

**INVERTEBRATE SURVEY AND ASSESSMENT
FOR WEST THURROCK LAGOONS 2005**

This report was written by

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1 SUMMARY

- 1.1 Although the whole of the last set of trap material remains to be sorted and identified, and a considerable amount of Hemiptera/Heteroptera material is also still to be identified, the results indicate without any doubt whatsoever that the West Thurrock lagoons are of national importance for their invertebrate assemblage.
- 1.2 At the moment a total of 939 species have been recorded in 2005, making 1243 species recorded from the site since 1996. This total now includes 35 Red Data Book species, 116 Nationally Scarce and 352 Nationally Local. This is a remarkable total.
- 1.3 The distinctive jumping spider *Sitticus distinguendus* is recorded as new to Britain and is present in a very localised area of the North Lagoon in a well established population. A chloropid fly *Homalura* probably *tarsata* found in a reedbed in the SSSI is certainly new to Britain and represents a genus new to the country. The RDB1+ ground beetle *Scybalicus oblongiuscula* was found in the North Lagoon. Until a single individual was found at Canvey Northwick in 2002, this species was considered extinct in the UK. A number of other species have been found that have been recorded at only two or three other sites in the country.
- 1.4 There are populations at the site of 3 priority UKBAP (UK Biodiversity Action Plan) species, the Brown-banded Carder Bee *Bombus humilis*, the wasp *Cerceris quinquefasciata* and the ground beetle *Anisodactylus poeciloides*. The main habitat for the first two species is in the North Lagoon, with only small areas suitable for forage and hunting in the SSSI. The ground beetle has well established populations in both saline areas within the North Lagoon and in the SSSI.
- 1.5 *Sitticus distinguendus* has been proposed by the British Arachnological Society UKBAP Review Working Group as a proposed new UKBAP species on the grounds of its status in western Europe and its predicted decline. The mining bee *Colletes halophilus*, and spider *Argenna patula* are both proposed UKBAP species for which Britain holds internationally important populations, but which are under a large degree of threat from sea level rise and, in the Thames Gateway, from loss of habitat to development. The mining bee *Andrena labialis* and bumblebee *Bombus ruderarius* are proposed UKBAP species on the basis UK decline and the dolichopid fly *Campsicnemus magius* is also a proposed UKBAP species.
- 1.6 150 species are included in or automatically qualify for the provisional Essex Red Data list including nine species definitely new to Essex. There may be further species new to the county, but the author is waiting for details from the relevant specialists. Where Essex rarity and threat statuses are defined, 7 are listed as Endangered in the county, 9 as Vulnerable, 27 as Essex Threatened and 34 as Regionally Important.
- 1.7 Further work is recommended to evaluate the status of the RDB1+ ground beetle *Scybalicus oblongiuscula* at the site, where at the time of writing a single individual has been recorded in the North Lagoon. Work specifically on six proposed UKBAP species recorded at the site is also recommended, especially to establish the extent of the chloropid fly *Cryptonevra consimilis* and whether the associated proposed UKBAP *Lipara similis* is found at West Thurrock.
- 1.8 Specialist survey for Lepidoptera (moths) and aquatic invertebrates in the seasonally wet water body in the North Lagoon, the main sewer, and permanent saline water body in the Narrow Lagoon is also recommended in order to enable comparison with Canvey Wick SSSI to be on a equal basis.
- 1.9 Comparison with other sites in the region indicate that West Thurrock is the most important, more so even than Canvey Wick SSSI (Northwick), in terms of numbers of rare and scarce species and overall diversity. It also supports a substantially different fauna to Canvey and other well-recorded sites, with many species not represented at these other sites. Half the species found at West Thurrock Lagoons are not recorded at Canvey Wick.

- 1.10** Comparison between the North Lagoon at West Thurrock and the SSSI shows that they are different in character and that although many species occur across both parts of the site, many other species are confined either to the North Lagoon or the SSSI. In view of the different characters of the vegetation mosaic present on each part of the site, this is not unexpected. The North Lagoon is more important than the SSSI in terms of numbers of Red Data Book and Nationally Scarce species.
- 1.11** Mitigation for loss of habitat on the North Lagoon would be extremely difficult to achieve either on-site or off-site. The habitats present have developed over a timescale significantly longer than at least 10 years, and some of the most important ones, such as seasonally wet saline areas, old lichen/Bryophyte heath, complex mosaics where vegetation typically associated with acid and calcareous substrates are adjacent and grade into each other and extensive flower-rich areas are unlikely to be re-creatable e.g. on brown roofs, and the success of this form of mitigation to even provide ordinary 'wasteground' invertebrate habitat is unproven.
- 1.12** Mitigation off-site would also be extremely difficult. The recreation of equivalent habitat would need to be in the general vicinity of the current site to enable colonisation from the existing assemblage of the species of conservation importance and over a realistically long timescale. Fly ash or pulverised fuel ash (PFA) is nowadays virtually an irreplaceable resource, and even if the substrate could be sourced it would not provide mitigation unless the source was currently of low nature conservation interest, which is unlikely.
- 1.13** The removal of substrate from the West Thurrock Lagoons to a new location which was then allowed to re-vegetate and was managed for the benefits of nature conservation would be better than nothing, but the nature of the vegetation that would develop and its subsequent succession would almost certainly be unlike that present at the site now, due to changes in the chemical nature of the PFA through weathering. In addition the re-establishment of invertebrate assemblages would be unpredictable and dependent on their colonisation from nearby sites, and this would involve a long timescale – which is unlikely to be available.
- 1.14** The translocation of PFA turfs to a prepared site might succeed in preserving vegetational aspects of the habitat, but is most unlikely to conserve the faunal assemblages. Off-site mitigation that provided other alternative land would not compensate due to the unique character of the substrate and the vegetation mosaic that develops.

2 INTRODUCTION

- 2.1** The East Thames Corridor has proved to possess a remarkable concentration of rare and scarce invertebrate species in recent years, for example with 96% of the Essex aculeate Hymenoptera fauna and over 74% of the national fauna. 83% of the Essex fauna and 55% of the national fauna has been recorded within a total area of about one 10km square in south Essex. At one site in Thurrock now almost completely destroyed by housing development, the Invertebrate Index (a measure of the biodiversity and rarity of the invertebrate fauna present) was greater than that of Salisbury Plain, a vastly greater area of acknowledged national importance in Britain (Tattersfield *et al.* 1996). There are numerous Red Data Book and Nationally Scarce species that occur, at present, in extensive metapopulations along the East Thames Corridor (see figure below for data on aculeate hymenoptera), as well as many species of much more restricted occurrence in the region.
- 2.2** Although the aculeate Hymenoptera fauna is especially well represented in the region rare and characteristic species are not confined to this group and there are a significant number of rare species in other groups such as the spiders (Araneae), beetles (Coleoptera), flies (Diptera) and bugs (Heteroptera).
- 2.3** This nationally important ‘Thames Terrace invertebrate fauna’ is associated with a unique combination of climatic, geographic and ecological factors, which have only been recognised in recent years (e.g. Harvey, 2000a). Many species are normally associated with heathland and sand habitats but some species are more characteristic of calcareous or chalk habitats. Other species are coastal and associated with dune systems.
- 2.4** The East Thames Corridor has a unique climate in Britain, more continental than the rest of the country (Jermyn, 1974). Southeast Essex is the driest part of the country, with frequent soil water deficit in the months of May through to August. In summer the Corridor is one of the warmest parts of the country with high sunshine levels. In winter the influence of the Thames ensures mild temperatures, which although not as warm as Cornwall, result in a greater range of temperature.
- 2.5** Although in the past this ‘Thames Terrace invertebrate fauna’ would have been associated with the open grasslands developed on Thames Terrace sands and gravels, nowadays almost all the original semi-natural habitat has been lost, and instead the fauna is now more likely to be found on ‘brownfield’ land. However these habitats themselves have a long continuity in the region. Old mineral extraction sites have been present in Thurrock for hundreds of years, with various exposures of Chalk, Thanet sands, Thames Terrace gravels and brickfields resulting from quarrying, with some leases dating back to the 16th century. There is therefore little doubt that there has been a very long ecological continuity to the nationally important ecological assemblages in Thurrock. It is also unlikely that the remarkable biodiversity and the extensive metapopulations of many Red Data Book and Nationally Scarce invertebrate species are a new feature of the whole East Thames Corridor region. There is evidence from work done in north Kent by workers such as H. Elgar, G.E. Frisby, G. Dicker in the distant and recent past, and in the Colchester area by the Harwoods at the end of the 19th century that an important fauna has long been present on the Thames Terrace sands and gravels in this region (Harvey, 2000a).
- 2.6** One of the main reasons for the invertebrate importance of these post-industrial or ‘waste ground’ sites is the combination of otherwise rare ecological features that they contain – infertile mineral deficient substrates, combined with the unique climate of south and east Essex, provide an abundance of sparsely vegetated ground that takes decades to gradually develop towards scrub and woodland. This bare and sparsely vegetated ground warms up quickly and provides important habitat for many rare species at the edge of their range in Britain, as well as providing essential exposures of friable substrate for ground nesting bees and wasps. Infertile substrates and drought promote the development of a diverse flower-rich vegetation, with an associated invertebrate diversity.

- 2.7** The invertebrate wealth is largely the result of the development of extensive flower-rich, often ruderal and drought-stressed, vegetation on dry friable substrates and a lack of management other than sporadic disturbance, which allows a continuity of forage and nesting habitats throughout the season and from year to year. The presence of poor, dry and well-drained substrate curtails succession allowing the diversity of invertebrate fauna to develop over time, whilst providing the bare and sparsely vegetated ground in sunny situations required by many species for nesting.
- 2.8** All habitats are dynamic in nature, even original wild forest long since lost from Britain. Many brownfield sites are considerably less dynamic than semi-natural alternatives – because of their mineral-deficient substrates, contamination and the low rainfall of south Essex they frequently take many, many decades to become scrub and secondary woodland even without the interference of disturbance or management. This is one of the key reasons they may support important invertebrate assemblages. Most of our important semi-natural habitats such as chalk grasslands and heathland are ‘man made’ in the same way as brown field land in every respect except the origin of the substrate, even more so in terms of management.
- 2.9** Invertebrate species may occur in a number of different habitats, they may have a range of differing ecological requirements. Many species are likely to have complex life cycles, with different specific requirements at different stages of their life cycle, but these requirements are only known for rather few species. This indicates the importance, especially to the rare and scarcer species, of a continuity of habitat mosaic within a locality.
- 2.10** Open bare areas are an important and often undervalued resource. Bare soil offers a number of benefits. In particular it warms up rapidly in sunshine, it is used by burrowing and ground nesting species and for egg laying and it provides a clear visual field for predators (Key, 2000).
- 2.11** The requirement of many invertebrate species for a suitable foraging area where nectar and pollen may be gathered is paramount to their survival. Whilst many species may forage on a range of flower species, others are highly plant-specific. In addition to forage areas, predatory species require suitable hunting areas of open flower-rich vegetation, grassland or scrub that provide the specific prey species and it seems probable that fairly extensive areas are needed by some species.
- 2.12** There is a parallel need for suitable larval development or nesting habitat and, in the case of parasitic species, there is a requirement for the presence of the host. Larval development may take place on or in roots, stems, leaves, buds and seeds of plants or nesting may take place in the ground. For stem nesting species it is critical that these resources remain in situ from one generation to the next for the survival of these species and their parasites.
- 2.13** Hence the invertebrate importance of the open flower-rich grassland is largely dependent on the unmanaged nature of the vegetation enabling the survival of species which live inside leaves, stems, flower heads and seeds and which over winter inside or at the bases of dead herbaceous stems and in ground litter. For stem nesting species it is critical that these resources remaining in situ from one generation to the next for the survival of these species and their cleptoparasites. Management that removes dead wood or herbaceous stems on a regular basis is therefore a very harmful practice for these species.
- 2.14** The regular mowing or cutting of the grassland is the most significant factor that reduces their value for many grassland invertebrates. If cutting takes place at any time during the summer season some species will lose their forage at a critical time - many solitary bee species have short seasons where they are dependent on specific forage sources; bumblebees require a continuity of suitable forage sources throughout the whole season. Even cutting just once a year in the autumn, winter or early spring period will knock out invertebrates that nest and overwinter in dead herbaceous stems.

3 METHODOLOGY

- 3.1** Parts of the site (mostly in the SSSI but also including some areas of the northern lagoon) were subject to invertebrate survey in 1996 (Plant, 1996) and both areas were subject to survey in 2003 (ESL, 2003) and where available these data are included in this report and identified in the appendices.
- 3.2** The current invertebrate survey of land to the south of Oliver Road at West Thurrock (the North Lagoon of the West Thurrock Marshes site) was commissioned by Ecology Consultancy Ltd (ECL) at the end of March 2005. This was later extended in scope to include the SSSI southern lagoons and the use of traps set in 5 sample locations in both the northern and southern areas.
- 3.3** Although designed to be taxonomically wide-ranging, the emphasis during the field survey was on target groups of habitat indicator species, most notably the spiders (Arachnida), bees and wasps (aculeate Hymenoptera), beetles (Coleoptera) and flies (Diptera), which contain a number of rare species which have important populations in the region and which are effective indicators of grassland, wetland and scrub habitats. Other groups were also recorded where possible, including froghoppers (Homoptera), plant bugs (Heteroptera), grasshoppers and crickets (Orthoptera) and allied orders, as well as smaller orders such as woodlice (Isopoda), millipedes and centipedes (Myriapoda), harvestmen (Opiliones) and pseudoscorpions (Pseudoscorpiones).
- 3.4** The North Lagoon was initially visited on 12th, 22nd and 28th April, 23rd May and 10th June, when active fieldwork was undertaken. Visits were made to help with mapping invertebrate habitats at the site on 17th and 22nd June, when fieldwork was also undertaken in the SSSI. On 20th June D.A. Smith and the author visited the site to set traps at sample locations in both the North Lagoon and SSSI and further visits were made by both surveyors on 4th July, 19th July, 2nd August and 16th August and finally 1st September. On each occasion the traps were collected and reset (except on 1st September) and active fieldwork was undertaken in both the North Lagoon and SSSI. A further visit has been made during the writing of this report on September 1st, but all this material awaits sorting and then identification, as does some material from previous traps.
- 3.5** Active survey work on each occasion entailed the following standard field techniques:
- direct observation
 - sweep netting
 - beating
 - hand netting
 - turning over stones and pieces of debris
 - ‘grubbing around’ at the base of vegetation and grass roots.
- 3.6** In order to maximise the quantity of data available, passive sampling - in the form of pan traps and pitfall traps set in representative areas of habitat - was undertaken as well as active fieldwork. These are an effective means of collecting various foraging and hunting insects and spiders and take advantage of spells of good weather when the field worker is not present. The trap locations are indicated on Map 1. Malaise trapping was ruled out because of the visibility of the equipment and its very low chance of surviving intact at the site.
- 3.7** Pan traps are yellow, plastic trays placed on the ground and charged with a preservative solution in water (30-40% ethylene glycol), and a small amount of detergent to reduce surface tension. Insects confuse the traps with large flowers and are caught. This method is especially effective for flies and solitary bees and wasps.
- 3.8** Pitfall traps are an effective means of collecting various foraging and hunting insects and spiders and take advantage of spells of good weather when the field worker is not present. They are designed to intercept ground moving insects and spiders and then retain them. Plastic containers containing 30-40% antifreeze and a small amount of detergent are set into the ground flush with

the surface. Pitfall trapping is effective for many ground moving insects and spiders, and also tends to collect species that are difficult to locate by other methods, including those active at night. They are especially effective in grasslands with a short sward, which are difficult to sample satisfactorily by active fieldwork.

- 3.9** Pan traps and pitfall traps were set at 5 sample locations in the North Lagoon and 5 sample locations in the southern SSSI area, consisting of one pan trap and five pitfall traps in each case. In the author's experience traps are most effective when they are sited in the open. However this inevitably makes them more visible to people (who evidently make considerable use of the site for scrambler and quad biking, especially at weekends). The siting of the traps was therefore a compromise between the sampling of the variety of invertebrate habitats present and the need for the traps to be sited where they might survive the attentions of scrambler and quad bikers and their audience at weekends. In the event the trap locations were remarkably successful, with only odd traps lost, probably to foxes, and all traps destroyed at Area D in the North Lagoon on one occasion. Location SSSI trap site C was moved after the first trap period to a better location C2.

Trap locations (one pan trap and 5 pitfall traps at each location)

North Lagoon	Grid reference	Description
Trap site A	TQ58527702	pylon area, sparsely vegetated and open herbaceous area with scrub on north side
Trap site B	TQ58687708	Area adjacent to shallow saline water body dry by mid June
Trap site C	TQ58667709	Rabbit grazed drought-stressed bryophyte heath
Trap site D	TQ58757715	Drought-stressed lichen heath adjacent to dry Phragmites
Trap site E	TQ58357700	Saline Sea Aster/ <i>Salicornia</i> area
SSSI		
Trap site A (South Lagoon)	TQ58487653	Open <i>Glaux</i> area
Trap site B (South Lagoon)	TQ58427652	Sheltered open sparse area in scrub edge
Trap site C/C2 (Phragmites bed)	TQ58607635	Edge of <i>Phragmites</i> bed
Trap site D/E	TQ58637658	Rushy area with <i>Salicornia</i> near wetland with rushes, <i>Salicornia</i> , Phragmites and Scirpus
Trap site F (Raised PFA area)	TQ58777646	Raised open area south of the Narrow Lagoon

- 3.10** Inevitably, the need to site traps away from view, but in the open, has meant that some areas of probable interest have not been adequately sampled e.g. the edges and banks of the raised PFA area in the North Lagoon where bikers appear to have an 'arena', and saline areas immediately below this were impracticable as places to set traps.
- 3.11** The large flower-rich grassland in the northwest of the site and tall grasslands elsewhere were not sampled by traps, since it was considered that sweeping would be more effective as a sampling method. This was therefore the main technique used in these areas.
- 3.12** An important nesting area in the North Lagoon identified during survey in 2003 was also not sampled using traps, not only because it was adjacent to the raised 'arena', but also because it was judged that traps would capture excessively high levels of rare and scarce aculeate Hymenoptera. Instead traps were located nearby, in an open area between one of the pylons and some scrub, where no evidence of public interference was evident.
- 3.13** Material was identified by the author apart from the following: Mr D. A. Smith the Essex Field Club Recorder for Diptera, identified the flies other than some hoverflies and Larger Brachycera, and the national expert Dr Peter Hammond identified the majority of the Coleoptera. Dr Peter Kirby identified some Hemiptera/Homoptera collected in April/May, but the timetable change has meant that much further material awaits identification. This report is also not able to incorporate the results of the last trap material to be collected in early September.

4 INVERTEBRATE HABITATS

4.1 GENERAL

4.1.1 The whole of the West Thurrock PFA lagoons, both north and south, have blended into the landscape and represent natural and complex ecological systems developed over time except where areas have been disturbed by the ongoing and illegal activities of scrambler and quad bikers at the site.

4.1.2 Practically the whole site is developed on Pulverised Fuel or Fly Ash (PFA), and both the north and south lagoons were evidently at one time substantially wetter than at present. However the habitats present on both the North Lagoon and the southern SSSI are remarkably unchanged from 1996 apart from (1) the presence of a greater development of scrub in both the North Lagoon and the SSSI, where scrub encroachment has extended in the main South Lagoon and on the raised PFA banks around the lagoon (2) the almost complete loss of a flower-rich band present in 1996 but not in 2003, in the main South Lagoon between the upper saltmarsh vegetation and northern area of scrub, and (3) the disturbance caused by scrambler and quad bikers, whose activities were not present at all in 1996. This activity has caused substantial areas of PFA to be reduced to completely bare ground, as well to create tracks through areas which are then periodically abandoned in favour of new routes.

4.2 NORTH LAGOON

4.2.1 The North Lagoon comprises a complex mosaic of habitats, both in terms of vegetation, vegetation structure, diversity and hydrology. Key components of this mosaic include extensive flower-rich grassland areas including a range of plants more usually associated with calcareous substrates, seasonally wet saline areas, areas of lichen and Bryophyte heath, sparsely vegetated ground and banks, dry Phragmites areas and warm, but species-poor tall open grasslands. Birch and Sallow scrub development is generally a negative component of the area, although it does provide sheltered areas that benefit a proportion of invertebrate species.

4.2.2 Flower-rich grassland

Extensive tall open flower-rich grassland occurs especially in the north western and middle parts of the lagoon. These grasslands are remarkably rich in Carrot *Daucus carota*, Hoary Ragwort *Senecio erucifolius*, Ragwort *Senecio jacobaea* and Hawkweed-leaved Ox-tongue *Picris hieracioides* as well as containing extensive patches or numbers of Common Vetch *Vicia sativa*, Fodder Vetch *Vicia villosa*, Tare *Vicia hirsuta*, *Crepis*, Parsnip *Pastinaca sativa*, Celery *Apium graveolens*, Hogweed *Heracleum sphonfylum*, earlier in the season.

This area forms a crucial foraging area for many insects, not only because of the specific flowers available (with which particular invertebrate species are associated), but also because of the continuity of forage resource through the season. This is very important for species such as the UKBAP bumblebee, the Brown-banded Carder Bee *Bombus humilis*, as well as other species with short seasons dependent on particular forage resources.

The area is also crucial in its provision of vegetative resources and their continuity from year to year and through the whole season. There are abundant tall herbaceous stems, seeds and fruit heads, as well as below ground resources and shelter provided at the bases of rosettes. These all support a diversity of invertebrates associated with specific plants as well as their predators or parasites. An abundance of prey in the form of various small weevils is for example important for the UKBAP wasp *Cerceris quinquefasciata*. Over-wintering dead herbaceous stems provide a crucial resource for stem-nesting aculeate Hymenoptera such as several scarce *Hylaeus* species.

The extensive nature of this grassland is important – each year the vagaries of weather and season affect the development and flowering of different species, for example in 2003 flowering Hoary Ragwort was co-dominant with Carrot in large areas, but in 2005 the flowering of Hoary Ragwort

was much reduced. The extensive nature and variation within the grassland enables there to always be resources for specific insects, such as the Nationally Scarce picture-winged fly *Merzomyia westermanni*, whose larvae feed in the flower heads of Hoary Ragwort. A similar situation occurs at Canvey Wick SSSI, where for example some *Lotus glaber* areas are in flower when other areas have already finished, according to localised topography, hydrology and shelter and in response to the vagaries of a particular season's weather and other factors such as previous disturbance.

Flower-rich grassland in northwest of the North Lagoon



Extensive areas of Melilot *Melilotus officinalis* occur towards the south middle of the lagoon. These provide important forage for workers of the UKBAP Brown-banded Carder Bee, as well as prey weevils for the UKBAP wasp *Cerceris quinquefasciata*.

Areas of grassland at the eastern end of the site contain small but significant quantities of Red Bartsia *Odontites verna*, which support foraging by the Nationally Scarce mining bee *Melitta tricincta*.

4.2.3 Warm, species-poor grasslands

Sheltered tall species-poor grassland areas occur at the eastern end of the North Lagoon. These grasslands are generally less significant in supporting important invertebrate assemblages, but they do provide a warm open habitat supporting species such as the grass-feeding Nationally Scarce shieldbug *Eurygaster maura*, otherwise confined to the North Downs. There are also more exposed species-poor grassland areas on the western edge of the lagoon. Experience at Canvey Northwick suggests that these species-poor grasslands develop as grasses gradually out-compete herbaceous plants, but that they are easily returned to species-rich grasslands by periodic disturbance or small scale fires.

4.2.4 Seasonally wet saline areas

Seasonally wet saline areas are a very important component of the mosaic present in the North Lagoon. Apart from a small area in the northwest of the site where Sea Milkwort *Glaux maritima* occurs, the saline areas are restricted to the south west of the lagoon below the raised PFA area, and along the southern part of the site between the shallow seasonally wet water body and along the edges of the track to the west. These form two distinct types of saline habitat, one formed on PFA containing a substantial clinker-type component on the raised area (sampled at trap location B) and one formed in winter wet depressions below the raised PFA area, where scrambler

activities seem to be helping maintain a dynamic continuity of habitat with Glasswort *Salicornia* and Sea Aster *Aster tripolium* developing along the sides of winter wet depressions created by disturbance (sampled at trap location E). In 1996 this area was a naturally low, wetter part of the lagoon with some quite extensive drifts of Sea Aster, essentially quite similar to the present situation.

The saline edges of the large seasonal water body and edges of the adjacent track are the only parts of the site found to support the jumping spider *Sitticus distinguendus*, first collected here in 2003 but remaining unrecognised until the current survey. A well established population is present within a small area, and may well have been present as far back as 1996, but was not an area sampled at that time.

Saline *Sitticus distinguendus* habitat along edge of seasonally wet water body at southern edge of North Lagoon (near trap site B)



This area and the saline areas below the raised PFA with glasswort and Sea Aster support the UKBAP ground beetle *Anisodactylus poeciloides* and the areas with Sea Aster provide forage for the proposed UKBAP mining bee *Colletes halophilus*, the females of which collect pollen specifically from the flowers of the plant.

Saline area in southwest of the North Lagoon (near trap site E)



4.2.5 Lichen and Bryophyte heath

Areas of very sparsely vegetated and drought-stressed lichen and Bryophyte heath occur in parts of the eastern and southern sections of the North lagoon, where rabbit grazing seems to help maintain localised areas of the habitat. These were sampled at trap locations C (south middle of lagoon) and D (eastern end of lagoon). Area A, near to the pylon nesting area, also sampled a proportion of species associated with this type of habitat. These areas appear to be very old, some at least were certainly present in 1996, and not the result of recent disturbance. As such they are fragile habitats that are vulnerable to damage, and a certain amount of very localised damage has occurred as a result of scrambler activity. These areas support an invertebrate assemblage that includes species normally associated with dry heathlands, such as the tiger beetle *Cicindela campestris*, the sphecid wasp *Astata boops*, its cleptoparasite *Hedychridium roseum* and the bug *Alydus calcaratus*. In addition however these areas are where for example the shieldbug *Sciocoris cursitans* occurs with its Endangered parasite the tachinid fly *Gymnosoma nitens*, both normally associated with calcareous sandy habitats.

Lichen and Bryophyte heath in the North Lagoon (trap site C)



Lichen and Bryophyte heath in the North Lagoon (near trap site D)



Detail of lichen heath



Pylon area in the North Lagoon (trap site A)



4.2.6 Undisturbed sparsely vegetated ground and banks

Areas of undisturbed sparsely vegetated and bare ground are important for many invertebrates. Aculeate Hymenoptera and other ground nesting species require these areas in order to nest, different species preferring to burrow into flat ground, slopes or banks, and different species preferring friable or compact substrates. Bare and sparsely vegetated ground warms up quickly and provides important habitat for many rare species at the edge of their range in Britain, as well as providing predators with a clear view. Especially important areas of habitat occur on a bank and on the adjacent flat ground on the eastern side of the raised PFA 'arena' to the west of the 'pylon area' (trap location A) and a small sandy bank immediately to the north of this area adjacent to the most south-westerly pylon. These are key nesting areas for many aculeate Hymenoptera as well as providing habitat for the tiger beetle *Cicindela campestris*. Another

important area is the bank immediately to the north of the shallow seasonally wet water body at the south of the lagoon, as well as the southern banks of the raised PFA area.

Pylon nesting area in the North Lagoon



Sandy bank in the North Lagoon



Generally it is probable that a number of aculeate Hymenoptera also nest in smaller undisturbed areas of bare ground found distributed throughout the lagoon. The bare ground produced by regular scrambler and quad bike activity is too disturbed to support an associated invertebrate fauna or to be used for nesting.

4.2.7 Drought-stressed bramble

A number of aculeate Hymenoptera such as the Blue Carpenter Bee *Ceratina cyanea* and the cleptoparasitic bee *Stelis ornatula* nest inside dead bramble stems in sunny situations. Bramble which grows on mineral-deficient substrates and in drought-stressed conditions seems especially favoured, with an abundance of nesting resource in warm sunny conditions becoming available.

Important areas providing this resource and supporting nesting *Ceratina cyanea* occur around the south western pylons and in other limited areas at the south and eastern parts of the lagoon.

4.2.8 Dry *Phragmites* areas

Significant areas in the northern part of the lagoon contain Common Reed *Phragmites australis* in a dry situation grading into grassland. This is the situation especially favoured by a number of rare invertebrates dependent on *Phragmites*, such as the sphecid wasp *Passaloecus clypealis* and the bee *Hylaeus pectoralis*, both of which nest inside old *Lipara* 'cigar galls' in the stems of the plant.

4.2.9 Scrub

In 1996 birch and willow scrub was present near the pylons in the middle south part of the lagoon, but this has substantially extended so that now there is scattered scrub with some denser stands across a much greater part of the middle area, as well as in the northern and eastern sections. This generally has a negative impact on the important open habitats, but does provide valuable sheltered areas where open ground is enclosed by scrub.

4.3 SOUTH LAGOONS (SSSI)

4.3.1 The SSSI is also largely developed on a PFA substrate, but is substantially different in character to the North Lagoon. It supports extensive upper saltmarsh vegetation, especially in the main South Lagoon, as well as permanently wet saline areas in the Narrow Lagoon to the east. The two lagoons are separated by a raised PFA bank now mostly covered in mature scrub. Separated by a PFA bund and to the south of the South Lagoon there is a narrow but extensive *Phragmites* reed bed. To the east a raised dry PFA area provides a small area that is the nearest the SSSI contains to the extensive dry open habitats found in the North Lagoon.

On the eastern boundary a well vegetated ditch (the main sewer) and wide band of tall Hemlock separates the lagoons from the former power station site. Work in progress by the Environment Agency is forming a new channel to replace a currently defunct section at the northern end.

4.3.2 Flower-rich grassland

There are **practically no areas of flower-rich grassland in the SSSI area**. Hence the availability of forage and vegetative resources, as well as over-wintering dead herbaceous stems, is very restricted within the SSSI. In 1996 a band of flower-rich grassland with Carrot, Hop Trefoil *Trifolium campestre*, Yellow-wort *Blackstonia perfoliata*, Kidney Vetch *Anthyllis vulneraria* and orchids *Dactylorhiza* was present in the main South Lagoon in the north eastern corner between the upper saltmarsh vegetation and mature birch scrub (Plant, 1996), but by 2003 this had disappeared, possibly due to several very wet summers in the previous years. A raised PFA shelf on the western side of the Narrow Lagoon, also flower-rich in 1996 and with plants such as Red Bartsia and Pyramidal Orchid *Anacamptis pyramidalis*, is no longer present and now dominated by scrub.

The main South Lagoon and Narrow Lagoon are very flower-poor, with only scattered forage resources in the open areas. There is large area of Dittander *Lepidium latifolium* in a channel between the southern end of the South and Narrow Lagoons and a large area of *Melilotus*, *Hypericum* and some thistles and Asteraceae on the raised PFA area to the south. These provide abundant forage when in flower, but for only a very limited part of the season. Before and after this resources are scarce. There are extensive areas of Hemlock between the sea wall and lagoons, but this is not generally a valuable insect resource, and certainly no comparison to umbellifers such as Carrot or Parsnip.

The sea wall can provide limited forage resources, but when this is cut during the summer, all flower and vegetative resources are removed at once. Hence the sea wall can only provide temporary forage.

4.3.3 Warm, species-poor grasslands

These are limited to a small area of the raised PFA to the south of the Narrow and main South Lagoon. Here the grass-feeding shieldbug *Eurygaster maura* was found.

4.3.4 Upper saltmarsh

4.3.5 The main South Lagoon contains extensive upper saltmarsh vegetation with large areas with abundant Sea Milkwort *Glaux maritima*, probably the most extensive such vegetation in the Thames Gateway region or even south eastern England. Scrub encroachment is gradually reducing its extent, although even in 1996 the main northern area of mature birch scrub was already present in its present form and a smaller area of scrub was developing in the south eastern corner. Scrambler bike activity not evident here in 1996, and only slight in 2003, has increasingly affected substantial areas of the vegetation producing large areas of bare PFA, whose edges gradually vegetate with Glasswort, etc.

Upper saltmarsh in the main South Lagoon (SSSI) – trap site A



4.3.6 Seasonally wet saline areas

Judging from the vegetation, much of the main South Lagoon and Narrow Lagoon is probably wet in winter. Details of the vegetation and mosaic however have clearly changed since both 1996 and 2003, partly through increased scrub development in the South Lagoon, partly through disturbance from scrambler activity and partly because both the lagoons may be continuing to dry out. At least some of the areas where saline vegetation grades into drier grassland support the UKBAP ground beetle *Anisodactylus poeciloides*. Other extensive saline areas with Glasswort occur as depressions in the Narrow Lagoon to the north of the permanent water body. These were present in 1996, but especially to the north of the lagoon they have been much disturbed by scrambler bike activity.

Seasonally wet saline area in the Narrow Lagoon (SSSI) – trap site D/E



4.3.7 Permanently wet saline areas

Although it is clear that at one time both the SSSI and North Lagoon contained permanent bodies of water, much of this had gone by 1996, when most of the habitat present was remarkably similar to that found in 2005. The only permanent water body other than the ditch comprising the main sewer is at the southern end of the Narrow Lagoon, where a large saline pond is fringed by extensive *Bulboschoenus (Scirpus) maritimus* marsh and areas of Sea Aster. This has a very similar appearance to the wide saline borrowdykes and fleets found in the grazing marsh landscape further east in the Fobbing, Vange and Pitsea area. The water level drops through the season, exposing PFA mud edges, mainly on the western side, important for a number of wetland species such as the rare dolichopid fly *Campsicnemus magius*.

Permanently wet saline water body in the Narrow Lagoon (SSSI)



A saline channel fringed by extensive amounts of Sea Aster meanders from the sluice at the southern end of the Narrow Lagoon into the permanent water body. On the western side of this is a remarkable area of permanently wet closely rabbit-cropped grassland intercut with a criss-cross of narrow channels, probably originating from cracks formed as the PFA 'mud' dried out.

Saline channel in the Narrow Lagoon near the sluice (SSSI)



Permanently wet closely rabbit-cropped grassland intercut with a criss-cross of channels in the Narrow Lagoon



4.3.8 Undisturbed sparsely vegetated ground and banks

Dry sparsely vegetated ground suitable for ground-nesting invertebrates is very limited. It is more or less confined to parts of the raised PFA area to the south of the Narrow Lagoon and to small

parts of the west-facing bank that separates this lagoon from the South Lagoon. The remainder of the raised PFA within the SSSI has become closed in by scrub development.

4.3.9 Drought-stressed bramble

A small area of drought-stressed bramble on mineral-deficient substrate occurs on the raised PFA area to the south of the Narrow Lagoon. Here Blue Carpenter Bee is nesting in small numbers. This area was located near to trap site F.

Drought-stressed bramble and sparsely vegetated area south the Narrow Lagoon (trap site F)



4.3.10 *Phragmites* areas

Common Reed *Phragmites australis* occurs as a reedbed immediately south of the main South Lagoon, separated by a PFA bank. Although generally dry, it appears wetter than *Phragmites* habitat in the North Lagoon. At the eastern end there is a rather abrupt junction with upper saltmarsh *Glaux* vegetation. There is also a *Phragmites* area at the southeast end of the South Lagoon which continues along a channel towards the Narrow Lagoon and sluice.

Reedbed south the main South Lagoon (trap site C)



4.3.11 Scrub

In 1996 (Plant, 1996) the northern end of the main South Lagoon had a substantial area of mature scrub rising to 6-8m and developing into woodland, much as at present. Birch and willow scrub up to 1m was beginning to invade a band of grassland on the southern edge. Smaller areas of scrub invading the south-eastern and south-western corners of the lagoon are now much more extensive, especially on the east side. A wide raised shelf of PFA along the western edge of the lagoon had birch scrub rising to 5-6m, joining the scrub at the southern and northern ends. The PFA bunds around the lagoon and separating it from the Narrow Lagoon supported were already covered in bramble, birch and willow, but are now dominated by much more mature scrub. A raised shelf on the western side of the Narrow Lagoon that was in 1996 open and vegetated by a tall flower-rich grassland with calcicole species such as Red Bartsia and Pyramidal Orchid is now replaced by scrub.

The main block of old scrub at the northern end of the South Lagoon that has almost become secondary woodland has few redeeming features of invertebrate interest, but does support a population the robberfly *Neoitamus cyanurus*, rare in Essex with very few records.

4.4 COMPARISON OF HABITATS PRESENT IN NORTH LAGOON AND SSSI

4.4.1 The following table very roughly compares important invertebrate habitats or features present and their extent in the North Lagoon and SSSI areas.

Invertebrate habitat	North Lagoon	SSSI
Flower-rich grasslands	Extensive in north west, more patchily distributed in middle of lagoon.	None. Flower resources widely scattered except for limited areas of e.g. <i>Melilotus</i> , Dittander and thistles in raised PFA area
Warm, species-poor grasslands	Areas in eastern end of lagoon	Small area in Area F (raised PFA area)
Seasonally-wet saline areas	Areas in southwest and west of lagoon and large shallow seasonal water body and track edges at south middle and southwest	Areas in both Narrow and South Lagoon. Nothing comparable to cindery and 'grey dune' habitat
Permanently wet saline areas	None	At southern end of Narrow Lagoon
Lichen and Bryophyte heath	Some fairly extensive areas, some lichen, some Bryophyte, towards south of lagoon between western pylon and eastern end of lagoon	None
Undisturbed sparsely vegetated ground and banks	Pylon nesting area, bank below western pylon, bank adjacent to large seasonal water body and scattered	Limited to small areas of the PFA bank separating the main South and Narrow lagoon and part of the raised PFA area to the south of the Narrow Lagoon
Dry <i>Phragmites</i>	Areas grading into grassland, mostly in northern part of lagoon	Extensive reedbed south of South Lagoon and area between South and Narrow Lagoons
Drought-stressed bramble	Substantial areas around western pylons and towards eastern end of lagoon	Small area at trap location F on the raised PFA to the south of the Narrow Lagoon
Scrub	Scattered and denser stands, mostly in middle of lagoon	Extensive scrub at northern and south-eastern ends of South Lagoon, less extensive on western side, also well developed scrub on raised shelves and bunds.

5 INVERTEBRATE SURVEY RESULTS

5.1 WHOLE SITE (NORTH LAGOON AND SSSI EXCLUDING STONE NESS)

- 5.1.1** Any invertebrate survey is a sampling exercise, and the results are dependent on natural changes in population levels as well as the vagaries of climate, season and weather, and its affect on invertebrate populations and associated vegetation, vegetation structure, vegetative resources, and flowering. Some invertebrate species occur widely, but in low or large numbers, other species may be confined to very specific habitats that may not have been sampled by the survey. In addition survey of some taxa is a matter of being in the right place at the right time. The use of pitfall and pan traps will go some way to overcome these problems.
- 5.1.2** Previous survey at the site has been undertaken in 1996 (Plant, 1996) and 2003 (ESL, 2004). The 1996 survey was undertaken as part of an evaluation of the affect of a proposed pipeline on the SSSI, and therefore invertebrate survey in the North Lagoon was limited in extent, mostly in the south western part of the lagoon. The results of the 1996 and 2003 surveys are included in the current report since there is no reason to suppose that species not recorded during the current survey do not still occur (see 5.2.1 above and 4.1.2). However Plant (1996) included a list of spiders recorded from Stone Ness saltmarsh in 1988. These are not included here in the lists or analysis, since the tidal saltmarsh has not been considered a part of the PFA lagoon site.
- 5.1.3** At present the results of the current survey are limited by the shortened timetable that means that the last set of traps was only collected whilst the report was being written and this material has not yet been sorted or identified, and much Hemiptera (leafhoppers) and Heteroptera (bugs) material from the whole survey remains to be identified.
- 5.1.4** At the moment a total of 939 species have been recorded in 2005, making 1243 species recorded from the site since 1996. This total now includes 36 Red Data Book species, 116 Nationally Scarce and 352 Nationally Local. This is a remarkable total, details summarised in the table overleaf.
- 5.1.5** The distinctive jumping spider *Sitticus distinguendus* is recorded as new to Britain and is present in a very localised area of the North Lagoon in a well established population. A chloropid fly *Homalura* probably *tarsata* found in a reedbed in the SSSI is certainly new to Britain and represents a genus new to the country. The RDB1+ ground beetle *Scybalicus oblongiuscula* was found in the North Lagoon. Until a single individual was found at Canvey Northwick in 2002, this species was considered extinct in the UK. A number of other species have been found that have been recorded at only two or three other sites in the country.
- 5.1.6** There are populations at the site of 3 priority UKBAP (UK Biodiversity Action Plan) species, the Brown-banded Carder Bee *Bombus humilis*, the wasp *Cerceris quinquefasciata* and the ground beetle *Anisodactylus poeciloides*. The main habitat for the first two species is in the North Lagoon, with only small areas suitable for forage and hunting in the SSSI. The ground beetle has well established populations in both saline areas within the North Lagoon and in the SSSI.
- 5.1.7** In 1996 a fourth UKBAP species was recorded, the Hornet Robber Fly *Asilus crabroniformis*. This was a single individual that is assumed to be a stray from a breeding population elsewhere (Plant, 1996).
- 5.1.8** *Sitticus distinguendus* has been proposed by the British Arachnological Society UKBAP Review Working Group as a proposed new UKBAP species on the grounds of its status in western Europe and its predicted decline. The mining bee *Colletes halophilus*, and spider *Argenna patula* are both proposed UKBAP species for which Britain holds internationally important populations, but which are under a large degree of threat from sea level rise and, in the Thames Gateway, from loss of habitat to development. The mining bee *Andrena labialis* and bumblebee *Bombus ruderarius* are proposed UKBAP species on the basis UK decline and the dolichopid fly *Campsicnemus magius* is also a proposed UKBAP species.

5.1.9 The chloropid fly *Cryptonevra consimilis* has only two previous confirmed sites both within Cambridgeshire. Its larvae have been reared from *Phragmites* stems inhabited by another rare (RDB2) chloropid, *Lipara similis* and the known Cambridgeshire records correspond to some of the few known sites of *L. similis*, yet another proposed UKBAP species that may be present at West Thurrock. The wasp *Cerceris ruficornis* was proposed as an addition to the UKBAP (Edwards, 2004), but was not subsequently put forward. A further spider *Baryphyma duffeyi*, recorded from Stone Ness is another proposed UKBAP species.

Summary of national status for recorded species

National Status	Number in category
UKBAP	3 (+1 assumed to be vagrant 1996)
pUKBAP	6 (+1 recorded from Stone Ness, +1 associated with a RDB2 fly that was found during the current survey and +1 proposed, but not in final list)
New to Britain	2
RDB Appendix	3
RDB1+	1
RDB1	3
RDB2	4
RDB3	19
RDBK	6
Na	22
Nb	63
N	31
Local	352
Unknown	80
Common	660

5.1.10 This is an extremely diverse and nationally important assemblage. It should be noted that West Thurrock PFA lagoons are at least as important as the Canvey Wick SSSI and that Canvey Wick has been demonstrated to be only second to Dungeness in Britain for its importance in terms of rare and scarce species, despite the much smaller area concerned. The West Thurrock SSSI and North Lagoon together are smaller in area than Canvey Wick, yet even more important in terms of recorded invertebrate assemblage.

5.1.11 Essex Red Data species are included in the provisional Essex Red Data list produced on behalf of English Nature, which is available at www.essexfieldclub.org.uk. In the Diptera only those families covered by the national status review (Falk, 1991a) have so far been covered by the list. However all Red Data Book and Nationally Scarce species would qualify, as well as other species in an Essex context. The Essex threat statuses used for Arachnida, aculeate Hymenoptera and Syrphidae (Diptera) are based on the definitions used for ants (Harvey, 1998) and harvestmen (Harvey, 1999). Essex Threat statuses have not been evaluated or assigned for other taxonomic groups.

5.1.12 150 species are included in or automatically qualify for the provisional Essex Red Data list including nine species definitely new to Essex. There may be further species new to the county, but the author is waiting for details from the relevant specialists. Where Essex rarity and threat statuses are defined, 7 are listed as Endangered in the county, 9 as Vulnerable, 27 as Essex Threatened and 34 as Regionally Important.

5.1.13 The full species list is given in Appendix 3, annotated with the national and regional status and whether recorded in North Lagoon and/or the SSSI. Within major groups taxa are arranged alphabetically to facilitate use by non-specialists.

5.2 NORTH LAGOON

5.2.1 A total of 850 species are so far recorded, with 28 in the Red Data Book, 75 Nationally Scarce and 262 Nationally Local.

Summary of national status for recorded species

National Status	Number in category
UKBAP	3
pUKBAP	4 (+1 proposed, but not in final list)
New to Britain	1
RDB Appendix	3
RDB1+	1
RDB1	3
RDB2	1
RDB3	15
RDBK	5
Na	20
Nb	38
N	17
Local	262
Unknown	40
Common	445

5.2.2 111 species are included in or automatically qualify for the provisional Essex Red Data list including two species definitely new to Essex. Where Essex rarity and threat statuses are defined, 6 are listed as Endangered in the county, 7 as Vulnerable, 23 as Essex Threatened and 29 as Regionally Important.

5.3 SOUTHERN LAGOONS (SSSI EXCLUDING STONE NESS)

5.3.1 A total of 935 species are now recorded, with 19 in the Red Data Book, 86 Nationally Scarce and 263 Nationally Local.

Summary of national status for recorded species

National Status	Number in category
UKBAP	3 (+1 assumed to be vagrant 1996)
pUKBAP	4 (+1 recorded from Stone Ness, +1 associated with a RDB2 fly that was found during the current survey)
New to Britain	1
RDB1	2
RDB2	3
RDB3	11
RDBK	3
Na	15
Nb	47
N	24
Local	263
Unknown	55
Common	513

5.3.2 103 species are included in or automatically qualify for the provisional Essex Red Data list including six species definitely new to Essex. Where Essex rarity and threat statuses are defined, 4 are listed as Endangered in the county, 7 as Vulnerable, 16 as Essex Threatened and 25 as Regionally Important.

6 ASSESSMENT ON THE BASIS OF NATIONAL STATUS

6.1 Method

6.1.1 National Red Data Book species are those falling within the Status categories defined in the *British Red Data Books* (Bratton, 1991; Shirt, 1987). These are internationally recognised species listed in the various *Red Data Books* published by, or under the auspices of, the International Union for the Conservation of Nature (IUCN). Species included may not be informally removed or transferred between categories. **Nationally Endangered (RDB1)** taxa are those considered to be in danger of extinction and whose survival is unlikely if the causal factors continue operating. These include species known from only a single locality since 1970, species restricted to habitats which are especially vulnerable, species which have shown a rapid and continuous decline in the last twenty years and are now estimated to exist in five or fewer ten km squares and species believed extinct but which would need protection if re-discovered. **Nationally Vulnerable (RDB2)** taxa are those that are believed likely to move into the Endangered category in the near future if the causal factors causing their decline continue operating. This includes species declining throughout their range, species in vulnerable habitats and species whose populations are low. **Nationally Rare (RDB3)** taxa are those with small populations that are not at present Endangered or Vulnerable, but are at risk. This includes species known or estimated to exist in only 15 or fewer post 1970 ten km squares. **Insufficiently Known (RDBK)** taxa are those suspected of falling into categories 1-3, but about which there is insufficient information to be certain.

6.1.2 The concept of Nationally Scarce (Notable) species was introduced by Ball (1986). They are species which are estimated to occur within the range of 16 to 100 ten-kilometre squares of the British National Grid system since 1970 and are subdivided as follows: **Notable/Na** refers to species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System. **Notable/Nb** refers to species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System. Diptera (flies) and some Coleoptera (beetles) are not separated. Categorisations have been revised for various taxonomic groups including Araneae (spiders) in Merrett (1990), aculeate Hymenoptera in Falk (1991a), Coleoptera in Hyman & Parsons (1992, 1994), Diptera in Falk (1991b), Hemiptera in Kirby (1992) and Pyralidae (Lepidoptera) in Parsons (1993).

6.1.3 Nationally LOCAL species are those estimated to have been recorded from over one hundred ten-kilometre squares of the UK National Grid and which are less widespread than common species. Local designations have been obtained from the RECORDER 3 software. Remaining species have either been formally declared “Common” or else are listed as “Unknown” where insufficient data is available to assign a species to any category.

6.1.4 In order to provide a broad indication of site quality, an Invertebrate Index can be calculated (Ball, 1986). Using this method, invertebrates recorded are scored according to their national status as follows:

RDB species	100 points
Notable - Na species	50 points
Notable - Nb species	40 points
Notable - N species	40 points
Local species	20 points
Common species	no score

It is important to remember that in less well-worked groups, where species are categorized with an Unknown status, these may eventually turn out to be scarce and of conservation significance, but they are not included in this analysis.

6.1.5 Adding together the scores in each category provides the overall **Invertebrate Index**.

6.1.6 However, increased effort at a site will increase the number of species recorded and in time the Invertebrate Index will also increase, rendering use of the Invertebrate Index alone of limited value unless all the sites in a comparison are thoroughly and equally recorded. In order to take account of the overall number of species recorded (as a measure of recording effort) in assessing the rarity value of a species assemblages, a **Species Quality Index (SQI)** may be calculated through division of the Invertebrate Index gained from a site by the number of species recorded at that site.

6.1.7 In this way, SQI is effectively the average number of points which each recorded species is worth. A site with ten recorded species, all of which were of Red Data Book status and so with a species value of 100 points each, would score 10 x 100 points to give an invertebrate index of 1000. Dividing this index by the ten species gives an SQI value of 100.

6.1.8 In fact, sites always support a mix of common and scarcer species so that the SQI value is always well below 100. How far below, is a measure of the value of the site to invertebrate ecology on a national scarcity basis. As a general guide, a “good” invertebrate site in England would have an SQI value of at least 5.00 after moderate recording coverage. An “excellent” site might have a value of 7.50 and any site with an SQI value approaching 10.00 is almost certainly of national significance.

6.2 WHOLE SITE (NORTH LAGOON AND SSSI EXCLUDING STONE NESS)

6.2.1 The current survey’s invertebrate list for the site is so far a total of 1243 species, 36 of which are Red Data Book species, 22 Nationally Scarce category Notable/Na, 63 Nationally Scarce category Notable/Nb, 31 Nationally Scarce category Notable/N and 352 that are regarded as Nationally Local. The invertebrate index for this survey is, therefore, 15500.

6.2.2 The Species Quality Index value is 15500 divided by 1243 = 12.5. **This is a very high value indicating an assemblage of national importance.**

Summary of national status assessment using invertebrate scores

National Status	Category score	Number in category	Total scores
RDB	100	36	3600
Na	50	22	1100
Nb	40	63	2520
N	40	31	1240
Local	20	352	7040
Unknown	-	80	0
Common	-	661	0
Invertebrate Index			15500
Total number of taxa			1243
Species Quality Index			12.5

6.3 NORTH LAGOON

- 6.3.1** The current survey's invertebrate list for the North Lagoon is so far a total of 850 species, 28 of which are Red Data Book species, 20 Nationally Scarce category Notable/Na, 38 Nationally Scarce category Notable/Nb, 17 Nationally Scarce category Notable/N and 262 that are regarded as Nationally Local. The invertebrate index for this survey is, therefore, 11340.
- 6.3.2** The Species Quality Index value is 11340 divided by 850 = 13.3. This is a very high value indicating an assemblage of high national importance.

Summary of national status assessment using invertebrate scores

National Status	Category score	Number in category	Total scores
RDB	100	28	2800
Na	50	20	1000
Nb	40	38	1520
N	40	17	680
Local	20	262	5240
Unknown	-	40	0
Common	-	445	0
Invertebrate Index			11340
Total number of taxa			850
Species Quality Index			13.4

6.4 SSSI EXCLUDING STONE NESS

- 6.4.1** The current survey's invertebrate list for the SSSI (excluding Stone Ness) is so far a total of 935 species, 19 of which are Red Data Book species, 15 Nationally Scarce category Notable/Na, 47 Nationally Scarce category Notable/Nb, 24 Nationally Scarce category Notable/N and 263 that are regarded as Nationally Local. The invertebrate index for this survey is, therefore, 10750.
- 6.4.2** The Species Quality Index value is 10750 divided by 935 = 11.5. This is a high value indicating an assemblage of national importance

Summary of national status assessment using invertebrate scores

National Status	Category score	Number in category	Total scores
RDB	100	19	1900
Na	50	15	750
Nb	40	47	1880
N	40	24	960
Local	20	263	5260
Unknown	-	55	0
Common	-	513	0
Invertebrate Index			10750
Total number of taxa			935
Species Quality Index			11.5

6.5 DISCUSSION ON SPECIES STATUS

6.5.1 Species included in the Red Data Book or national status reviews may not be informally removed or transferred between categories. Red Data Book category 1 species include for example the rhopalid bug *Stictopleurus abutilon* and *S. punctatonervosus*, both placed in the Red Data Book Appendix – regarded as extinct. The rules of the Red Data Book are that such species, if rediscovered, should be placed in category 1. However both these species have recolonised Britain in the last few years and are now widespread and even frequent in suitable habitat in the south-east. Other species are also known to have undergone significant expansions in range and frequency in recent years. On the other hand a few species are also now known to qualify for a higher conservation status than was known at the time of the Red Data Book or national status reviews. It might therefore be helpful to look at what would happen if the status of these species was revised in the light of current knowledge.

6.5.2 The table below summarises changes that might be justified from current knowledge:

Order	Taxon	Official status	Revision	Change
Arachnida: Araneae	Argiope bruennichi	Notable/Na	Local	downgraded
Arachnida: Araneae	Zilla diodia	Notable/Nb	Local	downgraded
Diptera: Chloropidae	Oscinimorpha arcuata	Notable/Nb	Local	downgraded
Diptera: Muscidae	Coenosia atra	Notable/Nb	Local	downgraded
Hemiptera: Heteroptera	Lygus pratensis	RDB3	Local	downgraded
Hemiptera: Heteroptera	Stictopleurus abutilon	RDB1+	Local	downgraded
Hemiptera: Heteroptera	Stictopleurus punctatonervosus	RDB1+	Local	downgraded
Hymenoptera: Aculeata: Apidae	Andrena labialis	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apidae	Bombus humilis	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apidae	Bombus rudericus	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apidae	Hoplitis claviventris	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apidae	Hylaeus pectoralis	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apidae	Lasioglossum malachurum	Notable/Nb	Local	downgraded
Hymenoptera: Aculeata: Apidae	Lasioglossum pauxillum	Notable/Na	Local	downgraded
Hymenoptera: Aculeata: Apidae	Melitta leporina	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apoidea	Nomada fucata	Notable/Na	Local	downgraded
Hymenoptera: Aculeata: Apoidea	Cerceris ruficornis	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apoidea	Ectemnius dives	Local	Notable/Nb	upgraded
Hymenoptera: Aculeata: Apoidea	Philanthus triangulum	RDB2	Local	downgraded
Hymenoptera: Aculeata: Vespoidea	Myrmica bessarabica	RDB3	Notable/Nb	downgraded
Orthoptera	Conocephalus discolor	Notable/Na	Local	downgraded
Orthoptera	Metrioptera roeselii	Notable/Nb	Local	downgraded

6.5.3 If these changes are incorporated into a Species Quality Analysis the invertebrate index becomes 15080.

6.5.4 The Species Quality Index value would then be 15080 divided by 1243 = 12.1. This is not significantly different to the SQI based on formal scores of 12.5.

7 A COMPARISON OF THE FAUNA OF THE NORTH LAGOON AND SSSI

7.1 The invertebrate habitats have been described and compared in section 4. Here the fauna recorded at each part of the site is compared.

7.2 The following table compares the total numbers of species recorded by national status.

Comparison of national status

National Status	Whole site	North Lagoon	SSSI (excluding Stone Ness)
UKBAP	3*	3	3*
pUKBAP	6 ⁺	4 ⁺⁺	4 ⁺
New to Britain	2	1	1
RDB Appendix	3	3	
RDB1+	1	1	
RDB1	3	3	2
RDB2	4	1	3
RDB3	19	15	11
RDBK	6	5	3
Na	22	20	15
Nb	63	38	47
N	31	17	24
Local	352	262	263
Unknown	80	40	55
Common	660	445	513
Total	1243	850	935

*(+1 assumed to be vagrant 1996)

⁺ (+1 recorded from Stone Ness, +1 associated with a RDB2 fly that was found during the current survey and +1 proposed, but not in final list)

⁺⁺ (+1 proposed, but not in final list)

7.3 The following table compares the species quality in terms of national status.

Comparison of species quality

Species quality	Whole site	North Lagoon	SSSI (excluding Stone Ness)
Invertebrate Index	15500	11340	10750
Total no. species	1243	850	935
Species Quality Index	12.5	13.4	11.5

7.4 The following tables examine where at the whole site species have been recorded in terms of their national status:

National status summary for the West Thurrock Lagoons

Status	Total number of spp.	Only recorded in		Recorded in	
		North lagoon	SSSI	both	Unlocalised
RDB Appendix		3			
RDB1+		1			
RDB1	3	1		2	
RDB2	4	1	3		
RDB3	19	8	4	7	
RDBK		3	1	2	
Notable/Na	22	7	2	13	
Notable/Nb	63	14	23	24	2
Notable/N	31	7	14	10	
Local	352	88	89	174	1
Unknown	80	23	38	17	2
Common	660	146	213	299	1

UKBAP summary for the West Thurrock Lagoons

Order	Family	Taxon	UKBAP status	North lagoon	SSSI
Arachnida	Dictynidae	Argenna patula	pUKBAP		+
Arachnida	Salticidae	Sitticus distinguendus	pUKBAP	+	
Coleoptera	Carabidae	Anisodactylus poeciloides	UKBAP	+	+
Diptera	Dolichopodidae	Campsicnemus magius	pUKBAP		+
Hymenoptera	Andreninae	Andrena labialis	pUKBAP	+	+
Hymenoptera	Apinae	Bombus humilis	UKBAP	+	+
Hymenoptera	Apinae	Bombus ruderarius	pUKBAP	+	
Hymenoptera	Colletinae	Colletes halophilus	pUKBAP	+	+
Hymenoptera	Sphecidae	Cerceris quinquefasciata	UKBAP	+	+

7.5 It can be seen that a considerable number of species, including those of Red Data Book and Nationally Scarce status and the UKBAP species, have been recorded only from either the North Lagoon or the SSSI, indicating that each part of the site supports a substantially unique faunal assemblage.

7.6 This is not surprising considering the substantially different nature of the habitats present in each part of the site (see section 4). The difference is in fact probably more marked than these figures indicate, since invertebrates may be quite mobile, and the known ecology of a number of taxa recorded in both areas indicates that they are likely to be mostly dependent on one or other part of the site (such as species dependent on flower-rich areas, which are likely to be heavily dependent on the North Lagoon e.g. *Andrena labialis*, *Bombus humilis*, *B. ruderarius*). There are also

species that are dependent on a combination of features provided only by the whole site (see species text for examples, such as the sphecid wasp *Crossocerus palmipes*).

7.7

The whole site should be seen in this context, where the features of each area are complimentary as well as inter-dependent. It is also important to recognise that many species depend on substantial areas of habitat, so that for example fluctuating population levels from year to year are always sufficient to support parasitic species and to enable populations to successfully respond to changes in the landscape in response to weather and resultant changes to vegetation structure, forage resources and continuity through the season, especially important for example for the UKBAP bumblebee *Bombus humilis*.

8 REGIONAL CONTEXT AND AN ASSESSMENT OF IMPORTANCE TO THE SOUTH ESSEX FAUNA

8.1 A number of sites in the region have been surveyed with comparable amounts of fieldwork. The data for sites with approximately 400 recorded species or more is given in the following table (EEDA, 2004), with West Thurrock lagoons included to put the site into perspective.

Regional comparison for well recorded sites in south Essex and north Kent

Site name	Invertebrate index	SQI	No spp.	RDB	Status			Local
					Nationally Scarce Na	Nb	N	
West Thurrock PFA Lagoons (whole site)	15500	12.5	1243	36	22	63	31	352
West Thurrock PFA Lagoon North	11340	13.3	850	28	20	38	17	262
West Thurrock PFA Lagoons SSSI	10750	11.5	935	19	15	47	24	263
Mill Wood Pit (destroyed)	6520	13.6	480	16	14	27	15	122
Northwick Road, Canvey (Canvey Wick SSSI)*	13640	10.7	1273	25	22	57	29	330
Untidy Industries site, Pitsea	4810	10.7	451	9	5	25	11	111
West Thurrock lagoons SSSI	5770	10.5	552	11	11	28	14	122
Aveley Bay (Inner Thames SSSI)	5830	10.2	570	12	7	29	9	138
Broom Hill, West Tilbury	4780	9.8	486	7	10	25	4	121
Mucking Heath	4850	9.8	494	4	7	39	4	119
Ferry Fields (now destroyed)	4000	9.5	423	8	10	19	4	89
Belton Hills SSSI/LNR	5980	9.0	667	4	10	38	14	150
Vange Heights	2850	7.4	383	5	7	14	4	64
Rainham Marshes (Inner Thames SSSI)	3360	7.1	471	3	4	17	5	99
Rammey Marsh (Lee Valley)	3990	7.0	574	5	5	17	7	114
Temple Mills (Waltham Forest)	2950	6.5	456	4	3	15	4	82
Grays Chalk Quarry SSSI	4340	6.6	655	5	6	25	6	115
Mill Meadows SSSI/LNR	2390	5.6	429	2	3	8	4	78
Eastbrookend LNR & CP	4300	5.0	867	1	8	22	2	142
Erith Marshes		4.08						
Dartford Marshes		3.74						
Crayford Marshes		3.70						

*there is some further data published as a result of survey in 2003 on particular species not included in these figures – the 2003 survey added approx. 130 new species to this total

8.2 Comparison with other sites in the region indicate that it is the most important, more so even than Canvey Wick SSSI (Northwick), in terms of numbers of rare and scarce species and overall diversity.

8.3 In terms of overall diversity, the numbers of species are much higher than any other site except Canvey Wick, with which it is comparable. However it should be noted that Canvey Wick was thoroughly worked over a number of years for Lepidoptera by Don Down and subject to moth trapping at various points over the site on one occasion in 2003 by C.W. Plant. 258 species were recorded and these data are included in the these figures. West Thurrock has had no targeted Lepidoptera survey except a single trapping exercise at one location in the SSSI in 1996 (Plant, 1996) and casual recording by a non-specialist in 2003 and 2005. If Lepidoptera are removed from the figures for Canvey Wick and West Thurrock the results are as follows:

Comparison of West Thurrock with Canvey Wick without Lepidoptera data

Site name	Invertebrate index	SQI	No spp.	Status				
				RDB	Na	Nb	N	Local
West Thurrock PFA Lagoons (whole site)	15160	12.9	1175	36	22	58	31	345
Northwick Road, Canvey (Canvey Wick SSSI)*	12230	13.3	919	23	21	47	29	292

8.4 The results indicate that West Thurrock Lagoons are more diverse and support significantly more Red Data Book and Nationally Scarce species than Canvey Wick SSSI despite the smaller size of the West Thurrock site (excluding Stone Ness and the mudflats, the SSSI appears to be about 20ha and the North Lagoon 22 ha in size, as opposed to about 80ha for Canvey Wick.

8.5 If a comparison is made between the species recorded at Canvey Wick* and West Thurrock Lagoons, then only 635 species are common to both sites out of 1243 currently recorded at West Thurrock Lagoons and 1273 at Canvey Wick. A summary of the national status of these species is given in the following table.

Status summary of species common to both West Thurrock Lagoons and Canvey Wick

Status	Numbers
UKBAP	3
pUKBAP	3
RDB1+	1
RDB1	1
RDB2	1
RDB3	7
RDBK	3
Na	14
Nb	27
N	12
Local	180

8.6 This means that a substantial number of species of nature conservation significance found at West Thurrock Lagoons are not recorded at Canvey Wick. A summary of the national status of these species is given in the following table.

Status summary of species at West Thurrock Lagoons not recorded from Canvey Wick

Status	Numbers
pUKBAP	3
New to Britain	2
RDB Appendix	3
RDB1+	1
RDB1	2
RDB2	3
RDB3	12
RDBK	3
Na	8
Nb	36
N	19
Local	172

8.7 Clearly the site should be considered to be a crucial node in the maintenance of regional metapopulations. It is also substantially different in character and supports a significant proportion of species not found at Canvey Wick or at other sites.

8.8 The *Guidelines for selection of biological SSSIs 17. Invertebrates* available at the JNCC website indicate that where possible Red Data Book, nationally scarce and regionally scarce species should be conserved as part of rich invertebrate faunal assemblages, as well as localities within each AOS supporting strong populations of Red Data Book species in well-recorded groups. The guidelines also state that all nationally scarce species should be represented in the SSSI series within each AOS where they occur. This can only occur if the whole West Thurrock site is included in the SSSI series.

9 RECOMMENDATIONS FOR THE CONSERVATION OF IMPORTANT SPECIES

9.1 The variation in vegetation structure and plant diversity present, especially in the North Lagoon, provides an excellent habitat mosaic to invertebrates which favour bare and sparsely vegetated ground, warm conditions, plentiful forage and seasonally wet areas. The unmanaged nature of the vegetation and the presence of plants stressed by drought and low nutrient levels allow scarce invertebrate species to establish populations.

9.2 As has been noted elsewhere in the report, changes to both the North Lagoon and SSSI have been remarkably slight since 1996, almost certainly an example of slow rate of succession brought about by the chemical nature of PFA, with high salt content and boron toxicity, and the changes it undergoes as it weathers (Shaw, 1994), the mineral-deficient substrate, low rainfall and high summer sunshine levels typical of south Essex near the Thames.

9.3 The extent and complex inter-relationship of the habitats is almost certainly crucial to the viability of many of the populations of species of nature conservation significance. Most invertebrates have complex life cycles, often not well understood, and the availability of relatively extensive areas and structural and vegetative diversity is extremely important for species with differing requirements at different stages of their life cycle, as well to enable populations to find the exact conditions they need within habitats subject to natural change in response to succession, varying degrees of disturbance, grazing and different weather patterns from one year to the next.

9.4 West Thurrock Lagoons support an extremely important invertebrate fauna with most species of significance associated with flower-rich areas, various specific plants, lichen and Bryophyte heath, drought or mineral-stressed vegetation, permanent and seasonally wet saline water bodies and upper saltmarsh, but it is the complex mosaic and juxtaposition of these habitats that provides an additional degree of importance. The calcicolous vegetation component at West Thurrock (typified by plants such as Yellow-wort, Ploughman's Spikenard and various orchids, as well as various invertebrates), also mainly in the North Lagoon, is of particular significance to a number of species that are under enormous threat in Essex e.g. the bees *Andrena minutuloides*, *Ceratina cyanea*, the shieldbugs *Eurygaster maura* and *Sciocoris cursitans*, with its parasite *Gymnosoma nitens*.

9.5 It is crucial for the invertebrate fauna that these habitat components and the complex mosaic survive. Factors affecting this include natural succession, disturbance, which has both negative and positive aspects, rabbit grazing, topography and hydrology and the gradual drying out of the lagoons, possibly partly in response to increasingly evident climate change, natural weather patterns, and the possibility of loss of substantial areas of the site to development.

9.6 Natural succession

9.6.1 All habitats are dynamic in nature, although brownfield sites are often considerably less dynamic than semi-natural alternatives – because of their mineral-deficient substrates, contamination and the low rainfall of south Essex they frequently take many, many decades to become scrub and secondary woodland even without the interference of disturbance or management. West Thurrock Lagoons have changed remarkably little since 1996, with the most importance differences being the presence of substantial disturbance from scrambler and quad bikers since at least 2003 and more extensive scrub development on both the North Lagoon and SSSI. Rather few species of nature conservation importance are associated with trees or scrub, although several are important in an Essex context, and scrub removal is recommended to return areas to more open habitat. However the value of open areas sheltered by the presence of scrub should be recognised and these features should be retained.

9.7 Disturbance

9.7.1 In 1996 there was no evident public access or noticeable disturbance at the site, but by 2003 there was already a substantial level of scrambler and quad bike activity that had had a high level of impact on parts of the North lagoon. By 2005, this had extended into the SSSI, at least in the form of scrambler bike disturbance. These activities have destroyed all vegetation cover over substantial areas, especially where the bikers seem to have ‘arenas’ around which people evidently act as spectators. These disturbed areas are generally too disturbed to support any vegetation or associated ground-nesting invertebrates except at the edges. On the other hand where scrambler tracks have occasionally become disused, the lower topography from ruts in the PFA allows seasonally wet areas to develop a saline vegetation that supports species such as the UKBAP ground beetle *Anisodactylus poeciloides* and foraging by the proposed UKBAP mining bee *Colletes halophilus* on Sea Aster.

9.7.2 However currently this positive benefit is too uncontrolled and the negative aspects outweigh the positive benefits. It is strongly recommended that illegal trespass and biking activity on the whole site is prevented by effective security measures. It would then be far more beneficial to introduce a management scheme that deliberately introduced a controlled level of disturbance and excavation of shallow hollows to maintain a level of seasonally wet saline habitat on a rotational basis, whilst safeguarding the drier stony saline habitats at the southern end of the North Lagoon that support the population of the jumping spider *Sitticus distinguendus*.

9.8 Grazing

9.8.1 The sparsely vegetated lichen and Bryophyte heath areas in the North Lagoon, typified by trap sample areas C and D, are very important components of the habitat mosaic in the northern area. These appear to have developed in response to a combination of drought and mineral-deficient stress, combined with the localised affect typical of rabbit grazing in keeping areas from developing significant amounts of tall vegetation. These lichen and Bryophyte heath areas have clearly developed over a long time-scale and are fragile and vulnerable to destruction from uncontrolled disturbance. They are also almost certainly difficult to re-create and need conservation, minimal management and protection to maintain their current value. Experiments in species-poor grassland areas to remove vegetation in sample areas on the site to investigate the viability of their re-creation is recommended.

9.9 Topography, hydrology and wetland features

9.10 The upper saltmarsh habitat, especially in the main South Lagoon, is probably the largest extent in the Thames Estuary. Seasonally wet areas within this or within drier grasslands in the North Lagoon have either occurred naturally in depressions or in response to previous disturbance that has created new depressions, which then vegetate with saltmarsh plants such as glasswort and Sea Aster. These are important for the UKBAP ground beetle *Anisodactylus poeciloides* and the proposed UKBAP mining bee *Colletes halophilus*. Small shallow depressions of different depths deliberately created in both the North Lagoon and SSSI on a rotational basis would be an important way of ensuring continuity of seasonally wet saline habitat, which is not only important for some key invertebrates, but also rare Essex plants such as Lesser Centaury. If there is evidence of the loss of upper saltmarsh vegetation through drying of the site and drought caused by consecutive dry seasons, then it is recommended that water from the Thames is pumped into the lagoon during the winter so that a proportion of the habitat is under water, but which then gradually dries out during the summer. An additional benefit would be that scrub would be killed by the saline water. There might also be a benefit in the excavation of areas to lower levels. Great care would have to be taken not to impact negatively on the three colonies of Marsh Helleborine.

9.11 The large shallow seasonally wet water body at the southern end of the North Lagoon is important for its associated beetles and other species associated with saline conditions. The drier edges and the saline edges of the track running west from the water body are the habitat for the proposed UKBAP jumping spider *Sitticus distinguendus*. A balance between maintaining water levels in the winter and spring and the dry edges might at some stage in the future need

management to ensure sufficient water is retained in the winter, perhaps by pumping water from the Thames.

9.12 A large permanently wet saline pond joined by a saline creek from the sluice at the south end of the Narrow Lagoon is edged by *Phragmites* and *Scirpus* marsh and Sea Aster areas. This forms a wetland of high interest, supporting rare flies such as the proposed UKBAP dolichopid *Campsicnemus magius* and *Stratiomys* larvae as well as foraging *Colletes halophilus*. If there is any ongoing drying of the wetland in the future then water levels would need to be deliberately maintained by the introduction of water from the Thames through the sluice, if still functional, or by pumping.

9.13 The quite extensive but relatively dry *Phragmites* reedbed to the south of the main South Lagoon is also an important area, with a number of important Diptera in particular recorded. There are indications that not only species such as the rare wasp *Passaloecus clypealis*, but also the chloropid fly *Cryptonevra consimilis* and proposed UKBAP *Lipara similis* (not recorded from the site, but associated with *Cryptonevra consimilis*) are found in dry *Phragmites* habitats rather than wet reedbeds. It would be important therefore not to raise water levels in this reedbed unless alternative habitat can be shown to support these species elsewhere on the site – the North Lagoon does have significant development of dry *Phragmites* grading into grasslands.

9.14 Management of grasslands

9.14.1 The requirement of many invertebrate species for a suitable foraging area where nectar and pollen may be gathered is paramount to their survival. Whilst many species may forage on a range of flower species, others are highly plant-specific. Bumblebee species depend on a continuity of suitable forage resources throughout the whole season. Many other species develop inside leaves, stems, flower heads and seeds and which over winter inside or at the bases of dead herbaceous stems and in ground litter. For stem nesting species it is critical that these resources remaining in situ from one generation to the next for the survival of these species and their cleptoparasites.

9.15 The invertebrate importance of the open flower-rich vegetation is therefore largely dependent on its relatively unmanaged nature enabling the survival of species which live these resources. Management such as mowing or cutting that removes herbaceous stems on a regular basis is therefore a very harmful practice for these species and parks, gardens and amenity grasslands have virtually no value at all. The form of management is therefore crucial. It should be more akin to that used to manage heathlands and the opposite of that typically associated with amenity land and even nature conservation grasslands – cutting of vegetation except on small areas in a large area over a long rotation would be very harmful to many of the species of nature conservation significance, and instead periodic disturbance, small-scale fires and rabbit grazing should be employed to ensure a continuity of bare and sparsely vegetated ground.

9.16 Weather patterns and habitat mosaic

9.16.1 Changing weather patterns, and in the longer term possible climate change, affects the vegetation from year to year. For example in 2003 the immensely flower-rich grassland in the north west half of the North Lagoon was mostly co-dominant with flowering Carrot and Hoary Ragwort, but in 2005 the Hoary ragwort was still present extensively in a vegetative state, but flowering was much reduced. The Nationally Scarce picture-winged fly *Merzomyia westermanni* develops in the flower heads of the plant, and the reduced flowering will impact on its success in the current year. Flowering yellow Asteraceae, an important resource for many invertebrate species, was also present in much higher quantities in 2003 than 2005. This is typical of the variations that occur naturally in the landscape and can be seen e.g. at Canvey Wick with *Lotus glaber*, and have been monitored over several years in associated reports in relation to the Shriill Carder Bee *Bombus sylvarum* (Harvey, 2001a; EEDA, 2004). The implications of these natural seasonal variations is clear – larger areas can buffer against the years when resources are reduced, and the larger the areas the more a population will be able to survive low points, both in terms of vegetative or associated prey resources. This is a crucial consideration for the long term survival of invertebrate populations.

10 AN ASSESSMENT OF POTENTIAL MITIGATION

10.1 PFA as a substrate

- 10.1.1** Shaw (1994) provides valuable background to the nature of PFA and the plant communities and succession that develops on the substrate. However little, if anything, has been published about invertebrate communities associated with the substrate. The author has published several articles (e.g. Harvey, 1998b; 2004c) noting the importance of invertebrates recorded on PFA at Barking (where the PFA has now almost completely been removed and the habitat destroyed). An area of PFA in the Lea Valley at the former Royal Ordnance site has also been subject to invertebrate survey in 2002-3 (Harvey, 2003a), but this is has a substantially different nature, and is mostly secondary woodland apart from interesting recently excavated shallow water bodies. It is interesting that the Barking PFA habitats were substantially different to those at West Thurrock, in particular there were at Barking quite extensive areas of PFA that ecologically resembled 'dune' and had typical dune species. The fauna of both of these sites is not comparable to that found at West Thurrock. The author is not aware of any published invertebrate survey and analysis of other sites in the country, most of which have been lost to redevelopment or succession.
- 10.1.2** PFA is composed largely of glassy spheres of fused aluminosilicates along with 1-9% quartz and the range of particle size is mainly from 2 to 20 μ M, corresponding to a fine sand or silty soil (Shaw, *op. cit.*). This enables many ground-nesting species to utilise the substrate as a sand substitute, particularly striking at the now destroyed Barking site, where one area of PFA physically formed a 'dune' system colonised by typical dune species.
- 10.1.3** Shaw also explains that PFA is pozzolanic, meaning that it reacts with free lime to form a strong and stable cement. There is sufficient lime in fresh PFA for this reaction to occur spontaneously, and the development of an impermeable pan 10-20cm below the surface is a common feature of PFA lagoons.
- 10.1.4** However even more important to the invertebrate assemblages at West Thurrock is the influence of salts in the substrate and the alkalinity. Shaw states that the precise chemistry of PFA is rather variable, but typically 2-5% of fresh PFA by weight consists of water-soluble salts, dominated by sodium, potassium, calcium, sulphates and chlorides, with lower quantities of boron compounds. Fresh PFA is extremely alkaline with pH values of 9-11 being typical. Halophytic plants are the first to vegetate PFA, but Shaw says that the soluble salts that make PFA toxic to non-halophytes are gradually removed by natural weathering, the timescale depending on rainfall and initial ash composition, but typically 3-5 years after disposal the PFA loses most of its toxic characteristics, the residual ash remaining alkaline (pH 7.5-8), and having many of the characteristics of an infertile calcareous silt.
- 10.1.5** At West Thurrock the situation must be more complex than this, because the PFA substrate has been present since before 1991, when the southern section was notified as a SSSI and when large reedbeds with abundant *Phragmites* and *Scirpus* already bordered its south and eastern perimeter and supported nesting Reed Warblers, Sedge Warblers and Bearded Tit (SSSI citation). Despite this period of at least 15 years, salt and halophytic plants are still a key component of parts of the North Lagoon, and most of the main South and Narrow lagoons. This may be a result of a combination of previous flooding with water from the Thames, an impermeable pan below the surface and capillary action drawing salts to the surface as seasonally wet areas periodically dry out.
- 10.1.6** The calcareous influence at West Thurrock is clearly visible in the presence of plants more usually associated with calcicolous grasslands, such as Yellow-wort, Common Centaury, Ploughman's Spikenard and various orchids, as well as Carrot and Hoary Ragwort, typically found in dry and often calcareous grassland, but rarely in the quantity to be seen in the northern and western part of the North Lagoon. Calcicolous grasslands are otherwise confined in Essex to the chalk exposures in Thurrock or the chalky boulder clays of north-west Essex, where the

character of the flora and fauna is very different and almost all semi-natural habitat is replaced by arable farmland. These calcicolous habitats are amongst the most threatened of all in Thurrock, where they only occur in the west of the borough on the remnant Chalk outcrops exposed by quarrying or as here developed on the unique PFA substrate. The associated habitats are already mostly lost to industrial and housing developments.

10.1.7 Also built into the complexities of the drier parts of the site are the areas of lichen and Bryophyte heath in the North Lagoon, which support a range of species more typically found on heathlands. These appear to be formed over a long timescale in response to drought and mineral deficiency stress, as well as rabbit grazing.

10.2 Mitigation feasibility

10.2.1 Very significant areas of important invertebrate habitat will be lost by any development of the site. Crucial elements in the survival of individual species and whole invertebrate assemblages include the area, age and management of habitats as well as complexities of habitat mosaic. Many species would not be able to survive on small areas of habitat, indicating that loss of any significant proportion of the North Lagoon is likely to impact severely on the existing fauna. However it is also likely to be difficult to re-create comparable habitats and certainly not in a predictable manner. It would take many years for re-created habitats to become suitable for colonisation by the most significant species of nature conservation concern. Effective mitigation is therefore highly problematic and mitigation for loss of habitat on the North Lagoon would be extremely difficult to achieve either on-site or off-site.. Some potential mitigation strategies are considered below.

10.2.2 The habitats present have developed over a timescale significantly longer than at least 10 years, and some of the most important ones, such as seasonally wet saline areas, old lichen/Bryophyte heath, complex mosaics where vegetation typically associated with acid and calcareous substrates are adjacent and grade into each other and extensive flower-rich areas are unlikely to be re-creatable e.g. on brown roofs, and the success of this form of mitigation to even provide ordinary 'wasteground' invertebrate habitat is unproven.

10.3 Mitigation off-site would also be extremely difficult. The recreation of equivalent habitat would need to be in the general vicinity of the current site to enable colonisation from the existing assemblage of the species of conservation importance and over a realistically long timescale. Fly ash or pulverised fuel ash (PFA) is nowadays virtually an irreplaceable resource, and even if the substrate could be sourced it would not provide mitigation unless the source was currently of low nature conservation interest, which is unlikely.

10.4 Shaw in 1994 reflects on the threats of redevelopment facing PFA sites, and records that the solution frequently adopted is to transplant turfs from the threatened site to a safe location nearby, known as habitat translocation schemes. The translocation of PFA turfs to a prepared site might succeed in preserving vegetational aspects of the habitat, but is unlikely to conserve the faunal assemblages, and an additional problem in the region is that safe sites nearby (that don't already have nature conservation importance of their own) are almost certainly impossible to find.

10.5 The removal of substrate from the West Thurrock Lagoons to a new location which was then allowed to re-vegetate and was managed for the benefits of nature conservation would be a worst-case scenario, but the nature of the vegetation that would develop and its subsequent succession would almost certainly be unlike that present at the site now, due to changes in the chemical nature of the PFA through weathering. In addition the re-establishment of invertebrate assemblages would be unpredictable and dependent on their colonisation from nearby sites, and this would involve a long timescale – which is unlikely to be available.

10.6 Off-site mitigation that provided other alternative land for nature conservation would not compensate due to the unique character of the substrate, vegetation mosaic and invertebrate fauna at West Thurrock.

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12 NOTES ON SPECIES OF NATURE CONSERVATION SIGNIFICANCE

Text is provided for species of national and regional (Essex) significance with information on their ecology where this is known.

12.1 Arachnida, Araneae (spiders)

12.1.1 Araneidae, *Argiope bruennichi*, Notable/Na, Essex Red Data species, Regionally Important

The spider was first recorded in Britain in 1922 at Rye, East Sussex (Locket & Millidge 1951) and for many years, seemed to be restricted to a few areas close to the south coast in Sussex, Kent, Hampshire and Dorset. Since the 1970s, evidence suggests that the spider has been increasing its range, probably due to longer warmer summers and autumns. Although now widely recorded as far north as Derbyshire, the species currently still warrants Nationally Scarce status. It is now widespread in suitable habitat in the East Thames Corridor, where it was first found in 1965. The large orb webs are slung low down in the vegetation and the adult spider is easily hidden by the surrounding herbage. Grasshoppers form the main food item. The large urn shaped egg cocoon is positioned in the higher levels of vegetation and the eggs over-winter, hatching out in the following spring. Both sexes mature in the late summer, the females perhaps living on until October but the much smaller males living for only a short time. Any form of regular cutting of grassland will destroy the webs and the over-wintering egg cocoons, presumably explaining why large populations seem to be confined to unmanaged rough grassland and waste ground (Harvey *et al.* 2002).

The wasp spider *Argiope bruennichi*



12.1.2 Araneidae, *Zilla diodia*, Notable/Nb, Essex Red Data species, Regionally Important

The species is confined to the southern half of Britain, and is especially frequent in parts of south-east England. The spider is found on tall heather, brambles, bushes and the lower branches of trees, usually in sheltered shady places and among scrub on cliffs by the coast. It occurs at the edge of clearings or rides in broad-leaved or mixed woodland, in old hedgerows, green lanes, scrub and sometimes gardens. The spider is relatively frequent in southern and eastern Essex in scrub and woodland edge habitat. It has been recorded in 118 post-1979 10km squares (Harvey *et al.*, 2002) and its status will be downgraded in a forthcoming status review.

12.13 Dictynidae, *Argenna patula*, Notable/Nb, proposed UK Biodiversity Action Plan species, Essex Red Data species, Essex Threatened, pUKBAP

In Britain the spider is confined to strand-line litter and under stones on the banks of tidal rivers or on estuaries and saltmarshes, but most records are from the east coast between Lincolnshire and Kent. Pollution on some rivers and loss of saltmarsh to land reclamation may threaten the species at some sites. Sea level rise and saltmarsh erosion are more likely to threaten the species on the east coast and the spider is proposed UKBAP species. Retention of strand-line litter is important (Harvey *et al.* 2002).

12.14 Gnaphosidae, *Trachyzelotes pedestris*, Notable/Nb, Essex Red Data species, Regionally Important

T. pedestris is confined to southern Britain south of a line from Norfolk to Herefordshire. The spider is abundant in some places, especially on dry coastal grassland with many loose stones, but rather local inland. It usually occurs in chalk and limestone grassland, often under stones in fairly open areas. In Essex it occurs on dry south-facing grasslands, landslip areas and at the base of sea walls (Harvey *et al.* 2002).

12.15 Linyphiidae, *Hypomma fulvum*, Notable/Na, Essex Red Data species, Essex Threatened

Hypomma fulvum occurs mainly in East Anglia and the extreme south-east of England. Coastal Essex is a national stronghold for *H. fulvum*, where it is relatively frequent in brackish *Phragmites* near the coast. The spider occurs most frequently in fens and marshes, on *Phragmites* or in the litter beneath, sometimes in *Cladium* marshes. In Essex, it has been collected mainly in *Phragmites* marsh in borrowdykes, but also grazing marsh grassland, in saltmarshes and on the landward side of a sea wall in herb rich grassland.

12.16 Lycosidae, *Alopecosa barbipes*, Essex Red Data species, Essex Threatened

This wolf spider is widely distributed but scattered in much of Britain. It is rare in the agricultural lowlands of southern England e.g. in Leicestershire (Crocker & Daws, 1996) and Essex (Harvey, 2000), and very rare in most of the north of Britain. *A. barbipes* occurs on heathlands and old and unimproved grasslands, especially where there are areas of sparsely vegetated ground, short turf and lichen heath.

The wolf spider *Alopecosa barbipes*



12.1.7 Lycosidae, *Arctosa leopardus*, Local, Essex Red Data species, Essex Vulnerable

This wolf spider is widespread in Wales and on southern heathland, but very scattered elsewhere and absent from much of central and northern Britain. It is associated with wet heathland, dune slacks, fenland and other wet marshy places (Harvey *et al.* 2002) but in Essex is almost exclusively found in seasonally wet brackish locations including brackish ditches and saline hollows behind the seawall.

12.1.8 Lycosidae, *Pardosa agrestis*, Notable/Nb, Essex Red Data species, Regionally Important

This wolf spider is more or less restricted to the southern half of Britain (Harvey *et al.*, 2002) and occurs in open habitats with a good proportion of bare ground, such as some grasslands and old sand and chalk pits, as well as post-industrial habitats. It is widespread in southern Essex.

12.1.9 Salticidae, *Bianor aurocinctus*, Notable/Nb, Essex Red Data species, Regionally Important

Most records of *Bianor aurocinctus* are from the south-eastern part of England, and the spider is most frequent in Britain in the East Thames Corridor (Harvey *et al.*, 2002). It is found on dry sparsely vegetated ground in a variety of habitats, but always among short vegetation or in stony areas.

The jumping spider *Bianor aurocinctus*



12.1.10 Salticidae, *Sitticus distinguendus*. New to Britain, proposed UK Biodiversity Action Plan species, Essex Red Data species, Essex Endangered

Two small males and one subfemale of this spider was first found at this site in pitfall trap material in the same area of the North Lagoon in September 2003 (Harvey & Hammond, 2003), but was misidentified at the time as *Sitticus saltator*. The collection of live specimens (males and females) during the current survey made it clear the spider was not this species and that it was not any other species previously recognised in the British fauna. Dmitri Logunov, an expert in the Salticidae, identified the specimens as *Sitticus distinguendus*, a species with a Palaearctic nemoral range from France to Maritime Province and Japan, north to Tansk and South Yakutia and south to Shanxi (Logunov & Marusik, 2000). He commented that there are no zoogeographical constraints on this species occurring in Britain (pers. comm.). This suggests that there is no reason to suppose that the colony at West Thurrock has been introduced, but rather is the result of natural colonisation of suitable habitat. It is certainly well established at the West Thurrock site, with two small males and a subfemale in pitfall traps in Autumn 2003 and a thriving but very restricted colony found during the current survey in dry stony saline habitat at the edges of the large seasonally wet water body and saline edges of adjacent track, with specimens being found in numbers throughout the season. It is also possible that the population has been present for much longer, since the 1996 survey did not sample the area in which it is located.

The recognition of the species at West Thurrock resulted in the realisation that a single female collected by Tony Russell-Smith in 2004 on a substrate of cement factory flue-ash at Swanscombe Marshes, only 2 kilometres from the West Thurrock site across the River Thames was also this species.

In West Thurrock the very localised habitat is dry sparsely vegetated ground close to seasonally wet areas on a substrate of fine almost sand-like PFA and stony clinker that has a distinctly saline character. In the area immediately adjacent to where the spider has been found salt can often be seen encrusted on the surface and plants such as glasswort *Salicornia* grow. Much of the rest of the site comprises dry flower rich grasslands with plant species associated with calcareous substrates as well as sparsely vegetated ‘sandy’ areas that provide a mosaic with features of heathland. The character of the habitat where the spider has been found in Britain has distinct similarities to most of its recorded habitats in Europe, for example grey dune vegetation has high affinities with heathland and chalk grassland vegetation and at Boulonnais the grey dunes make contact with chalk grassland (Bonte *et al.* 2003). Logunov & Marusik (*op. cit.*) provide the following habitat details for the species: zonal forb-grass steppes, salt marshes, sloping shrub-stony steppes, screes and cobble-gramineous stands, bird cherry stand, stony river banks and taiga edges, larch forests and mountain steppe-semidesert, cliffs and screes. Žabka (1997) describes the habitat as sandy places covered with sparse vegetation and Krasnobayev (2004) describes habitats in some regions of European Russia as upland meadows and pine forests, sandy and cretaceous sloping steps and on riverbanks.

S. distinguendus is listed as Endangered in the Czech Republic (Buchar & Růžička, 2002) and in Flanders (Instituut voor Natuurbehoud, 2005), it has a Proposed Red List status of Endangered and Declining in Norway, as Vulnerable in Poland (Zabka, 1997), and there is only one 10km dot in the Spiders of Serbia. It is also regarded as one of the most interesting species from Antwerp (Vanuytven, 1997). In Britain the spider is unlikely to have been overlooked on dune systems or rocky habitats – it is large and males very distinctive in life. The scarcity of habitat, the importance of the population in Western European terms and the high degree of threat have meant that the British Arachnological Society UKBAP Review Panel have proposed the species as an addition to the UKBAP.

The jumping spider *Sitticus distinguendus*



12.1.11 Tetragnathidae, *Tetragnatha pinicola*, Notable/Nb, Essex Red Data species, Regionally Important

The species is usually found in broad-leaved or mixed woodland on herbage in clearings or rides, but sometimes, as here, on scrub and tall herbage in post-industrial situations. In Essex it is relatively widespread and frequent.

12.1.12 Theridiidae, *Theridion impressum*. Local, Essex Red Data species, Essex Threatened

Although widespread in much of Britain, *Theridion impressum* is very rare in Essex and other parts of south-eastern England. It has only otherwise been found in the county at Epping Forest, where it is reasonably frequent in the remnant heathlands, and at Friday Woods in North Essex. Its occurrence at West Thurrock is somewhat unexpected, but perhaps a reflection of the 'heathy' nature of parts of the habitat mosaic, reflected also in other species present.

12.1.13 Zodariidae, *Zodarion italicum*. Proposed Nationally Scarce (A), Essex Red Data species, Regionally Important

The centre of distribution in Britain is the East Thames Corridor in south Essex and north Kent (Harvey *et al.* 2002). The species is recorded from only 16 ten-kilometre squares in Britain, and many of its habitats are threatened by development. It is currently assigned Scarce A status in a national status review in preparation. The spider is strongly associated with dry, warm, sunny open habitats containing a proportion of bare ground. The spider makes an 'igloo'-like retreat and feeds on ants such as the common black ant *Lasius niger*.

12.2 Coleoptera (beetles)

12.2.1 Apionidae, *Ceratapion carduorum*. Local

This is a small weevil feeding on thistles. It is widespread in southern England though there is only one other post-1970 record for Essex.

12.2.2 Apionidae, *Oxystoma cerdo*, Notable/Nb, Essex Red Data species

This is a small weevil whose larvae develop in seed pods of *Viccia* species. It is widespread but local in the Midlands and northern England, and also recorded from southern and eastern England, North Wales and South West Scotland.

12.2.3 Cantheridae, *Silis ruficollis*, Notable/Nb, Essex Red Data species

Silis ruficollis is a scarce red and black soldier beetle found in fens and reedbeds, which is widely distributed in southern England but very rare in the north.

12.2.4 Carabidae, *Amara consularis*, Notable/Nb, Essex Red Data species

Amara consularis is widely distributed throughout Britain but very uncommon. It is found in open conditions for example on sand or gravel on heathland, sand dunes, undercliffs, gravel pits and calcareous grassland. The larvae are predatory, while adults are phytophagous. A gregarious species. Adults have been found in a variety of situations including under stones, under driftwood and at the roots of grasses. This species is threatened by destruction of habitat and through natural succession (Hyam & Parsons, 1992).

12.2.5 Carabidae, *Anisodactylus poeciloides*, Rare (RDB3), UKBAP, Essex Red Data species

Anisodactylus poeciloides was found to be present in three separate areas of the Thurrock PFA site when this was surveyed in 1996 (Plant, 1996), including the North Lagoon. However, its distribution within the whole site is likely to be limited to small patches of relatively open ground

with early succession salt-associated plants (e.g. glasswort, sea aster) that are surrounded by or adjacent to relatively dense grass or other vegetation (Harvey & Hammond, 2003).

A. poeciloides is a medium-sized ground beetle of about one centimetre in length. It is generally green or brassy in colouration. Although it has a number of highly distinctive anatomical features, in the field it may easily be confused with other, much commoner, ground beetles of similar colour, such as *Harpalus affinis* or *Pterostichus cupreus*.

Classified in Hyman & Parsons (1992) as Rare (RDB3), *A. poeciloides* is the subject of a UK Biodiversity Action Plan (UK Biodiversity Group Tranche 2 Action Plans Volume IV – invertebrates). Objectives of the UKBAP include the maintenance and enhancement of populations at all known sites. Proposed actions include ensuring that all occupied habitat is appropriately managed by 2008, through SSSI or agri-environment scheme management agreements, and that the habitat requirements of *A. poeciloides* are taken into account in relevant development policies, plans and proposals. It is therefore strongly recommended that a management agreement be made for both the South and North Lagoons that reflects the needs of this species.

The recently published Atlas of British ground beetles (Luff, 1998) gives post-1969 records for *A. poeciloides* for only three 10-km squares, all in North Kent. However, field surveys carried out as part of the BAP process by Peter Hammond, Alex Williams and others have shown the species to be present in a wider range of localities in Kent and Essex. Recent field surveys have also shed light on the habitat needs of the species. Although reputedly a denizen of salt-marshes, *A. poeciloides* seems, in fact, to be more of a grassland + saltpan species. It is rarely found in saltmarshes proper, and apparently avoids exposure to tidal conditions. It seems to use both areas of relatively open and saline terrain and denser adjacent vegetation where the soil may not be at all saline. These conditions may be found, for example, in the vicinity of a saline or brackish pool or borrowdyke that has gently sloping edges as these dry out.

12.2.6 Carabidae, *Bradycellus distinctus*, Notable/Na, Essex Red Data species

Records are restricted to sandy coastal sites in south and east England from Norfolk to Devon, and south Lancashire. There are older records from central southern England and south Wales, but these probably refer to a different species *B. sharpi* (Luff, 1998).

12.2.7 Carabidae, *Calathus ambiguus*, Notable/Nb, Essex Red Data species

Calathus ambiguus is a predatory black ground beetle, widely distributed through Great Britain, but very local. It is found under stones, and leaf rosettes on dry, usually sandy ground with sparse vegetation as well as amongst marram on sand dunes. It has been recorded from heathland, sand dunes, chalk pits, gravel pits and disused quarries.

12.2.8 Carabidae, *Cicindela campestris*. Local, Essex Red Data species

Although widespread on open, dry heaths and moors throughout Britain, many records shown in Luff (1998) are old. The tiger beetle *Cicindela campestris* is rare and threatened in Essex and neighbouring counties. It is an annual species, breeding early in spring, the larvae inhabiting vertical burrows in the soil. In Essex the only recent records appear to be from from Walton-on-Naze and Colchester (J. Bowdrey, 2001), a small area of Danbury Common and Linford Sand Pit (possibly now lost). There are earlier records from Epping Forest, Grays and Sandon.

12.2.9 Carabidae, *Demetrias imperialis*, Notable/Nb,, Essex Red Data species

This is a yellowish brown ground beetle with conspicuous dark markings. It was formerly not uncommon in the East Anglian fens and Thames marshes. Around the turn of the century it declined dramatically. Since then this species has increased substantially, and is now recorded throughout much of south-east England (Luff, 1998). It occurs in fens, broads, marshes, ponds, gravel pits, brackish marshes and tidal rivers, living among tall plants growing in or near water,

particularly Phragmites beds and also in flood litter. It may be found hibernating in dead bulrush stems. Cutting, on a rotational basis, may be needed to maintain open conditions, and water tables should be maintained at high levels (Hyman & Parsons 1992).

12.2.10 Carabidae, *Dicheirotichus obsoletus*, Notable/Nb, Essex Red Data species

Dicheirotichus obsoletus is a yellowish ground beetle that is widespread in southern estuaries, north to the Wash, but very local, with some records from Scotland. It is found under driftwood and seaweed on saltmarshes and sandy and muddy shores. On saltmarshes grazing should not be introduced where there is no grazing at present Hyman & Parsons, 1992).

12.2.11 Carabidae, *Dyschirius nitidus*, Notable/Na, Essex Red Data species

This is a local species found mainly in coastal saltmarshes with *Bledius* rove beetles. Many records mapped in Luff are pre-1970, with only ten modern 10km squares shown.

12.2.12 Coleoptera, *Microlestes minutulus*

This ground beetle was first recorded in Britain from Rainham (Essex) in 1995, although it was first found in Suffolk in 1976, but went unrecognized until later. It has since been found in a small number of coastal localities in the south-east of England, with only four 10km squares shown in Luff (1998). However the author found the species inland in 2000 (Harvey, 2000b) and a number of new localities in the East Thames Corridor. It may be a recent colonist, but it may have been overlooked in the past.

12.2.13 Carabidae, *Ophonus ardosiacus*, Notable/Nb, Essex Red Data species

Most recent records of the phytophagous ground beetle *Ophonus ardosiacus* are from the south coast and the Thames estuary. It lives on chalk or limestone soils and coastal clay, usually being found under stones or in cracks in the substrate (Luff 1998).

12.2.14 Carabidae, *Ophonus rupicola*, Notable/Nb, Essex Red Data species

The ground beetle is widespread but local in England. It is difficult to identify and may be confused with other members of the genus, consequently, the exact status of this species is hard to assess. It occurs in calcareous grassland, open ground on chalky soils, coastal shingle and the drier parts of saltmarshes. It is phytophagous, feeding mainly on seeds. Adults probably occur under stones or at the roots of vegetation. Management should aim at maintaining open conditions and encouraging early successional stages.

12.2.15 Carabidae, *Platyderus ruficollis*, Notable/Nb, Essex Red Data species

Platyderus ruficollis is a southern and eastern species in Britain. It occurs only in the more western countries of Europe, where it is often montane, Britain representing its northern limit (Luff 1998). It is found on dry, sandy or chalky soils, in open situations. It is predatory and is found amongst leaves, moss and other vegetation, and under stones.

12.2.16 Carabidae, *Scybalicus oblongiuscula*, Extinct (RDB1+), Essex Red Data species

The ground beetle *Scybalicus oblongiusculus* was considered by coleopterists to be extinct in the UK until a single specimen was found by the author at West Canvey in 2002 (Harvey, 2002). All previous records had been from the south coast of Dorset, where it was last recorded in 1926 with an unsubstantiated record from Portland Bill in 1951 (Luff, 1998). Despite further work at the West Canvey site in 2003 no more specimens were found, and the discovery of the species at West Thurrock during the current survey is extremely important in establishing not only that the beetle's occurrence is not as a vagrant, and that the North Lagoon may support a population of the species. Further work is strongly recommended to clarify the status of the beetle at the site.

12.2.17 Carabidae, *Stenolophus teutonius*, Notable/Nb, Essex Red Data species

This ground beetle is found only in southern England and south Wales, most recent records coming from Hampshire, Surrey and Sussex. It appears to be very rare in Essex. It inhabits damp, rather open ground near water, such as gravel pits and pond margins (Luff 1998).

12.2.18 Chrysomelidae, *Cryptocephalus aureolus*, Notable/Nb, Essex Red Data species

Cryptocephalus aureolus is a large golden green leaf beetle recorded from England, Wales and also North East Scotland. This species is difficult to identify and can be confused with *C. hypochaeridis*. Consequently, the exact status of this species is hard to assess. The beetle feeds on *Hypochaeris* flowers in sandy or chalky places and is primarily found on lightly grazed grassland, particularly on base-rich soils, as well as sand dunes. Larvae are cased and free living on foliage, sometimes occurring in leaf-litter and possibly ant associated. It is threatened by loss of habitat and excessive disturbance of the vegetation through activities such as motorbike access, horse-riding and human trampling (Hyman & Parsons, 1992).

Cryptocephalus aureolus/hypochaeridis



12.2.19 Chrysomelidae, *Longitarsus parvulus*, Notable/Nb, Essex Red Data species

Longitarsus parvulus is a very local flea beetle. Old records indicate that this species was formerly widespread in southern England, with scattered records north to Cumberland, but Hyman & Parsons (1992) state that it has recently been recorded from only four vice-counties, all in south-eastern England. It occurs in chalk grassland and probably field margins and disturbed ground. The beetle has been recorded feeding on Perennial Flax *Linum perenne*, but is possibly polyphagous. Grazing, cutting or some other disturbance, such as rotovation, on a rotational basis, may be needed to maintain open conditions.

12.2.20 Chrysomelidae, *Phyllotreta punctulata*, Notable/Nb, Essex Red Data species

Phyllotreta punctulata (= *aerea*) is a black flea beetle that is widespread but local in southern and central England, and also recorded in North West England and South Wales. There are old records for North East England. It has been recorded from radish *Raphanus sativus*, horse-radish *Armoracia rusticana* and turnip *Brassica rapa*, but probably also on other species of the Cruciferae. The larvae probably feed at the roots of the foodplant during May and early June, with pupation probably occurring in June or July (Hyman & Parsons, 1992).

12.2.21 Coccinellidae, *Adonia variegata* (Adonis' Ladybird), Notable/Nb, Essex Red Data species

Adonia variegata is scarce and restricted mainly to dry sandy places, in particular to heathlands and the coast. It is widespread with scattered records around southern Britain but is only frequent

in the Thames area, in South Wales and in Staffordshire. The ladybird is a characteristic component of open dry warm habitats in the London region.

Adonis' Ladybird *Adonia variegata*



12.2.22 Coccinellidae, *Hyperaspis pseudopustulata*, Notable/Nb, Essex Red Data species

Hyperaspis pseudopustulata is widespread but local throughout Great Britain, becoming extremely local and infrequently recorded in northern England and Scotland. It has been recorded from deciduous woodland, heathland, grassland, coastal marshes and saltings. The ladybird is predatory and usually found amongst herbage or in moss on or below trees. Threats include loss of habitat through change in land use and coastal developments (Hyman & Parsons, 1992).

12.2.23 Coccinellidae, *Platynaspis luteorubra*, Notable/Na, Essex Red Data species

This ladybird is very scarce, and recorded from a few counties in southern England as far north as Nottinghamshire. It has been recorded at the roots of grass, by beating dead hedgerow shrubs and hawthorn blossom, from under broom bushes and, particularly in winter, from under the bark of firs and willows (Hyman & Parsons, 1992). There is a probable association with ants, probably *Myrmica* species (Peter Hammond, pers. comm.).

12.2.24 Cucujidae, *Leptophloeus clematidis*, Endangered (RDB1), Essex Red Data species

Hyman & Parsons (1992) state that *Leptophloeus* (*Laemophloeus*) *clematidis* has only been recorded this century from Higham (Kent) in 1913 and near Ipswich (Suffolk) in 1977 and 1978, with old records from Gravesend and Dartford (Kent) and Henley (Oxfordshire). In Hyman & Parsons they state that Nash reports that both A.A. Allen and A. Masee failed to find this species in Kent, and he believes that it may be extinct in that county. It is a predator upon the bark beetle *Xylocleptes bispinus* which occurs in the dead stems of Traveller's joy *Clematis vitalba*.

12.2.25 Curculionidae, *Glocianus distinctus*, Local, Essex Red Data species

Glocianus distinctus (*Ceutorhynchus marginatus*) is a local weevil with only one other modern Essex record and one pre-1950.

12.2.26 Curculionidae, *Ceutorhynchus chalybaeus*, 1 or 2 confirmed Essex records

Ceutorhynchus chalybaeus is a relatively scarce little weevil and the name has been the subject of much confusion. Old British records for *chalybaeus* (e.g. by Joy) refer to other species (*pectoralis*, *thomsoni* etc.), but it looks as though old records for *C. timidus* refer at least in part to the true *C. chalybaeus*. There are only one or two confirmed Essex records for the true *chalybaeus* (P. Hammond, pers. comm.).

12.2.27 Curculionidae, *Otiorhynchus ligneus*

This is a widely distributed but local ground-living weevil. It is found particularly on the coast, on cliffs under stones and debris etc, but also inland in similar situations, particularly on light soils (Morris, 1997). It is polyphagous with no known feeding preferences. *Otiorhynchus ligneus* is very local in Essex, with only one other recent record.

12.2.28 Curculionidae, *Otiorhynchus raucus*, Notable/Nb, Essex Red Data species

Otiorhynchus raucus is a scarce ground-dwelling weevil widely distributed in southern and eastern England. It is associated with disturbed ground, especially on loose sandy soils and the species appears to prefer loose sandy or chalky soils. It is phytophagous and polyphagous. The larvae feed on the roots of plants while adults tend to be found at the base of plants and in litter. This species may be threatened by urban development, the infilling of pits, the use of pesticides and herbicides, and natural succession and scrub invasion (Hyman & Parsons, 1992).

12.2.29 Curculionidae, *Sibinia primita*, Notable/Nb, Essex Red Data species

The small weevil *Sibinia primita* is widespread but local in the southern half of England, and also recorded in parts of Wales. It is found in dry sandy areas on disturbed ground, sand pits, coastal shingle, heathland, downland and gardens. It is phytophagous, associated with pearlwort *Sagina*, also recorded from rock sea-spurrey *Spergularia rupicola* and possibly associated with chickweed *Stellaria* and mouse-ear *Cerastium*. Threats include loss of habitat through improvement and conversion to arable agriculture, development, afforestation, gravel extraction, the infilling of pits, and natural succession. Except on coastal shingle, which should be left undisturbed, disturbance, such as rotovation, is needed to maintain open conditions Hyman & Parsons, 1992).

12.2.30 Curculionidae, *Sitona macularius*, Notable/Nb, Essex Red Data species

Sitona macularius is an uncommon and possibly declining but widely distributed weevil in Britain, associated with Leguminosae. The weevil has been recorded from grassland, field margins in cultivated land, quarries and disturbed ground, particularly on chalky soils. The larvae feed on roots and root nodules. On the Continent, the species has been associated with common vetch *Vicia sativa*, lucerne *Medicago sativa*, black medick *M. lupulina*, red clover *Trifolium pratense* and cultivated pea *Pisum sativum*. Adults have been recorded from sainfoin *Onobrychis sativa*, wild liquorice *Astragalus glycyphyllos*, bird's-foot-trefoil *Lotus*, hairy tare *Vicia hirsuta* and smooth tare *V. tetrasperma*. Hairy Tare and Common Vetch are the most likely hosts at West Thurrock. This species may be threatened by the loss of grassland through conversion to arable agriculture or other land use. The infilling of quarries, the use of herbicides and pesticides, and natural succession and scrub invasion may be further threats. Grazing, cutting or some other disturbance, such as rotovation, on a rotational basis, is needed to maintain open conditions and encourage early successional stages (Hyman & Parsons, 1992).

12.2.31 Curculionidae, *Smicronyx reichi*, Rare (RDB3), Essex Red Data species

Smicronyx reichi is very local and recently recorded from just two vice-counties (East Sussex and Surrey). Old records suggest that this species was formerly more widespread in southern England. It is a tiny blackish red phytophagous weevil associated with Common Centaury *Centaureum erythraea*, Yellow-wort *Blackstonia perfoliata* and possibly Autumn Gentian *Gentianella germanica*. In Britain, adults have emerged in September from seedheads of Common Centaury. It is found mainly on calcareous grassland (Hyman & Parsons, 1992).

12.2.32 Curculionidae, *Tychius brevisculus*, 2 other Essex sites

The weevil *Tychius brevisculus* is (in part) what older works had as '*haematopus*' or '*crassirostris*', but is effectively a newly (recently) recognized British species. It is known so far

from 2 Essex sites (Canvey Northwick and Bradwell Waterside) and a couple of sites in Kent/Sussex (P. Hammond, pers. comm.). It is strictly associated with *Melilotus*.

12.2.33 Elateridae, *Athous campyloides*, Notable/Nb, Essex Red Data species

The click beetle *Athous campyloides* is local in south-east England, but with a scatter of records to West Cornwall. It has been recorded from grassland, road-sides verges, gardens, coastal cliffs, a disused chalk pit and a disused clay pit. The beetle probably breeds in the soil at the roots of plants. The species is crepuscular and gregarious.

12.2.34 Hydraenidae, *Ochthebius viridis*, Notable/Nb, Essex Red Data species

Ochthebius viridis is a small metallic coloured water beetle. The map for this species on the NBN Gateway shows coastal records on the east and south coast of England as far as the Scilly Isles, with the majority of records from the Thames Estuary and the north Kent and Essex coast. It is found in brackish pools.

12.2.35 Hydrophilidae, *Helophorus fulgidicollis*, Notable/Nb, Essex Red Data species

This is a small brownish water beetle with a metallic green thorax. It occurs in saltmarsh pools and coastal grazing levels ditches. The species is very rarely recorded but difficult to identify and therefore likely to be overlooked, although it seems to be genuinely scarce (Recorder species account).

12.2.36 Melyridae, *Dasytes plumbeus*, Notable/Nb, Essex Red Data species

Dasytes plumbeus is recorded from England and South Wales. Its status is uncertain because of former confusion over nomenclature, combined with the difficulty in reliably distinguishing this species from its close relative (also Nationally Scarce) *D. puncticollis*. *D. plumbeus* has been noted from grassland in derelict chalk pits, cliff tops, grazing levels, fen edge, neutral grassland on a railway cutting and possibly woodland. It is found by sweeping grassland and also by beating oak (Hyman & Parsons, 1992).

12.2.37 Mordellidae, *Mordellistena parvula*, Insufficiently Known (RDBK), Essex Red Data species

The tumbling flower beetle *Mordellistena parvula* is widely distributed but rare on disturbed ground in southern England. The larvae probably develop in herbaceous plant stems and the adults appear to be associated with mugwort and yarrow. A number of scarce *Mordellistena* species have been found in the East Thames Corridor in open unmanaged grasslands, especially on post-industrial sites where there is a continuity of stems throughout the season and from year to year.

12.2.38 Mordellidae, *Mordellistena pseudoparvula*, Insufficiently Known (RDBK), Essex Red Data species

Mordellistena pseudoparvula is a tumbling flower beetle that has only recently been recognised in Britain. There are now several published records in south-eastern England, It was first found in Essex by the author at Aveley in 2000 and the author has subsequently collected it at Hornchurch Country Park and Canvey Northwick. This is a difficult group, with many European species, some others of which have been recognised as British in recent years. Larvae probably develop in plant stems and the adults appear to be associated with flowers such as Carrot *Daucus carota*.

A tumbling flower beetle *Mordellistena* sp.



12.2.39 Mordellidae, *Variimorda villosa*, Notable/Nb, Essex Red Data species

Variimorda villosa is widespread and local in the southern half of England, and also recorded in South Wales. It is very rare in Essex, but has also been found across the river in north Kent at Littlebrook Lakes where there is open unmanaged herbaceous vegetation with some scrub development along the northern edge. The larvae develop in either dead wood or plant stems, probably the latter and adults are usually found on flowers, particularly umbellifers. Management and conservation are uncertain, though trees, and both fallen and standing dead timber, especially with the bark attached, should be retained. The removal of dead timber from ancient trees should be avoided. Gaps in the age structure of the tree population should be identified and the continuity of the appropriate dead wood habitat ensured by regeneration, suitable planting and possibly with pollarding. The presence of nectar sources such as umbellifers and composite herbs may also be particularly important for this species (Hyman & Parsons, 1992). At West Thurrock the species may be dependent on mature scrub at the northern end of the main South Lagoon.

12.2.40 Phalacridae, *Olibrus flavicornis*, Insufficiently Known (RDBK), Essex Red Data species

Olibrus flavicornis is only known from southern England and recorded as far north as Suffolk. It is relatively widespread in the East Thames Corridor. It is probably associated with grassland and coastal habitats, and on the continent is apparently associated with Autumn Hawkbit *Leontodon autumnalis*, the larva probably developing in the flower head, while the adults feed on pollen (Hyman & Parsons 1992).

12.2.41 Scarabidae, *Aphodius plagiatus*, Notable/Nb, Essex Red Data species

Aphodius plagiatus is a widespread and very local shiny black or very dark brown beetle related to dung beetles found around the coasts of southern Britain. The map on the NBN Gateway shows the beetle recorded from less than 20 10km squares. It occurs on sandhills, sand dunes, saltmarshes and damp places near the coast, associated with small fungi growing in damp hollows. It has also been found in rotting seaweed on a saltmarsh. Threats include loss of dune habitat, particularly through afforestation, urban and development, the degradation of remaining habitat by excessive disturbance of the vegetation through activities such as motorbike access, horse-riding and human trampling (Hyman & Parsons, 1992).

12.2.42 Scarabidae, *Hoplia philanthus*, Local, Essex Red Data species

The small red brown chafer *Hoplia philanthus* is local in southern England, becoming much rarer in the north. Essex records are scattered and few. It is found mainly in sandy places. The larvae develop at plant roots, the adults are found on flowers. It is abundant at West Thurrock.

12.2.43 Scolytidae, *Xylocleptes bispinus*, Local, Essex Red Data species

The bark or Ambrosia beetle *Xylocleptes bispinus* feeds inside Travellor's Joy (*Clematis*) stems or under the bark. There are very few Essex records. The beetle is preyed on by the RDB1 beetle *Leptophloeus clematidis*, found at West Thurrock.

12.2.44 Silphidae, *Nicrophorus interruptus*, Notable/Nb, Essex Red Data species

Nicrophorus interruptus is an orange and black banded burying beetle widespread but local in England and Wales. This is an opportunistic and highly mobile and possibly declining species (Hyman & Parsons 1992) requiring a continuity of carrion availability. Because of its dependence on carrion this species is likely to require large areas of suitable habitat for its continued survival.

12.2.45 Staphylinidae, *Anotylus mutator*, Notable/Nb, Essex Red Data species

Anotylus mutator is a small rove beetle Widespread but local in England and also recorded in South East Scotland. It is difficult to identify and may be confused with *A. sculpturatus*, from which it is separable only in the male sex. The beetle has been found in grassland, wetland, beaches and probably other habitats, in reed litter, in sand on a beach, in cow dung and in carrion (Hyman & Parsons, 1994).

12.2.46 Staphylinidae, *Tasgius pedator*, Notable/Na, Essex Red Data species

Tasgius (Ocyopus) pedator is widely distributed but very local in southern England, with scattered records north to Mid-west Yorkshire. Hyman & Parsons (1994) state that it has recently been recorded from only five vice-counties. It has been found in limestone grassland, coastal undercliffs, chalk downland and also found in a chalk quarry, under stones, at the roots of herbage, in moss and under clods of earth. Hyman & Parsons note that in areas of unstable cliff, large areas are required so that the population does not become isolated and subsequently threatened by individual landslips. This principle would apply to any populations where habitat would be lost.

12.3 Diptera (flies)

12.3.1 Asilidae, *Asilus crabroniformis*, Notable/Nb, UKBAP, Essex BAP, Essex Red Data species

The Hornet Robber Fly *Asilus crabroniformis* is a priority UKBAP species on the basis of its decline, with post-1970 records from only about 40 ten km squares nationally (UKBAP). Smith (2000) suggests that there are no more than 40-45 sites in England where populations of *Asilus* are breeding. The fly is found in unimproved grassland and heath in southern England and Wales. However, these habitats have shown significant decline in range and quality in recent years, with fragmentation enhancing the difficulties facing this insect. The fly's larvae are believed to prey on the larvae of large dung beetles and the adult flies feed on a variety of insects, including grasshoppers, dung beetles and flies. As such, it requires suitable grassland sward to support its prey community. Current factors causing loss or decline nationally are the loss of unimproved grassland and heath leading to habitat fragmentation, the use of persistent parasite treatments for stock (e.g. ivermectins) which kill dung beetle hosts and changes in stock management. Dung used for oviposition so far appears to only be cattle and rabbit (Pinchen *et al.* 1998). However an association with horses at sites in the UK, including Broom Hill and the Dagenham Corridor in Essex needs further investigation. Putative hosts and/or prey for larval *Asilus* in the UK are assumed to be some of the larger species of dung beetle such as *Geotrupes* or possibly *Typhaeus* (Smith, 2000). The co-occurrence with Minotaur beetles *Typhaeus* is strong on heathland sites (Pinchen *et al.* 1998).

Asilus crabroniformis is an Essex Red Data species that should be considered Vulnerable or even Endangered in the county. It is subject to an Essex BAP Species Action Plan. In Essex it has been recorded in recent years only from a handful of sites in the south of the county, in remnant species-rich grassland on Thames Terrace sands and gravels and grazing marshes between Tilbury and East Tilbury, and in the Dagenham Corridor. These sites have a history of cattle

and/or horse grazing, but at some rabbits are also present. None of the sites benefits from statutory protection. Indeed despite the presence of both the UKBAP species and many other rare and scarce species, two key sites near Tilbury have been lost, one to development and the second to capping and 'restoration'. One of the two known sites in the Dagenham Corridor has also probably now been destroyed by landscape 'restoration' (Harvey, 2003b).

A single adult was seen near the sea wall in 1996 (Plant, 1996) and was assumed to be a stray. This assumption is supported by the lack of records for the species in 2003 or 2005.

12.3.2 Asilidae, *Neiotamus cyanurus*, Local, Essex Red Data species

This robberfly has a wide distribution from southern England to the Moray Firth area of Scotland. It is generally a woodland species, especially ancient woods, where it is most usually found on foliage along woodland rides. Small moths appear to be the favoured prey (Stubbs & Drake, 2001). In Essex prior to 1970 this woodland species had only been recorded in Epping Forest and "Colchester" (Harwood, 1903), but since then there have been occasional records from several widely scattered localities, at Brightlingsea and Donyland Woods in North Essex and Hadleigh Great Wood and throughout Epping Forest in South Essex. Its occurrence in numbers at West Thurrock, associated with the mature birch and willow scrub at the northern end of the South Lagoon is unexpected.

12.3.3 Chamaemyiidae, *Parochthiphila coronata*. Endangered (RDB1), Essex Red Data species

Parochthiphila coronata is only known from three previous sites in East Anglia, an old site at Walton on Naze, N. Essex (1909, 1912) and two modern sites: Holme Dunes, Norfolk (1978 and 1983) and Blackburn Meadows, Yorkshire (1991, 1993). It has not been found during a recent visit to Walton on Naze and must be regarded as endangered (national status review in preparation). Adults have been found amongst *Ammophila* and *Elymus* on coastal sand dunes and the dune saltmarsh transition zone at the Norfolk locality. The Yorkshire specimens were beside a canal adjacent to former sludge beds. Larvae have been recorded abroad as being predatory upon the scale insect *Pseudococcus aberrans* in the leaf sheaths of *Agropyron repens*. At West Thurrock it was found in Area B of the North Lagoon, the sparsely vegetated saline edge of the large seasonal water body, which also supports the population of the jumping spider *Sitticus distinguendus*.

12.3.4 Chloropidae, *Cryptonevra consimilis*, Vulnerable (RDB2), Essex Red Data species

Cryptonevra consimilis has only two previous confirmed sites both within Cambridgeshire, at Chippenham Fen NNR (1941 to 1977) and Wicken Fen (1932, 1980s to 1990). Larvae have been reared from *Phragmites* stems inhabited by another rare (RDB2) chloropid, *Lipara similis*. The larvae of *C. consimilis* fed in the hollow reed stem and before pupation most of them passed down to beneath the *L. similis* larvae. The known Cambridgeshire records correspond to some of the few known sites of *L. similis*, a species most abundant in thin *Phragmites* at the edge of areas of dense *Phragmites* (unpublished national status review) – very similar to the situation where *Cryptonevra consimilis* was found at West Thurrock.

12.3.5 Chloropidae, *Homalura* probably *tarsata*. New genus to Britain

In July D.A. Smith collected a chloropid fly from the *Phragmites* reedbed south of the main South Lagoon that is in a genus new to Britain and is certainly not a known British species. It seems probable that it is *Homalura tarsata*, but this awaits confirmation. It is a southern European species, associated with reeds and the larva lives in the roots. It does not have the appearance of a strong flier and is an unlikely migrant (D.A. Smith, pers. comm.) suggesting that it is not recently established at the site.

12.3.6 **Chloropidae, *Lipara rufitarsis*. Notable, Essex Red Data species**

This chloropid fly is widespread in the south but highly localised with about fifteen known post-1960 sites. The larvae develop within the stems of Phragmites and form galls which cause foreshortening and sterility of the host plant. They are narrow unlike the distinctive cigar-shaped galls of the common *L. lucens*. The galls are found in dense beds of Phragmites but may be more abundant in thin Phragmites among coarse grasses and thin scrub (national status review in preparation).

12.3.7 **Chloropidae, *Melanochaeta pubescens*. Notable, Essex Red Data species**

This small fly is a widespread but localised species of southern England, with about twenty known post-1960 sites (six within Essex). It is locally frequent on the south Essex marshes and occurs in brackish coastal levels and wetlands near the coast where *Phragmites* grows.

12.3.8 **Chloropidae, *Oscinimorpha arcuata*. Notable, Essex Red Data species**

This fly was previously considered as notable, with only a few post-1960 records for scattered localities in southern England and Anglesey in Wales. However this is now a very common Essex species being more often recorded inland than on the coast. It is found in a wide range of habitats including parks, gardens and woodlands. A common feature may be good drainage or dry conditions. The larvae are probably phytophagous and some related species develop in labiates. Management should encourage a rich and varied flora and prevent scrub invasion (national status review in preparation).

12.3.9 **Dolichopodidae, *Campsicnemus magius*, Rare (RDB3), Essex Red Data species**

Campsicnemus magius is a small dolichopodid fly in which the front legs of the male are strongly ornamented with processes and bristles which give the appearance of additional legs. Most records are from the Thames Estuary, especially the North Kent Marshes, but also East Anglia, Sussex and an isolated record from saline influenced areas of Thorne Moors in south Yorkshire. The fly occurs on bare mud in coastal levels and upper saltmarsh where there is an intermediate level of salinity and does not normally occur on the tidal parts of a saltmarsh. The larval biology is unknown, but it is probably a semi-aquatic predator in mud. Adults are found skimming across areas of gently shelving bare mud.

12.3.10 **Dolichopodidae, *Dolichopus strigipes*, Notable, Essex Red Data species**

This is a small fly usually recorded from saltmarshes but with a few records from fens. It is found in southern England and East Anglia. The larvae are predatory.

12.3.11 **Dolichopodidae, *Sciapus laetus*, Notable, Essex Red Data species**

The small dolichopodid fly *Sciapus laetus* has been recorded in southern England north to Salop, and is also known from S. Wales. It is usually recorded from coastal dunes or grassland, though also noted inland on heathland or grassland (Recorder species account).

12.3.12 **Empididae, *Rhamphomyia caliginosa*, Notable, Essex Red Data species**

Rhamphomyia caliginosa is a small predatory fly, with scattered records from southern England and Wales. It has been recorded from a wide range of wetland situations, including fens, dune slacks, and possibly coastal marshes (Recorder species account). The NBN Gateway map for this species shows eleven 10km squares from the Wash to Cornwall, all coastal except one inland record in East Anglia.

12.3.13 **Ephydriidae, *Parydroptera discoomyzina*, Vulnerable (RDB2), Essex Red Data species**

The Recorder species account states that *Parydroptera discoomyzina* has been recorded from four sites on the coast of southern England from Suffolk to Sussex, although the NBN Gateway map

only shows three 10km squares, one in Essex and two in Sussex. West Thurrock lagoons is the first Essex record for 25 years, previously recorded from Barling Marshes in 1980 (D.A. Smith, pers. comm.). It has been noted from saltmarshes and coastal levels. The biology is unknown, though larvae are probably carnivore in damp, saline mud.

12.3.14 Heliomyzidae, *Oecothea praecox*, Notable, Essex Red Data species

The Recorder species account states that records are widely scattered in southern England with isolated records extending north to Cheviot, although the NBN Gateway only shows four 10km squares between the Humber and East Anglia. Larvae develop in burrows of various mammals.

12.3.15 Heliomyzidae, *Trixoscelis marginella*, Notable, Essex Red Data species

Trixoscelis marginella is mainly a coastal species, larvae probably develop in decaying animal or vegetable matter. The Recorder species account states that it is recorded from Berkshire to Argyll, but only ten 10km squares are shown on the NBN Gateway map as far north as Lancashire, but with most records in East Anglia.

12.3.16 Hybotidae, *Drapetis infitialis*, Notable, pRDBK, Essex Red Data species

Drapetis infitialis is a very local species, recorded from Hampshire and East Anglia, with only four 10km squares nationally shown on the NBN Gateway map for this species. Recorder 3 lists it as a pRDBK species, presumably based on a national status review that has yet to be published. The larvae of this genus have been recorded from dung (Recorder species account).

12.3.17 Hybotidae, *Platypalpus articulatus*, Notable, Essex Red Data species

Platypalpus articulatus is a very small predatory fly found rarely on ground vegetation and low bushes. The NBN Gateway map for this species shows widely scattered records from Yorkshire southwards.

12.3.18 Hybotidae, *Platypalpus praecinctus*, Notable, Essex Red Data species

This is a small fly occurring in wetlands including coastal levels, inland fens and marshes from Wiltshire to Suffolk. The biology unknown, though larvae are likely to be predators in damp mud (Recorder species account). The NBN Gateway map for this species shows ten 10km squares nationally.

12.3.19 Lauxaniidae, *Homoneura patelliformis*, Notable, Essex Red Data species

This is a small fly with records scattered widely in England and Wales north to Yorkshire. It is found in a variety of situations including woods, gardens, grassland and hedgerows. The larvae of this family develop in rotting vegetation.

12.3.20 Lauxaniidae, *Homoneura tesquae*, Notable, New to Essex

Homoneura tesquae is a small fly mainly recorded from the southern counties of England, but also S. Yorks. The larvae may be phytophagous or general scavengers and it has been bred from a Dunnock's nest (Recorder species account). The NBN Gateway map shows only seven 10km squares nationally. Most *H. tesquae* have turned out to be a different species, *H. christophi*, so it may be even scarcer than records suggest (D.A. Smith, pers. comm.). Both species occur at West Thurrock and the *H. tesquae* is new to Essex.

12.3.21 Lauxaniidae, *Sapromyza obsoleta*, Nationally Scarce (Notable), Essex Red Data species

This is a small fly of retiring habits, generally associated with shady vegetation in damp places. The larvae probably develop in decaying vegetable material. Records are widely scattered in southern England as far north as Herefordshire and Lincolnshire with a purported record from Durham. It is most frequent in the south east of England, even within Greater London, becoming

progressively scarcer in other parts of its range. There are eight known post-1960 sites (national status review in preparation).

12.3.22 Lonchaeidae, *Lonchaea palposa*, Notable, Essex Red Data species

Lonchaea palposa is a small fly usually found in broadleaved woodland with old or diseased trees or dead wood. Larvae develop beneath the bark of various deciduous trees including birch, poplar and hawthorn. There are a few records scattered widely in England and Scotland with only nine known post-1960 sites. There is only one previous Essex record, from Basildon in 1988 (D.A. Smith, pers. comm.).

12.3.23 Muscidae, *Coenosia atra*, Notable, Essex Red Data species

Coenosia atra is a small fly with records widely scattered in Wales and England north to Nottinghamshire, also Perthshire in Scotland. It is said to be found in fens, marshy areas on heaths and in dune slacks, but in Essex it is found across a wide variety of habitats and is just as likely to be found in gardens in low numbers (D.A. Smith, pers. comm.) Its biology is unknown.

12.3.24 Muscidae, *Hydrotaea parva*, Notable, Essex Red Data species

Hydrotaea parva is probably with predacious larvae in soil or dung. It is recorded from scattered localities in Wales, South-west England and the Midlands north to Lancs and Notts.

12.3.25 Muscidae, *Lispe loewi*, Notable, Essex Red Data species

Lispe loewi is a muscid fly with about 15 known sites since 1960 widely scattered in England as far north as Cumbria. However the vast majority of records are from the Essex/Thames coastal marshes. It is found on the surface of mud around pools and ditches in saline situations. Larvae develop in organically rich sand and mud, including beneath mats of the alga *Entomophora* and are carnivorous.

12.3.26 Muscidae, *Phaonia fusca*, Rare (RDB3), Essex Red Data species

Phaonia fusca is a mainly south-eastern fly of estuarine areas, whose larvae probably develop as predators of other invertebrates in soil. The NBN Gateway map for this species shows only five 10km squares in Britain.

12.3.27 Opomyzidae, *Opomyza punctata*, Notable, Essex Red Data species

Opomyza punctata is a small fly with spotted wings. Records are widely scattered in England, with about twenty known post-1960 sites (status review in prep.). In Essex it has been recorded from the Lower Lee, Roding Meadows and West Thurrock. The larvae of this family develop in the stems of grasses although the host plant is not known. It has been caught in *Dactylis* dominated areas, but also from *Arrhenatherum*-dominated sward on coastal dunes.

12.3.28 Sarcophagidae, *Blaesoxipha plumicornis*, Notable, Essex Red Data species

Blaesoxipha plumicornis is a locally frequent flesh fly in southern England, especially Dorset, Hampshire and Surrey. It is found on heaths and commons. The larvae are parasitoids of grasshoppers, including *Chorthippus parallelus* and *C. brunneus*. There are records from several other Essex sites, all in the East Thames Corridor.

12.3.29 Sarcophagidae, *Macronychia griseola*, Rare (RDB3), Essex Red Data species

Macronychia griseola is a fly recorded from heaths and coastal dunes in southern England and South Wales. The NBN Gateway map for this species shows records from seven 10km squares. The larvae appear to develop in the nests of sphecoid wasps or bumblebees (Recorder species account).

12.3.30 Sarcophagidae, *Macronychia polyodon*, Rare (RDB3), Essex Red Data species

The NBN Gateway map for this species shows records from seven scattered 10km squares in England. It is a small fly, whose larvae develop in the nests of a range of aculeates including sphecid wasps in the genera *Crossocerus* and *Ectemnius* and the bumble bee *Bombus terrestris* (Recorder species account).

12.3.31 Sarcophagidae, *Miltogramma germani*, Rare (RDB3), Essex Red Data species

Miltogramma germari is a flesh fly found in dunes, sandy heaths and chalk downland. The larvae are believed to feed on the food stores of mining bees and the adults are likely to occur in habitat which supports good colonies of such bees. According to the Recorder species account it is recorded from south-west England and South Wales, but there are a records from four sites in south Essex on the Thames and Middlewick Ranges in N. Essex (D.A. Smith, county database).

12.3.32 Sarcophagidae, *Sarcophila arcipes*, Notable, Essex Red Data species

Sarcophila(Dischochaeta) arcipes is a flesh fly seemingly confined to southern and eastern England, and less frequently recorded than in the past. Many records are from chalk grasslands/scrub, but it may also occur on heaths. The biology is unknown (Recorder species account). There are only four 10km squares shown on the NBN Gateway map for this species.

12.3.33 Sarcophagidae, *Sarcophila latifrons*, Notable, Essex Red Data species

Sarcophila latifrons is a Nationally Scarce (Notable) flesh fly usually found in coastal dunes and beaches. It is widely distributed but very local on southern coasts from Glamorgan to Norfolk, but most often recorded from Cornwall. It has been reared from carrion and dead insects, and may possibly be a parasitoid or predator of grasshoppers. It has been recorded from several localities in the East Thames Corridor, one in the Lee Valley and one at Colne Point in North Essex.

12.3.34 Scathophagidae, *Conisternum decipiens*, Notable, Essex Red Data species

The Recorder species account states that *Conisternum (Scathophaga) decipiens* is an uncommon coastal dung fly. The NBN Gateway map for this species shows scattered records in England

12.3.35 Stratiomyidae, *Stratiomys potamida*, Notable, Essex Red Data species

Stratiomys potamida is a spectacular large yellowish soldier fly of wetlands, including fens, damp heaths, damp woodlands, alder carr and coastal landslips and ravines. Records widely dispersed in England as far north as Northumberland and also into south Wales. Larvae develop in the mud of seepage marsh, and away from seepages, in the mud and standing water amongst vegetation at the edge of ponds and ditches. They probably take three or four years to develop and seem able to tolerate quite severe drying out of sites in summer droughts (Falk, 1991a).

The soldier fly *Stratiomys potamida*



12.3.36 Stratiomyidae, *Stratiomys singularior*, Notable, Essex Red Data species

Stratiomys singularior is a spectacular large yellowish soldier fly of brackish marshes and fens, found mainly on brackish coastal marshes. It is widespread but very local in Britain. The larvae are detritus feeding in shallow, sometimes temporary pools and are resistant to desiccation.

12.3.37 Syrphidae, *Cheilosia velutina*, Notable, Essex Red Data species, Essex Threatened

Cheilosia velutina remains poorly known with very few confirmed records, mainly on the eastern side of Britain. Apart from a site in Colchester all recent records in Essex are from the chalk pits and adjacent areas of the Grays-Thurrock area in the East Thames Corridor, many of which are threatened by development (Payne in Harvey 2002a). The larval host may mine the stems of *Cirsium*, and adults are often found at the flowers of white umbels such as Carrot *Daucus carota*.

12.3.38 Syrphidae, *Triglyphus primus*, Notable, Essex Red Data species, Essex Threatened

Triglyphus primus is rather scarce and local in south-east Britain from around Dorset and Wiltshire eastwards, and north to about a line between the Mersey and the Humber. The larvae are aphidophagous, and appear to be specific to the galls induced by *Cryptosiphum artemisiae* on *Artemisia vulgaris*. Adults are elusive, but tend to be found visiting flowers such as white umbels or resting on sunny foliage in the sorts of places that *Artemisia* grows. These include urban waste ground, abandoned quarries and disused railway lines, but also semi-natural grassland with an element of disturbance (Ball & Morris, 2000).

12.3.39 Syrphidae, *Volucella inanis*, Notable, Essex Red Data species, Regionally Important

The larvae of this large hoverfly are ectoparasites of social wasp larvae, and have been found in association with *Vespula germanica* (Fabricius) and *Vespa crabro* Linnaeus. They are found in open areas in woodland and scrub and, most frequently, in suburban areas, in parks and gardens where adults are usually seen visiting flowers, especially white umbels and Buddleja (Ball & Morris, 2000). In some years it is locally abundant in the outer suburbs of London and the surrounding countryside. Although reports indicate that it is expanding its range to the north, it also appears to have contracted eastwards with very few records from central-southern and south-western counties (Stubbs & Falk, 2002).

The hoverfly *Volucella inanis*



12.3.40 Syrphidae, *Volucella zonaria*, Notable, Essex Red Data species, Regionally Important

This, our largest and most spectacular hoverfly, seems to be almost entirely anthropogenic in Britain. Its larvae are scavengers and predators in the nests of social wasps (including the hornet *Vespa crabro*), where they probably feed on larvae and pupae. It is usually seen visiting flowers in suburban areas where it occurs in parks and gardens. Many recent records come from civic

amenity plantings around car-parks and urban roads (Ball & Morris, 2000). Until about 1940 it was regarded as a rare vagrant to the south coast of England, then, during the 1940s, it began to become established in the London area and is now quite frequent, especially in the outer suburbs and in northern Kent. Current evidence shows this species is expanding its range into Suffolk and Norfolk, and north and west from London into Hertfordshire and along the Thames valley (Stubbs & Falk, 2002).

12.3.41 Tachinidae, *Clytiomya continua* New to Britain in 1997, Essex Red Data species

Clytiomya continua was considered doubtfully British in earlier works and it cannot now be established whether this had any basis in fact. However its recent occurrence in Britain has been confirmed by Plant & Smith (1997) who recorded it from Essex at Alsa Sand Pit in the Stort valley. The author has subsequently taken the second and third British specimens at the former Royal Ordnance site in the Lee Valley (Harvey, 2003) and again at nearby Hackney Marshes in 2004 (Hanson, 2004). In Europe this species occurs in dry warm open countryside. It is a phasiine parasitoid of Heteroptera (Pentatomidae), in this case the shieldbug *Eurydema*. *Eurydema oleracea* (the brassica bug) is a local species that feeds on a wide range of crucifers.

Clytiomya continua



12.3.42 Tachinidae, *Frontina laeta*, Rare (RDB3), Essex Red Data species

There is no Recorder species account for this species or NBN Gateway map. Belshaw (1993) states that it is gregarious, with the main host the larvae of the Eyed Hawk-moth *Smerinthus ocellata* (Lepidoptera: Sphingidae). The JNCC Calypterate Review (1996) (from Tachinid Recording Scheme website) gives the distribution as southern England: Somerset, Dorset, Hants, Surrey, Middlesex, with only a single post-1960 record available (Hants, 1987) though it was found regularly on the Surrey and Dorset heaths in the 1940s and 1950s and may well remain there, undetected due to the general under recording in this group in recent decades. Most records are from heathland and grassland, possibly requiring areas of scrub or isolated trees and copses.

12.3.43 Tachinidae, *Gymnosoma nitens*, Endangered (RDB1), Essex Red Data species

The presence of this species was predicted in the report of last year's survey (Harvey, 2004). *Gymnosoma nitens* is a parasite of the Nationally Scarce ground-dwelling shieldbug *Sciocoris cursitans*. This host species is especially, but not exclusively, associated with chalk grassland and calcareous sand, and is always found on unshaded, well-drained and friable soils with a rather open vegetation structure and usually with a component of bare ground. Though believed to be phytophagous, there appear to be no certainly identified food plants, and it may be polyphagous. In Essex both species are known only from the Thames corridor. *G. nitens* has been recorded from a number of post-industrial sites along the East Thames Corridor, which forms its national stronghold

(Harvey, 2002b). However the majority of sites are either already lost to development or under immense development threat and the status of the fly in Britain is vulnerable.

Gymnosoma nitens



12.3.44 Tachinidae, *Litophasia hyalipennis*, RDB Appendix (RDB1+), Essex Red Data species

Litophasia hyalipennis, a parasitic fly recorded in 1887 from Sussex (Belshaw 1993), was believed to be extinct until rediscovered at Northfleet in Kent in 1987 (Clemons 1992). It is listed in the Red Data Book and Falk (1991) as an Appendix species. In 1996 the species was recorded at Chafford Hundred in south Essex (O'Toole & Ismay, 1997) and the author has collected it at further south Essex locations at Aveley Bay (Harvey, 2000c) and at former sand/gravel workings (where the habitat is now destroyed by restoration) in the nearby Ingrebourne Valley (Harvey, 2003).

12.3.45 Tephritidae, *Campiglossa malaris*, Insufficiently Known (RDBK), Essex Red Data species

Campiglossa malaris is a small picture winged fly with brown and white mottled wings. It is very local in Kent, but the author has collected the species in several localities in south Essex near the Thames since 2001. It is associated with ragworts, mainly *Senecio erucifolius*, but also *Senecio jacobaea* growing on chalk grassland, coastal shingle and other dry sites. It is believed to breed in the flower heads.

12.3.46 Tephritidae, *Ensina conchi*, Local, Essex Red Data species

The picture winged fly *Ensina conchi* has records for England north to Cheshire. It is rare in Essex. The larvae form a gall in the flower head of *Hypochoeris radicata*, *Aster tripolium*, *Leontodon*, *Picris*, *Sonchus*, or *Trapogon* (Recorder species account).

12.3.47 Tephritidae, *Merzomyia westermanni*, Notable, Essex Red Data species

The species is scarce, with all Essex records in the south of the county. Nationally it has a strongly southeastern distribution with almost all records south of a line between the Wash and Severn map in Clemons (2004). It is a gallfly, whose larvae form a gall in the flower head of *Senecio*. Infected plants are usually obvious because the swelling forces up groups of pappus hairs.

12.3.48 Tephritidae, *Tephritis matricariae*. Insufficiently Known (RDBK), Essex Red Data species

This species has only been recorded from Kent or Essex, with all locations shown in Clemons (2004) being in E. Kent except for one 10km square location in W. Kent. It was first collected in South Essex by the author at Belton Hills in 2001, with further records from an old sand pit at Hunts Hill in Havering during 2002 and Canvey Northwick in 2003. A single female from Kirby-

le-Soken during 2003 is the first record for N. Essex (D.A. Smith, pers. comm.). The species is quite widespread in the Mediterranean up to central Germany, but almost absent more in the north. Its host plant is probably *Crepis vesicaria* ssp. *taraxacifolia* and *C. capillaris* (Clemons 2000).

12.3.49 Therevidae, *Thereva fulva*, Rare (RDB3), Essex Red Data species

Most records of this species are from the early part of this century; it has a well-documented history in northern Kent (Darenth, Fooths Cray, Dartford, Farningham Road Station) between 1868 and 1939, though most of sites involved are probably now destroyed. It is also recorded from the south coast of Wales, with isolated records in West Sussex, West Kent and possibly Gloucestershire (old) and Lincolnshire (1896). More recent records include 3 sites in Glamorganshire in 1985 and 1986, and Sandwich, Kent in 1975 (Falk, 1991). A single female was collected new to Essex in 2003 at Anchor Field (Harvey, 2004), about one kilometre to the north of the North Lagoon, where it has occurred in numbers during the current survey.

Thereva fulva (RDB3)



12.3.50 Therevidae, *Thereva plebeja*, Notable, Essex Red Data species

Most records are for southern England but it has been found as far north as Shropshire and near Peterborough. It is clear that even up to the early 1960s it was not unduly scarce in the London area. However in recent years it has become something of a rarity. The decline closely resembles that undergone by many ground nesting aculeates and suggests that changing land use, and in particular reduced areas of disturbed, open habitat, may be largely responsible (Stubbs & Drake 2001). The limited habitat and site information suggests that a range of dry habitats, such as heathland, commons, ruderal and suburban situations can be exploited, with an association with disturbed and usually sandy soil, including that at the top of an estuarine shore. Areas of bare or sparsely vegetated, loose sand and soil should be maintained using mild forms of disturbance as necessary. At some sites, grazing may be important in producing correct situations, especially where limited poaching of the soil is occurring (Falk 1991a).

12.3.51 Tipulidae, *Nephrotoma scurra*, Local, Essex Red Data species

The crane-fly *Nephrotoma scurra* is genuinely scarce in Essex. It was recorded from Chafford Hundred in Thurrock, but the area is now built on (Essex Red Data list).

12.3.52 Tipulidae, *Nigrotipula nigra*, Local, Essex Red Data species

The crane fly *Nigrotipula nigra* is genuinely scarce in Essex, recorded from Rainham and Aveyley Marshes, Chafford Hundred and Grays Chalk Quarry in Thurrock and Blackgrounds Marsh (Essex Red Data list).

12.3.53 Ulilidae, *Melieria picta*, Notable, Essex Red Data species

The species has a strong southeastern bias with records extending from the Isle of Wight to Yorkshire. The vast majority of records are from the Thames estuary, from saltmarsh and brackish ditches and fleets of coastal levels. The larvae possibly develop in decaying vegetable matter. Management should maintain a full transition of vegetation types on saltmarsh, unimpeded tidal patterns and use rotational ditch management to ensure a range of vegetation types and salinity.

12.4 Hemiptera: Heteroptera (true bugs)

12.4.1 Alydidae, *Alydus calcaratus*, Local, rare in Essex

Alydus calcaratus is widely distributed nationally, but something of a connoisseur of generally nice places (P. Kirby, pers. comm.). It is found mostly on coasts and heath, and despite being a good flier, it is seemingly very rarely found in secondary sites. There are few Essex records, although it was present in a small heathy area at the western end of the Canvey Wick site. At West Thurrock it was found at the lichen and Bryophyte heath area C and the pylon trap site A.

Alydus calcaratus



12.4.2 Coreidae, *Bathysolen nubilus*, Notable/Nb, Essex Red Data species

Bathysolen nubilus has a rather restricted distribution in the south-east of England. It was first recorded in Essex in 1938 (Thomas 1943) in a chalk pit at Purfleet, and was still present in chalk pits at Grays in 1988. It has been recorded from several derelict urban and industrial sites within the Essex part of Greater London, and may remain to be recorded at many other similar sites. It has increased considerably in the present century, and its national status may require re-assessment in the near future. The bug is a ground-dwelling species associated especially with black medick, *Medicago lupulina*.

12.4.3 **Miridae, *Lygus pratensis*, Rare (RDB3), Essex Red Data species**

Although on the continent *L. pratensis* has apparently always been a polyphagous species found in weedy places, and there's been the occasional British record definitely not connected with old woodland, in Britain it has previously been considered a rare woodland ride and edge bug. In the last few years however, the bug has been widely recorded in the south-east, Hampshire to Kent to Essex to Berkshire. The scattered old colonies may have spread, or there may have been a secondary wave of continental immigration. When the Essex Red Data list was prepared, it had not been recorded from Essex since the taxonomy of the genus in Britain was adequately revised, but since 2000 the author has collected it in a number of locations in south Essex.

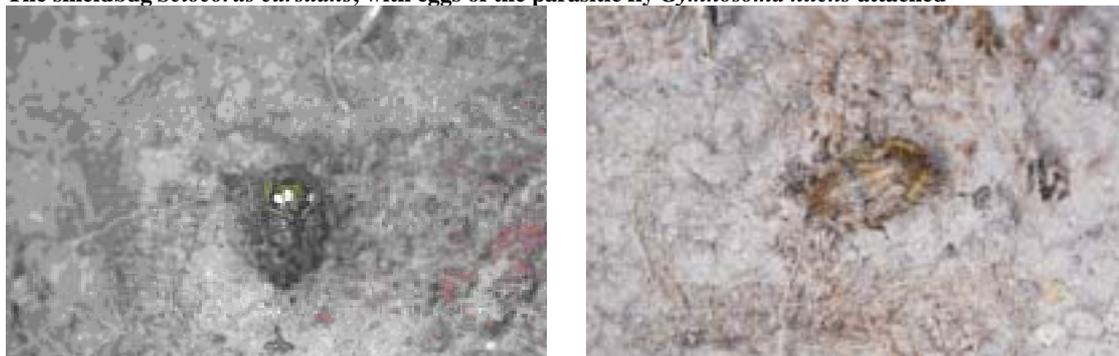
12.4.4 **Miridae, *Orthotylus rubidus*, Rare (RDB3), Essex Red Data species**

Orthotylus rubidus is a small red bug which feeds on glasswort *Salicornia* in non-tidal (or rarely tidal) saline areas, such as seepages behind sea walls and banks. Old records are of little use, because it was long thought conspecific with the widely distributed *O. moncreaffi*, which feeds on sea purslane *Atriplex portaculoides* along much of the Essex coast, and both were referred to under *rubidus*. Groves (1973) reports a record of the species being abundant at Stanford in 1938 (D.C. Thomas in litt. to W.E. China). Colonies of this species are often small and may be either temporary or very variable in size. Its rather specialised habitat makes this a vulnerable species, and it is probably declining (P. Kirby, pers. comm.).

12.4.5 **Pentatomidae, *Sciocoris cursitans*, Notable/Nb, Essex Red Data species**

This ground-dwelling shieldbug is especially, but not exclusively, associated with chalk grassland and calcareous sand, and is always found on unshaded, well-drained and friable soils with a rather open vegetation structure and usually with a component of bare ground. It is confined to the southern counties, particularly the south-east, on sands and chalk. It is the host for the RDB1 tachinid fly *Gymnosoma nitens*, and both species have nationally important populations in the East Thames Corridor (Harvey 2000c). Though believed to be phytophagous, there appear to be no certainly identified food plants, and it may be polyphagous. In Essex the species is only known from the Thames corridor where the majority of sites are threatened or lost to development.

The shieldbug *Sciocoris cursitans*, with eggs of the parasitic fly *Gymnosoma nitens* attached



12.4.6 **Rhopalidae, *Stictopleurus abutilon*, Appendix (RDB1+)**

Stictopleurus abutilon is a large pale greenish brown bug found in dry open habitats. There were confirmed records for Kent, Surrey, Hampshire and Dorset, but until recently it was believed to be extinct in Britain, but was recorded from Essex in 1996 and from several locations in the south of England (Kirby 1997). It is now recorded widely in warm open flower rich grassland in the southeast, presumably in response to climate change, on 'waste ground' or other unmanaged and sporadically disturbed habitat, but the species seems far less common than *Stictopleurus punctatonevrosus* (Harvey, 2004d).

The rhopalid bug *Stictopleurus abutilon*, believed extinct in Britain until a few years ago



12.4.7 Rhopalidae, *Stictopleurus punctatonervosus*. Appendix (RDB1+)

This is a large pale greenish brown bug found in dry open habitats. There were nineteenth century records of this species from Surrey and Sussex, but until recently it was believed to be extinct in Britain (Bowdrey, 1999). It is now recorded widely in warm open flower rich grassland in the southeast, presumably in response to climate change, on 'waste ground' or other unmanaged and sporadically disturbed habitat.

12.4.8 Scutelleridae, *Eurygaster maura*. Notable/Nb, Essex Red Data species

Old Essex records (Harwood 1903, Masee 1955) of *E. maura* are believed to be errors for the more common *E. testudinaria*, which for many years was not recognised as a separate species and with which confusion remains common. *E. maura* is largely confined to the chalk downs of Kent, Surrey, and Hampshire (Kirby in Essex Red Data list at www.essexfieldclub.org.uk). Its occurrence in Essex has only been definitely established by recent records (confirmed by Dr Peter Kirby) made by the author from Anchor Field and West Thurrock PFA North Lagoon, both under threat of development.

The shield bug *Eurygaster maura*



12.5 Homoptera: Auchenorrhyncha (leafhoppers)

12.5.1 Cicadellidae, *Idiocerus fulgidus*, Notable/Na, Essex Red Data species

The brownish leafhopper *Idiocerus fulgidus* was recorded from two areas in the West Thurrock lagoons by the 1996 survey (Plant, 1996). Kirby (1992) states that the single British specimen was taken from Lombardy Poplar *Populus nigra* var. *italica* in Norfolk in the last (19th) century, and with no recent records. It is a western European species, otherwise recorded from France, Germany, Austria, Hungary, Italy and Spain. The species also feeds on poplars in mainland Europe. There the female overwinters in heather, ivy and conifers, and oviposits in the spring. Kirby states that there is no strong evidence that this is a true British native, but that there is no good obvious reason why it should not occur in Britain. The area of East Anglia from which it was recorded has a very continental type of climate, and is one of the strongholds for the native black poplar, *Populus nigra*, which might be an alternative foodplant.

12.5.2 Delphacidae, *Asiraca clavicornis*, Notable/Nb, Essex Red Data species

Asiraca clavicornis is a planthopper with distinctive expanded front legs and antennae. It has a strongly south-eastern distribution, and is quite frequent in some parts of its range, such as in suitable habitat in the East Thames Corridor. It is found low down in dry grassland, including sparse grassland of recent origin on derelict land.

12.6 Hymenoptera, Aculeata: Apoidea - Apidae (bees)

12.6.1 Andreninae, *Andrena bimaculata*, Notable/Nb, Essex Red Data species, Essex Threatened

The species is confined to southern England where it remains widespread, but generally scarce and very local (Falk, 1991b). It is associated with reasonably open, sandy situations including heathland, sandpits, dry grassland, open woodland and coastal habitats. In Essex there are few records from the Colchester area and Thurrock, with almost all sites threatened with development.

12.6.2 Andreninae, *Andrena labialis*, Local, proposed UK Biodiversity Action Plan species

Andrena labialis has shown a marked decline nationally and for that reason is a proposed UKBAP species. It is a mesotrophic meadow species with a strong association with legumes (Fabaceae), from which the females collect pollen. In Essex the bee is still widespread in the Thames Corridor and elsewhere near the coast, where there is an abundance of suitable forage.

12.6.3 Andreninae, *Andrena minutuloides*, Notable/Na, Essex Red Data species, Essex Endangered

Andrena minutuloides was widely recorded in southern England, but with post-1970 records for only about 20 sites, mostly in Hampshire, Sussex and Kent (Falk 1991b). It is most often found on calcareous grassland and chalk heath, and was first recorded in Essex in 1993 from the chalk at Thurrock. Except at Grays Chalk Pit, it is now lost from its former Essex sites at Mill Wood Pit and Dolphin Pit, and is only otherwise known to occur at a small area of land by Tank Hill Lane site and in small numbers at the north lagoon at West Thurrock PFA Lagoons, both designated for development in the 2003 Deposit UDP.

12.6.4 Andreninae, *Andrena nigrospina* pRDB2, Essex Red Data species, Essex Endangered

The mining bee *Andrena pilipes* in the *carbonaria* group, has been split into the very rare *Andrena nigrospina* and the Nationally Scarce *Andrena pilipes* s.s. There are very few modern records of *Andrena nigrospina* and it is pRDB2 (Vulnerable) (the latest database of all the British aculeates and their conservation status, etc. at www.bwars.com). The habitats of these species includes sandy areas of heathland, waste ground and sandpits, coastal grassland and landslips,

although *A. nigrospina* has usually been recorded inland whereas *A. pilipes* is coastal. They require patches of bare, sandy soil or short turf in warm, sunny situations for nesting. *Andrena nigrospina* has been reported from the Mill Wood Pit (now destroyed) by Penny Anderson Associates (Tatterhall *et al.* 1996) and was found in 1999 flying around Hoary Cress at the Wennington riverside (habitat now probably destroyed) and Anchor Field (West Thurrock) in 2002 and 2003. It also occurs at West Thurrock North Lagoon in numbers, together with the form of the cleptoparasite *Nomada fulvicornis* associated with *A. nigrospina* (Falk, 2005).

12.6.5 Andreninae, *Andrena pilipes* sens. str., Notable/Nb, Essex Red Data species, Regionally Important

Andrena pilipes is a scarce mining bee in the *carbonaria* group, host to the Nationally Rare (RDB3) cuckoo bee *Nomada fulvicornis*. It is mainly coastal in distribution, and is widespread in south Essex along the East Thames Corridor. It occurs in sandy areas of heathland, waste ground and sandpits, coastal grassland and landslips. The bee requires patches of bare, sandy soil or short turf in warm, sunny situations for nesting. The first brood is reported to collect pollen from *Salix*, *Prunus* and *Brassica*, whilst the second brood favours *Rubus* and thistles (Falk, 1991b).

12.6.6 Andreninae, *Andrena tibialis*, Notable/Na, Essex Red Data species, Regionally Important

The mining bee *Andrena tibialis* is widespread but very local in most areas. A revision of its conservation status from RDB3 (Shirt 1987) has been necessary because this species has recently proved to be more widespread in the midlands and northern England than was previously suspected. In the south however, it appears to have declined substantially in many districts, probably in response to the loss and deterioration of suitable habitat. Post-1970 records are known for about 25 sites (Falk, 1991b). It is found in a variety of open habitats including heathland, road verges, quarries and also gardens and other suburban situations, usually on sandy or gravelly soils. Nest burrows are dug singly or in small aggregations in sparsely-vegetated areas. Adults are found from mid-March to late May, occasionally into early June, and obtain pollen from a variety of flowers including *Ranunculus*, *Acer*, *Prunus* and *Salix*.

12.6.7 Andreninae, *Andrena trimmerana*, Notable/Nb, Essex Red Data species, Regionally Important

Andrena trimmerana is a much declined mining bee recorded from disturbed coastal areas such as soft rock cliffs, and inland from heathland, woodland edge and moorland. Nesting probably occurs in warm, sparsely-vegetated areas. This species is double-brooded and seasonally dimorphic, which has caused much taxonomic confusion. Pollen sources in Britain are not established but the spring brood is often seen on *Salix* and *Prunus*, while the second brood has been seen visiting *Rubus* and umbellifers.

12.6.8 Andreninae, *Panurgus banksianus*, Local, Essex Red Data species, Essex Threatened

Panurgus banksianus has a restricted distribution in southern Britain. In Essex it is very rare, restricted to several sites near the Thames and Wanstead Flats in the southern part of Epping Forest. It forages on yellow Asteraceae.

12.6.9 Anthophorinae, *Nomada flavopicta*, Notable/Nb, Essex Red Data species, Regionally Important

This bee is a cleptoparasite of mining bees in the genus *Melitta*. It is very local and probably declined in most areas, except in Kent where most records are recent. The bee and its hosts favour a wide variety of flower rich situations on light soils, including heathland, chalk downland, sandpits, coastal landslips, soft rock cliffs, fixed dune and waste ground (Falk, 1991b). In Essex there are only records from locations in the East Thames Corridor.

12.6.10 Anthophorinae, *Nomada fucata*, Notable/Na, Essex Red Data species, Regionally Important

This bee is a cleptoparasite of the local mining bee *Andrena flavipes*. It occurs in southern England, and was considered very local and probably declined by Falk (1991b) with most sites during the 1970s being on the south coast of Dorset. It has since spread to become an almost certain companion of the *Andrena* throughout much of its range, and is now widely distributed throughout southern England (Edwards & Telfer, 2002).

12.6.11 Anthophorinae, *Nomada fulvicornis*, Rare (RDB3), Essex Red Data species, Regionally Important

Nomada fulvicornis is a cuckoo bee that has important populations in Essex along the East Thames Corridor and near Colchester. The species was formerly widely distributed in southern England, but it is today very scarce (Falk, 1991a). It is cleptoparasitic on mining bees in the *Andrena carbonaria* group, and both the race on *A. pilipes* s.s., *A. bimaculata* and *A. tibialis* and the race on *A. nigrospina* (subspecies *subcornuta*) occur at the West Thurrock North Lagoon.

12.6.12 Anthophorinae, *Nomada rufipes*, Essex Red Data species, Essex Threatened

Nomada rufipes is commonly found on heathland where it is a cleptoparasite of the mining bee *Andrena fuscipes*, a heather specialist. *Andrena fuscipes* is very rare in Essex, restricted to several surviving heathland remnants, and *Nomada rufipes* is only recorded at the largest at Tiptree Heath. Its other host is *Andrena denticulata*, a much declined bee that collects pollen from Asteraceae and one with very few records in Essex. This is presumably its host at West Thurrock North Lagoon, although it has not been recorded at the site.

12.6.13 Apinae, *Bombus humilis* (Brown-banded Carder Bee). UK Biodiversity Action Plan species. Essex Red Data species; Essex Vulnerable

The bumblebee is a national BAP species on the basis of major declines across Britain, especially inland. Although not included in Falk (1991b) it should now be viewed as Nationally Scarce. The East Thames Corridor region currently supports one of the most important remaining metapopulations in the UK, but many sites are already lost or under direct threat of development.

Bumblebee populations appear to operate at a landscape scale and it is probable that viable individual populations require minimum ranges of between ten to twenty sq. km of good matrix habitat within farmland (Edwards 1998).

Forage areas need to be considered separately for queens and workers. The queens require nectar resources early in the season after their long winter hibernation to build up their reserves. They then need pollen resources for stocking cells in newly established nests to enable the first workers to develop. Workers also require nectar and pollen resources both for their own sustenance and to stock the developing nest.

It appears that areas of fairly tall, open flower-rich grasslands **providing areas of abundant forage** are required to support populations of *Bombus humilis*, but it is more able to utilise suitable small areas within a landscape than Shril Carder Bee, another bumblebee with a nationally important metapopulation in the region. Observations suggest that large patches of flowers are used more frequently and are much more important than widely distributed resources. Observations also indicate that the availability of suitable forage (nectar and pollen) sources throughout the whole season from May to September is crucial. These resources need to be provided by an abundance of specific key forage sources, all of which significantly have very long flowering seasons as well as long corolla tubes which correspond to the long tongues of the bumblebees. Important plant species used in early summer by queens include Fodder Vetch, Red Clover *Trifolium pratense* and Broad-leaved Everlasting-pea *Lathyrus latifolius*. Workers forage on the flowers of species such as bird's-foot trefoils *Lotus* spp., clovers, Black Horehound *Ballota nigra*, Lucerne *Medicago sativa* and Red Bartsia *Odontites verna* (Harvey 2000b; Harvey 2001a).

Brown-banded Carder Bee *Bombus humilis*



12.6.14 Apinae, *Bombus ruderarius*, proposed UK Biodiversity Action Plan species, Essex Red Data species; Essex Vulnerable

Bombus ruderarius is a nationally declining species which at the time of publication of the Bumblebees of Essex (Benton, 2000) was still considered to be widespread, but local, in the county. However current evidence suggests a drastic decline has occurred, with sites where the bumblebee used to occur in numbers a few years ago now apparently without populations. Like other declining bumblebees, the species requires extensive areas which support a variety of flowering plants, especially Fabaceae and Lamiaceae, and it is essential that suitable forage resources are available throughout the flight period of the colony. The nest is constructed of grass clippings and moss on or just above the ground among long vegetation, often using an old mouse nest as a foundation (Edwards & Telfer, 2001).

12.6.15 Colletinae, *Colletes halophilus*, Notable/Na, proposed UK Biodiversity Action Plan species, Internationally Important, Essex Red Data species, Regionally Important

This mining bee is an endemic species of the southern part of the North Sea coasts, where the species is confined to the coasts of eastern and southern England, south-west Germany, the Netherlands, Belgium and north-west France. In Britain most records are from the south-east and East Anglia. Britain holds internationally important populations of *C. halophilus* (Harvey 2001b) with the most important ones occurring in the Thames estuary and Essex coast. The Thames-side saltmarsh holds nationally important populations of this mining bee (George Else, Natural History Museum, pers. comm.), and it is important that suitable habitat is conserved. The localities that support the largest populations are often where human intervention has extended the 'upper saltmarsh' habitat into more extensive areas on artificially produced substrates such as silt and pulverized fly ash (PFA) lagoons. The bee nests, often in large aggregations, on bare sandy soil and south-facing sunny slopes.

Females have a close association with flowers of Sea Aster *Aster tripolium*, from which they collect pollen to provision their nest cells, and the species has a late season coinciding with the flowering of its forage plant. It nests, often in large aggregations, on bare sandy soil and south-facing sunny slopes in upper saltmarsh or situations close by. However the localities that support the largest populations are often where human intervention has extended the 'upper saltmarsh' habitat into more extensive areas on artificially produced substrates such as silt and pulverized fly ash (PFA) lagoons.

Falk (1991b) states that the bee has probably been lost from many sites through coastal development and the loss of upper saltmarsh in recent decades. The species is threatened in various ways. The grazing of upper saltmarsh produces grass swards that contain little suitable forage. Rising sea levels are causing erosion of salt marshes in Essex and at the present rate most of the habitat will have been lost within a few decades (Gibson, 2000). Managed realignment should benefit this species at some places on the Essex coast. However many of the Thames Marshes have been reclaimed for industrial development, and with the abandonment of older

industrial sites next to the Thames, there is now enormous pressure from initiatives such as the 'Thames Gateway' to redevelop, often for high value riverside housing. Barking riverside and PFA lagoons and various sites on the Kent side of the Thames have been lost in recent years. Virtually all the remaining East Thames Corridor localities are under imminent threat of destruction or severe degradation.

pUKBAP mining bee *Colletes halophilus* male



12.6.16 Colletinae, *Colletes marginatus*, Notable/Na, Essex Red Data species, Essex Threatened

Colletes marginatus is most typically associated with the semi-fixed mid dune area of coastal dunes but there are also inland records from the Brecks. This species apparently prefers looser sand than other *Colletes* species, and in any of these situations flower-rich areas are required for foraging (Falk, 1991). Confirmed records are almost exclusively from southern coasts from Camarthenshire to West Norfolk. In Essex the species is extremely rare, with records only from four other sites, one lost and others threatened.

12.6.17 Colletinae, *Hylaeus cornutus*, Notable/Na, Essex Red Data species, Regionally Important

Records of this bee are largely confined to the south-central and south-eastern counties of England, with about 30 known post-1970 sites known to Falk (1991b), over half in Kent. In Essex the bee is mostly found near the Thames in post-industrial habitats and disused mineral extraction sites where Carrot *Daucus carota* or other white umbellifers occur in quantity. There is a close association with these flowers, especially Carrot, from which the bee collects pollen to provision its cells. Nesting is reported in herbaceous stems and the dead stems of bramble.

12.6.18 Colletinae, *Hylaeus pectoralis*, Local, Essex Red Data species, Essex Threatened

Hylaeus pectoralis is associated with stands of the Common Reed *Phragmites australis*, in particular the old spindle-shaped galls of the chloropid fly *Lipara lucens*, which becomes available for use by *H. pectoralis* after the fly emerges in early summer. The map shown in Else (1995) shows less than 40 10km squares with records of the species, and fewer post 1970 records. It should clearly be considered Nationally Scarce (Notable). In Essex the bee has only been found in a handful of sites, and has only been frequent at Canvey Wick SSSI.

12.6.19 Colletinae, *Hylaeus signatus*, Notable/Nb, Essex Red Data species, Regionally Important

This bee is mainly recorded from southern England, with about 30 known post-1970 sites known to Falk (1991b), over half in Kent. In Essex the bee is mainly found near the Thames in post-industrial habitats and disused mineral extraction sites where Weld *Reseda luteola* or Mignonette *Reseda lutea* occur. There is a close association with *Reseda*, from which the bee collects pollen to provision its cells. Falk (at a lecture in 2003) stated that in Warwickshire the species does not occur in isolated parts of the county even where good stands of *Reseda* occur – indicating the

importance of a continuity of habitat mosaic and the nature conservation losses that occur when fragmentation becomes excessive, currently a massive threat in the East Thames Corridor. Nests have been recorded from dead woody stems of bramble and rose, in hard clay banks and occasionally in the mortar of masonry.

12.6.20 Halictinae, *Lasioglossum lativentre*, Unknown, Essex Red Data species, Essex Threatened

Despite apparently being reasonably frequent in parts of Kent the mining bee *Lasioglossum lativentre* is very rare in Essex, with records from only a handful of sites, usually of single individuals. It may be more widely distributed than present records suggest, but in very small numbers where a suitable habitat mosaic survives in the agricultural countryside. Unlike many other aculeate Hymenoptera in Essex, it does not usually seem to be associated with brownfield sites. It is likely to be threatened by further decline in the countryside of suitable forage and nesting habitats.

12.6.21 Halictinae, *Lasioglossum malachurum*, Notable/Nb

This bee occurs in southern England, mainly near the coast, but in south Essex it is so widespread and frequent that it has not been included in the Essex Red Data list. British pollen sources are not known, but flower visits are reported from a variety of species (Falk, 1991b), including various yellow composites (Asteraceae).

12.6.22 Halictinae, *Lasioglossum pauperatum*, Rare (RDB3), Essex Red Data species, Regionally Important

Lasioglossum pauperatum is a very local bee, recorded from several southern counties as far north as Essex and as far west as Devon, but with very few recent records except in south Essex near the Thames where it seems to be reasonably widespread. It was especially numerous on the silt lagoons at Rainham, but the habitat has been almost completely destroyed by re-use of the lagoon. The author also recorded the bee in 1998 at one site near Colchester in N. Essex, also on Thames Terrace sands and gravels. The bee is presumed to nest in light soils in sunny situations. Pollen sources are unknown, but flower visits include *Senecio* and *Crepis*.

12.6.23 Halictinae, *Lasioglossum pauxillum*, Notable/Na, Essex Red Data species, Regionally Important

The bee is recorded from southern England, and Falk (1991b) describes it as an extremely local species with post-1970 records known for about twenty sites, mostly in Kent and Sussex but also sparingly in S. Hampshire and S. Essex. Recent years have seen the species become much more frequent, and it is much more frequently encountered.

12.6.24 Halictinae, *Lasioglossum puncticolle*, Notable/Nb, Essex Red Data species, Regionally Important

The mining bee *Lasioglossum puncticolle* is much declined inland (Falk 1991b) but still widespread in Essex near the coast. It seems to prefer dry clay substrates and bare or sparsely vegetated soil in warm, sunny situations for nesting. Pollen sources probably include Wild Carrot, *Ranunculus*, *Cirsium* and several yellow composites.

12.6.25 Halictinae, *Lasioglossum xanthopum*, Notable/Nb, Essex Red Data species, Essex Threatened

A large attractive halictine mining bee *Lasioglossum xanthopus* is widely recorded in southern England as far north as Leicestershire, but it has suffered a severe decline in many areas, especially inland (Falk 1991b), almost certainly due to the loss of flower rich grasslands and landscape fragmentation. In Essex it is extremely scarce, with few modern records. The bee nests in warm situations in bare soil and possibly close-cropped turf. A variety of flowers are utilised but it is not known which are important as pollen sources, and which are visited for nectar. A

strong population occurred in 2002 and 2003 at Anchor Field, about a kilometre to the north of the North Lagoon.

Lasioglossum xanthopum



12.6.26 Halictinae, *Lasioglossum zonulus*, Unknown, Essex Red Data species, Essex Vulnerable

Lasioglossum zonulus may be a locally frequent ground nesting bee in some areas, but is very rare in Essex, only otherwise recorded at Canvey Wick SSSI, plus a single individual from East Tilbury silt lagoons in 1993.

12.6.27 Halictinae, *Sphecodes crassus*, Notable/Nb, Essex Red Data species, Regionally Important

Sphecodes crassus is a small black and red cuckoo bee, cleptoparasitic on *Lasioglossum* sp. especially *L. nitidusculum* and *L. parvulum*. Females are very difficult to distinguish from the related *S. geoffrellus (fasciatus)*, therefore its status and distribution is unclear. However it does currently seem to be widespread in the East Thames Corridor.

12.6.28 Halictinae, *Sphecodes ferruginatus*, Notable/Nb, Essex Red Data species, Essex Threatened

Sphecodes ferruginatus is widespread, with scattered records throughout England Widespread but very scarce and rarely numerous at a site. The reasons for this are not entirely clear as probable hosts are still common in many parts of Britain. Post-1970 records are available for about 10 sites mostly in southern England but also W. Norfolk and N.W. Yorkshire. In Essex there are only records of single specimens from two other localities. Probable hosts include *L. fulvicorne*, a widespread species predominantly on calcareous, *L. fratellum*, another widespread species and possibly *L. laticeps*, *L. pauxillum* and *L. rufitarse* (Falk, 1991b). There is evidence of an association with chalk grassland and there is likely to be a requirement for bare and sparsely vegetated ground or short turf in sunny situations (such as south-facing slopes and banks) for host nesting.

12.6.29 Halictinae, *Sphecodes longulus*, Notable/Na, Essex Red Data species, Regionally Important

Sphecodes longulus is a cuckoo bee cleptoparasitic on mining bees of the genus *Lasioglossum*, probably usually *L. minutissimum*. It is locally frequent in Kent and the East Thames Corridor, but is otherwise exceedingly scarce and apparently declined with post-1970 records from single sites in S. Hampshire, W. Sussex and W. Norfolk (Falk 1991b).

12.6.30 Halictinae, *Sphecodes miniatus*, Notable/Nb, Essex Red Data species, Essex Threatened

The bee is a cleptoparasite of *Lasioglossum* mining bees, reported to be associated with *L. nitidiusculum*, a very rare bee in Essex. Confirmed records are confined to the southern half of England, with a strong easterly bias. It has strong preference for dry, sandy habitats such as heathland and disturbed ground.

12.6.31 Halictinae, *Sphecodes reticulatus*, Notable/Na, Essex Red Data species, Regionally Important

Sphecodes reticulatus is a very local cuckoo bee that has probably declined with post-1970 records for about twentyfive sites (Falk 1991b). It is confined to the southern England from Devon to E. Kent and N. to Norfolk. In Essex all records are from the East Thames Corridor and Thames Terrace habitat near Colchester. It has been found in a variety of habitats on light soils such as sandy heathland, soft rock cliffs, sandpits and chalk grassland. The host species is unconfirmed, but *Lasioglossum prasinum*, *Andrena argentata* (both species not recorded in Essex), *A. dorsata* and *A. barbilabris* are possibilities (Falk 1991b).

12.6.32 Halictinae, *Sphecodes rubicundus*, Notable/Na, Essex Red Data species, Regionally Important

This bee is a cleptoparasite, almost certainly on the mining bee *Andrena labialis*. It is a widespread, but local southern species with post-1970 records for only about 20 sites, mostly in Kent and on the south coast of the Isle of Wight (Falk, 1991b). A substantial decline seems to have occurred in many districts, especially inland. In Essex the host is currently widely distributed along the South Essex coast, with two isolated records in North Essex, but the cleptoparasite is practically confined to the East Thames Corridor.

12.6.33 Megachilinae, *Hoplitis claviventris*, Essex Red Data species, Essex Vulnerable

This bee is widely distributed but uncommon throughout much of southern England and in south Wales (Edwards, 1998), which lists it as Nationally Notable (Nb). In Essex it is very rare, with very few records near the Thames. It has been recorded collecting pollen from *Lotus*, but it probably uses other flowers as well. The bee nests in dead stems, including bramble, rose and ragwort.

12.6.34 Megachilinae, *Stelis ornatula*, Rare (RDB3), Essex Red Data species, Essex Endangered

There are scattered records for southern Britain, but is a rare and declined bee with post-1970 records for only about a dozen widely scattered sites (Falk, 1991b). *Stelis ornatula* is a cleptoparasite of the bee *Hoplitis claviventris*, itself an Essex Red Data book species considered Vulnerable in the county. *S. ornatula* has been reared on numerous occasions from the bramble, rose and ragwort stem-nests of the host.

12.6.35 Melittinae, *Dasygaster hirtipes*, Notable/Nb, Essex Red Data species, Regionally Important

This mining bee occurs in southern Britain, and whilst still reasonably widespread and locally common on southern coastal dunes, it has declined significantly inland (Falk, 1991a). In Essex most records are from near the Thames. It is remarkable for the female's very large pollen brushes on the hind tibia. The bee will form nesting aggregations in bare or sparsely vegetated sandy or other friable soils and females collect pollen exclusively from composites (Asteraceae) especially yellow flowered species such as ox-tongues *Picris* spp. and ragworts *Senecio* spp.

12.6.36 Melittinae, *Melitta leporina*, Local (pScarce B), Essex Red Data species, Essex Threatened

This bee collects pollen from clovers and vetches, and is an uncommon species of open grassland on sand, chalk and clay soils in southern England, becoming scarce in the northern counties and Wales. Current evidence suggests that its status should be reviewed (Edwards, 1998; BWARS website www.bwars.com). It nests in sandy ground. It is probably a host species to the Nationally

Scarce cuckoo bee *Nomada flavopicta*. In Essex the bee all but one record is from the East Thames Corridor, where its metapopulation is threatened by large-scale loss of flower rich grassland, post industrial habitats, old sand pits and waste ground by development.

12.6.37 Melittinae, *Melitta tricincta*, Notable/Nb, Essex Red Data species, Regionally Important

Melitta tricincta is a mining bee recorded widely from W. Cornwall to W. Norfolk, with post-1970 records mostly from the southern English chalk downs and the coast of Sussex and Kent, in a variety of habitats, including dry chalk and limestone grassland, coastal landslips and soft rock cliffs. In Essex it has been found in a number of locations in the south of the county, usually reasonably near the coast. Nesting has not been observed but burrows are thought to occur in warm, sunny localities with bare ground or short turf. It is probably a host species to the Nationally Scarce cuckoo bee *Nomada flavopicta*. The bee has a close association with Red Bartsia *Odontites verna*, from which the females collect pollen to provision their nests. Red Bartsia is usually a plant found in situations where some disturbance occurs, enabling the plant to germinate and develop in an open sward.

12.6.38 Xylocopinae: *Ceratina cyanea* (Blue Carpenter Bee), Rare (RDB3), Essex Red Data species, Essex Vulnerable

The Blue Carpenter Bee *Ceratina cyanea* is a rare bee confined to southern England, with most recent records from West Sussex and the Maidstone area of Kent. It was rediscovered in Essex after nearly 100 years in 1993 at Mill Wood Pit, part of the Chafford Hundred development in Thurrock. Here it was present in very large numbers, but the site has now been destroyed and is a large housing estate. Populations in south Essex have subsequently been found in smaller numbers on 'wasteground' by St Clements Church in Thurrock, where most of the site has been lost to development; at the Aveley-Wennington riverside (Havering) where most of the habitat has now been levelled and is being used for waste disposal and the construction of an access road; along a sandy bank at the Ingrebourne Valley landfill site (Harvey 2003), which has now been destroyed by 'restoration' work; and at Anchor Field adjacent to 'Lakeside' which is designated for housing in the new deposit UDP. Single specimens have been collected at Alphamstone and Middlewick Ranges, Colchester in North Essex, as well as on an area of wasteground in Colchester, which will be developed in the near future. Most recently (2003) it has been found at two more sites near the Thames in Thurrock, both currently designated for development in the new UDP.

This species nests in dead, broken bramble stems, so the presence of a certain amount of bramble scrub in open situations where dead stems are exposed to the sun is crucial to its survival. It is likely to prefer bramble growing in drought-stressed and mineral deficient situations. The bee collects pollen from a variety of flowers including yellow composites, knapweed and *Lotus*.

Blue Carpenter Bee *Ceratina cyanea*



12.7 Hymenoptera, Aculeata: Apoidea - Sphecidae

12.7.1 *Astata boops*, Local, Essex Red Data species, Essex Threatened

The species is confined to southern England, East Anglia and the Channel Islands. Although not listed in Shirt (1987) or Falk (1991) the restricted range suggests revision of its status (to Nationally Scarce) is needed (Edwards, 1998). It occurs mainly in sandy localities, such as inland heaths and coastal dunes. The wasp is usually confined to old heathland or acid grassland sites, and is very scarce in Essex. Its occurrence in numbers at a main nesting area and the lichen heath Area D in the West Thurrock PFA North Lagoon is an important population.

12.7.2 *Cerceris quinquefasciata* (5-banded Tailed Digger Wasp), Rare (RDB3), UK Biodiversity Action Plan species, Essex Red Data species, Essex Threatened

The **RDB3** *Cerceris quinquefasciata* is a medium-sized yellow and black wasp which nests gregariously in areas of bare sand in places exposed to the sun. It provisions its nest with adult weevils, and may occur in numbers at favourable sites.

It is a national Biodiversity Action Plan species currently subject to research into its autoecology. It is included in English Nature's Species Recovery Program because of a severe decline in its modern distribution. This is thought to be due to the loss of open areas of sandy ground for nesting and flower-rich sandy grasslands for foraging (Action Plan in UK BAP, Tranche 2 volume IV – invertebrates).

Although the wasp has historically been recorded from 49 ten km squares in southern and eastern England, it has been found in rather few ten km squares (now probably totalling 17) since 1980, largely in south-eastern England with one isolated occurrence in Oxfordshire. The main metapopulation currently appears to be in the East Thames Corridor, but there are indications that other important centres survive in the Colchester, Ipswich and Breck areas.

Many or most sites where the wasp is currently known or has recently been recorded are threatened or have already been lost to development, this affecting most of the sites in the East Thames Corridor and the Colchester and Ipswich area. It appears crucial to make serious attempts to safeguard these core areas of population (Harvey, 2001).

Although the wasp appears to collect common and widespread weevils as prey to provision its larvae, the species is associated with sporadically disturbed land (including brown field land and 'waste ground') and the relatively unmanaged parts of heath edge or other sandy habitats. The restricted distribution of the wasp is probably partly climatic, but also reliant on an abundant prey supply associated with grasslands and scrub containing a diverse flower-rich vegetation with areas of bare ground and uncut stems, seeds, flower heads and fruit heads that support the weevil prey species (Harvey, 2001; Harvey, 2002d).

Cerceris quinquefasciata



12.7.3 *Cerceris ruficornis* Local, pScarce B, Essex Red Data species, Essex Vulnerable

This wasp is sometimes locally common on sandy heathland in southern England, including coastal heaths in Cornwall, but there are few records elsewhere. The restricted distribution and its precise habitat requirements suggest that it may be under threat (Edwards, 1997) and it a proposed Scarce B species (www.bwars.com). It was proposed as a potential species for the UKBAP (Edwards, 2004) on the basis of modern decline. In Essex it has only otherwise been recorded from Rowhedge in N. Essex in 1986 and one small part of Chafford Hundred in 1996. The wasp preys on curculionid weevils, occasionally also beetles in other families.

12.7.4 *Crossocerus palmipes*, Notable/Nb, , Essex Red Data species, Essex Endangered

This sphecid wasp is widely distributed in Britain, but it is very scarce in the south-east where recording levels have been relatively high (Falk, 1991b). The species occurs in open sandy habitats especially heathland and disturbed situations such as sandpits and coastal landslips. It nests in bare or sparsely vegetated sandy substrates in warm sunny situations, and the cells are provisioned with a small number of flies e.g. Muscidae, Dolichopodidae, Chloridae or Lauxaniidae. Despite extensive survey of apparently suitable habitats in Essex, the occurrence at the West Thurrock PFA Lagoons is the only county site. A single male was swept by bushes adjacent to sparsely vegetated aculeate nesting area in 2003 as new to Essex, but females (and further males) collected during the current survey brought to light the misidentification of a female in 1996 as *C. pusillus*, so there has been a long established population at the site. Results from traps seem to indicate that the wasp may nest in the North Lagoon, but forage for prey mainly in the SSSI.

12.7.5 *Ectemnius dives*, Local (pScarce B), Essex Red Data species, Regionally Important

Edwards (1998) notes that records for *Ectemnius dives* are concentrated in south-east England and Yorkshire, and are notably sparse in the Midlands and East Anglia despite relatively good recording levels there, also suggesting that its national status should be reviewed (to Nationally Scarce). Nesting occurs in dead wood and cells are stocked with flies such as syrphids and tachinids. Adults visit umbellifers such as Carrot flowers.

12.7.6 *Ectemnius lituratus*, Local, Essex Red Data species, Essex Threatened

Most records of this wasp are restricted to southern England south of a line between the Bristol Channel and the Wash. In Essex it is scarce, with very few records in the west of the county. It occurs in a variety of habitats, but perhaps especially woodlands. It is typically encountered around dead wood, timber and umbellifer flowers (Edwards, 1998).

12.7.7 *Gorytes quadrifasciatus*, Local, Essex Red Data species, Essex Threatened

The wasp *Gorytes quadrifasciatus* is widespread in England, but local. It preys on planthoppers *Philaenus* and nests in soil, sometimes quite heavy (Richards, 1980). It is rare in Essex with all records adjacent to the Thames.

12.7.8 *Harpactus tumidus*, Local

Harpactus (Gorytes) tumidus is a mainly southern solitary wasp species, nowhere common. In Essex most records are in the East Thames Corridor where it is found on sparsely vegetated ground in sandy places. It preys on cicadellid and cercopid hoppers such as *Philaenus* and *Aphrodes* species. Adults visit flowers such as Carrot *Daucus carota* and Wild Parsnip *Pastinaca sativa* (Edwards & Telfer, 2001). It is host to the Nationally Scarce cleptoparasite *Nysson dimidiatus*.

12.7.9 *Lestiphorus bicinctus* , Notable/Nb, Essex Red Data species, Regionally Important

Lestiphorus (Gorytes) bicinctus is a digger wasp with records confined to southern counties of England. In Essex most records are near the Thames. It is apparently associated with bushy places on reasonably light soils mainly in heaths, dunes and soft-rock cliffs. The ecology is rather poorly known. Nesting is likely to occur in light soil in warm, sunny situations. It is unclear whether bare soil or vegetated situations are preferred for this. The prey consists of auchenorrhynchous bugs of the families Cicadellidae and Cercopidae (Richards 1980). The decline of traditional land use and the effects of myxomatosis on rabbit populations has led to succession which may have left many other sites unsuitable for this species. Overgrazing and excessive clearance of bushy places could also be damaging (Falk, 1991b).

12.7.10 *Mimesa equestris*, Local, Essex Red Data species, Essex Vulnerable

Mimesa equestris is widely distributed, but in Essex there is otherwise only a single record from a second site in South Essex. The wasp nests in sandy soil, often in flat places and preys on Hoptera (Cicadellidae, occasionally including nymphs) (Richards, 1980).

12.7.11 *Mimesa lutaria*, Local, Essex Red Data species, Essex Vulnerable

Mimesa lutaria is widely distributed in south-eastern England, but in Essex it has occurred only at the West Thurrock lagoons and the now destroyed nearby Mill Wood Pit. It burrows in sand and preys on Homoptera (Cicadellidae, nearly all Jassinae) (Richards, 1980).

12.7.12 *Mimumesa unicolor*, Notable/Na, Essex Red Data species, Regionally Important

Mimumesa (Psen) unicolor was only formally added to the British list in 1994 (Else & Felton 1994), although the species was first taken in 1950. It is confined to South Hampshire, West Sussex, the Isle of Wight and the East Thames Corridor (Knowles & Roberts 2002), which holds a nationally important metapopulation. The wasp is associated with *Phragmites* areas, and has been found visiting Carrot *Daucus carota* and Parsnip *Pastinacea sativa*.

12.7.13 *Nysson dimidiatus*, Notable/Nb, Essex Red Data species, Essex Threatened

Nysson dimidiatus has records from scattered localities throughout England and Wales as far north as Northumberland but it is a very local species with about 25 known post-1970 sites. Both *N. dimidiatus* and its host are likely to have declined during this century, in response to the loss and deterioration of sandy habitats such as heathland, and from coastal development. This species and its main host favour warm sunny areas, especially south-facing slopes in sheltered spots, where the host excavates its nests in bare and sparsely vegetated ground. It is a cleptoparasite of the local sphecid wasp *Harpactus (Gorytes) tumidus*, with which it is usually taken and closely resembles. Scrub invasion and the loss of bare sand has resulted from changes in land use and the decline in rabbit populations following the introduction of myxomatosis. At some sites, horse riding and motorcycle activity could jeopardise the future of the species, though at others some disturbance will probably be beneficial in promoting the presence of bare and sparsely vegetated ground.

12.7.14 *Nysson trimaculatus*, Notable/Nb, Essex Red Data species, Regionally Important

The wasp is widely distributed in the southern half of England, and nearly all Essex records are in the East Thames Corridor. It is a cleptoparasite of the wasp *Gorytes quadrifasciatus* and *G. bicinctus* and is recorded from a variety of open habitats on light soils, including heathland, dry grassland and scrub, open woodland, coastal landslip and soft rock cliffs, quarries and post industrial sites (Edwards & Telfer, 2001).

12.7.15 *Passaloecus clypealis*, Rare (RDB3), Essex Red Data species, Regionally Important

In Falk (1991b) *Passaloecus clypealis* was known from about a dozen sites in East Anglia and south-east England. It has been recorded from several sites in Essex near the Thames, especially where extensive stands of *Phragmites* are growing in relatively dry conditions. It is associated with *Phragmites* beds in fens, and in the ditches and reedbeds of coastal marshes. The species has been recorded in Britain nesting within the empty cigar-galls of the chloropid fly *Lipara lucens* in *Phragmites* and in cut, hollow stems of the same plant.

12.7.16 *Pemphredon morio*, Notable/Nb, Essex Red Data species, Essex Endangered

This species (as both *Pemphredon morio* and *P. clypealis*) is a scarce, but widespread species recorded from about 25 vice-counties from E. Cornwall to E. Kent and north to S. Lancashire and N.E. Yorkshire, with about 35 post-1970 records. There are only three other Essex records. There is much taxonomic confusion surrounding this wasp and *P. clypealis* but recent work suggests that they are a single, highly variable, species (Falk, 1991b). It is associated with dead wood such as dead trees, stumps and old fence posts in warm, sunny situations. The cells are provisioned with aphids.

12.7.17 *Philanthus triangulum* (Bee Wolf), Vulnerable (RDB2), pRDB4 (out of danger)

Less than 20 years ago this wasp was considered to be one of the great aculeate rarities in Britain, with colonies only in sandy habitats on the Isle of Wight and Suffolk. It has since undergone an expansion in range, with the wasp now locally common in a steadily increasing number of sites (Edwards, 1997) as far north as Yorkshire (Archer, 2002). In view of the expansion in range and the probability that this is climate driven, its status should be revised.

Bee Wolf *Philanthus triangulum*



12.8 Hymenoptera, Aculeata: Chrysoidea (ruby tailed wasps and relatives)

12.8.1 *Cleptes semiauratus*, Notable/Nb, Essex Red Data species, Essex Threatened

This ruby tailed wasp is widely distributed in England, and although formerly widespread and locally frequent, it is now scarce everywhere and seems to have declined considerably (Falk 1991b). There are very few records in Essex. It is a parasitoid of the cocoons of the common currant sawfly *Nematus ribesii*, a garden pest of redcurrant and gooseberry.

12.8.2 *Elampus panzeri*, Local, Essex Red Data species, Essex Endangered

The species is widely distributed as far north as Yorkshire, but most records are from southern heathlands of Dorset, Hampshire, Sussex and Surrey. It is a brood parasite of species of *Mimesa* (Sphecidae), occurring in the sandy habitats of the hosts. The species profile map (Archer & Roberts, 2002) suggests a status revision (to Nationally Scarce) would be warranted. The occurrence at the pylon nesting area in the West Thurrock PFA North Lagoon is the first record for Essex.

12.8.3 *Hedychrum niemelai*, Rare (RDB3), Essex Red Data species, Essex Threatened

The ruby-tailed wasp *Hedychrum niemelai* is a cleptoparasite of the national Biodiversity Action Plan RDB3 *Cerceris quinquefaciata*. In the past the species was apparently locally common in southern England, from W. Cornwall to W. Norfolk, but now seems to be very scarce, with post-1970 information from only a handful of sites (Falk, 1991b). It is are known to inhabit open, sandy situations with nesting taking place in bare or sparsely vegetated sandy substrates fully exposed to the sun. The *Cerceris* has recently been subject to research into its autoecology and is recorded collecting a number of weevils as prey, including some very common species. The UK Action Plan gives the loss of open areas of sandy ground for nesting and flower-rich grasslands for foraging as the current factors causing decline.

Ruby tailed wasp *Hedychrum niemelai*



12.9 Hymenoptera, Aculeata: Vespoidea (wasps and ants)

12.9.1 Eumenidae, *Gymnocerus laevipes*, Local, Essex Red Data species, Essex Threatened

12.9.2 Formicidae, *Myrmica bessarabica* (=specioides), Rare (RDB3), Essex Red Data species, Regionally Important

Listed only for East Kent in Falk (1991a) *Myrmica bessarabica* was first recorded in Britain from Sandwich, but is now known to be more widespread in warm coastal situations in Kent and Essex. It may be increasing in range, but identification of this and related *Myrmica* species is difficult and the ant had probably formerly been overlooked in its coastal Essex locations. It favours warm, sparsely vegetated ground in sunny situations, such as dunes, south-facing landslip grassland, south-facing terrace gravel grassland and more rarely on old sparsely vegetated post-industrial habitat.

12.9.3 Mutillidae, *Smicromyrme rufipes*, Notable/Nb, Essex Red Data species, Regionally Important

This velvet ant is recorded widely in southern England, but is generally scarce (Falk, 1991). In Essex the species is recorded around Colchester and the East Thames Corridor, mostly from sites threatened by development. It is a cleptoparasite of a variety of ground nesting bees and wasps, in bare and sparsely vegetated, sandy situations in warm, sunny locations.

12.9.4 Pompillidae, *Anoplius nigerrimus*, Local, Essex Red Data species, Essex Endangered

The spider-hunting wasp *Anoplius nigerrimus* is said to be widespread and fairly common., but in Essex there is only one other site known, in the Lee Valley where it was found in 2003. It is found in a fairly wide range of habitats and nesting in a variety of situations including under stones, in dry plant stems, in deserted burrows of other aculeates and in snail shells. Reported prey include Lycosidae, Gnaphosidae and Pisauridae.

12.9.5 Pompillidae, *Arachnospila minutula*, Notable/Nb, Essex Red Data species, Essex Threatened

Arachnospila minutula is mostly recorded in southern England, but is a very local species with widely scattered post-1970 records. The loss and deterioration of semi-natural habitats such as downland and heathland is likely to have influenced the status of this wasp (Falk, 1991b). In Essex all records are from South Essex in the Thames and Lee corridors. The wasp is found on chalk downs, heaths, quarries and other habitats with warm, sparsely-vegetated ground. Prey is probably wolf spiders (Lycosidae) and, in France, a nest has been found beneath a stone. Adults have been seen visiting umbellifer flowers such as *Pastinaca* and *Daucus*.

12.9.6 Pompillidae, *Auplopus carbonarius*, Notable/Nb, Essex Red Data species, Essex Vulnerable

Auplopus carbonarius is a rare spider-hunting wasp confined to southern England. There are four other Essex records. Recorded prey includes *Clubiona*, *Philodromus* and *Agelena*. Nests are constructed under stones, in old stumps or in old shells and are made of cells of clay taken from damp areas. This spider hunting wasp tends to inhabit woodland, especially that with streams and marshy areas which provide wet mud and clay for nesting materials. The nests are built in cavities in a great variety of situations and stocked most frequently with spiders in the family Clubionidae (Edwards, 1997).

12.9.7 Pompillidae, *Priocnemis agilis*, Notable/Nb, Essex Red Data species, Essex Threatened

It is widely recorded in the southern half of England and is also known from south Wales. It is very local with few recent records, suggesting a general decline, although the wasp has been recorded from a number of sites in Kent since 1981 (Falk 1991b). There are very few records in Essex, although it has been found in numbers at some sites. It is typically encountered in dry, open, grassy situations such as sunny banks and south facing slopes. Nothing seems to be known about its nesting habits, but there is a prey record for a *Drassodes* species. Adults can be found visiting the flowers of umbellifers such as Carrot.

12.9.8 Pompillidae, *Priocnemis gracilis*, Notable/Nb, Essex Red Data species, Essex Threatened

Priocnemis gracilis is recorded widely in England and although previously regarded as a rarity, it is now known to be fairly frequent in Kent (Falk, 1991b). In Essex all records are from the Thames and Lee corridors except for one near Colchester. A good proportion of the British records seem to come from woodland on stiff clay soils, where the wasp is likely to be found in sunny rides, glades and clearings. Many other records are coastal, often from the disturbed ground of soft rock cliffs and landslips. It has also been taken on heathland and in sandpits. *Priocnemis* species usually excavate multi-celled burrows, often in natural cavities or the old burrows of other aculeates. These are stocked with spiders. Recent prey records are of an immature *Clubiona* (Clubionidae) and a salticid spider. Adults visit umbellifers such as *Daucus*.

12.10 Lepidoptera (butterflies and moths)

Lepidoptera (moths) have not been well-recorded at the site, with data only resulting from a single moth-trapping exercise in 1996 (Plant, 1996).

12.10.1 Geometridae, *Aplocera efformata* Lesser Treble-bar, Essex Red Data species

This moth has few scattered records in Essex. Habitat is given in Goodey (2004) as heaths and scrub and the larval foodplant *Hypericum*.

12.10.2 Geometridae, *Scopula emutaria* Rosy Wave, Notable/Nb, Essex Red Data species

This moth is recorded mostly in the north-east of the county. It is mostly coastal and the larvae feed on Sea Beet, plantain and dock (Goodey, 2004). The West Thurrock site is the only county record in the Thames Corridor.

12.10.3 Noctuidae, *Cucullia asteris* Star-wort, Notable/Nb, Essex Red Data species

The moth is coastal, occurring on saltmarsh or saline areas with Sea Aster, the larval foodplant.

Star-wort larva *Cucullia asteris*



12.10.4 Pyralidae, *Agriphila latistria*, Local, Essex Red Data species

In Recorder 2002 the status of *Agriphila latistria* is given as Notable/Nb in the 1984 provisional review of Microlepidoptera, but this must have been superseded by the national pyralid review by Parsons (1993), which does include the species. It is noted on the coasts of England from Lincolnshire and Lancashire southwards, sandy heaths in the New Forest, also Monmouthshire, Ayrshire, Perthshire and the Isle of Arran. It is local, found on coastal sandhills, dry heaths and occasionally the borders of woodland rides in sandy districts. Goodey (2004) provides gravel pits and coastal as habitat details. Bradley (2000) states that it feeds on grasses, especially brome.

12.10.5 Pyralidae, *Evergestis extimalis* Marbled-yellow straw pearl, Notable/Nb, Essex Red Data species

Although undoubtedly resident, and recently recorded from twenty-three vice-counties, this species is probably only breeding in the Breckland and along the Thames estuary. The larva feeds on the seed-heads of Cruciferae, especially perennial wall-rocket *Diplotaxis tenuifolia* (Thames estuary), and charlock *Sinapis arvensis* and white mustard *S. alba* (Breckland), making a silken web in which several larvae may be found together. When full grown, the larva makes a tough cocoon in soil in which it hibernates, pupating in May. Much habitat has probably been lost through afforestation and development, such as housing and road building. Vegetation succession leading to a loss of bare disturbed ground and a loss of the species' ruderal foodplants may threaten this moth. Management should aim to maintain a varied vegetation, from open disturbed ground, which will help in encouraging a continuity of foodplant supply, through to taller grassy

vegetation. On some Breckland sites rotovation may be considered. This should be undertaken on rotation involving only a small area of land in any one year (Parsons, 1993).

12.10.6 Pyralidae, *Sitochroa palealis*, Notable/Nb

Sitochroa palealis has been widely recorded over southern Britain from East Kent to Cornwall north to Lancashire and North-east Yorkshire, and has also been found in parts of Wales. The moth is an immigrant to Great Britain and in places temporary colonies have become established. On a number of sites in southern England the species has been regularly recorded over several years indicating long term establishment, and this has certainly occurred in south Essex near the Thames over the past decade or more. This species frequents grassland on light soils and grassy cliff-tops and has also been found on vegetated shingle. The larva inhabits a tubular silken web in the seed-head of wild carrot *Daucus carota*, and can be found in August and September. Hibernation takes place in a tough, subterranean cocoon in which pupation occurs in spring. It is not known if this species is currently breeding on any SSSIs and NNRs (Parsons, 1993).

12.10.7 Sesiidae, *Synanthedon formicaeformis*, Red-tipped Clearwing, Notable/Nb, Essex Red Data species

Synanthedon formicaeformis is local in southern England north to Dumfriesshire, and also noted in south Wales. It occurs in gravel pits, fenland and marshy areas, the larva feeding in the stems and branches of *Salix viminalis* and occasionally other species of *Salix*. Goodey (2004) states that it was last seen in Essex in 1984 at Dagenham Chase, further west in the Thames Corridor.

12.11 Orthoptera (grasshoppers and crickets)

12.11.1 Conocephalidae, *Conocephalus discolor*, Notable/Na, Essex Red Data species

Conocephalus discolor is a small brown and green bush cricket which inhabits areas of long grass, reeds or rushes in wet places. Until recent years it was almost always found within a few miles of the sea and confined to the south coastal area, with records from Dorset, Hampshire, Sussex and Kent. However it has been spreading widely and was first recorded in the extreme west of Essex in 1995. It has now colonised more than thirteen 10km squares (Gardiner 2003). However, the records indicate that this species is currently rare in Essex and because of this it is currently included on the Essex Red Data list (Gardiner 2002).

12.11.2 Tettigonidae, *Metrioptera roeselii*, Notable/Nb

The East Thames Corridor has long been a national stronghold for this bush cricket, but in recent years the species has undergone a very large climate driven expansion of range. In Essex the species now occurs in considerable abundance in agricultural grasslands such as set-a-side, grass field margins and lightly grazed pastures where there is plenty of vegetation cover. Road verges are also a suitable habitat as they contain tall rank grasses which are ideal cover for this species. Given that *M. roeselii* has colonised these inland areas in considerable abundance there is no reason for it to be included in the Essex red data list as it is no longer at risk from extinction in the county (Gardiner, 2002).

APPENDIX 1: ESSEX STATUS DEFINITIONS

Essex Red Data species are included in the provisional Essex Red Data list produced on behalf of English Nature, which is available at www.essexfieldclub.org.uk. In the Diptera only those families covered by the national status review (Falk, 1991) have so far been covered by the list, but taxa included in the Red Data Book or which are Notable (Nationally Scarce) would automatically be included unless there was clear evidence that the species had become much more widespread and frequent in Britain and Essex than when it was given its official national status. The Essex threat statuses used for Arachnida, aculeate Hymenoptera and Syrphidae (Diptera) are based on the definitions used for ants (Harvey 1998) and harvestmen (Harvey 1999). Essex Threat statuses have not been evaluated or assigned for other taxonomic groups.

WATSONIAN ESSEX THREAT CATEGORIES

These Watsonian Essex threat categories are defined as:

Essex Endangered

- species which are known as a single extant population within a single post 1980 one km square or only from threatened or vulnerable sites in the county.
- species believed extinct in the county but which if rediscovered would need protection.

Essex Vulnerable

- species known from only two extant populations within the county.
- Essex Rare species which are restricted to habitats or sites known to be under threat in the county e.g. from agricultural improvement, development or inappropriate management.
- species which only occur at sites within the county known to be vulnerable.
- species which have shown a continuous decline over the last twenty years and are now known to exist in less than 1% of the covered post 1980 one km squares in the county.

Essex Threatened

- scarce species with an Essex rarity status of Rare or Scarce and with a Frequency Ratio of less than 1.5 and Tetrads percentage of less than 1.0 indicating widely isolated populations within the county.
- Essex Scarce species which are restricted to habitats or sites known to be under threat in the county e.g. from agricultural improvement, development or inappropriate management.
- species which have shown a continuous decline over the last twenty years.

Regionally Important

- species which are important in a national context because the county contains a significance proportion* of the national populations.
- species which are important in a national context because they have a close association with a specific nationally threatened habitat included in the Biodiversity Action Plan.
- species which are important in a national context because they are dominant in or peculiar to a specific habitat for which the county contains a large percentage of the national habitat.

*the following definitions have been used to define a *significant proportion* of the national population, using the definitions of RDB and Notable categories in Shirt (1987), Ball (1986), revised by Falk (1991):

RDB species - all species not already defined as Essex Endangered or Essex Vulnerable are included;

Notable A - species with records from 3 or more ten km squares, representing at least 10% of the known national distribution;

Notable B - species with records from 5 or more post-1980 ten km squares, representing at least 5% of the known national distribution.

Essex Unknown

species for which there is insufficient data available to determine a reliable threat status but which may be under significant habitat or site threat.

Species of Arachnida, aculeate Hymenoptera and Syrphidae (Diptera) not assigned an Essex Threat status are assumed to be under no direct threat of severe decline or extinction in Essex at the present time or the county is not known to contain a significant proportion of the national populations of the species. Other taxonomic groups have not been assigned a threat status.

APPENDIX 2: LIST OF SPECIES RECORDED

*ERD species are those included in the Essex Red Data list (see Appendix 1)

*for those taxa with an Essex Threat status assigned (see Appendix 1)

Taxon	First Found	Last Found	North	SSSI	Status	Essex Status ⁺	Essex Threat*
NON-INSECT GROUPS							
Arachnida: Araneae (spiders)							
Agelenidae							
<i>Agelena labyrinthica</i>	2003	2005	+	+			
<i>Tegenaria agrestis</i>	1996	2003	+	+	Local		
<i>Tegenaria gigantea</i>	1996	2005	+	+	Local		
Araneidae							
<i>Agalenatea redii</i>	1996	2005	+	+	Local		
<i>Araneus diadematus</i>	2005	2005		+			
<i>Araneus quadratus</i>	1996	2005		+			
<i>Araniella cucurbitina</i> s.s.	2005	2005		+			
<i>Araniella opisthographa</i>	2005	2005		+	Local		
<i>Argiope bruennichi</i>	2001	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
<i>Hypsosinga pygmaea</i>	2005	2005	+		Local		
<i>Larinioides cornutus</i>	2005	2005		+			
<i>Neoscona adianta</i>	1996	2005	+	+	Local		
<i>Nuctenea umbratica</i>	2003	2003	+				
<i>Zilla diodia</i>	2005	2005	+		Notable/Nb	Essex Red Data species	Regionally Important
Clubionidae							
<i>Cheiracanthium erraticum</i>	2003	2005	+	+			
<i>Cheiracanthium virescens</i>	1996	2005	+	+	Local		
<i>Clubiona comta</i>	2003	2003	+				
<i>Clubiona lutescens</i>	2005	2005		+			
<i>Clubiona neglecta</i> s.s.	1996	2005	+	+	Local		
<i>Clubiona pallidula</i>	2003	2003	+				
<i>Clubiona phragmitis</i>	1996	2005	+	+	Local		
<i>Clubiona reclusa</i>	2003	2005	+	+			
<i>Clubiona stagnatilis</i>	2005	2005	+	+			
<i>Clubiona subtilis</i>	1996	2005	+	+	Local		
<i>Clubiona terrestris</i>	1996	2005	+	+			
Dictynidae							
<i>Argenna patula</i>	2005	2005		+	Notable/Nb, pUKBAP	Essex Red Data species	Essex Threatened
<i>Argenna subnigra</i>	1998	2005	+	+	Local		
<i>Dictyna arundinacea</i>	1996	2005	+	+			
<i>Dictyna latens</i>	2003	2005	+	+	Local		
<i>Dictyna uncinata</i>	1997	2005	+	+			
Dysderidae							
<i>Dysdera crocata</i>	1996	2005	+	+			
<i>Harpactea hombergi</i>	2005	2005	+		Local		
Gnaphosidae							
<i>Drassodes cupreus</i>	2005	2005	+		Local		
<i>Drassodes lapidosus</i>	2003	2005	+	+			
<i>Drassyllus pusillus</i>	2005	2005	+		Unknown		
<i>Haplodrassus signifer</i>	1996	2005	+	+	Local		
<i>Micaria pulicaria</i>	1996	2005	+	+			
<i>Trachyzelotes pedestris</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Zelotes latreillei</i>	1996	2005	+	+	Local		
Hahniidae							
<i>Antistea elegans</i>	1996	2005	+	+	Local		

Hahnia nava	2005	2005	+		Local		
Linyphiidae							
Bathyphantes gracilis	1996	1996		+			
Bathyphantes parvulus	1996	1996		+			
Centromerus sylvaticus	2001	2001		+			
Diplostyla concolor	2001	2005	+	+			
Dismodicus bifrons	2005	2005	+	+	Local		
Erigone atra	1996	2005	+	+			
Erigone dentipalpis	2005	2005	+	+			
Gnathonarium dentatum	1996	2005	+	+			
Hypomma fulvum	2005	2005	+	+	Notable/Na	Essex Red Data species	Essex Threatened
Kaestneria pullata	2005	2005		+			
Lepthyphantes tenuis	1996	2005	+	+			
Linyphia triangularis	1996	2005		+			
Micrargus subaequalis	2005	2005	+		Local		
Microlinyphia pusilla	2005	2005	+				
Microneta viaria	2005	2005	+				
Neriere clathrata	2005	2005		+			
Oedothorax fuscus	1996	2005	+	+			
Oedothorax gibbosus	2005	2005	+				
Oedothorax retusus	1996	2005	+	+			
Pelecopsis parallela	2005	2005		+	Local		
Pocadicnemis juncea	1996	2005		+			
Walckenaeria antica	2005	2005	+	+			
Walckenaeria atrotibialis	2005	2005		+	Local		
Walckenaeria vigilax	2003	2005	+	+	Local		
Liocranidae							
Agroeca inopina	1996	1996		+	Local		
Agroeca proxima	1996	2003	+	+			
Phrurolithus festivus	1996	2005	+	+			
Lycosidae							
Alopecosa barbipes	2005	2005	+			Essex Red Data species	Essex Threatened
Alopecosa pulverulenta	1996	2005	+	+			
Arctosa leopardus	1996	2005	+	+	Local	Essex Red Data species	Essex Vulnerable
Arctosa perita	1996	1996	+		Local		
Pardosa agrestis	1996	2005		+	Notable/Nb	Essex Red Data species	Regionally Important
Pardosa hortensis	2003	2005	+	+	Local		
Pardosa nigriceps	2003	2005	+	+			
Pardosa palustris	1996	2005	+	+			
Pardosa prativaga	1996	2005	+	+			
Pardosa pullata	1996	2005	+	+			
Trochosa ruricola	1996	2005	+	+			
Trochosa terricola	1996	2005		+			
Philodromidae							
Philodromus cespitum	2003	2005	+	+			
Thanatus striatus	1996	2005	+	+	Local		
Tibellus oblongus	1996	2005	+	+			
Pisauridae							
Pisaura mirabilis	1996	2005	+	+			
Salticidae							
Ballus chalybeius	2003	2005	+				
Bianor aurocinctus	1996	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
Euophrys frontalis	1996	2005	+	+			
Heliophanus cupreus	1997	2005	+	+			
Heliophanus flavipes	1996	2005	+	+			
Salticus scenicus	1996	2005	+	+			
Sitticus distinguendus	2003	2005	+		New to Britain, pUKBAP	New to Essex	

Talavera aequipes	1998	2005	+		Local		
Tetragnathidae							
Pachygnatha clercki	2003	2003	+				
Pachygnatha degeeri	1996	2005	+	+			
Tetragnatha extensa	2003	2005	+	+			
Tetragnatha montana	2003	2005	+	+	Local		
Tetragnatha nigrita	2005	2005		+	Local		
Tetragnatha pinicola	2003	2003	+		Notable/Nb	Essex Red Data species	Regionally Important
Theridiidae							
Anelosimus vittatus	2005	2005	+				
Enoplognatha latimana	2003	2005	+	+	Local		
Enoplognatha ovata s.s.	2003	2005	+	+			
Enoplognatha thoracica	2005	2005		+	Local		
Episinus angulatus	1996	2005	+		Local		
Robertus arundineti	2003	2003		+	Local		
Simitidion simile	2005	2005	+				
Theridion impressum	2005	2005	+	+	Local	Essex Red Data species	Essex Threatened
Theridion sisypium	2003	2005	+				
Theridion varians	2003	2005	+				
Thomisidae							
Misumena vatia	2003	2005	+				
Ozyptila sanctuaria	1996	2005	+	+	Local		
Ozyptila simplex	1996	2005	+	+	Local		
Xysticus cristatus	1996	2005	+	+			
Xysticus kochi	1996	2005	+	+	Local		
Zodariidae							
Zodarion italicum	1996	2005	+	+	pScarce A	Essex Red Data species	Regionally Important
Zoridae							
Zora spinimana	1996	2005	+	+			
Arachnida: Opiliones (harvestmen)							
Leiobunidae							
Leiobunum rotundum	1996	1996	+	+			
Nemastomatidae							
Nemastoma bimaculatum	1996	2005	+	+			
Phalangiidae							
Odiellus spinosus	2003	2005	+		Local		
Oligolophus tridens	1996	1996		+			
Opilio saxatilis	1996	2005	+	+			
Paroligolophus agrestis	1996	2003	+				
Phalangium opilio	1996	2005	+	+			
Arachnida: Pseudoscorpiones							
Chthoniidae							
Chthonius ischnocheles	2001	2001		+			
Isopoda (woodlice)							
Armadiillidiidae							
Armadiillidium nasatum	1997	2005	+	+	Local		
Armadiillidium vulgare	1996	2005	+	+			
Philosciidae							
Philoscia muscorum	2003	2005	+	+			
Platyarthridae							
Platyarthrus hoffmannseggii	2001	2001		+			
Porcellionidae							

Porcellio scaber	2005	2005	+			
Trachelipidae						
Trachelipus rathkei	2005	2005	+	+	Local	
Trichoniscidae						
Trichoniscus pusillus	2005	2005	+	+		

Myriapoda (millipedes and centipedes)

Chilopoda (centipedes)

Cryptopsidae

Cryptops hortensis	2003	2005	+			
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Geophilidae

Strigamia acuminata	2003	2003	+		Local	
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Lithobiidae

Lithobius forficatus	2003	2005	+	+		
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Lithobius melanops	2001	2005	+	+		
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Lithobius microps	2005	2005	+	+		
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Diplopoda (millipedes)

Julidae

Tachypodoiulus niger	2005	2005	+			
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Polydesmidae

Polydesmus angustus	2005	2005	+	+		
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INSECT GROUPS						
Coleoptera (beetles)						
Anthicidae						
Anthicus antherinus	2005	2005	+		Local	
Notoxus monoceros	2005	2005	+	+	Local	
Omonadus floralis	2005	2005		+		
Apionidae						
Ceratapion carduorum	1996	1996		+	Local	
Ceratapion gibbirostre	2005	2005	+			
Ischnopterapion loti	2005	2005	+			
Oxystoma cerdo	2005	2005	+		Notable/Nb	Essex Red Data species
Oxystoma pomonae	2005	2005	+	+		
Perapion hydrolapathi	2003	2003	+			
Protapion apricans	2005	2005	+			
Protapion nigrirtarse	2005	2005	+			
Stenopterapion meliloti	2005	2005	+	+		
Byrrhidae						
Byrrhus pilula	2005	2005		+		
Chaetophora spinosa	2003	2005	+		Unknown	
Syncalypta striatopunctata	2005	2005	+		Local	
Byturus tomentosus	2005	2005	+			
Cantharidae						
Cantharis cryptica	2003	2005	+			
Cantharis lateralis	2005	2005	+	+	Local	
Cantharis nigra	2005	2005		+		
Cantharis pallida	2005	2005		+	Local	
Cantharis rufa	2003	2005	+			
Cantharis thoracica	2005	2005		+	Local	
Rhagonycha fulva	1996	2005	+	+		
Silis ruficollis	2005	2005		+	Notable/Nb	Essex Red Data species
Carabidae						
Acupalpus dubius	2005	2005		+	Local	
Acupalpus parvulus	2005	2005		+	Local	

Agonum marginatum	2001	2001		+	Local	
Agonum thoreyi	2005	2005		+	Local	
Amara aenea	1996	2005	+	+		
Amara apricaria	2003	2003	+			
Amara bifrons	1996	2005	+	+	Local	
Amara communis	2005	2005		+	Local	
Amara consularis	1996	1996		+	Notable/Nb	Essex Red Data species
Amara convexior	2005	2005	+	+	Local	
Amara familiaris	1996	1996		+		
Amara lunicollis	2005	2005	+	+	Local	
Amara ovata	2003	2005	+			
Amara plebeja	1996	2005	+	+		
Amara similata	1996	1996		+		
Amara tibialis	2003	2005	+	+	Local	
Anchomenus dorsalis	1996	2001		+		
Anisodactylus binotatus	2005	2005	+	+	Local	
Anisodactylus poeciloides	1996	2005	+	+	RDB3, UKBAP	Essex Red Data species
Asaphidion curtum	1996	1996		+		
Asaphidion stierlini	2005	2005	+		Local	
Badister bullatus	1996	2005	+	+		
Bembidion assimile	2005	2005	+	+		
Bembidion guttula	2005	2005		+		
Bembidion iricolor	2005	2005	+		Local	
Bembidion lampros	1996	1996		+		
Bembidion lunulatum	2005	2005		+		
Bembidion minimum	1996	2001		+		
Bembidion normannum	2001	2005		+	Local	
Bembidion properans	2003	2005	+	+		
Bembidion quadrimaculatum	1996	2005	+	+		
Bembidion varium	1996	2005	+	+		
Bradycellus distinctus	2005	2005	+		Notable/Na	
Bradycellus harpalinus	1996	2005	+	+		
Bradycellus verbasci	1996	1996	+	+		
Calathus ambiguus	1996	2005	+		Notable/Nb	Essex Red Data species
Calathus cinctus	2005	2005	+		Local	
Calathus fuscipes	1996	2005	+	+		
Calathus melanocephalus	1996	2005	+	+		
Calathus mollis	1996	1996	+	+	Local	
Calathus rotundicollis	1996	1996		+		
Carabus violaceus	1996	2005	+	+		
Cicindela campestris	2005	2005	+		Local	Essex Red Data species
Curtonotus aulicus	1996	2005	+	+		
Curtonotus convexiusculus	1996	2005	+	+	Local	
Demetrias imperialis	2005	2005		+	Notable/Nb	Essex Red Data species
Dicheirotrichus gustavii	2005	2005	+		Local	
Dicheirotrichus obsoletus	1996	2005	+	+	Notable/Nb	Essex Red Data species
Dromius linearis	1996	2005	+			
Dromius melanocephalus	2001	2001		+		
Dyschirius nitidus	2005	2005	+	+	Notable/Na	Essex Red Data species
Dyschirius salinus	1996	2005	+	+	Local	
Harpalus affinis	1996	2005	+	+		
Harpalus anxius	2005	2005	+		Local	
Harpalus attenuatus	1996	1996		+	Local	
Harpalus latus	2005	2005	+			
Harpalus rubripes	1996	2005	+	+	Local	
Harpalus rufipes	1996	2005	+	+		
Harpalus tardus	1996	2005	+	+	Local	
Leistus ferrugineus	1996	2005	+	+		

Loricera pilicornis	2005	2005	+	+		
Microlestes maurus	2005	2005	+			
Microlestes minutulus	2003	2005	+	+		
Nebria brevicollis	1996	2005	+	+		
Nebria salina	2003	2005	+	+		
Notiophilus biguttatus	1996	1996	+	+		
Notiophilus palustris	1996	1996		+	Local	
Notiophilus rufipes	2005	2005		+	Local	
Notiophilus substriatus	2005	2005	+	+	Local	
Olisthopus rotundatus	2003	2003	+		Local	
Ophonus ardosiacus	1996	1996		+	Notable/Nb	Essex Red Data species
Ophonus puncticeps	1996	2005	+	+	Local	
Ophonus rufibarbis	1996	1996		+		
Ophonus rupicola	1996	1996		+	Notable/Nb	Essex Red Data species
Platyderus ruficollis	1996	1996		+	Notable/Nb	Essex Red Data species
Poecilus cupreus	1996	2005	+	+	Local	
Poecilus versicolor	2005	2005		+	Local	
Pterostichus macer	2005	2005	+	+	Local	
Pterostichus madidus	1996	2005	+	+		
Pterostichus melanarius	1996	1996		+		
Pterostichus vernalis	2005	2005		+	Local	
Scybalicus oblongiusculus	2005	2005	+		RDB1+ Extinct	Essex Red Data species
Stenolophus mixtus	2005	2005	+	+	Local	
Stenolophus teutonius	2005	2005	+		Notable/Nb	Essex Red Data species
Syntomus foveatus	1996	2005	+	+		
Syntomus truncatellus	2005	2005	+		Local	
Trechus obtusus	1996	1996	+	+		
Trechus quadristriatus	1996	2003	+	+		
Trichocellus placidus	2005	2005	+		Local	
Cerambycidae						
Leptura maculata	2005	2005		+		
Chrysomelidae						
Altica lythri	2003	2005	+			
Altica palustris	2003	2005	+			
Aphthona euphorbiae	1996	2005	+	+	Local	
Cassida rubiginosa	2005	2005	+			
Cassida vibex	2003	2003	+		Local	
Chaetocnema hortensis	1996	2005	+	+		
Chrysolina hyperici	2005	2005		+	Local	
Crepidodera aurea	2005	2005		+		
Crioceris asparagi	2003	2005	+		Synanthropic	
Cryptocephalus aureolus	1996	1996		+	Notable/Nb	Essex Red Data species
Cryptocephalus fulvus	2003	2005	+	+	Local	
Cryptocephalus hypochaeridis	2003	2005	+	+	Local	
Cryptocephalus moraei	2005	2005		+	Local	
Longitarsus flavicornis	1996	2005	+	+		
Longitarsus melanocephalus	2005	2005	+			
Longitarsus parvulus	1996	1996		+	Notable/Na	Essex Red Data species
Longitarsus pratensis	2005	2005	+			
Neocrepidodera ferruginea	2005	2005		+		
Neocrepidodera transversa	1996	2005		+		
Oulema melanopus	1996	1996	+	+		
Phaedon tumidulus	1996	1996	+	+		
Phyllotreta nigripes	2005	2005	+			
Phyllotreta punctulata	2005	2005	+		Notable/Nb	Essex Red Data species
Phyllotreta undulata	1996	2005		+		

<i>Plagioderma versicolora</i>	1996	1996	+	+	Local	
<i>Psylliodes chrysocephala</i>	1996	1996		+	Local	
<i>Sphaeroderma testaceum</i>	1996	2005	+	+		
Coccinellidae						
<i>Adalia bipunctata</i>	1996	2005	+	+		
<i>Adalia decempunctata</i>	1996	1996	+	+		
<i>Adonia variegata</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species
<i>Anisosticta novemdecimpunctata</i>	2005	2005		+	Local	
<i>Calvia quattuordecimguttata</i>	1996	2003	+	+		
<i>Coccidula rufa</i>	2003	2005	+	+		
<i>Coccinella septempunctata</i>	1996	2005	+	+		
<i>Coccinella undecimpunctata</i>	1996	1996		+	Local	
<i>Halyzia sedecimguttata</i>	2005	2005	+		Local	
<i>Hyperaspis pseudopustulata</i>	2005	2005	+		Notable/Nb	Essex Red Data species
<i>Platynaspis luteorubra</i>	2005	2005	+	+	Notable/Na	Essex Red Data species
<i>Propylea quattuordecimpunctata</i>	2003	2005	+	+		
<i>Psyllobora 22-punctata</i>	1996	2005	+	+		
<i>Rhyzobius litura</i>	1996	2005	+	+		
<i>Scymnus frontalis</i>	2005	2005	+	+		
<i>Subcoccinella 24-punctata</i>	1996	2005	+	+		
<i>Tytthaspis sedecimpunctata</i>	2005	2005	+	+	Local	
Cryptophagidae						
<i>Atomaria linearis</i>	2005	2005		+		
<i>Cryptophagus setulosus</i>	1996	2005	+	+		
Cucujidae						
<i>Leptophloeus clematidis</i>	2001	2003	+	+	RDB1	Essex Red Data species
Curculionidae						
<i>Barynotus obscurus</i>	2005	2005	+			
<i>Barypeithes pellucidus</i>	1996	1996	+	+		
<i>Ceutorhynchus assimilis</i>	2005	2005	+			
<i>Ceutorhynchus chalybaeus</i>	2005	2005	+			Only 1 or 2 confirmed Essex records
<i>Ceutorhynchus pallidactylus</i>	2005	2005	+			
<i>Ceutorhynchus turbatus</i>	2005	2005	+		Local	
<i>Euophryum confine</i>	2005	2005	+			
<i>Glocianus distinctus</i>	2005	2005	+		Local	Essex Red Data species
<i>Gymnetron pascuorum</i>	2005	2005	+			
<i>Hypera postica</i>	2005	2005	+			
<i>Otiorhynchus ligneus</i>	2003	2005	+	+		Essex Red Data species
<i>Otiorhynchus ovatus</i>	1996	2005	+	+	Local	
<i>Otiorhynchus raucus</i>	2005	2005	+		Notable/Nb	Essex Red Data species
<i>Otiorhynchus rugosostriatus</i>	1996	2005	+	+	Local	
<i>Otiorhynchus sulcatus</i>	1996	2005		+		
<i>Phyllobius maculicornis</i>	2003	2005	+		Local	
<i>Phyllobius pomaceus</i>	1996	1996		+		
<i>Phyllobius pyri</i>	1996	2005	+	+		
<i>Phyllobius roboretanus</i>	2003	2005	+	+		
<i>Phyllobius viridiaeris</i>	2005	2005	+	+	Local	
<i>Polydrusus cervinus</i>	2003	2005	+	+		
<i>Rhinoncus pericarpus</i>	2005	2005	+			
<i>Sibinia primita</i>	2005	2005		+	Notable/Nb	Essex Red Data species
<i>Sitona cylindricollis</i>	2005	2005	+	+	Local	
<i>Sitona hispidulus</i>	1996	2005		+		
<i>Sitona humeralis</i>	2005	2005	+	+	Local	
<i>Sitona lepidus</i>	2005	2005	+	+		
<i>Sitona lineatus</i>	1996	2005	+	+		

<i>Sitona macularius</i>	2005	2005	+		Notable/Nb	Essex Red Data species
<i>Sitona puncticollis</i>	2005	2005	+		Local	
<i>Smicronyx reichi</i>	2005	2005	+		RDB3	Essex Red Data species
<i>Strophosoma melanogrammum</i>	2005	2005		+		
<i>Trachyphloeus bifoveolatus</i>	2005	2005	+		Unknown	
<i>Trichosirocalus troglodytes</i>	2003	2003	+			
<i>Tychius brevisculus</i>	2005	2005	+			Only 2 other Essex sites
<i>Tychius junceus</i>	2005	2005	+		Local	
<i>Tychius meliloti</i>	2005	2005	+		Local	
<i>Tychius picirostris</i>	2005	2005	+			
Elateridae						
<i>Agriotes lineatus</i>	2005	2005	+	+		
<i>Agriotes pallidulus</i>	1996	1996		+		
<i>Agriotes sputator</i>	2005	2005	+	+		
<i>Agrypnus murinus</i>	2005	2005	+	+	Local	
<i>Athous campyloides</i>	1996	1996		+	Notable/Nb	Essex Red Data species
<i>Denticollis linearis</i>	1996	1996	+	+		
<i>Kibunea minuta</i>	1996	1996		+	Local	
Heteroceridae						
<i>Heterocerus obsoletus</i>	2005	2005		+	Unknown	
Histeridae						
<i>Hister unicolor</i>	2005	2005	+	+		
<i>Kissister minimus</i>	2005	2005	+		Unknown	
<i>Margarinotus brunneus</i>	2005	2005		+	Local	
<i>Margarinotus neglectus</i>	2005	2005		+	Local	
<i>Margarinotus purpurascens</i>	2005	2005	+		Local	
<i>Saprinus aeneus</i>	2005	2005		+		
<i>Saprinus semistriatus</i>	2005	2005		+		
Hydraenidae						
<i>Ochthebius viridis</i>	2005	2005		+	Notable/Nb	Essex Red Data species
Hydrophilidae						
<i>Anacaena globulus</i>	2005	2005		+		
<i>Helophorus brevipalpis</i>	2005	2005		+		
<i>Helophorus fulgidicollis</i>	2003	2003	+	+	Notable/Nb	Essex Red Data species
<i>Helophorus nubilus</i>	2003	2003	+		Local	
<i>Megasternum concinnum</i>	2003	2003	+			
Kateretidae						
<i>Brachypterolus pulicarius</i>	2005	2005	+			
Lathridiidae						
<i>Aridius bifasciatus</i>	1996	1996		+	Naturalised	
<i>Aridius nodifer</i>	1996	1996	+	+		
<i>Corticarina fuscula</i>	2005	2005		+		
<i>Corticara gibbosa</i>	1996	2005	+	+		
Leioididae						
<i>Catops grandicollis</i>	1996	1996		+		
<i>Catops morio</i>	2005	2005	+			
<i>Catops nigricans</i>	1996	2005	+	+		
<i>Catops tristis</i>	2003	2003		+		
<i>Leiodes rufipennis</i>	2005	2005	+		Local	
<i>Nargus velox</i>	1996	1996	+	+		
<i>Ptomaphagus subvillosus</i>	2005	2005	+	+		
<i>Sciodrepoides watsoni</i>	2005	2005		+		
Melyridae						
<i>Anthocomus rufus</i>	2005	2005		+	Local	
<i>Dasytes plumbeus</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species
<i>Malachius bipustulatus</i>	1996	1996	+	+		
<i>Malachius viridis</i>	2003	2005	+	+	Local	

Mordellidae						
Mordellistena parvula	2005	2005	+		RDBK	Essex Red Data species
Mordellistena pseudoparvula	2005	2005	+		RDBK	Essex Red Data species
Mordellistena pumila	2003	2005	+		Local	
Variimorda villosa	2000	2005		+	Notable/Nb	Essex Red Data species
Nitidulidae						
Epuraea aestiva	2005	2005		+		
Glischrochilus hortensis	2005	2005	+			
Meligethes aeneus	2005	2005	+	+		
Meligethes nigrescens	2005	2005	+			
Pria dulcamarae	1996	1996		+	Local	
Oedemeridae						
Nacerdes melanura	2005	2005	+	+	Local	
Oedemera lurida	2003	2005	+	+	Local	
Oedemera nobilis	1996	2005	+	+		
Phalacridae						
Olibrus affinis	2005	2005	+		Local	
Olibrus flavicornis	1996	2005	+	+	RDBK	Essex Red Data species
Scarabaeidae						
Amphimallon solstitiale	2005	2005		+	Local	
Aphodius plagiatus	2005	2005		+	Notable/Nb	
Hoplia philanthus	2003	2005	+	+	Local	Essex Red Data species
Onthophagus joannae	2005	2005	+	+	Local	
Serica brunnea	2005	2005	+	+	Local	
Scirtidae						
Cyphon phragmiteticola	2005	2005		+	Local	
Scolytidae						
Xylocleptes bispinus	2001	2003	+	+	Local	Essex Red Data species
Scraptiidae						
Anaspis regimbarti	2005	2005	+			
Silphidae						
Nicrophorus interruptus	2005	2005		+	Notable/Nb	Essex Red Data species
Silpha atrata	2005	2005	+	+		
Silpha laevigata	2003	2005	+	+	Local	
Silpha tristis	2003	2005	+	+	Local	
Thanatophilus sinuatus	2005	2005	+	+		
Staphylinidae						
Aleochara bipustulata	2005	2005	+	+		
Aleochara curtula	2005	2005	+	+		
Aleochara intricata	2005	2005		+	Unknown	
Anotylus mutator	1996	1996		+	Notable/N	Essex Red Data species
Anotylus rugosus	2005	2005		+		
Anotylus sculpturatus	2005	2005	+	+		
Atheta oblita	2005	2005	+		Unknown	
Bledius limicola	1996	2005	+	+	Local	
Dimetrota atramentaria	2005	2005	+			
Dinaraea angustula	2005	2005	+	+	Local	
Drusilla canaliculata	1996	2005	+	+		
Gyrophypnus angustatus	2005	2005	+			
Lordithon thoracicus	2005	2005		+		
Megalinus glabratus	1996	1996		+		
Megarthritis depressus	2005	2005		+		
Micropeplus staphylinoides	1996	1996		+	Local	
Mocyta fungi	2005	2005	+			
Ocypus olens	1996	2005	+	+		
Ontholestes murinus	2005	2005		+		
Philonthus carbonarius	2005	2005	+			

<i>Philonthus cognatus</i>	2003	2005	+	+			
<i>Philonthus succicola</i>	2005	2005		+	Local		
<i>Plataraea brunnea</i>	2005	2005		+	Local		
<i>Platydracus stercorarius</i>	1996	2005	+	+	Local		
<i>Platystethus cornutus</i>	2005	2005		+	Local		
<i>Quedius boops</i>	2005	2005	+				
<i>Quedius curtipennis</i>	2003	2005		+			
<i>Quedius levicollis</i>	1996	2005	+	+			
<i>Quedius maurorufus</i>	2003	2003	+				
<i>Quedius molochinus</i>	2003	2003		+			
<i>Quedius persimilis</i>	2003	2003	+				
<i>Quedius picipes</i>	2005	2005	+	+			
<i>Quedius schatzmayri</i>	2003	2005	+	+	Local		
<i>Quedius semiaeneus</i>	1996	1996	+	+			
<i>Quedius semiobscurus</i>	1996	2005	+	+			
<i>Quedius simplicifrons</i>	1996	2005	+	+	Local		
<i>Rybaxis longicornis</i>	2005	2005		+			
<i>Sepedophilus immaculatus</i>	2005	2005	+		Local		
<i>Sepedophilus marshami</i>	2005	2005	+				
<i>Sepedophilus nigripennis</i>	2005	2005	+				
<i>Stenus aceris</i>	2005	2005		+			
<i>Stenus junco</i>	2005	2005		+			
<i>Stenus ossium</i>	2003	2003	+				
<i>Tachinus signatus</i>	1996	1996		+			
<i>Tachyporus atriceps</i>	2005	2005	+		Local		
<i>Tachyporus hypnorum</i>	1996	2005	+	+			
<i>Tachyporus nitidulus</i>	2005	2005	+	+			
<i>Tachyporus pusillus</i>	1996	2005	+	+			
<i>Tasgius ater</i>	1996	2005	+	+			
<i>Tasgius pedator</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	
<i>Tasgius winkleri</i>	1996	2005	+	+			
<i>Xantholinus jarrigei</i>	1996	2005	+	+	Local		
<i>Xantholinus linearis</i>	1996	2005	+	+			
<i>Xantholinus longiventris</i>	1996	2005	+	+			
<i>Zyras limbatus</i>	2005	2005	+	+	Local		
Tenebrionidae							
<i>Isomira murina</i>	2003	2005	+				
<i>Lagria hirta</i>	2005	2005		+			
Dermaptera (earwigs)							
Forficulidae							
<i>Forficula auricularia</i>	2005	2005		+			
Diptera (flies)							
Agromyzidae							
<i>Cerodontha denticornis</i>	2005	2005	+				
<i>Liriomyza lutea</i>	2003	2003	+		Unknown		
Anthomyiidae							
<i>Anthomyia pluvialis</i>	1996	1996		+	Unknown		
<i>Anthomyza collini</i>	2005	2005	+	+			
<i>Anthomyza gracilis</i>	2005	2005	+	+			
<i>Anthomyza neglecta</i>	1996	1996		+	Unknown		
Asilidae							
<i>Asilus crabroniformis</i>	1996	1996		+	Notable/N, UKBAP	Essex Red Data species, Essex BAP	
<i>Dioctria atricapilla</i>	2003	2005	+		Local		

<i>Dioctria baumhaueri</i>	2003	2005	+	+	Local	
<i>Dioctria rufipes</i>	2003	2005	+		Local	
<i>Leptogaster cylindrica</i>	1998	2005	+	+		
<i>Machimus atricapillus</i>	1996	2005	+	+		
<i>Machimus cingulatus</i>	2003	2005	+	+	Local	
<i>Neoitamus cyanurus</i>	2005	2005		+	Local	Essex Red Data species
Asteiidae						
<i>Asteia concinna</i>	2005	2005		+	Unknown	
Bibionidae						
<i>Bibio marci</i>	2005	2005	+			
Calliphoridae						
<i>Calliphora vicina</i>	1996	2005	+	+		
<i>Lucilia caesar</i>	1996	2005	+	+		
<i>Lucilia illustris</i>	2005	2005	+			
<i>Lucilia richardsi</i>	2005	2005	+		Unknown	
<i>Lucilia sericata</i>	1996	2005	+	+		
<i>Lucilia silvarum</i>	1996	2005	+	+	Local	
<i>Melanomya nana</i>	2003	2005	+			
<i>Melinda viridicyanea</i>	2005	2005	+	+		
<i>Pollenia angustigena</i>	2005	2005	+	+		
<i>Pollenia pediculata</i>	2005	2005	+	+		
<i>Pollenia rudis</i>	2005	2005	+	+		
<i>Pollenia viatica</i>	2005	2005	+	+	Unknown	
<i>Protocalliphora azurea</i>	2005	2005	+		Unknown	
Camillidae						
<i>Camilla flavicauda</i>	2005	2005		+	Unknown	
<i>Camilla fuscipes</i>	2005	2005	+		Unknown	
Campichoetidae						
<i>Campichoeta punctum</i>	1996	2005	+	+	Local	
Carnidae						
<i>Meoneura flavifacies</i>	2005	2005		+		
Chamaemyiidae						
<i>Chamaemyia aridella</i>	2005	2005	+	+		
<i>Chamaemyia herbarum</i>	2005	2005	+	+		
<i>Parochthiphila coronata</i>	2005	2005	+		RDB1	
Chloropidae						
<i>Aphanotrigonum fasciella</i>	1996	1996		+	Local	
<i>Aphanotrigonum femorellum</i>	1996	1996	+	+	Local	
<i>Aphanotrigonum inerme</i>	2005	2005	+	+	Unknown	
<i>Calamoncosis duinensis</i>	2005	2005	+		Local	
<i>Calamoncosis minima</i>	2003	2005	+	+		
<i>Cetema neglectum</i>	2005	2005		+		
<i>Conioscinella mimula</i>	2003	2003	+			
<i>Cryptonevra consimilis</i>	2005	2005		+	RDB2	New to Essex
<i>Cryptonevra diadema</i>	1996	2005		+	Local	
<i>Cryptonevra flavitarsis</i>	2005	2005	+	+	Local	
<i>Dicraeus fennicus</i>	2005	2005	+		Local	
<i>Dicraeus vagans</i>	2003	2005	+	+		
<i>Elachiptera brevipennis</i>	1997	2005		+	Unknown	
<i>Elachiptera cornuta</i>	2005	2005		+		
<i>Elachiptera tuberculifera</i>	2005	2005		+	Unknown	
<i>Homalura ?tarsata</i>	2005	2005		+		New to Essex
<i>Lasiosina herpini</i>	2005	2005		+	Local	
<i>Lipara lucens</i>	2005	2005	+			
<i>Lipara rufitarsis</i>	2005	2005	+		Notable/N	
<i>Melanochaeta pubescens</i>	1996	2005		+	Notable/N	
<i>Melanum laterale</i>	2005	2005		+		
<i>Meromyza femorata</i>	1996	1996		+		

<i>Meromyza zachvatkini</i>	2003	2005	+	+	Local	
<i>Oscinella cariciphila</i>	1996	1996		+	Local	
<i>Oscinella frit</i>	1996	2005	+	+		
<i>Oscinella hortensis</i>	2005	2005	+			
<i>Oscinella nigerrima</i>	2005	2005	+	+		
<i>Oscinella nitidissima</i>	2005	2005		+		
<i>Oscinella pusilla</i>	2005	2005		+		
<i>Oscinomorpha arcuata</i>	2005	2005	+		Notable/N	
<i>Thaumatomyia glabra</i>	1996	2005	+	+		
<i>Thaumatomyia hallandica</i>	1996	2005	+	+	Unknown	
<i>Thaumatomyia notata</i>	2005	2005	+	+		
<i>Tricimba cincta</i>	2005	2005	+	+		
Conopidae						
<i>Conops ceriaeformis</i>	1996	1996		+	Local	
<i>Myopa buccata</i>	2005	2005	+		Local	
<i>Myopa testacea</i>	2005	2005	+		Local	
<i>Physocephala rufipes</i>	1996	2003	+	+	Local	
<i>Sicus ferrugineus</i>	2005	2005		+	Local	
<i>Thecophora atra</i>	1996	2005	+	+	Local	
Culicidae						
<i>Ochlerotatus caspius</i>	2005	2005		+	Local	
Diastatidae						
<i>Diastata adusta</i>	2005	2005		+		
<i>Diastata costata</i>	2005	2005		+	Unknown	
Dolichopodidae						
<i>Argyra diaphana</i>	2005	2005		+		
<i>Argyra vestita</i>	2005	2005		+	Local	
<i>Campsicnemus armatus</i>	2005	2005	+	+	Local	
<i>Campsicnemus curvipes</i>	2005	2005	+	+		
<i>Campsicnemus magius</i>	2005	2005		+	RDB3, pUKBAP	
<i>Campsicnemus scambus</i>	2005	2005	+	+		
<i>Chrysotus blepharosceles</i>	2005	2005	+	+	Local	
<i>Chrysotus cilipes</i>	2005	2005		+		
<i>Chrysotus gramineus</i>	2005	2005	+	+		
<i>Chrysotus neglectus</i>	2005	2005	+	+		
<i>Dolichopus claviger</i>	2005	2005		+		
<i>Dolichopus clavipes</i>	2005	2005		+	Local	
<i>Dolichopus diadema</i>	2005	2005	+	+	Local	
<i>Dolichopus festivus</i>	2005	2005	+	+		
<i>Dolichopus griseipennis</i>	1996	2005	+	+		
<i>Dolichopus latilimbatus</i>	1996	2005	+	+	Local	
<i>Dolichopus nubilus</i>	1996	2005	+	+		
<i>Dolichopus sabinus</i>	2005	2005	+	+	Local	
<i>Dolichopus strigipes</i>	1996	1996		+	Notable/N	
<i>Dolichopus unguatus</i>	2003	2005	+	+		
<i>Hercostomus chrysozygos</i>	1996	2005	+	+	Local	
<i>Hydrophorus praecox</i>	2005	2005		+	Local	
<i>Machaerium maritimae</i>	1996	2005	+	+	Local	
<i>Medetera saxatilis</i>	2005	2005	+	+	Local	
<i>Medetera truncorum</i>	2005	2005	+	+		
<i>Poecilobothrus nobilitatus</i>	2005	2005	+	+		
<i>Poecilobothrus principalis</i>	1996	2005	+	+	Local	
<i>Rhaphium caliginosum</i>	2005	2005	+	+		
<i>Scellus notatus</i>	2003	2005	+	+	Local	
<i>Sciapus laetus</i>	2005	2005		+	Notable/N	New to Essex
<i>Sciapus platypterus</i>	2005	2005	+			
<i>Sciapus wiedemanni</i>	2005	2005	+	+	Local	
<i>Sympycnus desouteri</i>	2005	2005		+		

<i>Syntormon denticulatum</i>	2005	2005	+	+	Local	
<i>Syntormon pallipes</i>	1996	2005	+	+		
<i>Syntormon pumilum</i>	2005	2005	+		Local	
<i>Teuchophorus spinigerellus</i>	1996	2005	+	+	Local	
<i>Xanthochlorus ornatus</i>	2005	2005	+	+	Local	
<i>Xanthochlorus tenellus</i>	2005	2005	+	+	Local	
Drosophilidae						
<i>Drosophila subobscura</i>	2005	2005		+		
<i>Scaptomyza flava</i>	1996	2005	+	+		
<i>Scaptomyza pallida</i>	1996	2005	+	+		
Empididae						
<i>Empis femorata</i>	2005	2005	+			
<i>Empis tessellata</i>	2005	2005	+			
<i>Rhamphomyia barbata</i>	2005	2005	+		Local	
<i>Rhamphomyia caliginosa</i>	2005	2005		+	Notable/N	
<i>Rhamphomyia maculipennis</i>	2005	2005	+		Unknown	
<i>Rhamphomyia tarsata</i>	2005	2005	+			
Ephydriidae						
<i>Atissa limosina</i>	2005	2005		+	Unknown	New to Essex
<i>Atissa pygmaea</i>	2003	2005	+	+	Unknown	Only Essex site
<i>Discomyza incurva</i>	2005	2005	+	+	Unknown	
<i>Ephydra macellaria</i>	2005	2005		+	Unknown	
<i>Ephydra riparia</i>	2005	2005	+	+		
<i>Hyadina guttata</i>	2005	2005		+	Unknown	
<i>Hydrellia albifrons</i>	1996	1996		+	Unknown	Only Essex site
<i>Hydrellia griseola</i>	1996	2005	+	+		
<i>Hydrellia maura</i>	1996	2005	+	+		
<i>Paracoenia fumosa</i>	2005	2005		+	Unknown	
<i>Parydroptera discomyzina</i>	2005	2005		+	RDB2	2nd Essex site
<i>Pelina aenea</i>	2005	2005		+	Unknown	
<i>Philotelma defectum</i>	1996	1996		+	Unknown	
<i>Philotelma nigripenne</i>	1996	1996		+	Unknown	
<i>Psilopa compta</i>	2005	2005		+		
<i>Psilopa leucostoma</i>	1996	1996		+		
<i>Psilopa nana</i>	2005	2005		+	Unknown	
<i>Psilopa pulicaria</i>	2005	2005		+	Unknown	
<i>Scatella lutosa</i>	1996	2005		+	Unknown	
Fanniidae						
<i>Fannia armata</i>	2005	2005	+	+		
<i>Fannia canicularis</i>	1996	2005	+	+		
<i>Fannia fuscua</i>	2005	2005	+			
<i>Fannia polychaeta</i>	1996	2005	+	+		
Heleomyzidae						
<i>Oecothea fenestralis</i>	2005	2005	+		Local	
<i>Oecothea praecox</i>	1996	2005		+	Notable/N	
<i>Suillia affinis</i>	2005	2005		+	Local	
<i>Suillia notata</i>	1996	1996		+		
<i>Suillia variegata</i>	1996	2005	+	+		
<i>Tephrochlamys rufiventris</i>	2005	2005	+		Unknown	
<i>Trixoscelis marginella</i>	2005	2005	+		Notable/N	
Hybotidae						
<i>Crossopalpus curvipes</i>	2005	2005		+	Local	New to Essex
<i>Drapetis exilis</i>	2005	2005		+		
<i>Drapetis infitialis</i>	1996	1996		+	pRDBK	
<i>Platypalpus albiseta</i>	1996	2005	+	+	Local	
<i>Platypalpus articulatus</i>	2005	2005		+	Notable/N	
<i>Platypalpus flavicornis</i>	2005	2005	+	+	Local	
<i>Platypalpus leucocephalus</i>	2005	2005	+		Local	

<i>Platypalpus longiseta</i>	2005	2005	+	+		
<i>Platypalpus notatus</i>	1996	1996		+		
<i>Platypalpus pallidicornis</i>	2005	2005	+	+	Local	
<i>Platypalpus pallidiventris</i>	1996	2005	+	+		
<i>Platypalpus praecinctus</i>	2005	2005		+	Notable/N	
<i>Tachydromia aemula</i>	1996	2005		+		
<i>Tachydromia arrogans</i>	2001	2001		+		
<i>Tachydromia umbrarum</i>	2005	2005	+	+	Unknown	
<i>Tachypeza nubila</i>	2001	2001		+		
Keroplastidae						
<i>Orfelia nemoralis</i>	2005	2005	+	+		
<i>Orfelia tristis</i>	2005	2005	+		Unknown	
Lauxaniidae						
<i>Calliopum aeneum</i>	2005	2005	+			
<i>Homoneura christophi</i>	2005	2005	+			
<i>Homoneura patelliformis</i>	2005	2005	+		Notable/N	
<i>Homoneura tesquae</i>	2005	2005		+	Notable/N	New to Essex
<i>Minettia fasciata</i>	2005	2005		+	Unknown	
<i>Minettia rivosia</i>	1996	2005	+	+		
<i>Sapromyza quadripunctata</i>	1996	2005	+	+	Unknown	
Limoniidae						
<i>Symplecta stictica</i>	2003	2005	+	+		
Lonchaeidae						
<i>Dasiops mucronatus</i>	2005	2005	+		Unknown	
<i>Lonchaea scutellaris</i>	2005	2005	+		Unknown	
Lonchopteridae						
<i>Lonchoptera bifurcata</i>	1996	2005		+		
<i>Lonchoptera lutea</i>	1996	2005	+	+		
Micropezidae						
<i>Micropeza corrigiolata</i>	2003	2005	+	+	Local	
Milichiidae						
<i>Madiza glabra</i>	2005	2005	+		Unknown	
Muscidae						
<i>Coenosia antennata</i>	2005	2005	+	+	Local	
<i>Coenosia atra</i>	2003	2005	+		Notable/N	
<i>Coenosia infantula</i>	2005	2005	+	+	Unknown	
<i>Coenosia mollicula</i>	2005	2005	+			
<i>Coenosia rufipalpis</i>	2005	2005	+			
<i>Coenosia testacea</i>	1996	2005	+	+		
<i>Coenosia tigrina</i>	2003	2005	+	+		
<i>Hebecnema nigra</i>	2005	2005		+		
<i>Helina confinis</i>	2005	2005	+		Unknown	
<i>Helina evecta</i>	2003	2003		+		
<i>Helina lasiophthalma</i>	1996	2005	+			
<i>Helina obscurata</i>	2005	2005		+	Local	
<i>Helina reversio</i>	1996	2005	+	+		
<i>Helina setiventris</i>	2005	2005		+		
<i>Helina trivittata</i>	2005	2005	+	+	Unknown	
<i>Hydrotaea cyrtoneurina</i>	1996	2005		+	Local	
<i>Hydrotaea dentipes</i>	2005	2005		+		
<i>Hydrotaea parva</i>	2003	2005	+	+	Notable/N	
<i>Limnophora tigrina</i>	2003	2005	+		Local	
<i>Limnospila albifrons</i>	2005	2005		+	Local	
<i>Lispe loewi</i>	2005	2005	+	+	Notable/N	
<i>Lispe tentaculata</i>	2005	2005	+	+		
<i>Lispocephala erythrocerata</i>	2005	2005	+			
<i>Morellia hortorum</i>	2005	2005		+		
<i>Musca autumnalis</i>	1996	2005	+	+		

Muscina levida	2005	2005		+		
Muscina prolapsa	2005	2005	+			
Neomyia cornicina	1996	1996	+			
Phaonia errans	2005	2005		+		
Phaonia fusca	2005	2005	+		RDB3	
Phaonia fuscata	2005	2005		+	Local	
Phaonia perdita	1996	1996	+	+		
Phaonia rufipalpis	2005	2005		+		
Phaonia tuguriorum	2005	2005	+	+		
Phaonia valida	2005	2005		+		
Schoenomyza litorella	2005	2005	+	+		
Spilogona marina	2005	2005	+		Local	
Opetiidae						
Opetia nigra	2005	2005		+		
Opomyzidae						
Geomyza subnigra	1996	2005	+	+	Local	
Geomyza tripunctata	1996	2005		+		
Opomyza germinationis	1996	2005	+	+		
Opomyza petrei	2003	2003	+			
Opomyza punctata	1996	1996		+	Notable/N	
Phoridae						
Anevrina thoracica	1996	1996		+	Unknown	
Borophaga incrassata	1996	1996		+		
Chaetopleurophora erythronota	1996	1996		+	Unknown	
Diplonevra funebris	1996	1996	+	+	Unknown	
Metopina pileata	1996	1996		+	Unknown	
Phora atra	1996	1996		+	Unknown	
Pseudacteon formicarum	1996	1996		+	Unknown	
Platystomatidae						
Rivellia syngenesiae	2003	2003	+		Local	
Psilidae						
Chamaepsila rosae	1996	2005	+	+		
Ptychopteridae						
Ptychoptera contaminata	2005	2005		+	Local	
Rhagionidae						
Chrysopilus asiliformis	2005	2005	+	+		
Rhagio lineola	2005	2005	+	+		
Rhinophoridae						
Phyto discrepans	1996	2005		+		
Phyto melanocephala	1996	2005	+	+	Unknown	
Rhinophora lepida	1996	2005	+	+	Unknown	
Sarcophagidae						
Amobia signata	2005	2005	+	+	Local	
Blaesoxipha plumicornis	1996	2005	+	+	Notable/N	
Macronychia griseola	2005	2005		+	RDB3	
Macronychia polyodon	2005	2005	+		RDB3	
Metopia argyrocephala	1996	2005	+	+	Local	
Metopia grandii	2005	2005		+		
Miltogramma germari	2003	2005	+		RDB3	
Miltogramma punctata	1996	1996		+		
Nyctia halterata	2005	2005	+		Local	
Ravinia pernix	1996	1996		+		
Sarcophaga anaces	1996	1996	+	+	Unknown	
Sarcophaga arcipes	1996	2005		+	Notable/N	
Sarcophaga carnaria	1996	2005	+	+		
Sarcophaga crassimargo	2005	2005		+		
Sarcophaga filia	1996	2005	+	+	Local	

<i>Sarcophaga haemorrhoea</i>	2005	2005	+	+		
<i>Sarcophaga incisilobata</i>	1996	2005	+	+		
<i>Sarcophaga melanura</i>	1996	2005	+	+	Local	
<i>Sarcophaga nigriventris</i>	1996	2005	+	+		
<i>Sarcophaga pumila</i>	1996	2005	+	+	Local	
<i>Sarcophaga subvicina</i>	2003	2005	+	+		
<i>Sarcophaga teretirostris</i>	2005	2005	+	+	Local	
<i>Sarcophaga vagans</i>	1996	2005	+	+		
<i>Sarcophaga variegata</i>	1996	2005	+	+		
<i>Sarcophila latifrons</i>	2005	2005	+	+	Notable/N	
<i>Senotainia conica</i>	2003	2005	+	+	Local	
Scathophagidae						
<i>Conisternum decipiens</i>	2005	2005		+	Notable/N	
<i>Scathophaga litorea</i>	1996	2005	+	+	Local	
<i>Scathophaga stercoraria</i>	1996	2005	+	+		
<i>Spaziphora hydromyzina</i>	2005	2005		+	Local	
Sciomyzidae						
<i>Coremacera marginata</i>	1996	2005	+	+	Local	
<i>Dichetophora obliterateda</i>	2005	2005	+		Local	
<i>Limnia paludicola</i>	1996	2005	+	+		
<i>Limnia unguicornis</i>	2003	2005	+	+		
<i>Pherbellia cinerella</i>	1996	2005	+	+		
<i>Pherbina coryleti</i>	1996	2005		+		
<i>Tetanocera elata</i>	2005	2005		+		
<i>Tetanocera ferruginea</i>	2005	2005		+		
<i>Trypetoptera punctulata</i>	2005	2005		+		
Sepsidae						
<i>Saltella sphondylii</i>	2005	2005	+			
<i>Sepsis cynipsea</i>	2003	2005	+			
<i>Sepsis duplicata</i>	2005	2005	+		Local	
<i>Sepsis fulgens</i>	2005	2005	+	+		
<i>Sepsis orthocnemis</i>	2005	2005	+	+		
<i>Sepsis violacea</i>	2005	2005	+			
Sphaeroceridae						
<i>Coproica acutangula</i>	2005	2005	+			
<i>Coproica hirticula</i>	2005	2005	+		Local	
<i>Coproica lugubris</i>	1996	1996		+		
<i>Copromyza equina</i>	1996	1996		+		
<i>Leptocera nigra</i>	2005	2005		+		
<i>Opacifrons coxata</i>	2005	2005		+		
<i>Pseudocollinella humida</i>	2005	2005	+	+		
<i>Pullimosina heteroneura</i>	1996	1996		+		
<i>Pullimosina pullula</i>	2005	2005		+	Local	
<i>Rachispoda fuscipennis</i>	2005	2005	+	+	Local	
<i>Rachispoda kabuli</i>	2005	2005		+		New to Essex
<i>Rachispoda lutosa</i>	1996	2005	+	+		
<i>Rachispoda lutosoidea</i>	2005	2005		+		
<i>Spelobia clunipes</i>	1996	2005		+		
<i>Spelobia luteilabris</i>	2005	2005		+		
<i>Spelobia ochripes</i>	1996	1996		+	Local	
<i>Spelobia palmata</i>	2005	2005		+		
<i>Spelobia talparum</i>	2005	2005	+		Local	
Stratiomyidae						
<i>Beris vallata</i>	2005	2005	+			
<i>Chloromyia formosa</i>	1996	2005	+	+		
<i>Chorisops tibialis</i>	1996	2005	+	+		
<i>Microchrysa flavicornis</i>	2005	2005	+	+		
<i>Nemotelus notatus</i>	1996	2005	+	+	Local	

Nemotelus uliginosus	2005	2005		+	Local		
Oxycera trilineata	1996	2005		+	Local		
Pachygaster atra	1996	2005	+	+			
Pachygaster leachii	1996	2005	+	+	Local		
Stratiomys potamida	1996	2005	+	+	Notable/N	Essex Red Data species	
Stratiomys singularior	1996	2005	+	+	Notable/N	Essex Red Data species	
Syrphidae							
Cheilosia impressa	1996	1996		+	Local		
Cheilosia proxima	1996	2005		+			
Cheilosia velutina	1996	1996	+	+	Notable/N	Essex Red Data species	Essex Threatened
Chrysotoxum bicinctum	1996	2005	+	+	Local		
Chrysotoxum festivum	1996	2005	+	+	Local		
Chrysotoxum verralli	2005	2005	+		Local		
Epistrophe eligans	2005	2005	+				
Epistrophe nitidicollis	2005	2005	+		Local		
Episyphus balteatus	1996	2005	+	+			
Eristalinus aeneus	2005	2005		+	Local		
Eristalinus sepulchralis	1996	2005		+	Local		
Eristalis arbustorum	2005	2005		+			
Eristalis intricarius	1996	1996		+			
Eristalis pertinax	1996	2005	+	+			
Eristalis tenax	1996	2005	+	+			
Eumerus funeralis	1996	1996		+			
Eumerus strigatus	1996	1996		+			
Eupeodes corollae	1996	2005	+	+			
Eupeodes luniger	1996	2005	+	+			
Helophilus hybridus	2005	2005		+	Local		
Helophilus pendulus	1996	2005	+	+			
Helophilus trivittatus	1996	1996	+	+	Local		
Melanostoma mellinum	2005	2005	+	+			
Myathropa florea	2005	2005	+				
Neoascia tenur	2005	2005		+	Local		
Paragus haemorrhous	1996	2005	+	+	Local		
Pipizella viduata	1996	2005	+	+			
Platycheirus albimanus	1996	2005	+	+			
Platycheirus clypeatus	1996	2005	+	+			
Platycheirus manicatus	1996	1996		+			
Platycheirus scutatus s.s.	1996	1996	+	+			
Riponnensia splendens	2003	2003	+		Local		
Scaeva pyrastris	2005	2005	+				
Sphaerophoria rueppellii	1996	2005	+	+	Local		
Sphaerophoria scripta	1996	2005	+	+			
Syritta pipiens	2005	2005	+	+			
Syrphus ribesii	2005	2005	+				
Syrphus vitripennis	2005	2005	+				
Triglyphus primus	1996	2005	+	+	Notable/N	Essex Red Data species	
Tropidia scita	2003	2005	+		Local		
Volucella inanis	1996	1996		+	Notable/N	Essex Red Data species	Regionally Important
Volucella zonaria	1996	2005	+	+	Notable/N	Essex Red Data species	Regionally Important
Xanthogramma pedissequum	1996	2005	+	+	Local		
Tabanidae							
Haematopota pluvialis	1996	2005	+	+			
Tabanus autumnalis	2005	2005	+		Local		
Tachinidae							
Actia infantula	2005	2005		+	Unknown		
Clytiomya continua	2005	2005		+			
Cylindromyia interrupta	2005	2005	+		Local		

<i>Dinera grisescens</i>	2005	2005	+	+	Unknown	
<i>Eriothrix rufomaculata</i>	1996	2005	+	+		
<i>Estheria cristata</i>	1996	2005	+	+	Unknown	
<i>Frontina laeta</i>	2005	2005	+		RDB3	New to Essex
<i>Gastrolepta anthracina</i>	2005	2005	+	+	Local	
<i>Gymnosoma nitens</i>	1996	2005	+	+	RDB1	
<i>Litophasia hyalipennis</i>	2005	2005	+		RDB Appendix	
<i>Lydella grisescens</i>	1996	2005		+	Unknown	
<i>Lydella stabulans</i>	2005	2005	+	+	Unknown	
<i>Lydina aenea</i>	2005	2005	+		Unknown	
<i>Medina luctuosa</i>	1996	1996		+	Unknown	
<i>Medina separata</i>	2005	2005	+		Local	
<i>Meigenia mutabilis</i>	2005	2005		+	Unknown	
<i>Nowickia ferox</i>	2003	2003	+		Unknown	
<i>Ocytata pallipes</i>	2003	2003		+		
<i>Pales pavida</i>	1996	1996		+	Unknown	
<i>Phania funesta</i>	2005	2005	+		Unknown	
<i>Phasia obesa</i>	2005	2005	+		Local	
<i>Phasia pusilla</i>	2005	2005	+	+	Local	
<i>Phryxe nemea</i>	1996	1996		+	Unknown	
<i>Phytomyptera nigrina</i>	2005	2005		+	Local	
<i>Siphona geniculata</i>	2001	2005	+	+		
<i>Thelaira solivaga</i>	2005	2005	+		Unknown	
<i>Triarthria setipennis</i>	2005	2005	+	+		
<i>Voria ruralis</i>	1996	1996		+	Unknown	
<i>Winthemia quadripustulata</i>	1996	1996		+	Unknown	
Tephritidae						
<i>Anomoia purmunda</i>	2005	2005		+	Local	
<i>Campiglossa malaris</i>	2005	2005	+		RDBK	
<i>Campiglossa misella</i>	2003	2005	+		Unknown	
<i>Campiglossa plantaginis</i>	2003	2005	+	+	Local	
<i>Ensina sonchi</i>	2005	2005	+		Local	Essex Red Data species
<i>Merzomyia westermanni</i>	2003	2005	+		Notable/N	Essex Red Data species
<i>Sphenella marginata</i>	2003	2005	+	+	Local	
<i>Tephritis cometa</i>	2003	2005	+	+	Local	
<i>Tephritis formosa</i>	2005	2005	+	+	Local	
<i>Tephritis matricariae</i>	2005	2005	+	+	RDBK	
<i>Tephritis neesii</i>	2005	2005	+	+	Local	
<i>Tephritis vespertina</i>	2005	2005	+			
<i>Terellia ruficauda</i>	2003	2005	+			
<i>Terellia serratulae</i>	2003	2003	+			
<i>Urophora cardui</i>	2003	2005	+	+		
<i>Urophora quadrifasciata</i>	2005	2005	+		Local	
<i>Urophora stylata</i>	2005	2005	+			
<i>Xyphosia miliaria</i>	2003	2005	+	+		
Tethinidae						
<i>Pelomyia occidentalis</i>	2003	2005	+	+		
Therevidae						
<i>Thereva fulva</i>	2005	2005	+	+	RDB3	Essex Red Data species
<i>Thereva nobilitata</i>	1996	2005	+	+		
<i>Thereva plebeja</i>	2005	2005	+		Notable/N	Essex Red Data species
Tipulidae						
<i>Nephrotoma flavescens</i>	2005	2005	+			
<i>Nephrotoma flavipalpis</i>	2005	2005	+		Local	
<i>Nephrotoma scurra</i>	2005	2005	+		Local	Essex Red Data species
<i>Nigrotipula nigra</i>	2003	2005	+	+	Local	Essex Red Data species
<i>Tipula lunata</i>	2005	2005	+			
<i>Tipula paludosa</i>	1996	2003	+	+		

Ulidiidae						
<i>Ceroxys urticae</i>	2003	2005	+	+	Local	
<i>Melieria omissa</i>	1996	2005	+	+	Local	
<i>Melieria picta</i>	2003	2005	+	+	Notable/N	
Hemiptera: Heteroptera (true bugs)						
Acanthosomatidae						
<i>Elasmostethus interstinctus</i>	2003	2005	+			
<i>Elasmucha grisea</i>	2005	2005	+			
Alydidae						
<i>Alydus calcaratus</i>	2005	2005	+		Local	Rare in Essex
Anthocoridae						
<i>Anthocoris nemoralis</i>	1996	1996		+		
<i>Anthocoris nemorum</i>	1996	1996		+		
<i>Orius niger</i>	1996	1996		+		
<i>Orius vicinus</i>	1996	1996		+		
Coreidae						
<i>Bathysolen nubilus</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species
<i>Coriomerus denticulatus</i>	1996	2005	+	+		
<i>Syromastes rhombeus</i>	2005	2005	+	+	Local	
Cydnidae						
<i>Legnotus limbosus</i>	1996	1996	+	+		
Lygaeidae						
<i>Drymus sylvaticus</i>	2005	2005	+			
<i>Heterogaster urticae</i>	1996	1996	+	+		
<i>Ischnodemus sabuleti</i>	2003	2003	+			
<i>Kleidocerys resedae</i>	1996	2005	+	+		
<i>Nysius ericae</i>	2003	2003	+			
<i>Nysius senecionis</i>	2003	2005	+			
<i>Peritrechus nubilus</i>	2005	2005	+		Local	
<i>Scolopostethus affinis</i>	1996	1996		+		
<i>Scolopostethus grandis</i>	2005	2005	+		Local	
<i>Scolopostethus thomsoni</i>	1996	1996		+		
<i>Stygnocoris fuliginus</i>	1996	1996		+		
Miridae						
<i>Adelphocoris lineolatus</i>	1996	2003	+	+		
<i>Blepharidopterus angulatus</i>	1996	1996		+		
<i>Calocoris norwegicus</i>	2003	2003	+			
<i>Campylomma verbasci</i>	2003	2003	+		Local	
<i>Capsus ater</i>	1996	1996		+		
<i>Cyllecoris histrionius</i>	1996	1996		+		
<i>Deraeocoris lutescens</i>	1996	2003	+	+		
<i>Deraeocoris ruber</i>	1996	2003	+	+		
<i>Europiella artemisiae</i>	1996	1996		+		
<i>Heterotoma planicornis</i>	1996	1996		+		
<i>Leptopterna dolabrata</i>	1996	1996		+		
<i>Liocoris tripustulatus</i>	1996	2003	+	+		
<i>Lopus decolor</i>	2003	2003	+			
<i>Lygocoris contaminatus</i>	1996	1996		+		
<i>Lygocoris pabulinus</i>	1996	1996		+		
<i>Lygus pratensis</i>	2003	2005	+		RDB3	Essex Red Data species
<i>Lygus rugulipennis</i>	1996	2005	+	+		
<i>Malacocoris chlorizans</i>	1996	1996		+		
<i>Notostira elongata</i>	1996	1996		+		
<i>Orthops campestris</i>	1996	2003	+	+		
<i>Orthotylus flavosparsus</i>	1996	1996		+		
<i>Orthotylus ochrotrichus</i>	1996	1996		+		

<i>Orthotylus rubidus</i>	2003	2003	+		pRDB3	Essex Red Data species
<i>Phytocoris varipes</i>	2003	2003	+			
<i>Pilophorus perplexus</i>	2003	2003	+		Local	
<i>Pinalitus cervinus</i>	1996	1996		+		
<i>Plagiognathus arbustorum</i>	1996	2003	+	+		
<i>Plagiognathus chrysanthemi</i>	2003	2003	+			
<i>Stenodema calcarata</i>	2003	2003	+			
<i>Stenodema laevigata</i>	1996	2003	+	+		
Nabidae						
<i>Himacerus major</i>	1996	1996		+		
<i>Himacerus mirmicoides</i>	2005	2005	+			
<i>Nabis ferus</i>	2003	2003	+			
Pentatomidae						
<i>Aelia acuminata</i>	2003	2005	+	+	Local	
<i>Eurydema oleracea</i>	1996	2005	+	+	Local	
<i>Eysarcoris fabricii</i>	1996	1996		+		
<i>Neottiglossa pusilla</i>	2005	2005	+		Local	
<i>Palomena prasina</i>	2003	2005	+	+		
<i>Picromerus bidens</i>	2005	2005	+			
<i>Piezodorus lituratus</i>	2005	2005		+		
<i>Podops inuncta</i>	1996	2005	+	+		
<i>Sciocoris cursitans</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species
Rhopalidae						
<i>Stictopleurus abutilon</i>	2005	2005	+		RDB Appendix	
<i>Stictopleurus punctatonervosus</i>	2003	2005	+		RDB Appendix	
Scutelleridae						
<i>Eurygaster maura</i>	2003	2005	+	+	Notable/Nb	Essex Red Data species
Tingidae						
<i>Kalama tricornis</i>	2005	2005	+		Local	
<i>Tingis ampliata</i>	1996	1996		+		
<i>Tingis cardui</i>	1996	1996		+		
Homoptera: Auchenorrhyncham (planthoppers)						
Cercopidae						
<i>Aphrophora alni</i>	1996	1996		+		
<i>Neophilaenus campestris</i>	2003	2003	+			
<i>Neophilaenus lineatus</i>	1996	2003	+	+		
<i>Philaenus spumarius</i>	1996	2003	+	+		
Cicadellidae						
<i>Agallia ribauti</i>	2003	2003	+		Local	
<i>Allygus mixtus</i>	1996	1996		+		
<i>Arthaldeus pascuellus</i>	2003	2003	+			
<i>Deltocephalus pulicaris</i>	2003	2003	+	+		
<i>Empoasca decipiens</i>	1996	1996		+		
<i>Eupelix cuspidata</i>	2003	2003	+			
<i>Eupteryx florida</i>	1996	1996		+	Local	
<i>Eupteryx urticae</i>	1996	1996		+		
<i>Euscelis incisus</i>	1996	2005	+	+		
<i>lassus lanio</i>	1996	1996		+		
<i>Idiocerus fulgidus</i>	1996	1996		+	Notable/Na	
<i>Macrosteles viridigriseus</i>	2003	2003	+			
<i>Mocycdia crocea</i>	1996	1996		+		
<i>Mocycdiopsis parvicauda</i>	2003	2003	+		Local	
<i>Psammotettix confinis</i>	2003	2003	+	+		
<i>Zyginidia scutellaris</i>	2003	2003	+			
Cixiidae						

<i>Cixius nervosus</i>	1996	1996		+			
Delphacidae							
<i>Asiraca clavicornis</i>	1996	2005		+	Notable/Nb	Essex Red Data species	
<i>Stenocranus major</i>	1996	1996		+	Local		
<i>Stenocranus minutus</i>	1996	1996		+			
Hymenoptera: Aculeata - Apoidea (bees and sphecid wasps)							
Andreninae							
<i>Andrena barbilabris</i>	2005	2005		+	Local		
<i>Andrena bicolor</i>	2005	2005	+	+			
<i>Andrena bimaculata</i>	2003	2005	+	+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Andrena chrysoseles</i>	2005	2005	+		Local		
<i>Andrena dorsata</i>	1996	2005	+	+	Local		
<i>Andrena flavipes</i>	1996	2005	+	+	Local		
<i>Andrena labialis</i>	2003	2005	+	+	Local, pUKBAP		
<i>Andrena minutula</i>	2005	2005	+	+			
<i>Andrena minutuloides</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	Essex Endangered
<i>Andrena nigroaenea</i>	2003	2005	+	+			
<i>Andrena nigrospina</i>	2005	2005	+		pRDB2	Essex Red Data species	Essex Endangered
<i>Andrena ovatula</i>	2005	2005	+	+			
<i>Andrena pilipes s.s.</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Andrena praecox</i>	1997	1997	+		Local		
<i>Andrena scotica</i>	2005	2005	+				
<i>Andrena semilaevis</i>	2003	2005	+				
<i>Andrena synadelpha</i>	2005	2005	+		Local		
<i>Andrena tibialis</i>	2005	2005	+		Notable/Na	Essex Red Data species	Regionally Important
<i>Andrena trimmerana</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Andrena wilkella</i>	2003	2005	+				
<i>Panurgus banksianus</i>	2003	2005	+		Local	Essex Red Data species	Essex Threatened
<i>Panurgus calcaratus</i>	1996	2005	+	+	Local		
Anthophorinae							
<i>Anthophora bimaculata</i>	2003	2005	+		Local		
<i>Epeolus variegatus</i>	1996	1996		+	Local		
<i>Nomada fabriciana</i>	2005	2005	+	+			
<i>Nomada flavoguttata</i>	2003	2005	+	+			
<i>Nomada flavopicta</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Nomada fucata</i>	2005	2005	+		Notable/Na	Essex Red Data species	Regionally Important
<i>Nomada fulvicornis</i>	1996	2005	+	+	RDB3	Essex Red Data species	Regionally Important
<i>Nomada goodeniana</i>	2005	2005		+			
<i>Nomada marshamella</i>	2005	2005	+				
<i>Nomada panzeri</i>	2005	2005	+				
<i>Nomada rufipes</i>	2003	2003	+			Essex Red Data species	Essex Threatened
Apinae							
<i>Apis mellifera</i>	1996	2005	+	+			
<i>Bombus hortorum</i>	2005	2005	+				
<i>Bombus humilis</i>	1996	2005	+	+	Local, UKBAP	Essex Red Data species	Essex Vulnerable
<i>Bombus lapidarius</i>	1996	2005	+	+			
<i>Bombus lucorum</i>	1996	2005	+	+			
<i>Bombus pascuorum</i>	1996	2005	+	+			
<i>Bombus pratorum</i>	2005	2005	+				
<i>Bombus ruderarius</i>	2005	2005	+		Local, pUKBAP		
<i>Bombus terrestris</i>	1996	2005	+	+			
Colletinae							
<i>Colletes fodiens</i>	1996	1996		+			
<i>Colletes halophilus</i>	1996	2005	+	+	Notable/Na, pUKBAP	Essex Red Data species	Regionally Important

<i>Colletes marginatus</i>	2003	2003	+		Notable/Na	Essex Red Data species	Essex Threatened
<i>Colletes similis</i>	1996	1996		+	Local		
<i>Hylaeus annularis</i>	1996	2005	+	+	Local		
<i>Hylaeus brevicornis</i>	2005	2005	+		Local		
<i>Hylaeus communis</i>	2003	2005	+	+	Local		
<i>Hylaeus confusus</i>	1996	1996		+	Local		
<i>Hylaeus cornutus</i>	1996	2005	+		Notable/Na	Essex Red Data species	Regionally Important
<i>Hylaeus hyalinatus</i>	1996	2005	+	+	Local		
<i>Hylaeus pectoralis</i>	2003	2005	+	+	Local	Essex Red Data species	Essex Threatened
<i>Hylaeus signatus</i>	2003	2003	+		Notable/Nb	Essex Red Data species	Regionally Important
Halictinae							
<i>Halictus rubicundus</i>	2005	2005	+	+			
<i>Halictus tumulorum</i>	1996	2005	+	+			
<i>Lasioglossum albipes</i>	1996	2003	+	+			
<i>Lasioglossum calceatum</i>	1997	2005	+				
<i>Lasioglossum lativentre</i>	1996	2005	+		Unknown	Essex Red Data species	Essex Threatened
<i>Lasioglossum leucopus</i>	1996	2005	+	+	Local		
<i>Lasioglossum leucozonium</i>	1996	2005	+	+			
<i>Lasioglossum malachurum</i>	1996	2005		+	Notable/Nb		
<i>Lasioglossum minutissimum</i>	1996	2005	+	+			
<i>Lasioglossum morio</i>	1996	2005	+	+			
<i>Lasioglossum parvulum</i>	2005	2005	+				
<i>Lasioglossum pauperatum</i>	2003	2005	+	+	RDB3	Essex Red Data species	Regionally Important
<i>Lasioglossum pauxillum</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
<i>Lasioglossum punctatissimum</i>	1996	2005	+	+	Local		
<i>Lasioglossum puncticolle</i>	1997	1997	+		Notable/Nb	Essex Red Data species	Regionally Important
<i>Lasioglossum smeathmanellum</i>	1996	1996		+	Unknown		
<i>Lasioglossum villosulum</i>	1996	2005	+	+			
<i>Lasioglossum xanthopus</i>	2003	2003	+		Notable/Nb	Essex Red Data species	Essex Threatened
<i>Lasioglossum zonulus</i>	2003	2003	+		Unknown	Essex Red Data species	Essex Vulnerable
<i>Sphecodes crassus</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Sphecodes ephippius</i>	1996	2005	+	+			
<i>Sphecodes ferruginatus</i>	1996	1996	+		Notable/Nb	Essex Red Data species	Essex Threatened
<i>Sphecodes geoffrellus</i>	1996	2005	+	+			
<i>Sphecodes gibbus</i>	1996	1996	+	+			
<i>Sphecodes longulus</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
<i>Sphecodes miniatus</i>	1997	1997	+		Notable/Nb	Essex Red Data species	Essex Threatened
<i>Sphecodes monilicornis</i>	1996	2005	+	+	Local		
<i>Sphecodes pellucidus</i>	2005	2005		+	Local		
<i>Sphecodes puncticeps</i>	1996	2005	+	+	Unknown		
<i>Sphecodes reticulatus</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
<i>Sphecodes rubicundus</i>	2003	2003	+		Notable/Na	Essex Red Data species	Regionally Important
Megachilinae							
<i>Hoplitis claviventris</i>	2003	2003	+			Essex Red Data species	Essex Vulnerable
<i>Hoplitis spinulosa</i>	1996	2005	+	+	Local		
<i>Megachile centuncularis</i>	1996	2005		+	Local		
<i>Megachile maritima</i>	1998	1998	+		Unknown		
<i>Megachile versicolor</i>	1996	2005	+	+	Local		
<i>Megachile willughbiella</i>	2005	2005	+				
<i>Osmia caerulescens</i>	1998	2003	+				
<i>Stelis ornatula</i>	1996	1996		+	RDB3	Essex Red Data species	Essex Endangered
Melittinae							
<i>Dasygaster hirtipes</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Melitta leporina</i>	1996	2005	+	+	Local	Essex Red Data species	Essex Threatened
<i>Melitta tricincta</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
Sphecidae							

<i>Ammophila sabulosa</i>	1996	2005	+	+	Local		
<i>Astata boops</i>	2003	2005	+		Local	Essex Red Data species	Essex Threatened
<i>Cerceris arenaria</i>	1996	2003	+	+			
<i>Cerceris quinquefasciata</i>	1996	2005	+	+	RDB3, UKBAP	Essex Red Data species	Essex Threatened
<i>Cerceris ruficornis</i>	1996	1996		+	Local	Essex Red Data species	Essex Vulnerable
<i>Cerceris rybyensis</i>	1996	2005	+	+	Local		
<i>Crabro cribrarius</i>	1996	2005	+	+	Local		
<i>Crossocerus elongatulus</i>	1996	2005	+	+			
<i>Crossocerus ovalis</i>	1998	2005	+		Local		
<i>Crossocerus palmipes</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Essex Endangered
<i>Crossocerus podagricus</i>	1996	1996		+			
<i>Crossocerus quadrimaculatus</i>	1996	2005	+	+			
<i>Crossocerus tarsatus</i>	1996	2005	+	+			
<i>Crossocerus wesmaeli</i>	1996	2005	+				
<i>Diodontus luperus</i>	1996	2005	+	+	Local		
<i>Diodontus minutus</i>	1996	2005	+	+			
<i>Diodontus tristis</i>	2005	2005		+	Local		
<i>Dryudella pinguis</i>	1996	1996		+	Local		
<i>Ectemnius continuus</i>	1996	2005	+	+			
<i>Ectemnius dives</i>	1996	2005	+	+	Local	Essex Red Data species	Regionally Important
<i>Ectemnius lituratus</i>	2005	2005	+		Local	Essex Red Data species	Essex Threatened
<i>Ectemnius rubicola</i>	1996	1996		+	Local		
<i>Entomognathus brevis</i>	2005	2005	+	+	Local		
<i>Gorytes quadrifasciatus</i>	1996	2003	+	+	Local	Essex Red Data species	Essex Threatened
<i>Harpactus tumidus</i>	1996	1996		+	Local		
<i>Lestiphorus bicinctus</i>	1996	1996		+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Lindenius albilabris</i>	2003	2005	+	+			
<i>Mellinus arvensis</i>	1996	2005	+	+			
<i>Mimesa equestris</i>	2005	2005	+	+		Essex Red Data species	Essex Vulnerable
<i>Mimesa lutarius</i>	2003	2005	+	+		Essex Red Data species	Essex Vulnerable
<i>Mimumesa unicolor</i>	1996	2005	+	+	Notable/Na	Essex Red Data species	Regionally Important
<i>Nysson dimidiatus</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Nysson trimaculatus</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
<i>Oxybelus uniglumis</i>	1996	2005	+	+			
<i>Passaloecus clypealis</i>	1996	2005		+	RDB3	Essex Red Data species	Regionally Important
<i>Passaloecus gracilis</i>	2005	2005	+				
<i>Passaloecus singularis</i>	1996	2005	+	+			
<i>Pemphredon inornata</i>	1996	2005		+			
<i>Pemphredon lethifera</i>	1996	2005	+	+			
<i>Pemphredon morio</i>	1996	1996	+		Notable/Nb	Essex Red Data species	Essex Endangered
<i>Philanthus triangulum</i>	1996	1996		+	RDB2		
<i>Rhopalum coarctatum</i>	2003	2005	+	+	Local		
<i>Stigmus solskyi</i>	2005	2005		+	Local		
<i>Tachysphex pompiliformis</i>	1996	2005	+	+	Local		
<i>Trypoxylon attenuatum</i>	1996	2005	+	+			
<i>Trypoxylon figulus s.s.</i>	1996	1996		+			
<i>Trypoxylon medium</i>	1996	2005	+	+			
Xylocopinae							
<i>Ceratina cyanea</i>	1996	2005	+	+	RDB3	Essex Red Data species	Essex Vulnerable
Hymenoptera: Aculeata - Chrysoidea							
Bethylidae							
<i>Bethylus cephalotes</i>	1996	1996		+			
<i>Epyris niger</i>	2005	2005		+	Unknown		
<i>Gonozius claripennis</i>	1996	1996		+	Unknown		
Chrysididae							

<i>Cleptes semiauratus</i>	1996	1996		+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Elampus panzeri</i>	2003	2003	+		Local	Essex Red Data species	Essex Endangered
<i>Hedychridium ardens</i>	1996	2005	+	+			
<i>Hedychrum niemelai</i>	1996	2005	+	+	RDB3	Essex Red Data species	Essex Threatened
<i>Pseudomalus auratus</i>	1996	2005	+	+			
<i>Trichrysis cyanea</i>	1996	2005	+	+			
Hymenoptera: Aculeata - Vespoidea							
Eumenidae							
<i>Ancistrocerus gazella</i>	1996	1996	+				
<i>Ancistrocerus trifasciatus</i>	2005	2005	+		Local		
<i>Gymnomerus laevipes</i>	2003	2005	+	+	Local	Essex Red Data species	Essex Threatened
Formicidae (ants)							
<i>Formica cunicularia</i>	1996	2005	+	+	Local		
<i>Lasius flavus</i>	1996	2005	+	+			
<i>Lasius mixtus</i>	1996	1996		+	Local		
<i>Lasius niger s.s.</i>	2005	2005	+	+			
<i>Lasius umbratus</i>	2005	2005		+	Local		
<i>Myrmica bessarabica</i>	2003	2003	+		RDB3	Essex Red Data species	Regionally Important
<i>Myrmica rubra</i>	1996	2005		+			
<i>Myrmica ruginodis</i>	1996	1996		+			
<i>Myrmica sabuleti</i>	1996	2005	+	+	Local		
<i>Myrmica scabrinodis</i>	1996	2005	+	+			
Mutillidae							
<i>Smicromyrme rufipes</i>	2003	2005	+	+	Notable/Nb	Essex Red Data species	Regionally Important
Pompilidae (spider hunting wasps)							
<i>Agenioideus cinctellus</i>	1996	2005	+		Local		
<i>Anoplius infuscatus</i>	1996	2005	+	+	Local		
<i>Anoplius nigerrimus</i>	2005	2005	+	+	Local	Essex Red Data species	Essex Endangered
<i>Arachnospila anceps</i>	1996	2005	+	+	Local		
<i>Arachnospila minutula</i>	2005	2005	+	+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Arachnospila trivialis</i>	1996	2005	+	+	Local		
<i>Auplopus carbonarius</i>	2005	2005		+	Notable/Nb	Essex Red Data species	Essex Vulnerable
<i>Caliadurgus fasciatellus</i>	1996	2005	+	+	Local		
<i>Episyron rufipes</i>	1996	2005	+	+	Local		
<i>Evagetes crassicornis</i>	1996	2005	+	+	Local		
<i>Priocnemis agilis</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Priocnemis exaltata</i>	1996	2005	+	+	Local		
<i>Priocnemis fennica</i>	1996	2005	+	+	Local		
<i>Priocnemis gracilis</i>	1996	2005	+	+	Notable/Nb	Essex Red Data species	Essex Threatened
<i>Priocnemis parvula</i>	1996	2005	+	+	Local		
<i>Priocnemis pusilla</i>	1996	2005	+	+	Local		
Tiphiidae							
<i>Myrmosa atra</i>	1996	2005	+	+	Local		
<i>Tiphia femorata</i>	1996	2005	+	+	Local		
Vespidae (social wasps)							
<i>Vespula germanica</i>	1996	2005	+	+			
<i>Vespula vulgaris</i>	1996	2003	+				
Hymenoptera: Parasitica							
Chalcididae							
<i>Brachymeria minuta</i>	2005	2005	+		Nr		
Lepidoptera (butterflies and moths)							
Arctiidae							

Tyria jacobaeae	2003	2003	+			
Coleophoridae						
Coleophora asteris	1996	1996		+	Unknown	
Geometridae						
Aplocera efformata	1996	1996		+		Essex Red Data species
Campaea margaritata	1996	1996		+		
Camptogramma bilineata	1996	1996		+		
Chiasmia clathrata	1996	1996		+		
Eupithecia absinthiata	1996	1996		+		
Eupithecia centaureata	1996	1996		+		
Eupithecia icterata	1996	1996		+		
Eupithecia succenturiata	1996	1996		+		
Gymnoscelis rufifasciata	1996	1996		+		
Opisthograptis luteolata	1996	1996		+		
Pelurga comitata	1996	1996		+		
Peribatodes rhomboidaria	1996	1996		+		
Scopula emutaria	1996	1996		+	Notable/Nb	Essex Red Data species
Scopula marginepunctata	1996	1996		+	Local	
Semiaspilates ochrearia	1996	1996		+	Local	
Timandra comae	1996	1996		+		
Xanthorhoe fluctuata	1996	1996		+		
Hepialidae						
Hepialus lupulinus	1996	1996		+		
Hesperiidae						
Ochlodes faunus	2005	2005		+		
Thymelicus lineola	2003	2005	+	+	Local	
Thymelicus sylvestris	2003	2005	+	+		
Lycaenidae						
Aricia agestis	2005	2005		+	Local	
Polyommatus icarus	2005	2005		+		
Noctuidae						
Agrotis ipsilon	1996	1996		+	Migrant	
Agrotis puta	1996	1996		+		
Agrotis segetum	1996	1996		+		
Amphipyra tragopoginis	1996	1996		+		
Arenostola phragmitidis	1996	1996		+	Local	
Autographa gamma	1996	1996		+		
Cucullia asteris	2005	2005	+	+	Notable/Nb	Essex Red Data species
Hoplodrina ambigua	1996	1996		+	Unknown	
Hypena proboscidalis	1996	1996		+		
Lacanobia oleracea	1996	1996		+		
Luperina testacea	1996	1996		+		
Mesoligia furuncula	1996	1996		+		
Mormo maura	1996	1996		+	Local	
Mythimna pallens	1996	1996		+		
Noctua comes	1996	1996		+		
Noctua janthe	1996	1996		+		
Noctua pronuba	1996	1996		+		
Paradrina clavipalpis	1996	1996		+		
Phlogophora meticulosa	1996	1996		+		
Xanthia icteritia	1996	1996		+		
Xestia c-nigrum	1996	1996		+		
Xestia sexstrigata	1996	1996		+		
Xestia xanthographa	1996	1996		+		
Nymphalidae						
Aglais urticae	2005	2005	+			
Inachis io	2005	2005	+			
Vanessa atalanta	2005	2005		+	Migrant	

Vanessa cardui	2003	2003	+		Migrant	
Oecophoridae						
Carcina quercana	1996	1996		+		
Pieridae						
Pieris napi	2005	2005	+			
Pieris rapae	2003	2005	+	+		
Pyralidae						
Acentria ephemerella	1996	1996		+		
Agriphila geniculea	1996	1996		+		
Agriphila latistria	1996	1996		+	Local	Essex Red Data species
Agriphila tristella	1996	1996		+		
Evergestis extimalis	1996	1996		+	Notable/Nb	Essex Red Data species
Sitochroa palealis	1996	1996		+	Notable/Nb	
Satyridae						
Coenonympha pamphilus	2005	2005		+		
Lasiommata megera	2005	2005		+		
Maniola jurtina	2003	2005	+	+		
Pararge aegeria	2005	2005		+		
Pyronia tithonus	2005	2005	+	+		
Sesiidae						
Synanthedon formicaeformis	2005	2005	+		Notable/Nb	Essex Red Data species
Tortricidae						
Agapeta hamana	1996	1996		+		
Odonata (dragonflies and damselflies)						
Libellulidae						
Orthetrum cancellatum	2003	2003	+		Local	
Sympetrum striolatum	2003	2003	+			
Orthoptera (grasshoppers and crickets)						
Acrididae						
Chorthippus albomarginatus	2005	2005	+	+	Local	
Chorthippus brunneus	2005	2005	+	+		
Chorthippus parallelus	2003	2005	+	+		
Conocephalidae						
Conocephalus discolor	2003	2005	+		Notable/Na	Essex Red Data species
Tetrigidae						
Tetrix subulata	2003	2005	+	+	Local	
Tettigoniidae						
Metriopectera roeselii	2003	2005	+	+	Notable/Nb	

MAP 1: TRAP LOCATIONS AT WEST THURROCK LAGOONS

At each location one pan trap and five pitfall traps was set and collected at approximately 2 week intervals between 20th June and 1st September 2005

