DYFED INVERTEBRATE GROUP

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THYSANURA

BRISTLETAILS IN CEREDIGION, VC 46 - A O CHATER

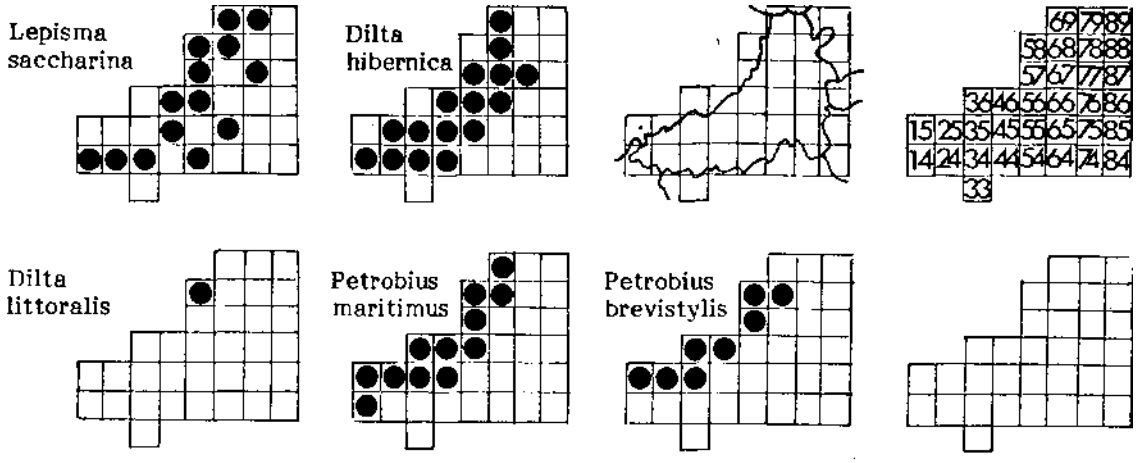
The bristletails are primitive, wingless insects belonging to the Order Thysanura. Five of the eight British and Irish species have been recorded in Ceredigion. The most familiar is the silverfish Lepisma saccharina, which is entirely synanthropic and confined to buildings. A record of this species from a house at Rhydyfelin (22/592792) in 1958 (Miles 1959) seems to be the only published record for the group in VC 46. The remainder, two species of Petrobius and two of Dilta, are in contrast found chiefly in some of the most unmodified and natural habitats, sea cliffs and coastal slopes, and dry woodland. All are slender, fast-moving animals 10-15mm long, with a dense covering of minute scales and three long 'tails' (one caudal filament and two lateral cerci). Silverfish feed on carbohydrates and various kinds of animal and vegetable debris. Petrobius and Dilta probably feed chiefly on algae and lichens growing on rocks, soil or bark. All tend to rest concealed during the day and come out to feed at night.

Identification: Delaney (1954b) provides brief keys and illustrations of the British and Irish species, although the reader should be aware that the illustrations of the chief diagnostic features of Petrobius are wrongly labelled: Fig. 4 should be P. brevistylis and Fig. 11 P. maritimus. More detailed information is available in Wygodzinsky (1941, 1945) and Palissa (1964). The taxonomy of Dilta in particular is rather confused. D. littoralis is easily identified if adult males are available. The remaining Dilta material from Ceredigion seems all to belong to one species, called here D. hibernica, which was originally described from Ireland (Carpenter 1907) and is said to be widespread in Britain. However, the characters of the male palps seem not to agree with those of D. hibernica, or with those of D. saxicola which is recorded from Ireland but not from Britain. Further investigation of our material is clearly required. In Petrobius too, adult males are required for certain identification, although recent papers (Davies & Richardson 1970, Davies 1990 and Friedrich & Makings 1990) have provided characters that can be used on female and immature specimens (those in Friedrich & Makings being the easiest to use and perhaps the most reliable).

DISTRIBUTION AND ECOLOGY: Lepisma saccharina is cosmopolitan and spread widely by man. It requires at least slightly moist conditions and is presumably sensitive to cold or frost and this prevents it from spreading into the wild in Britain. (The firebrat Thermobius domesticus can tolerate very dry conditions and requires much higher temperatures, so is confined in Britain to heated buildings, bakeries etc. It seems very rare in Wales (Morgan 1980) and has not been reported from Ceredigion where the main public and commercial pest controllers have had no requests to deal with infestations of it.)

Dilta littoralis is a Lusitanian species occurring from Portugal to south and west Britain. Its Ceredigion locality appears to be its northern limit. In Britain it occurs chiefly in coastal sites and on heaths, and Delaney (1954a) provides a very detailed account of its life history and ecology on heaths and grasslands in Devon and Hants. No comparable work has been done on D. hibernica, which seems to be much more widespread in Britain, occurring in both coastal and inland sites to at least as far north as Durham. The two species of Petrobius are

predominantly coastal and occur wherever there are suitable habitats around Britain and Ireland, with the exception of much of the east coast of England. P. maritimus also occurs inland in the west and in Ireland, and has been recorded up to 18km from the sea at 370m a.s.l. in Snowdonia (Davies 1966, Morgan 1968, Davies & Richardson 1970). Morgan (1968) also recorded P. brevistylis up to 4.5km from the sea at 140 m a.s.l. in North Wales, but there seem to be no other inland reports of this species. Because the two species have similar distributions but different habitats they have been the subject of several interesting ecological studies (Dixon 1970, Davies & Richardson 1970, Davies 1990). Their requirements in Ceredigion seem to match closely those in Britain as a whole as indicated by these studies. P. brevistylis uses for its resting sites narrow crevices where there is little movement of air, chiefly in hard rock cliffs or the masonry of well-built sea walls, normally within the spray zone. P. maritimus rarely occurs in such sites, using loose scree, plant tussocks or litter, under stones on cliff slopes on soil or shale, in drystone or crumbling mortared walls, or in larger cavities in rocks or masonry. Thus at Aberystwyth, P. brevistylis occurs in crevices in the bare, hard cliffs in the outer harbour, and in cracks in the high concreted and cemented wall running south from the Ystwyth bridge, whereas P. maritimus occurs on the densely vegetated cliff slope by the inner harbour, and in the drystone boulder wall, and adjacent crumbling mortared wall and tussocky grassland, 100m south from the Ystwyth bridge. Both species usually occur in great abundance and can most easily be seen at night when feeding on rock surfaces and walls. P. brevistylis can also sometimes be seen, especially in very hot weather, resting on rock surfaces in daylight. One other bristletail, Trigoniophthalmus alternatus, has been recorded from Wales on the Gower peninsula (Makings 1964, Dixon 1970) and should be looked for in Dyfed.



THE SPECIES IN CEREDIGION, BASED ON RECORDS 1983 - 1991.

Lepisma saccharina - 16 tetrads. Probably ubiquitous in houses, although few records are available. In a survey of haybarns and other farm buildings for pseudoscorpions, Lepisma was found in 17 out of 72 buildings. They occurred, never in much abundance, both in open Dutch barns and in closed barns and stables, and in isolated barns as well as those in farmyards. There seemed no obvious explanation for presence or absence in these sites.

Dilta hibernica - 30 tetrads. Widespread on the coast and in woodlands throughout Ceredigion, but nowhere common or abundant. The favoured woodland sites are sessile oakwoods (19 records) on dry slopes where there is a considerable depth of loose litter, and it can often be found where leaf litter is caught up in bilberry or heather, or in tussocks of greater woodrush. Only six records are from ash, beech or other woodland, and it has not been recorded from conifer plantations. Three records are from hedgebanks away from woods, and one is from inside a house at Llanfarian (22/584767) where individuals are regularly seen, particularly in winter (presumably as strays from the nearby woodland). The four coastal records are from grass and heather tussocks on cliff slopes. It is unusual to find more than half a dozen specimens in any one microsite.

Dilta littoralis - 1 tetrad. Recorded only from Constitution Hill, Aberystwyth (22/583826) where it was first found by A P Fowles in April 1989. The colony occupies at least seven hectares on the south slope of the hill, and extends a bit northwards along the sea cliffs, and for 300m north along the coastal footpath. It seems most abundant, or at least is most easily found, on the shaley scree and cliff slopes west of the Cliff Railway, where it occurs from 10-110m a.s.l. in tussocks or mats of cocksfoot, sea campion, thyme, red fescue, wood sage, etc., and under stones. East of the Cliff Railway it occurs throughout a large area of dense grassy scrub of gorse, bramble, blackthorn and ivy, up to 250m from the sea. At night it can be seen on screes, rocks, paths, walls and soil. In one place only, on a length of drystone but concrete-capped wall, does it occur with Petrobius maritimus (the latter is abundant up to 15m a.s.l. on the hill but is very rare higher up). As this seems the northernmost site known for D. littoralis, it is perhaps significant that Constitution Hill is the only extensive south- facing coastal scree slope in Ceredigion.

Petrobius maritimus - 30 tetrads. Widespread along the sea coast. It is most often found in grass, heather, sea campion and other tussocks or mats of vegetation on the cliffs and cliff slopes, as well as in screes, in shaley crumbling cliffs, and in drystone or mortared walls in poor repair. On shingle beaches it seems to be confined to areas where there is fairly dense grass turf or other vegetation such as mats of sea campion. There is only one record from sand dunes, at Ynyslas. It has been recorded no more than 2km inland, in Llanbadarn Fawr churchyard (22/599810), where it can be seen in abundance at night on alter tombs north of .the church, and up to 155m a.s.l. in a mortared wall at Tynbwlch farm (22/557731) 600m from the sea. In my own garden, 50m from the harbour at Aberystwyth, it occurs on three stone and earth walls but also in the cavity walls of the house, emerging through the ventilation grills to feed on the roughcast walls at night.

Petrobius brevistylis - 16 tetrads. Widespread along the sea coast, mostly on hard rock cliffs and well-maintained harbour walls, usually in the same zone (and sometimes in the same crevices) as the woodlouse Ligia oceanica, and not seen above 20m a.s.l. It can be found, often in many hundreds, in crevices by day and on the vertical surfaces at night. It is especially abundant on the harbour walls at New Quay, Aberaeron and Aberystwyth, and on the cliffs around Cardigan Island, Llangrannog and New Quay. In only two sites has it been found with P. maritimus, on the stone walls above the sandy beach at New Quay, and in a very uncharacteristic microsite, under sea campion mats on the east cliffs of Cardigan Island. Both species also occur on the scree slopes of Allt-wen (22/574791), but here brevistylis is confined to the unvegetated lower parts of the scree among the larger rocks and on adjacent cliffs, while maritimus occurs higher up in at least partially vegetated areas of mostly finer scree.

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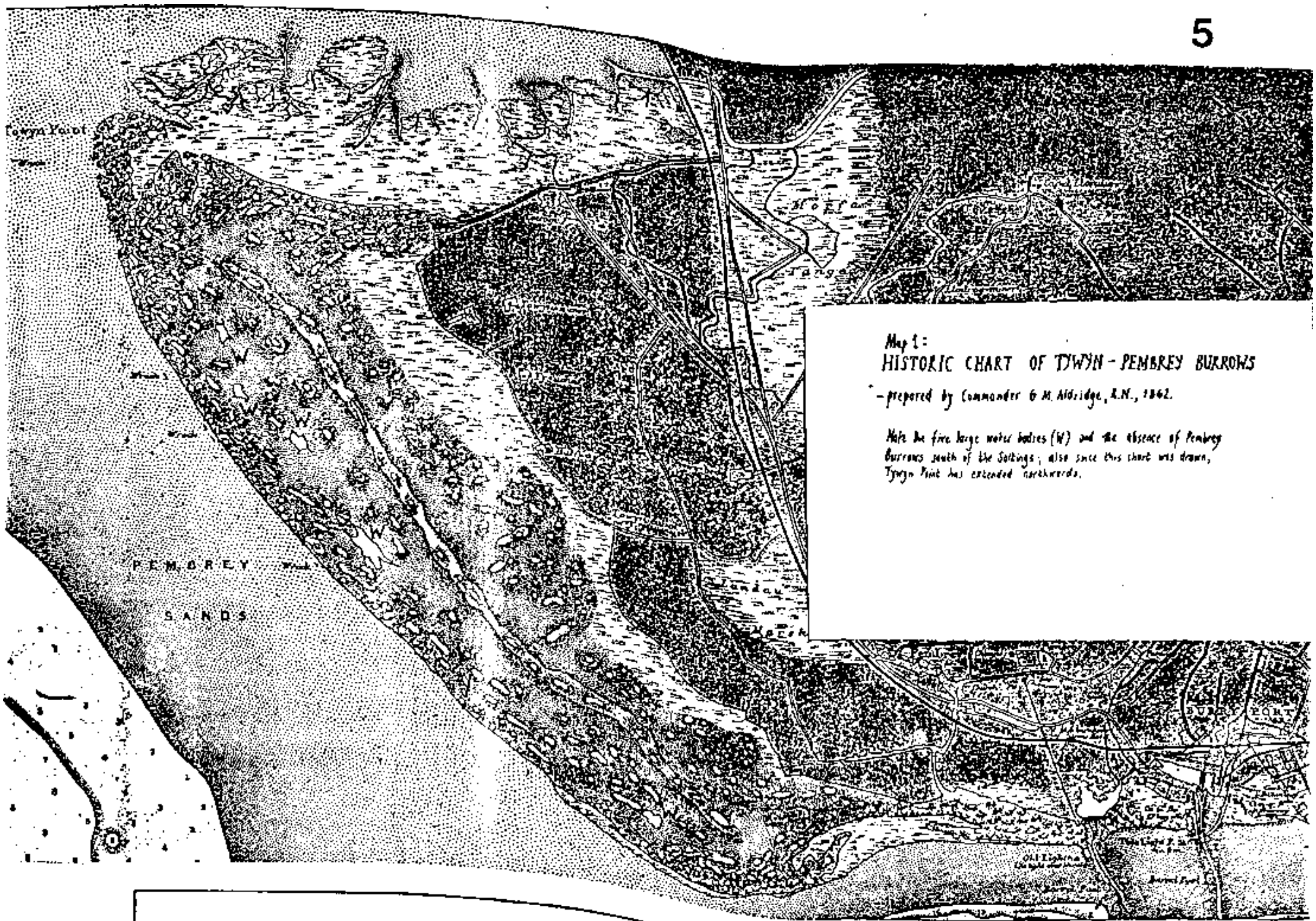
DYFED SITE REPORT (9): TYWYN-PEMBREY (22/30, 22/40, 21/49) CARMS, VC44 - I K MORGAN

INTRODUCTION

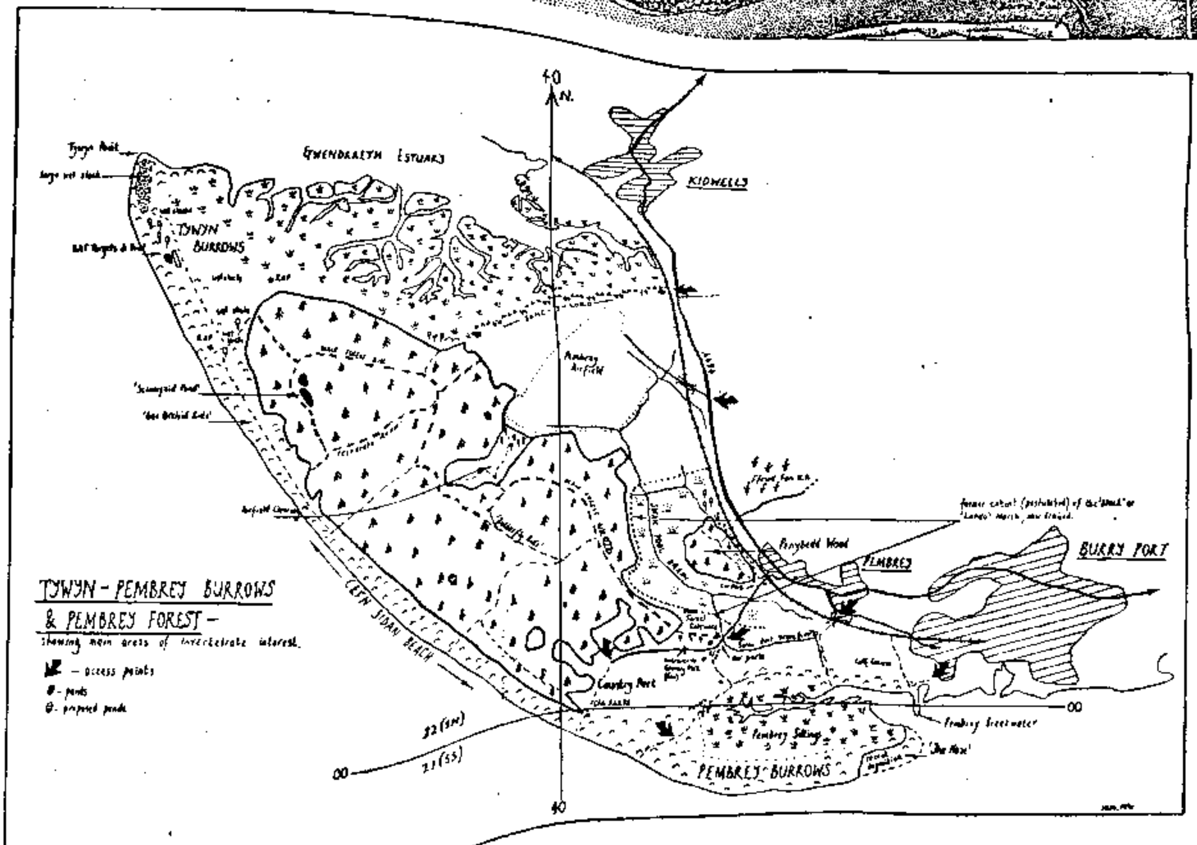
Sand dunes are a scarce and specialised habitat in Great Britain, with some 56,000ha, mostly concentrated in western Scotland and on the Welsh coast (Davidson et al 1991, p95), and they provide habitats which are relatively unaffected by Man and are rich in wildlife. Within Wales, important examples occur in Gwynedd and there is a fine series of dunelands on the south coast. Such dune systems are places of considerable scientific interest and natural beauty, of value for both wildlife conservation and responsible recreation in an increasingly bland agricultural landscape. Yet to the functional agriculturalist they were regarded as "wasteland" ie, non-productive (Davies et al 1944) and deserving of some economic use (eg, forestry), "but to the eyes of the entomologist, a long range of sandhills is an entrancing site; for he knows that bleak and desolate as it may seem, they yet swarm with insect life" (Butler 1910).

Tywyn-Pembrey is an extensive system approximately 10km long and orientated, lengthwise, on a NW - SE axis, and is comprised of Devensian till and outwash material laid down by glacial processes in Carmarthen Bay and whose sands were subsequently re-worked by wave and drift action to form the magnificent sand beach of Cefn Sidan and its hinterland of dunes; research showing that some 30m depth of sands lie on underlying estuarine clays (Kahn, 1968). This process is still continuing - defensive emplacements of World War 2 vintage are now situated in slacks separated from the beach by a line of dunes (they were originally built to overlook the beach) and there is continuing deposition at Tywyn Point and most particularly on "the Nose" of Pembrey Burrows - 1920's photographs show open sea where now are dunes (see Map 1), and there has been recent compensatory erosion on the central "dome" of Cefn Sidan. For a fascinating historical account on the growth of these dunelands readers are readily referred to James (1991).



Map 1:
HISTORIC CHART OF TYWYN - PEMBREY BURROWS
- prepared by Commander G M. Aldridge, R.N., 1862.

Note the five large water bodies (W) and the absence of Pembrey Burrows south of the Saltings; also since this chart was drawn, Tywyn Point has extended northwards.



Scale 1:50,000 (2cm to 1km).

It must be remembered that dunelands are dynamic systems in a state of continual flux and many of the specialised plant and invertebrate taxa, including rarities, have evolved to successfully exploit such conditions and ill-informed attempts to stabilise such environments are often to the detriment of specialised species, of narrow ecological tolerance, as unfortunately has happened at Tywyn-Pembrey. The many and varied attempts at stabilisation of this dune system (which are still continuing) not only include the construction of defensive structures, or the planting of sea buckthorn (which is rapidly spreading and threatening interesting communities), but also the indirect effect of the removal of grazing stock. No part of this extensive dune system is now regularly grazed, to the profound disadvantage of the more uncommon biological communities. Jones (1983) relates that, once, the "terrain included a large warren yielding provender ... (and) ...the grassland (was) used by local farmers ... who enjoyed pastorage for eight months of every year, and we are informed by Nicholas Carlisle in 1811, that up to 10,000 sheep annually depastured there".

Later, it is known (Webb 1985) that much of the site was grazed by horses and, of course, by the resident (if reduced) rabbit population. Not only has this removal of grazing allowed a cumulative increase in rank herbaceous growth and scrub, which although beneficial to some generalist taxa, it has meant the uncharted decline of others associated with dune grassland (although it must be remembered that ungrazed saltmarshes for example, have a fine invertebrate fauna). At Tywyn Burrows, the dilemma exists whereby grazing would greatly benefit the dune system but it would be damaging to both the vegetational and entomological interest of the saltmarsh. Little is known how this catastrophic change of management has affected the invertebrates at Tywyn-Pembrey, but it is clear that some plant species of open bare situations, or early successional stages, eg the fen orchid and chaffweed in damp areas, or sand catchfly in drier parts, have critically declined and a logical corollary would be to expect similar negative trends with some invertebrates. Certainly, for example, the dung-dependent scarabaeid fauna is less diverse on Tywyn-Pembrey than on Whiteford Burrows, Gower (PM Pavett, pers. comm.), which is part horse-grazed. It is critical to remember that the rich invertebrate fauna of Tywyn-Pembrey is an inherited assemblage (which partially reflects past land-usage) and there is the need to recreate pioneer communities of bare sand, both wet and dry; this should be viewed as a management priority.

A HISTORY OF INVERTEBRATE RECORDING

In this review of the invertebrate interest of Tywyn-Pembrey, it is proposed to treat the "two" dune systems as one site, for they are one geomorphological and ecological unit, linked by the narrow strip of unplanted dunes seaward of Pembrey Forest, and by the interconnecting network of rides and clearings in the Forest; certainly the older generation of naturalists regarded it as one site (usually calling it "Pembrey Burrows") prior to the planting of much of the central area with conifers by the Forestry Commission, which commenced in 1929.

The area first came to the attention of the entomological world when, in 1806, (Nat. Hist. Brit. Insects II: pl cccxc, fig 1), Edward Donovan figured a specimen of what was probably Anisoplia agricola, of which "about the latter end of July 1801", he was "fortunate to capture a living specimen ... on the sea coast ... of Carmarthen", A. agricola is an eastern European chafer and either a vagrant or an accidental introduction (D B Shirt, pers. comm. 1988). About half-a-century later, Sir John Dillwyn-Llewelyn caught another rarity here - the purple marbled moth Eublemna ostrina (reported in Barret, 1900).

At the commencement of the present century, E A Butler, a hemipterist of national repute, visited these coastal burrows and included many records of importance in his 'Biology of the British Hemiptera-Heteroptera' (1923) or in various papers (eg. Butler 1910). T W Barker personally did little work on invertebrates (although he visited the dunes to botanise) and while records of invertebrates are included in his book (Barker 1905), few hail from Tywyn- Pembrey. The late 1950's and the early 1960's saw Arthur Price, a schoolmaster who regularly holidayed at Kidwelly, researching the water beetle and hemipterous fauna of the area. In the next decade or so little work, apart from occasional visits, was carried out, until David Davies of Rhandirmwyn started to entomologise here, especially with regard to the Coleoptera and Lepidoptera. It was in July 1971, on a West Wales Naturalists' Trust field meeting on Tywyn Burrows, that David Davies showed the present author his first dark green fritillaries Argynnis aglaja and marbled whites Melanargia galathea. The author continued, with E J

Smith, to intermittently record butterflies in this area during the 1970's and early 1980's, although it was not until the middle years of that latter decade that his interest broadened to cover a range of other invertebrate groups. Concurrently, valuable work has been (and continues to be) carried out by P Mark Pavett, especially Coleoptera, but also including some Diptera and Hymenoptera. Since the mid-1980's parties of experienced dipterists, coleopterists, hymenopterists and, lately, hemipterists have visited Tywyn-Pembrey and have all contributed to our knowledge of the area.

TYWYN-PEMBREY: VEGETATION

To help readers paint a visual picture of Tywyn-Pembrey and to understand its invertebrate communities, it would be useful to first briefly discuss the plant assemblages which clothe the area. Tywyn-Pembrey is, expectedly, rich in plant species which grow on the semi-calcareous (due to shell fragments) dunes, the more stable dry grasslands or in the wet slacks. The latter are notable for rarities such as the diminutive gentian Gentianella uliginosa, blue-eyed grass (a North American element in our flora) or until recently, the fen orchid, which is now probably extinct due to inappropriate management). These plants typically occur in the wet mossy hollows with masses of creeping willow and variegated horsetail. These slacks also support growths of devil's-bit scabious, upon which colonies of marsh fritillaries Euroydryas aurinia depend. The slacks are by far best developed on Tywyn Burrows where they occupy extensive areas, only smaller examples occur in Pembrey Forest or on Pembrey Burrows. Marsh helleborines, marsh orchids and fragant orchids likewise colour these wet depressions, providing nectar for five-spot burnets Zygaena trifolii or bee chafers Trichius fasciatus. Some slacks hold thickets of alder and grey willow.

At Tywyn and Pembrey Burrows, a fine gradation into ungrazed saltmarsh vegetation can be seen, and these floristically colourful and nectar-rich saltings (with sea lavender, sea aster, parsley water-dropwort and various rushes and grasses) have been compared to those of north Norfolk in the range of vegetation types exhibited.

Landwards of these saltmarshes, there is a gradual change into a stabilised dune grassland vegetation, with areas supporting grasses such as red fescue, lady’s bedstraw, kidney vetch, ragwort, hairy hawkbit and violets; the most stable areas have coarse grasses, dewberry or unwelcome thickets of sea buckthorn. Disturbance of such grassland, resulting in areas of bare sand, re-initiates the plant succession, favouring many plants and invertebrates - whether phytophagous hemipterous species dependent on plants of such open, dry areas, eg. the bug Rhopalus parumpunctatus on storksbill, or solitary bees or wasps which require bare, sunny aspects for nesting purposes close to flower areas for foraging.

Seawards of the fixed dune grassland is a zone of foredunes including shoreline embryo dunes with sand couch, sea couch and marram, but also with dune fescue, evening primroses, sea spurge and rest harrow. Predatory robberflies such as Pamponerus germanicus or Philonicus albiceps frequent hollows, capturing and sucking dry of body juices any unfortunate dipteran they may sieze. Finally, facing the sea itself, the strandline - with its mass of driftwood and other jetsam (so important for certain specialised invertebrates such as the white pillbug Armadillidium album) - has sparse growths of sand couch, sea sandwort, prickly sandwort and other species.

Within Pembrey Forest itself, remnant areas - but of very substantial cumulative extent - of sand dune and slack vegetation persist, resulting in an invertebrate assemblage not dissimilar to the fixed dune grassland on the burrows of Tywyn or Pembrey. This sheltered, flower-rich, sunny, wood-edge habitat, with free-draining loose sandy soils, is of considerable interest, with, for example, the buprestid ("jewel-beetle") Agrilus angustulus found on young oaks and the larvae of various fritillaries feed here on wood-edge violets. The favourable climate of this coastal area (high levels of sunshine are recorded in summer) also favours certain invertebrates.

THE INVERTEBRATE HABITATS

It will be convenient to deal with the invertebrate interest of Tywyn-Pembrey as a number of sub-sites, reviewing each in an approximate NW - SE fashion:-

(1) TYWYN BURROWS (22/36-05- etc.)

As already noted, the burrows at Tywyn hold the best examples of wet slacks in the Tywyn-Pembrey complex. There are also extensive areas of ungrazed saltmarsh transition and an actively accreting area at Tywyn Point, where the large accumulations of driftwood and other lesser debris provide shelter for a suite of specialised invertebrates - the white pillbug Armadillidium album, the large sand-camouflaged carabid Eurynebria complanata (which reaches the northernmost edge of its European range here) and the oedemerid beetle Nacerdes melanura whose larvae develop in seawater-soaked deadwood. Breeding in the deadwood accumulations - as it does elsewhere on the Welsh coast - is the attractive "bee-chafer" Trichius fasciatus - when the adults emerge they can often be seen feeding on various flowers. Agile and restless predatory coast tiger beetles Cicindela maritima hunt the bare sandy areas, their technique comprising a mxture of flight and running hops. Not recorded, but very likely to occur is the "tiger beetle wasp" Methoca ichneumonides, whose larvae are parasitoids of the larvae of both C. maritima and the commoner C. campestris.

Immediately adjacent to Tywyn Point is a large wet slack (22/359060) of relatively recent origin, dominated by silverweed, marsh pennywort and water mint, with patches of reed and sea club-rush. This slack is flooded in winter (essentially freshwater with some brackish seepage through the porous sands), and it is here that the most distinguished invertebrate inhabitant of the area occurs - the Red Data Book 1 Panageus crux-major. This is now the only known British locality for this endangered, handsome, black-and-orange ground beetle, which was otherwise last seen at Wicken Fen in East Anglia during the 1960's. There are old records for north Gower, Glamorgan (Tomlin 1933) and it is quite likely to be found in the fens of Laugharne Burrows, just across the Tywi/Taf estuary. Due to its great rarity it should not be collected (indeed, formal written consent for invertebrate collecting at Tywyn Burrows should first be sought from the Countryside Council for Wales). The less rare (but similar) Panageus bipustulatus has also been recorded at this site, in the dry dunes that lie adjacent to the wet, fenny slack. The colourful, large rove-beetle Staphylinus dimidiaticornis also occurs under logs hereabouts, and sweeping of fleabane or skullcap will respectively yield the tortoise beetle Cassida murraea (often in its brown form) and the attractive Phyllobrotica quadrimaculata. A visit by a group of coleopterists to Tywyn Burrows in April 1989 resulted in a number of local species being recorded including, Agonum nigrum, Harpalus neglectus, Aphodius plagiatus, Altica ericiti, Baeckmanniolus dimidiatus, Sitona cambricus, Notaris bimaculatus, and N. scirpi.

Another notable inhabitat of the damp slacks is the small Cepero's groundhopper Tetrix ceperoi, a very localised species confined to coastal southern Britain. The adults can be seen in early spring (before the first true grasshoppers are abroad) and also in autumn; these cryptically- coloured groundhoppers have the engaging habit of being able to swim if inadvertantly they land on water. A good site to observe Tetrix ceperoi is the shallow pool behind the RAF targets, where, in late spring, the mostly coastal hairy dragonfly Brachytron pratense can also be noted. Once, in September 1985, the very local coastal cleg Haematopota grandis was caught on the adjacent upper saltmarsh; whilst the robberflies Philonicus albiceps, Dioctria rufipes, Pamponerus germanicus, Dysmachus trigonus and Lasiopogon cinctus have all been recorded. Pamponerus (a large, impressive species with white-marked wings) is considered a speciality of the larger western British dune systems. A field meeting of dipterists at Tywyn Burrows in July 1986 led to the recording of flies of note such as Acrocera globulus, Thinophilus ruficornis, Dolichopus notatus, Medetera pinicola and Thrypticus laetus. The large, ugly Tachina grossa (whose larvae paratisize noctuid moth caterpillars) is regularly seen on flowers in summer. Platycheirus immarginatus and the cranefly Tipula nigra frequent the expanses of saltmarsh and the curious hoverfly Microdon mutabilis, whose unusual slug-like larvae develop in ants' nests, can be swept from slack vegetation. Another syrphid, Tropidia scita, haunts more rankly-vegetated slacks and Eristalis abusuvius is the most typical member of its genus, though others are present including swarms of E. tenax in late summer. Drier ground

supports Chrysotoxum cautum (an effective wasp-mimic) and the pretty Xanthogramma pedissequum. Sweeping of flowers of water mint, ragwort or parsley water dropwort will provide specimens of the soldier-flies Nemotelus uliginosus, N. notatus, Oplodontha viridula and Oxycera trilineata; the leaf beetle Chrysomela populi is abundant in the wet slacks on creeping willow.

The ungrazed saltmarsh supports strong colonies of the short-winged conehead Conocephalus dorsalis, whose continuous, very high-pitched, song is barely audible in late summer and early autumn but, surprisingly, the lesser marsh grasshopper Chorthippus albomarginatus (which occurs on the North Gower saltings) is apparently absent; was it eliminated by heavy sheep grazing on the saltmarshes in the past? The dark bush cricket Pholidoptera griseoaptera is abundant in thickets and other rough vegetation throughout the Tywyn-Pembrey complex, whilst the speckled bush cricket Leptophyes punctatissima can regularly be beaten from herbage. The dark crab spider Xysticus luctuosus has been recently recorded, new to Wales, on the Burrows and in the adajcent Forest.

There has ben some limited collecting of bees and wasps by the author and Mark Pavett, augmented by a couple of visits by SJ Falk and also by a group of hymenopterists in 1988. Species of note include Symmorphus crassicornis, Colletes marginatus and Coelioxys mandibularis, the latter being a cleptoparasite of bees in the genus Megachile. C. mandibularis has a disjunct distribution in Britain, being confined to dune areas in NW England, South Wales and SW England (Falk 1991a). Anoplius viaticus, is a regularly seen spider-hunting wasp, flying over bare pathways with frenetic, jerky flight whilst, in late summer, the larger Ammophila sabulosa inhabits similar situations.

Only a little moth-trapping has been undertaken at Tywyn Burrows, supplemented by casual daytime recording, but noteworthy species include the yellow belle Aspitates ochrearia, crescent striped Apamea oblonga, dingy shears Enargia ypsilon, Archer's dart Agrotis vestigialis, cream-spot tiger Arctia villica, silver hook Eustrotia uncula, and the sand dart Agrotis ripae. The 'bee orchid' ride (22/368039) just southwards of Tywyn Burrows has yielded small waved umbers Horisme vitalba which feed on traveller's joy, a little of which grows in this area. This ride is also much favoured by dark green fritillaries - perhaps the best spot to see this species in the dune-forest complex.

Less common molluscs of interest on Tywyn Burrows are Vallonia excentrica and Pupilla muscorum on the dry dunes, and Vallonia pulchella and Vertigo antivertigo in the wet slacks.

(2) "BANC-Y-LORD" (22/398045)

Roughly eastwards of Tywyn Burrows, the sea embankment known locally as 'Banc-y-Lord' (built by Lord Ashburnham in 1818) also has invertebrates of interest. Various solitary bees of the genus Andrena nest in the dry sunny embankment, including the easily-recognised A. cineraria with its dark metallic blue abdomen and silver thoracic hairs. Parasite 'cuckoos' in the nests of several of these Andrenas are several species of Nomada. A pond at the western end (22/392042) of Banc-y-Lord holds the attractive weevil Grypus equiseti, whilst the turbid cattle pond, rich in organic matter, at the opposite end (22/410049) was examined by Arthur Price in the 1950's (Price 1959) and found to contain the local 'screech beetle' Hygrobia herrmanni (only recorded from one other vice-county site), which favours muddy conditions. Cassida vittata, a tortoise-beetle with marvellously iridescent elytral markings can be swept from nearby saltmarsh plants. The small brackish reedbed (22/401046) besides Banc-y-Lord needs to be investigated entomologically - it could, for example, be productive of various wainscot moths.

(3) PEMBREY FOREST (22/30 & 22/40)

The central section of Tywyn-Pembrey is clad by some l,000ha of Forestry Commission plantations, chiefly Corsican pine but also with other conifers and some deciduous blocks. Pembrey Forest contains many sites of invertebrate interest, whether open sandy areas inherited from the pre-existing dune system or the more wooded sections which have indirectly benefitted from the Forestry Commission's management policy. A wet ride near the edge of the Forest (22/388041), for example, is fringed by leggy growths of grey willow and the

old timber provides a suitable breeding medium for the rather scarce longhorn Strangalia quadrifasciata, which can be quite frequent in this northern section of the Forest. The localised leaf-beetle Mantura chrysanthemi has been swept from vegetation in this ride, and the large soldier-flies Stratiomys potamida and S. furcata have been recorded, perhaps as wanderers from an area of adjacent marshy ground (22/387042).

Within the Forest lies a pond (22/373039) which has been described by AE Stubbs as 'an outstanding site nationally' for snail-killing flies, with eighteen species recorded, including Colobaea bifasciella, Pherbellia dorsata, P. grisescens, P. nana, Pteromicra glabricula, Sciomyza simplex and Tetanocera punctifrons. These sciomyzid flies are at least partially dependent upon fluctuating water tables to strand their molluscan hosts (their larvae are parasitoids on various species of terrestrial and aquatic molluscs), and indeed this pond does exhibit markedly changing water levels, virtually drying out in some summers. It is possible that this specialised fauna was inherited from one of the more substantial water bodies that existed on the Burrows prior to afforestation (indeed the present pond may have been part- developed from one of these). The 'Sciomyzid Pond' was suffering badly from reed encroachment until conclusive management was recently undertaken by the Forestry Commission, without which it is conceivable that the distinctive fauna (and flora) would have been lost. New ponds have been created nearby as part of the Forestry Commission's very enlighted policy for the Pembrey Forest Nature Reserve, but it remains to be seen whether these ponds will be colonised by the sciomyzid flies. A modest dragonfly fauna is present, including the hairy dragonfly Brachytron pratense, the emperor Anax imperator and, once, a ruddy darter Sympetrum sanguineum was noted. Already a range of dragonflies has colonised the impressive new ponds and water boatmen Notonecta maculata share the pioneer mats of stonewort with various water-beetles. Acilus sulcatus, a large water beetle that is scarce in Wales, has been taken in another Forest pond (22/401011).

If the ride that skirts the 'Sciomyzid Pond' is followed seawards, then the naturalist is likely to see silver-washed fritillaries Argynnis paphia and colourful, day-flying scarlet tigers Callimorpha dominula in season, this being a regular location (22/376033) for both species. In the centre of the Forest, one ride which is aptly-called the 'Butterfly Ride' (22/395018) is noted for the diversity of its butterfly fauna, with 31 species recorded, though not all are present on a regular basis. Residents include silver-washed fritillaries, small blues Cupido minimus, brown argus Aricia agestis, green hairstreaks Callophrys rubi and with occasional springtime sightings of the now-rare pearl-bordered fritillary Boloria euphrosyne.

North-east of the 'Butterfly Ride* is another site (22/393027) of considerable invertebrate interest, comprising a broad sweep of former dune grassland (where conifer planting had failed) at the SW end of Pembrey Airfield and with an extraordinary variety of deciduous scrub and herbage around its edges adding to its richness. This site is notable for the aculeate fauna it supports, which includes the rare Coelioxys mandubularis, whilst other bees noted include the colourful Dasypoda altercator, the female of which has long golden hairs on the hind legs; it also occurs elsewhere in the Forest, as does the related, but duller coloured D. hirtipes. The tree wasp Dolichovespula sylvestris, which constructs a small ball-shaped nest in bushes, is another rather local inhabitant. There is a similarly diverse hemipteran fauna (favoured by the vegetational structure and sandy soils), with at least seventy species recorded recently during a brief visit, including the rare Adelphocoris seticornis, which is only known from a dozen or so British stations.

The moth fauna has been fairly well sampled by Barry Stewart and includes a wide range of species, such as the magnificent privet hawkmoth Sphinx ligustri. In Spring the delicate gold-coloured micro-moth Adella cuprella can be netted as it engages in dancing courtship flight around willow blossom.

Running through much of the length of the Forest, the main access ride (22/399024 etc.), being both open and sheltered, offers various niches for invertebrates. Species recorded here include the handsome weevil Pissodes castaneus, which is unwelcome from a forester's viewpoint as not only do the adults gnaw holes in the bark of conifer shoots but also the larvae burrow between the bark and the sapwood (Harde 1984). The pretty chequered-beetle Thanasimus formicarius, an effective predator of bark-beetles, on the other hand, is an ally

to the forester. It is gratifying to record that some dead timber - both standing and fallen - is left untouched by the Commission, for such old wood is of disproportionate value to all forms of wildlife, invertebrates included. Two recent discoveries in the Forest by Mark Pavett are also worthy of mention: the pine wood beetles Pediacus depressus and Arhopalus rusticus. There are few Welsh records of the latter, whose British stronghold is in Scotland.

The horseflies recorded in this area include Tabanus autumnalis, T. bromius and the rare Hybomitra muhlfeldi which, although it also occurs at nearby Ffrwd Fen (22/419024); is rare nationally, being known only from a handful of sites in South Wales and the Norfolk Broads (Falk 1991b). A less rare fly is the syrphid Didea fasciata which can be regularly seen in late summer on the flowers of wild parsnip; this hoverfly seems to favour pine plantations. Beating of conifers may produce the eyed ladybird Anatis ocellata, whilst the scarce, but spreading, cream-streaked ladybird Harmonia 4-punctata has also been noted. More easily overlooked because of its diminutive size and unobtrusive habits is the unusual little lacewing Psectra diptera, which has been swept from vegetation alongside the main forest track. The shield bug Elasmostethus tripustulatus, which is local in Wales, can be beaten from cypresses, particularly in spring and autumn.

Pembrey Forest, with its combination of bare sandy soils and warm climate, favours the thermophilous (heat-loving) aculeates, which have been recently studied by Mark Pavett. He notes, for example, that the pompilid Episyron rufipes is frequent in open sandy areas, preying on spiders, whilst Anoplius infuscatus has been found in damper situations around the edge of the new forest ponds (22/391032). Of the brilliantly-metallic jewel-wasps only Chrysis ignita, Hedychridium ardens and Trychrysis cyanea have been noted. A conspicuous ant (which is quite local in Dyfed) is Lasius fuliginosus, a shiny black gregarious species, often to be seen climbing trees in the neighbourhood of Pembrey Country Park (22/40-00- etc.).

(4) PEMBREY BURROWS (21/4199 & 22/4200 etc.)

Apart from the planting of Pembrey Forest, the biggest change to take place on Tywyn-Pembrey this century has been the rapid eastwards growth of what is now known as Pembrey Burrows (readers will recall that 'Pembrey Burrows' was the name also given to much of the remainder of the dune system). Photographs taken in the 1920's, for example, show open sea where the dunes and saltings now occupy many hectares and even since the late 1970's the amount of accretion at 'The Nose' (the Burrows eastern tip) has been significant, with many (lateral) metres of foredune having been laid down. As already intimated, these mobile conditions are of benefit to certain specialised invertebrates and help counter the successional problem that results in over-stabilisation elsewhere, and this - coupled with the broad expanse of saltmarsh - makes Pembrey Burrows a fine invertebrate site.

There has been some recent moth-trapping, with the very localised grass eggar Lasiocampa trifolii trifolii perhaps providing the most eminent record, but sand dart, Archer's dart, white- line dart Euxoa tritici and shore wainscot Mythimna littoralis have all been recorded of late. The robust swards of kidney vetch support what is probably Dyfed's strongest colony of small blues and here, as elsewhere on the Tywyn-Pembrey system, marbled whites are common in summer.

Eurynebria complanata, often in aggregations, can be seen under drift, perhaps in company with its 'stable-mates' Broscus cephalotes, Anisodactylus binotatus or Nacerdes melanura, whilst over the dunes Opatrum sabulosum, Melanimon tibialis and Phylan gibbus can be observed amongst swarms of the small dung beetle Aegialia arenaria or the regularly-occurring weevils Sitona griseus and Philopedon plagiatus. In high summer, the coleopterist cannot fail to notice the inelegant, noisy flight of the variously metallic-coloured chafer Anomala dubia. Sweeping of marram will reveal the presence of the carabid Demetrias monostigma whilst flowers of mignonette will be covered by an abundance of the all-yellow Cteniopus sulphureus, a mostly south-western beetle whose larvae live at the base of plants in dry habitats. Examination of sea rocket will provide specimens of the flea beetle Psylliodes marcida while more stable grassland areas will be frequented by the sooty-coloured Galeruca tanaceti in early autumn. Cidnopus aeruginosus and Agrypnus murinus are two regularly recorded click-beetles, but the rare Dichronychus equiseti has also been recorded on occasions, as have two local fungus- feeding beetles Leiodes ciliaris and L. furva and the scarce pollen-beetle Meligethes fulvipes.

The chrysomelids Chrysolina hyperici and Cryptocephalus aureolus are also noted with regularity. Copious accumulations of deadwood at 'The Nose' support the lesser stag-beetle Dorcus parallelipipedus, here at its only known vice-county station, and Cicindela maritima again hunts amongst the sand. The carrion-eating Phaleria cadaverina can be found under dead gulls. Of great concern to those seeking to conserve strandline invertebrates is the increasing desire to 'tidy-up' sandy beaches of various debris and this has occurred of late on Cefn Sidan beach. This is perhaps partly understandable with regard to those areas in close proximity to the Country Park and with unsightly non-degradable plastic rubbish, but natural debris, be it logs or seaweed, should be left in situ otherwise an important and distinctive faunal assemblage will be lost.

Diptera of note found on Pembrey Burrows and Saltings include Dolichopus cilifemoratus, Tetanops myopinus and the therevid Dialineura anilis, whose British stronghold is on the South Wales dunes. The northern belt of the Pembrey Dunes and adjoining hedgerows (22/427008) have yielded another rare therevid, Thereva fulva, caught by SJ Falk in August 1985. It is principally known from SE England and South Wales.

The eroding banks of the Saltings support characteristic beetles such as the carabids Bembidion laterale and Pogonus chalceus or the attractive rove-beetle Bledius spectabilis, whilst a search in drift material on Pembrey Beach (22/436002) may again reveal the presence of Armadillidium album. Loose stones on the nearby defunct Pembrey Breakwater (22/437000) shelter the delightful 'bristle millipede' Polyxenus lagurus and hordes of woodlice, including the 'Lusitanian* Porcellionides cingendus and Ligia oceanica. Predatory on woodlice is the spider Dysdera crocata and the local jumping spider Sitticus pubescens is also present. The spiders of the Burrows have been only imperfectly sampled but Synageles venator, Ceratinopsis romana and Argenna patula are known to be present.

(1) PENYBEDD WOOD & SWAN POOL DRAIN (22/4101)

Finally, although administered by the Forestry Commission as part of Pembrey Forest, Penybedd Wood is now an outlier separated from the main forest block by pasture. Penybedd Wood is planted on what are, perhaps, geologically the oldest dunes at Pembrey and is of easy access to the entomologist. Two uncommon orb-web spiders, the hump-backed Gibbaranea gibbosa and Araneus sturmi, have recently been noted. Scorched carpets Ligdia adusta have been moth-trapped and, by day, marbled whites, small blues and brown argus are among the more interesting butterflies to grace the grassy northern pathway. A remnant marshy area - the residuum of the once-extensive 'Landore' or 'Black Marsh' (22/413022) - supports the fenland hoverfly Tropidia scita, whilst patient searching of the ground layer will yield the slender groundhopper Tetrix subulata or the geographically-restricted (it is mostly south-western) millipede Leptoiulus belgicus. The 'Swan Pool Drain' which transects the pastureland between Penybedd and Pembrey Forest is home to the localised water-beetle Anacaena bipustulata and a mixed assemblage of dragonflies. The Swan Pool itself has disappeared. It was actually "two lake's close together...where there are plenty of eels and in the winter store of fowls" (Edward Llwyd, quoted in Fenton 1813). It is believed to have been somewhere in the vicinity of the Landore (Landau) or 'Black Marsh'. The destruction of this site, particularly when viewed with the drainage of the five ponds on the Burrows, has not only meant the loss of the wild swans and white-fronted geese that formerly wintered here (Vaughan 1970) but also the unknown legions of fen and pool invertebrates.

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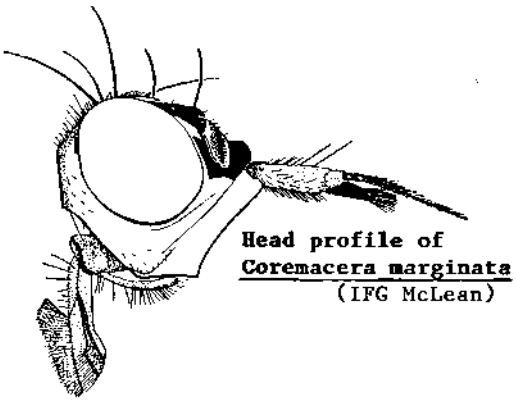
DIPTERA

AN INTRODUCTION TO THE SNAIL-KILLING FLIES (Diptera: Sciomyzidae) OF CEREDIGION

-AP FOWLES

Sciomyzids are a relatively small but distinctive family of flies with fascinating life-histories and certain traits which make them useful indicators of site quality for nature conservation. In general, they are small to medium-sized black or yellowish- brown flies with porrect, three-segmented antennae.

Many species have conspicuous and attractive wing- markings and most of the larger species, at least, have striking silvery-white facial cheeks. The recent atlas of British sciomyzids (Ball & McLean 1986) listed sixty-four species but there have been several additions in the last few years and the British fauna currently consists of approximately seventy species.



Head profile of Coremacera marginata (IFG McLean)

Snail-killing flies derive their family name from the habits of their larvae. The larval biology of most British flies is poorly-known but sciomyzids are of potential value as biological controls of viral diseases which are transmitted through snails and hence they have been comprehensively studied in many parts of the world. Exceptions will be discussed below but essentially most species are predators of aquatic or terrestrial snails. The larvae of the smaller British species (chiefly Pherbellia spp. and Tetanura pallidiventris) and the early instar larvae of the larger sciomyzids behave as parasitoids. They initially feed on the tissues of the living snails but eventually, after a period of some days, the snail succumbs and the larva continues to feed on the dead tissue. The true parasitoids then pupate, sometimes in the shell of the host but more usually in nearby vegetation, whilst the larger species become predators and move on to seek another snail on which to continue their development. Depending on the size of the host, each larva may consume up to thirty individual snails before pupating. Many species have larvae which are highly-specialised for an aquatic mode of life, swimming in slow-moving or stagnant water in search of their prey. Others are terrestrial and either feed on land snails or species of aquatic and semi-aquatic snails which are exposed, as a result of seasonal fluctuations in water-table for instance. It is clear that Renocera striata and Ilione lineata are mainly, if not exclusively, predators of pea mussels (Sphaeriidae) and other species are closely associated with amber snails (Succinea spp. etc.). However, most studies on larval biology have been carried out in the laboratory and, although some species show a degree of host-specificity, this may not be the case in the wild. It is likely that most sciomyzids are fairly catholic in their choice of prey.

There are three main exceptions to this generalised account. Larvae of Tetanocera elata (and probably also Euthycera fumigata) are slug-killers. At first the larva feeds only on the slug's mucus but as it grows it begins to feed on living tissue and eventually kills the slug. Anything up to ten slugs may be killed as the larva matures. By contrast, the larvae of Antichaeta species are predators on the egg-masses of snails of the genera Lymnaea and Succinea, devouring the eggs and developing embryos for the three weeks or so before pupating. Finally, it has been recently discovered in France that the sciomyzid Pelidnoptera nigripennis is a predator of woodland millipedes. However, Pelidnoptera species are distinct from other sciomyzids in several aspects of their adult morphology and it seems most likely that they are not members of the Sciomyzidae afer all (IFG McLean, pers. comm.).

Few of the British snail-killing flies are geographically-restricted (cf. Fig 2 in McLean 1990) and the abundance or scarcity of most members of the family seems to be much more closely linked with the availabilty of suitable habitat. This is relatively unusual amongst British insects, which are characteristically more diverse in the warmer climate of southern England. This is because the family as a whole is adapted to cool, temperate regions and also because of their ability to utilise a wide range of host species. Combined with the fact that molluscs

are recognised indicators of site stability and quality (Kerney & Stubbs 1980), this makes sciomyzids ideally placed to serve as indicator species of habitats of conservation value, particularly wetlands but also woodlands and dry grasslands. As predators and parasitoids, dependent upon the availability of their hosts, they are rarely abundant at a particular site and hence adverse effects upon their habitat can easily cause local extinctions. Pollution of the water-body, decimating populations of freshwater snails, will have catastrophic results on the local sciomyzid fauna, as will the burning of wetland vegetation or the drying-out of bogs and fens by water-abstraction or drainage. There are certainly deficiencies at present in our knowledge of the susceptibilty of different species to such events but increased recording (backed up with habitat data) should make the position clearer.

The recording of sciomyzids in Britain generally has taken a long while to gain popularity, even though they were the first family of flies to be covered by a national recording scheme at BRC, Monks Wood. It is only in the last decade or so that records have begun to accumulate to a point where the national status of individual species can be adequately assessed. The history of recording in Wales has always been poor and in Ceredigion is almost non-existent. The earliest known specimen is a Pherbina coryleti in the UCW Aberystwyth insect collection which was taken by 'C. M.' at Capel Bangor (22/68) on 16 June 1939. The Claude Morley Collection in the Ipswich Museum contains a specimen of Dictya umbrarum (the only example of this scarce species known from Ceredigion) taken at Capel Bangor on 20 June 1939. In 1954 GGE Scudder (1956) recorded Pherbellia albocostata on the north-east bog of Cors Caron (22/6963). Alan Stubbs recorded Pherbellia dubia at Hafod Peris (22/552672) on 13 May 1968 and Renocera pallida on the edge of Cors Fochno (22/650908) on 23 May 1968. Thus it was that the first account of the British distribution of sciomyzids (Stephenson & Knutson 1970) could only list three species for Cardiganshire - Ilione albiseta (the source of which is unknown) plus P. albocostata and R. pallida. Nothing then happened until July 1984 when Ian McLean visited Rhos Glwydwern (22/4950), Rhos Glyn-yr-helyg (22/4951) and Rhos Llawr-cwrt (22/4149). He collected nine species, including the first Welsh record of Renocera striata, but this information did not find its way into the 'Preliminary Atlas' (Ball & McLean 1986). Three species are mapped there as occurring in Ceredigion. In subsequent years recording has progressed substantially, my own efforts being added to by those of Dave Boyce, Pete Kirby and further visits by Alan Stubbs and Ian McLean. In 1986 and 1987, the Nature Conservancy Council's Welsh Peatland Invertebrate Survey sampled 19 sites in the county and their water- traps provided 123 records of sciomyzids from fourteen of these.

Currently there are 349 records of sciomyzids in Ceredigion for a total of thirty-five species, although it is conceivable that another ten or so species await discovery. For comparison, Stephenson and Knutson (1970) listed 42 species for the vice-county of Glamorgan but that list is also probably incomplete. On the basis of current records (although this will be biased to some extent by the sampling methods of the Welsh Peatland Invertebrate Survey) the ten commonest species in Ceredigion are as follows:

1. Tetanocera ferruginea
2. Pherbina coryleti
3. Ilione albiseta '
4. Tetanocera elata
5. Tetanocera arrogans
6. Sepedon sphegea
7. Tetanocera robusta
8. Tetanocera hyalipennis
9. Ilione lineate
10. Limnia paludicola

There are two Red Data Book (Antichaeta analis and Tetanocera freyi) and six Nationally Notable (Dictya umbrarum, Pherbellia dorsata, P. griseola, Psacadina verbekei, Renocera striata and Tetanocera punctifrons) species recorded from Ceredigion. Few sites have been comprehensively worked for sciomyzids and the emphasis so far has been strongly on wetlands. The Welsh Peatland Invertebrate Survey has provided a wealth of useful data but it is clear that static traps only catch a limited range of species (in particular Pherbellia spp. seem to be poorly sampled by water-traps). There is a distinct woodland fauna of snail-killing flies which is virtually unknown in the county and none of the sixty-two sites which have provided

records are mature woodlands. There are also possibilities for adding to the county list at Ynyslas Dunes (22/609935).

It is no real surprise that the three sites in the county with the highest number of species have all been surveyed by Ian McLean and/or Alan Stubbs. The top site in Ceredigion (to date) is Banc-y-mwldan (22/1948, 22/2048), a series of flush fens (varying in trophic status) with adjacent carr woodland. This was comprehensively investigated in July 1987 and also visited in May 1990. Sixteen species of sciomyzids have been recorded on the site, including Psacadina verbekei and Tetanocera punctifrons. Pentwd (22/182452) and Gwaun Garthenor a Llanio- isaf (22/636557) are both floodplain fens on the banks of the Teifi and each has fourteen species recorded. They are very different sites, however, as Pentwd is a coastal marsh with extensive stands of Phragmites and Typha whilst Garthenor is at 140 metres a.s.l. and 70 kilometres up the Teifi and is a mixture of poor-fen and carr habitats. Pentwd has Antichaeta analis and Psacadina verbekei whilst Garthenor has Pherbellia dorsata and Tetanocera freyi (both unconfirmed females). Both Pentwd and Garthenor were sampled by the Welsh Peatland Invertebrate Survey as well as being the subject of field surveys. At each site the water-traps produced ten species, the highest total captured at any single site in the county during their sampling programme. It is also worth bringing attention to Comin Esgairmaen (22/651649) which yielded nine species in the water-traps, including both of the county's Red Data Book species. This indicates that the valley fen of Esgairmaen is an important site for snail-killing flies in the county and a field survey by an experienced dipterist could produce further interesting results.

Sciomyzids are usually on the wing from early summer until mid-October, although a few species overwinter as adults and appear in early Spring. They are most often found by sweeping vegetation, particularly in fens, but some species, such as Pteromicra angustipennis, Antichaeta brevipennis and Colobaea spp., frequently occur low down amongst tussocks and rank herbage and are best found by hand-searching with a 'pooter' at the ready. I have been unable to trace any account of adult ecology in the literature but they can sometimes be found sitting on umbel flowers or the foliage of tall fen vegetation or bushes. A few species, such as Sepedon sphegea and Coremacera marginata, are sufficiently distinct to be identified in the field by the general naturalist. With experience, several more species can also be recognised with ease but the majority have to be checked under a microscope and some will require examination of the male genitalia. The standard identification work has been Knutson & Lyneborg (1965), supplemented with notes in the Sciomyzidae Recording Scheme Newsletter (McLean 1983). Rozkosny (1984) provides a full account (in English) of the snail-killing flies of Scandinavia and this covers all but one member of the British fauna. Much of the information on the biology of sciomyzids included in this review is taken from Rozkosny, with additional material from Ball & McLean (1986) and Falk (1991).

I am grateful to Stuart Ball, Dave Boyce, Pete Kirby, Ian McLean and Alan Stubbs for providing records and information and Ian McLean kindly supplied the illustration of the Coremacera head profile.

SYSTEMATIC LIST

Pherbellia albocostata (Fallen) - A widely distributed British species, occurring in damp woodlands where the larvae are parasitoids (and possibly predators) of small terrestrial snails, eg. Discus rotundatus and Cochlicopa lubrica. There is only a single record for Ceredigion: Scudder (1956) reports the species from the north-east bog of Cors Caron (22/6963) on 5 June 1954. [1 record from 1 site].

Pherbellia cinerella (Fallen) - This is a common fly in Britain with broad habitat tolerances, inhabiting wetlands, dry grassland and saltmarshes. The larvae are parasitoids of a wide range of terrestrial and aquatic snails. In Ceredigion P. cinerella is known from dune grassland at Gwbert (22/164484) and Ynyslas (22/610939) and from the shingle beach at Tanybwlch (22/5780). [3 records, 3 sites].

Pherbellia dorsata (Zetterstedt) - The only county record is a probable female taken by Ian McLean during the DIG field meeting to Gwaun Garthenor (22/635556) on 5 July 1986 (Fowles 1986). Males are. required to confirm identification. P. dorsata is a parasitoid of the ramshorn

snail Planorbis planorbis, although it is not clear whether it is entirely specific to this host, and is typically found in fens and grazing levels. It is a Nationally Notable species known chiefly from East Anglia and with scattered records elsewhere in southern Britain, [1 record, 1 site].

Pherbellia dubia (Fallen) - Common in a variety of terrestrial habitats but most frequently encountered in damp woodlands. The larvae are parasitoids of a wide range of the smaller land snails (Discus, Oxychilus etc.). Recorded on two occasions in the county - at the head of Cwm Peris (22/552672) on 13 May 1968 and on the floodplain fen of the Rheidol at Glanrafon (22/615804) on 11 August 1991. [2 records, 2 sites].

Pherbellia griseola (Fallen) - Widespread but uncommon throughout Britain, this Nationally Notable species has been recorded from two localities in Ceredigion. P. griseola is known from the marginal lagg of Cors Caron (22/690635) and a backwater fen on the Teifi near Maesypwll (22/564466) (Fowles 1990). The larvae have been reported as parasitoids of freshwater snails of the genus Lymnaea in a variety of wetland habitats with permanent standing water. [3 records, 2 sites],

Pherbellia schoenherri (Fallen) - A specialised parasitoid of amber snails Succinea spp., occurring widely in Britain at the edge of water-bodies and in fens. The few records from Ceredigion reflect this situation with adults recorded from base-rich flushes, willow carr, river fen and upper saltmarsh. [8 records, 7 sites].

Pherbellia ventralis (Fallen) - Only known from the base-enriched flush fens of Banc-y-mwldan (22/200489) where it was recorded on 13 July 1987. P. ventralis is a common British species which is a parasitoid of aquatic and semi-aquatic snails in a variety of wetland habitats. [1 record, 1 site].

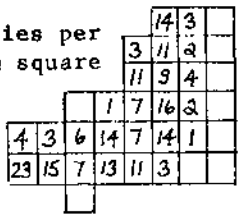
Pteromicra angustipennis (Staeger) - A local but widely distributed species in Britain, usually occurring amongst lush vegetation in fens and marshes where the larvae predate aquatic and semi-aquatic snails. Ceredigion records are from mesotrophic fens and flushes. [7 records, 7 sites].

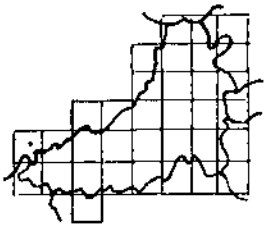
Tetanura pallidiventris Fallen - Associated typically with damp woodlands, the larvae are parasitoids of small terrestrial snails. However, the two Ceredigion records are from wetland habitats. The Banc-y-mwldan (22/196485) specimen presumably originated from the adjacent valley woodland but the watershed mire of Figyn Blaenbrefi (22/714546) is an unexpected habitat. [2 records, 2 sites].

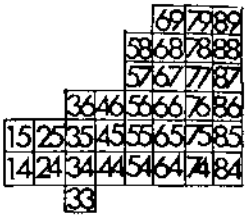
Antichaeta analis (Meigen) - Chiefly northern in distribution with most records from the Scottish Highlands, but also occurring in a handful of scattered localities elsewhere in Britian. Antichaeta analis is an inhabitant of fens and marshes and the larvae are thought to develop exclusively as predators on the eggs of the freshwater snail Lymnaea truncatula. The Welsh Peatland Invertebrate Survey recorded two specimens in water-traps - at Pentwd Marshes (22/183452) and on the valley fen of Comin Esgairmaen (22/651649). [2 records, 2 sites].

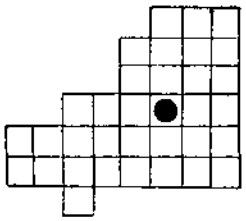
Coremacera marginata (F.) - Widespread in England and Wales south of the Mersey-Humber and rare further north. Coremacera lives in dry, usually calcareous, grasslands where the first instar larva is a parasitoid in terrestrial snails and then predates at least one other snail before pupating. Laboratory studies have shown a preference for Discus rotundatus and Cochlicopa spp. but other hosts may be chosen in the wild. This attractive fly has been recorded from coastal grassland on the cliffs at Gwbert (22/162492), Penbryn (22/292524) and Clarach (22/586835), and from a reedbed next to the railway line at Glandyfi (22/696971). [5 records, 4 sites]

Dictya umbrarum (L.) - Typically found on peaty flushes in northern and western Britain, with outlying populations on the valley mires of the New Forest and the Dorset heaths. The larvae are aquatic predators of freshwater snails, particularly Lymnaea spp. This Nationally Notable species is represented in the county only by a single specimen in the Claude Morley Collection at Ipswich Museum which was taken at Capel Bangor (22/68) on 20 June 1939. [1 record, 1 site].

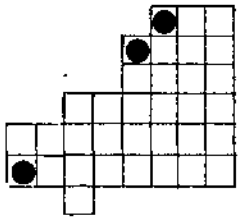




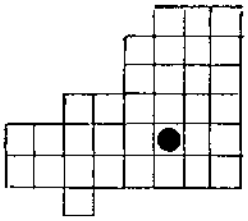




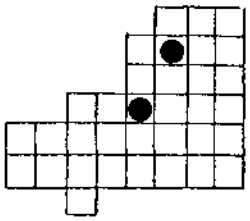
Pherbellia albocostata



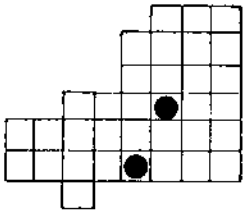
Pherbellia cinerella



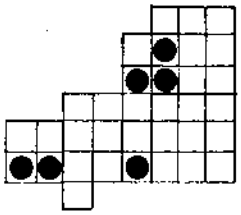
Pherbellia dorsata



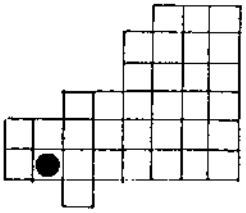
Pherbellia dubia



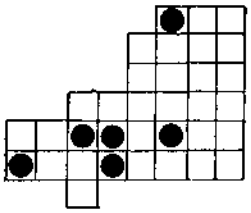
Pherbellia griseola



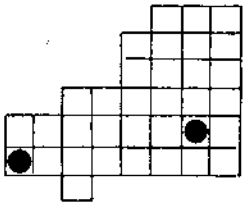
P. schoenherri



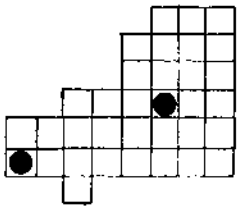
P. ventralis



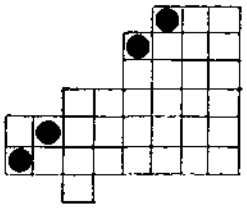
Pteromicra angustipennis



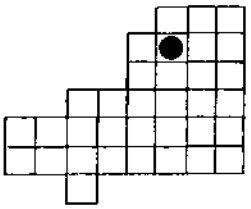
Tetanura pallidiventris



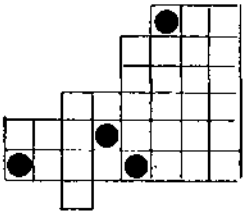
Antichaeta analis



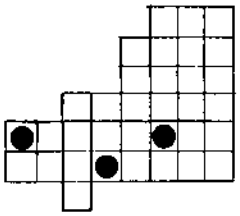
Coremacera marginata



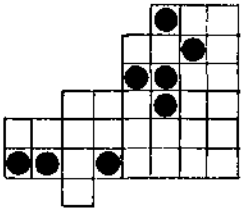
Dictya umbrarum



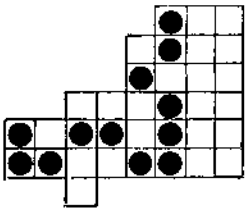
Elgiva cucularia



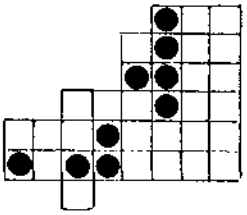
Euthycera fumigata



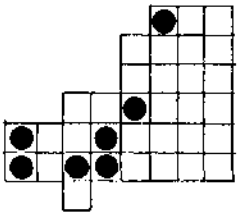
Hydromya dorsalis



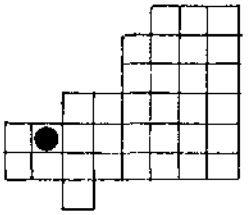
Ilione albiseta



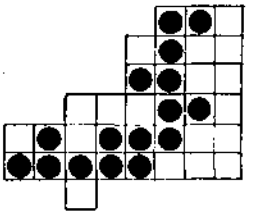
Ilione lineata



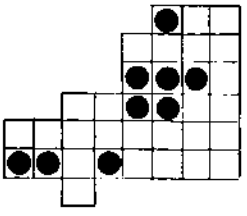
Limnia paludicola



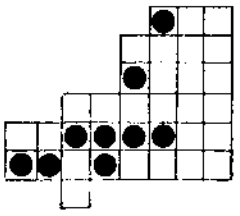
Limnia unguicornis



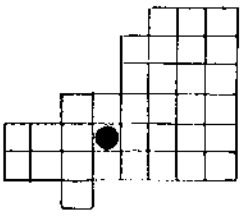
Pherbina coryleti



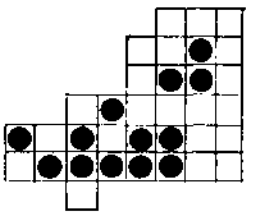
Psacadina verbekei



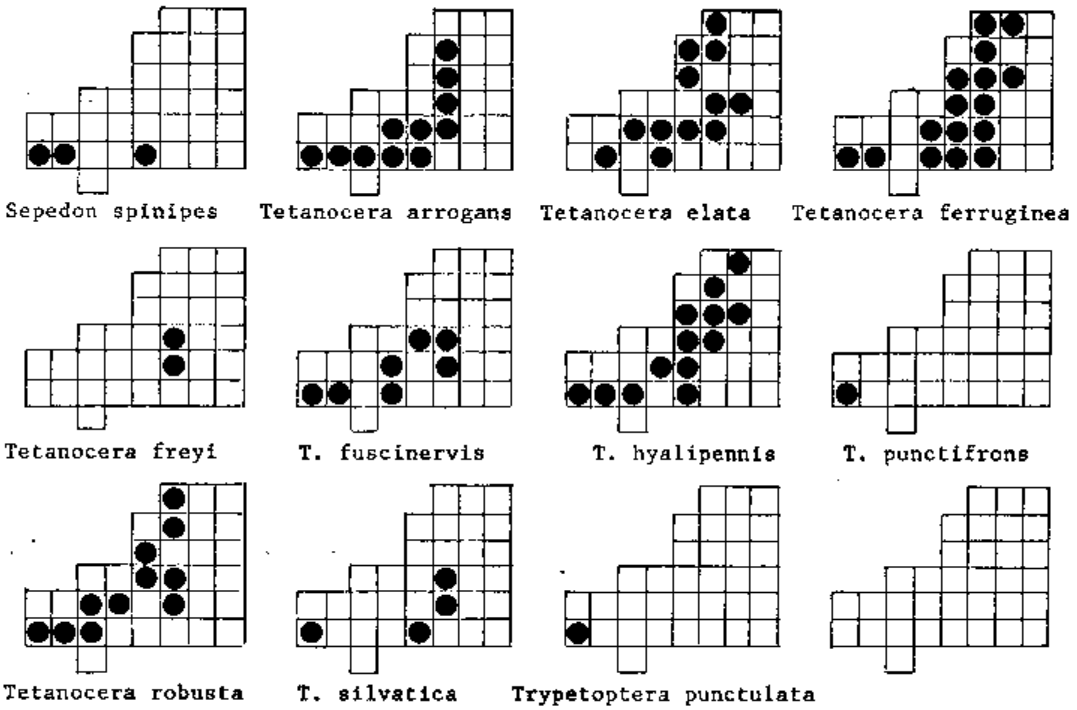
Renocera pallida

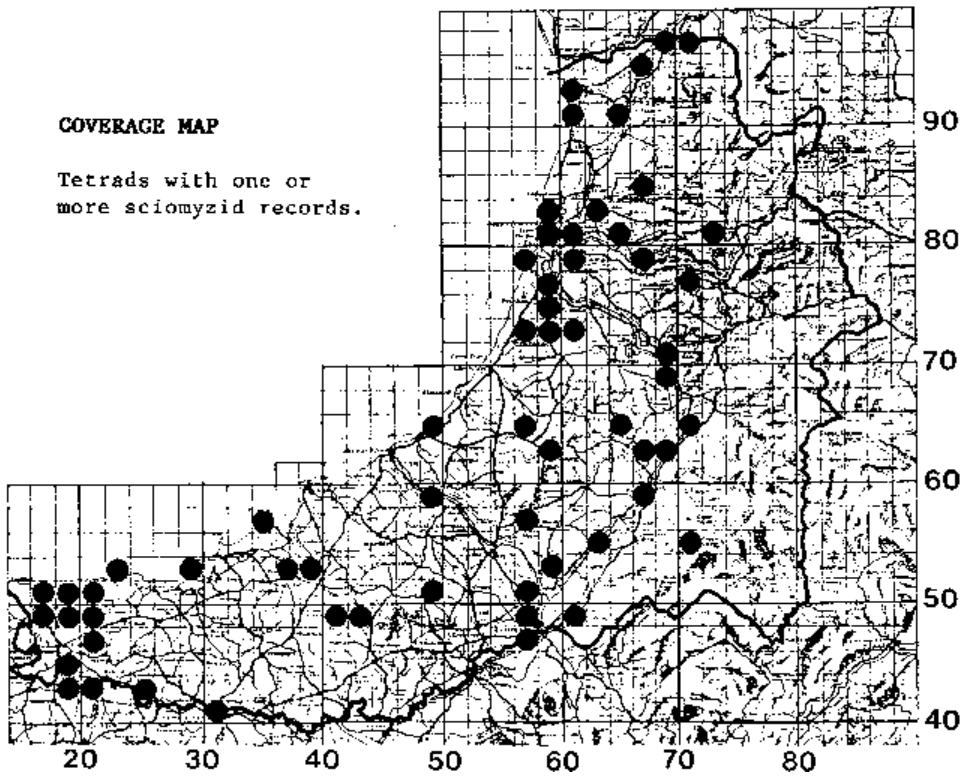


Renocera striata



Sepedon sphegea


Sepedon spinipes
Tetanocera arrogans
Tetanocera elata
Tetanocera ferruginea
Tetanocera freyi
T. fuscinervis
T. hyalipennis
T. punctifrons
Tetanocera robusta
T. silvatica
Trypetoptera punctulata


COVERAGE MAP
Tetrads with one or more sciomyzid records.
90
80
70
60
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Elgiva cucularia (L.) - A common and eurytopic wetland species in Britain, the few records for Ceredigion indicate a preference for mesotrophic fens. The larvae are aquatic predators of a variety of freshwater snails. [4 records, 4 sites].

Euthycera fumigata (Scopoli) - The larval biology of this species is unknown, although other species of Euthycera in Europe are believed to be parasitoids of slugs. Widely distributed in a range of habitats in England and Wales, occurring in fens, woodlands and dry calcareous grasslands. Ceredigion records are from poor-fen habitats and from seepages on the sandy cliffs at Mwnt (22/194518). [3 records, 3 sites].

Hydromya dorsalis (F.) - One of the commonest British sciomyzids, inhabiting a broad range of wetland situations. The larvae are initially parasitoids and then predators of a variety of aquatic snails. Base-rich fens and mesotrophic flushes are seemingly favoured in Ceredigion and Hydromya has also been taken on soft-rock cliff seepages at Gwbert (22/162492). [12 records, 10 sites].

Ilione albiseta (Scopoli) - Occurs in a variety of wetland habitats, including bogs, and two males taken by the Welsh Peatland Invertebrate Survey in water-traps on the raised mires of Cors Caron (22/680630 and 22/695638) are the only sciomyzid records from such mollusc- poor habitats in Ceredigion. Most records, however, are from mesotrophic fens and flushes. [24 records, 18 sites].

Ilione lineata (Fallen) - The larvae of this fly are entirely aquatic and are active predators of pea mussels (Sphaeriidae). They tend to favour acidic peatlands although Ceredigion localities also include the dune slacks at Ynyslas (22/610939) and shallow flushes in rhos pasture. [16 records, 14 sites].

Limnia paludicola Elberg - Ceredigion records for this common British species range from the dune slacks at Ynyslas (22/610939) to upland valley mires as at Cors Llyn Farch (22/599637) and adults have also been taken in water-traps in damp pasture at Coedmore (22/202431). The larval biology is unknown but it is probable that L. paludicola is a predator of aquatic and semi-aquatic snails. [17 records, 11 sites].

Limnia unguicornis (Scopoli) - Probably as common in Britain as paludicola but the two species have only been separated comparitively recently and distributional patterns are unclear. However, it is apparent that unguicornis is much scarcer than paludicola in Ceredigion. There is only a single county record, a female taken on coastal grassland at RAE Aberporth (22/238522) during the DIG field meeting on 15 July 1989 (Fowles 1989). The larvae are predators of semi-aquatic snails. [1 record, 1 site].

Pherbina coryleti (Scopoli) - Widespread in Britain and one of the commonest sciomyzids in Ceredigion. This is a conspicuous species and the records to date strongly suggest an affinity for mesotrophic fens in the county, with no records from the acidic valley fens of mid-Ceredigion. The larvae are predators of both aquatic and terrestrial wetland snails. [41 records, 24 sites].

Psacadina verbekei Rozkosny - A relatively uncommon species though fairly widespread in Britain south of the Humber. The larvae occur in aquatic margins where they are predators of freshwater snails, possibly exclusively Lymnaea spp. Chiefly an inhabitant of mesotrophic fens and marshes, this Nationally Notable species has been recorded from Banc-y-mwldan (22/200489), Pentwd (22/183451) (Fowles 1991), Cors-y-clettwr (22/421494), Rhos Fullbrook (22/667627), Cors Caranod (22/566647), Cors-y-sychnant (22/698689), Rhos Bwlch-y-rhandir (22/593732), Rhos-y-fforest (22/618729), Llyn Rhosrydd (22/705761) and Cors Afon Ddu (22/667942). [12 records, 10 sites].

Renocera pallida (Fallen) - Recorded from a range of fen habitats in Ceredigion, this is a common species nationally, being particularly associated with carr. The larval biology is unknown but related North American species are predators of pea mussels (Sphaeriidae). [11 records, 10 sites].

Renocera striata (Meigen) - A Nationally Notable sciomyzid with a northern distribution in Britain, mainly in the Spey valley and scattered localities in north-west England and Wales. The first Welsh record was a female taken by Ian McLean on the wet pasture of Rhos Glyn- yr-helyg (22/49-51-) on 4 July 1984. The larvae are probably aquatic predators of pea mussels. [1 record, 1 sitej.

Sepedon sphegea (F.) - Although widely distributed in Britain, this handsome blue-black fly with red legs is rather local and usually occurs around the margins of mesotrophic water-bodies. The larvae are aquatic predators of freshwater snails. Ceredigion records are from the marginal fens of lowland ponds and lakes and sphegea has also been swept from the banks of the Teifi at Cellan (22/613498). A less typical site for the species is the mesotrophic flush fens of Cors- y-clettwr (22/421494) where several specimens were swept on 15 Sept 1991. S. sphegea is usually encountered in small numbers but at the Alltybwla oxbow (22/255422) on the Teifi literally hundreds were present around the margins of this shallow, silty pool on 20 August 1991. [17 records, 15 sites].

Sepedon spinipes (Scopoli) - The Ceredigion records are from mesotrophic fens in the Teifi valley, on the backwaters of Maesypwll (22/564466), the oxbow at Alltybwla (22/255422) and the floodplain of Pentwd (22/183452). It is a southern species in Britain with few records north of the Humber, occurring in a range of non-acidic wetlands. The larvae are aquatic predators of freshwater snails, including Planorbis spp. [5 records, 3 sites].

Tetanocera arrogans (Meigen) - A common species which occurs in a variety of wetland habitats in 'Ceredigion, although generally in mesotrophic fens. Terrestrial or stranded aquatic snails are the prey for the larvae. 120 records, 15 sites],

Tetanocera elata (F.) - Probably the commonest British sciomyzid and certainly the species with the least-demanding habitat requirements, occurring in wetlands, damp woodlands and grasslands wherever slugs are found. Young larvae feed on the mucus of many different types of slugs without harming their host but as they develop they become aggressive predators, immobilising their prey with a toxic injection. In Ceredigion adults have been recorded from a variety of peatland habitats and on unimproved grassland at Coedmore (22/202431) and Gweunydd Pendinas (22/584807). [23 records, 16 sites].

Tetanocera ferruginea Fallen - Adults of this common species can be found in a wide range of wetlands where the larvae are predators of aquatic snails. Ceredigion records reflect these broad habitat tolerances, including localities such as the calcareous flush fens of Banc-y-mwldan (22/200489) and the upland acidic valley fen of Cors Llyn Farch (22/597637). [40 records, 26 sites].

Tetanocera freyi Stackelberg - A little known Red Data Book species recorded from widely scattered sites throughout Britain. There is no information available on larval biology. The Welsh Peatland Invertebrate Survey collected a male on the valley fen at Comin Esgairmaen (22/651649) in July 1987 and a probable female (males are needed for certain identification) on the floodplain fen at Llanio-isaf (22/637558) in Sept 1987. [2 records, 2 sites].

Tetanocera fuscinervis (Zetterstedt) - Very scarce south of the Thames but widespread further north in a *variety of* wetland habitats. The larvae are aquatic predators of freshwater snails, possibly acting as parasitoids in the early instars. Reasonably common in Ceredigion and recorded from a similar range of sites to T. ferruginea. [16 records, 9 sites],

Tetanocera hyalipennis Roser - A common British species which occurs typically at the margins of open water, particularly where there is carr woodland. The larvae are aquatic predators of freshwater snails. The Ceredigion localities include the lake fens at Nanteos (22/614783) and Falcondale (22/569498) and the valley fen of Cors Caranod (22/567648). [17 records, 14 sites],

Tetanocera punctifrons Rondani - A Nationally Notable species which occurs throughout Britain but at widely scattered sites. The larval biology is unknown and there are no clear habitat preferences amongst the available British records, although carr woodland is often present. The only Ceredigion locality is the flush system of Banc-y-mwldan (22/196485) where T.

punctifrons has been taken by Ian McLean and Alan Stubbs on 13 July 1987 (Fowles 1987) and 19 May 1990. [2 records, 1 site].

Tetanocera robusta Loew - Common throughout Britain in a wide range of wetland habitats. The larvae are aquatic predators of freshwater snails. Widespread in Ceredigion in mesotrophic fens and also recorded from relatively nutrient-poor sites such as the basin fen of Rhos Rydd (22/575736). [21 records, 14 sites].

Tetanocera silvatica Meigen - Ceredigion records are for mesotrophic fens, perhaps in association with carr woodland, and in Britain this is a common species of wetlands and damp woodlands. The larvae are terrestrial predators of exposed aquatic and semi-aquatic snails. [7 records, 5 sites].
Trypetoptera punctulata (Scopoli) - The only county record of this distinctive and nationally common fly is from the soft-rock cliffs of Creigiau Gwbert (22/162492), where Alan Stubbs recorded the species on 14 July 1987. Nothing is known of the larval biology and adults occur in a very wide range of habitats, although base-rich sites are favoured. [1 record, 1 site].

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