>			5	1	6

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Botanophila seneciella</i>	1	1	4	1	7
<i>Botanophila sonchi</i>			2		2
<i>Delia albula*</i>			2		2
<i>Delia coarctata</i>	1	1	6		8
<i>Delia florilega</i>			2		2
<i>Delia penicillosa*</i>	3		8		11
<i>Delia platura</i>	1		19	1	21
<i>Delia setigera*</i>	1		9		10
<i>Egle brevicornis*</i>			2		2
<i>Egle ciliata</i>			2		2
<i>Egle lyneborgi*</i>			1		1
<i>Egle minuta</i>			2	1	3
<i>Fucellia maritima</i>			4		4
<i>Fucellia tergina*</i>			1		1
<i>Heterostylodes pilifer*</i>		1	3		4
<i>Hydrophoria ruralis</i>				1	1
<i>Hylemya variata</i>		2		1	3
<i>Lasiomma seminitidum</i>				1	1
<i>Paradelia intersecta</i>				4	4
<i>Pegoplata aestiva</i>			1		1
<i>Pegoplata infirma</i>			1	1	2
<i>Phorbia sepia</i>			3		3
<i>Subhylemya longula</i>			3		3
<i>Zaphne divisa*</i>	1				1
CALLIPHORIDAE					
<i>Bellardia viarum</i>				1	1
<i>Bellardia vulgaris</i>				2	2
<i>Calliphora vicina</i>	1				1
<i>Lucilia silvarum</i>			1		1
<i>Melanomya nana</i>		3	1		4
<i>Pollenia labialis</i>	1			1	2
FANNIIDAE					
<i>Fannia genualis</i>		1	1		2
<i>Fannia postica</i>		1			1
<i>Fannia serena</i>		1			1
<i>Fannia similis</i>				2	2
<i>Fannia sociella</i>		1	1		2
MUSCIDAE					
<i>Coenosia antennata</i>			2		2
<i>Coenosia femoralis</i>			1		1
<i>Coenosia infantula</i>			1		1
<i>Coenosia lacteipennis</i>			7		7

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Coenosia minutalis</i> *			2		2
<i>Coenosia mollicula</i>		2	2		4
<i>Coenosia pedella</i>	1		1		2
<i>Coenosia pumila</i>	2	3	6	6	17
<i>Coenosia ruficornis</i>			2		2
<i>Coenosia testacea</i>	2	2	8	2	14
<i>Coenosia tigrina</i>			2	1	3
<i>Coenosia verralli</i>	3	2	3	1	9
<i>Hebecnema nigra</i>		1			1
<i>Hebecnema vespertina</i>		2			2
<i>Helina confinis</i> *			2		2
<i>Helina depuncta</i>		2	1		3
<i>Helina evectora</i>			3	2	5
<i>Helina impuncta</i>	1	1		1	3
<i>Helina obscurata</i>			1		1
<i>Helina parcepilosa</i>		1	1		2
<i>Helina protuberans</i>		1	5		6
<i>Helina reversio</i>	4	2	5	1	12
<i>Helina setiventris</i>			1		1
<i>Limnophora maculosa</i>			1		1
<i>Limnophora nigripes</i> *			3		3
<i>Limnophora tigrina</i>		1	4		5
<i>Limnophora triangula</i>			1		1
<i>Lispe pygmaea</i>	1	1	3	1	6
<i>Lispe tentaculata</i>			1		1
<i>Lispocephala erythrocerata</i>		1	5	3	9
<i>Lispocephala rubricornis</i> *			2		2
<i>Phaonia angelicae</i>		1			1
<i>Phaonia errans</i>		2	1		3
<i>Phaonia palpata</i>		1			1
<i>Schoenomyza litorella</i>	1		7	1	9
<i>Spanochaeta dorsalis</i>		1	1		2
<i>Spilogona aerea</i>			2		2
<i>Spilogona marina</i>			5		5
<i>Spilogona veterrima</i> *	1				1
RHINOPHORIDAE					
<i>Rhinophora lepida</i>		3	3		6
SARCOPHAGIDAE					
<i>Metopia argyrocephala</i>			1		1
<i>Ravinia pernix</i> *			1		1
<i>Sarcophaga filia</i> *			1		1
<i>Sarcophaga haemorrhoida</i>		2	1		3



Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Sarcophaga nigriventris</i>			3		3
<i>Sarcophaga pumila</i>			2		2
<i>Sarcophaga teretirostris</i> *			1		1
<i>Sarcophila latifrons</i> *			1		1
SCATHOPHAGIDAE					
<i>Delina nigrita</i> *		1			1
<i>Scathophaga furcata</i>			2		2
<i>Scathophaga inquinata</i>				1	1
<i>Scathophaga litorea</i>			8		8
<i>Scathophaga stercoraria</i>	1	1	5	6	13
<i>Scathophaga suilla</i>		1			1
TACHINIDAE					
<i>Blondelia nigripes</i>			1		1
<i>Lypha dubia</i>		1		2	3
<i>Macquartia grisea</i>			1		1
<i>Macquartia tenebricosa</i>			1		1
<i>Phryxe vulgaris</i>			1		1
<i>Platymya fimbriata</i>			1		1
<i>Ramonda spathulata</i>				1	1
<i>Siphona geniculata</i>		4	9	1	14
<i>Triarthria setipennis</i> *	1				1
<b>Count of records (Calyptrates)</b>	<b>30</b>	<b>55</b>	<b>221</b>	<b>48</b>	<b>354</b>
OTHER DIPTERA					
ANISOPODIDAE					
<i>Sylvicola cinctus</i>			1	1	2
<i>Sylvicola punctatus</i>		1	1		2
ASILIDAE					
<i>Dysmachus trigonus</i>	1				1
ASTEIIDAE					
<i>Asteia amoena</i>		1			1
BIBIONIDAE					
<i>Bibio johannis</i>			3	2	5
<i>Bibio leucopterus</i>				3	3
<i>Bibio marci</i>			2	2	4
<i>Bibio nigriventris</i>				1	1
<i>Dilophus febrilis</i>	1	1	2	1	5
<i>Dilophus femoratus</i>		2	5	4	11
CAMPICHOETIDAE					
<i>Campichoeta obscuripennis</i>				1	1
CHLOROPIDAE					
<i>Chlorops hypostigma</i> *				1	1

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Elachiptera cornuta</i>		1	1		2
<i>Eurina lurida</i> *			1		1
<i>Meromyza pratorum</i> *			3		3
CULICIDAE					
<i>Culex pipiens</i>				1	1
<i>Culiseta litorea</i> *		1		1	2
DIASTATIDAE					
<i>Diastata adusta</i>			1	1	2
DIXIDAE					
<i>Dixa aestivalis</i>			1		1
DROSOPHILIDAE					
<i>Lordiphosa andalusiaca</i>		1			1
<i>Scaptomyza flava</i>		1	1		2
<i>Scaptomyza graminum</i>				1	1
<i>Scaptomyza pallida</i>		3	4		7
EPHYDRIDAE					
<i>Discomyza incurva</i>				1	1
HELEOMYZIDAE					
<i>Heteromyza commixta</i>			1		1
<i>Neoleria maritima</i> *	2				2
<i>Suillia flava</i>		1			1
<i>Suillia laevifrons</i>			1		1
<i>Suillia variegata</i>		2			2
<i>Tephrochlaena oraria</i>			1		1
LAUXANIIDAE					
<i>Calliopum aeneum</i>		1			1
<i>Calliopum elisae</i>				1	1
<i>Calliopum geniculatum</i> *				1	1
<i>Homoneura notata</i> *		1	1		2
<i>Lauxania cylindricornis</i>		1		4	5
<i>Meiosimyza illota</i>		1			1
<i>Meiosimyza rorida</i>		1			1
<i>Meiosimyza subfasciata</i>		2			2
<i>Minettia fasciata</i>	1	5	15	2	23
<i>Minettia lupulina</i>			1	1	2
<i>Minettia plumicornis</i> *			1		1
<i>Minettia tubifer</i>			1		1
<i>Sapromyza quadripunctata</i>	1	2	4		7
<i>Sapromyza sexpunctata</i>	1	1			2
<i>Tricholauxania praeusta</i>		1			1
LONCHOPTERIDAE					
<i>Lonchoptera bifurcata</i>			3	3	6

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Lonchoptera lutea</i>		4	5	1	10
MICROPEZIDAE					
<i>Micropeza corrigiolata</i>			1		1
OPETIIDAE					
<i>Opetia nigra</i>		1			1
OPOMYZIDAE					
<i>Geomyza balachowskyi</i>			1		1
<i>Geomyza tripunctata</i>		1	2	1	4
<i>Opomyza germinationis</i>			1		1
<i>Opomyza petrei</i>		3	2	2	7
PALLOPTERIDAE					
<i>Palloptera modesta</i>			1		1
<i>Palloptera quinquemaculata</i>				1	1
<i>Palloptera trimacula</i>			1		1
PSILIDAE					
<i>Chamaepsila buccata*</i>		2	3		5
<i>Chamaepsila clunalis</i>				2	2
<i>Chamaepsila nigra</i>		1	1	1	3
<i>Chamaepsila rosae</i>		1	1	1	3
RHAGIONIDAE					
<i>Chrysopilus cristatus</i>		5	6	1	12
<i>Rhagio lineola</i>		2	4		6
<i>Rhagio scolopaceus</i>				1	1
SCIARIDAE					
<i>Schwenckfeldina carbonaria</i>		1	1	1	3
<i>Sciara hemerobioides</i>		1	2		3
SCIOMYZIDAE					
<i>Coremacera marginata</i>	1	1	1		3
<i>Dichetophora oblitterata*</i>			1		1
<i>Ilione albiseta</i>		1	2		3
<i>Ilione lineata</i>			1		1
<i>Limnia paludicola</i>	1				1
<i>Limnia unguicornis</i>				1	1
<i>Pherbellia cinerella</i>	3	4	22	2	31
<i>Pherbellia dubia*</i>			4		4
<i>Pherbellia griseola</i>		1			1
<i>Pherbellia nana*</i>			1		1
<i>Pherbellia schoenherri</i>		1	1		2
<i>Pherbellia ventralis</i>		1	3	2	6
<i>Pherbina coryleti</i>			3		3
<i>Sepedon sphegea</i>			2		2
<i>Tetanocera arrogans</i>		1			1

Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Tetanocera elata</i>			1	1	2
<i>Tetanocera ferruginea</i>		2			2
<i>Tetanocera robusta</i>			1		1
SEPSIDAE					
<i>Nemopoda nitidula</i>		1			1
<i>Sepsis cynipsea</i>		1	4	2	7
<i>Sepsis flavimana</i>	1				1
<i>Sepsis fulgens</i>			2		2
<i>Sepsis violacea</i>			1		1
<i>Themira lucida</i>			1		1
<i>Themira minor</i>	1		3		4
SPHAEROCERIDAE					
<i>Copromyza nigrina</i>				1	1
<i>Copromyza stercoraria</i>		2	1	1	4
<i>Leptocera fontinalis</i>		1			1
<i>Leptocera nigra</i>			2		2
<i>Lotophila atra</i>			2	2	4
<i>Opacifrons coxata</i>	1			1	2
<i>Opacifrons humida</i>			2		2
<i>Rachispoda lutosa</i>			1		1
STRATIOMYIDAE					
<i>Beris clavipes</i>				1	1
<i>Beris vallata</i>		1	1		2
<i>Chloromyia formosa</i>			1		1
<i>Chorisops tibialis</i>			1		1
<i>Oplodontha viridula</i>		1	6		7
<i>Oxycera trilineata</i>			2		2
TEPHRITIDAE					
<i>Acanthiophilus helianthi*</i>			3		3
<i>Anomoia purmunda</i>		1			1
<i>Campiglossa plantaginis</i>			6		6
<i>Ensina sonchi</i>	1				1
<i>Euleia heracleii*</i>		1	1		2
<i>Rhagoletis alternata*</i>			2		2
<i>Sphenella marginata</i>			2		2
<i>Tephritis matricariae*</i>			2		2
<i>Tephritis vespertina</i>	1		5	1	7
<i>Terellia serratulae*</i>			2		2
<i>Xyphosia miliaria</i>			1		1
THEREVIDAE					
<i>Acrosathe annulata</i>	1				1
<i>Dialineura analis*</i>			2		2

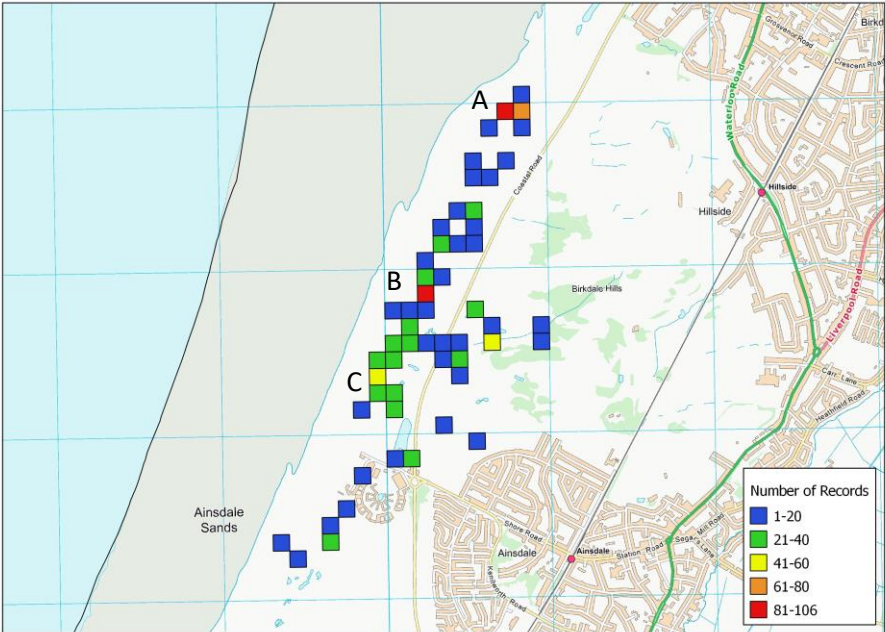
Groups, families and species	Ainsdale	Birkdale - scrub belt	Birkdale Green Beach	Birkdale Hills	Totals
<i>Thereva bipunctata*</i>			1		1
<i>Thereva nobilitata</i>		2			2
TRIXOSCELIDAE					
<i>Trixoscelis obscurella</i>			1		1
ULIDIIDAE					
<i>Melieria omissa</i>			2		2
<i>Rivellia syngenesiae</i>		1			1
<b>Count of records (Other Diptera)</b>	<b>18</b>	<b>77</b>	<b>190</b>	<b>60</b>	<b>345</b>

**Table 3:** PANTHEON habitat scores for Birkdale

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status
<b>open habitats</b>	tall sward & scrub	101	4	109	2
<b>tree-associated</b>	shaded woodland floor	69	6	100	
<b>wetland</b>	peatland	52	5	141	5
<b>wetland</b>	marshland	48	6	142	3
<b>open habitats</b>	short sward & bare ground	30	2	204	6
<b>wetland</b>	running water	28	3	168	3
<b>coastal</b>	saltmarsh	19	6	244	3
<b>wetland</b>	wet woodland	15	6	100	
<b>tree-associated</b>	wet woodland	13	5	100	
<b>coastal</b>	brackish pools & ditches	10	8	218	2
<b>tree-associated</b>	arboreal	7	<1	100	
<b>coastal</b>	sandy beach	5	5	300	1
<b>coastal</b>	rocky shore	3	8	100	
<b>tree-associated</b>	decaying wood	3	<1	100	1
<b>open habitats</b>	upland	2	1	100	
<b>wetland</b>	lake	1	<1	400	1

FIGURES

**Figure 1.** Map of the 100m survey squares with numbers of records in each. A marks the location of the tidal creek shown in Figure 2, B marks the natterjack breeding pool on the New Green Beach, and C is the Newest Green Beach.



**Figure 2.** The tidal creek at SD307149 (A in Fig. 1) and (inset) the Chloropid *Eurina lurida* found there



**Figure 3:** PANTHEON results for numbers of species by feeding guild (318 species analysed)

