



Initial overview of the invertebrate interest of Ennerdale



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Summary

A baseline survey of the invertebrate interest of the Ennerdale valley in 2022 was commissioned by the Wild Ennerdale Partnership. Information was specifically requested on the status of the Bilberry Bumblebee (*Bombus monticola*) as a potential indicator of the impact of heathland restoration work. The Northern Silver Stiletto fly (*Spiriverpa lunulata*) was selected as a representative of the specialist invertebrate community of exposed riverine sediments (ERS) on the River Liza. A survey for wood ants in the valley was also included in the specification. Other invertebrates were to be recorded incidentally while surveying the target taxa.

This is not an exhaustive or comprehensive report of the invertebrate habitats and species in Ennerdale. The survey was approached as an initial scoping study, with a view to flagging up important habitats and species for further, more detailed study and monitoring.

781 records of 351 invertebrate taxa were collected during the survey, indicating that the diverse habitats of the Ennerdale valley support a broad range of invertebrate species. Natural processes operating in the valley enable invertebrate populations to exploit dynamic systems where habitats develop, shift and renew in a natural way. These habitats were found to support 24 Nationally Rare, Scarce or Priority Species of insect and a further 65 regionally scarce species. Further survey will certainly discover additional species of conservation concern in the valley.

The Northern Silver Stiletto (*Spiriverpa lunulata*), appears to have a strong population on the River Liza. Adults were present at several points on the shingle banks within the deposition zone of the river, between Woundell Beck and High Beck. Larvae were found in fine sands and gravels on shingle bars at four locations and good numbers of adults were observed engaging in courtship behaviour.

The Bilberry Bumblebee (*Bombus monticola*) was recorded widely in the valley bottom and sides, from April through to August. A further 11 bumblebee species were recorded in the valley during the survey, including two tentatively identified cryptic species. Bumblebees were generally widely, but sparsely, distributed in the valley appearing in numbers only when flower-rich resources were present, such as at willow blossom in April, or in the floriferous Gillerthwaite pastures and at thyme flowers carpeting the river shingles in June. The blooming heather in late summer is also important to bumblebee populations, but the bees were more dispersed in those situations.

Although no evidence of mound-building wood ants was found during the survey, 6 other species of ant were recorded. One species of wood ant (*Formica* sp.), *Formica lemani*, is widespread in the open woodlands and on the fellsides of the valley. The distinctive nest mounds of Yellow Meadow Ants (*Lasius flavus*) are widespread in the valley bottom pastures and on the lower fellsides. These nest mounds are indicative of long-established unimproved grassland and create their own topography and soil structure, affecting vegetation and invertebrate communities in the immediate vicinity. Several myrmecophilous insects were found at various locations during the survey, indicating long-established invertebrate communities associated with various species of ant in the valley.

Extensive grazing with cattle is having a positive impact on the invertebrate value of habitats in the valley through the maintenance of sunny glades in the forest, greater diversity of vegetation structure and an increase in the flower resource. Populations of dung feeding insects are also benefiting from organic farming methods and the absence of worming pesticides in the cattle.

Of the locations visited, Side Wood returned the greatest number of different taxa (123) in the survey. The extensive shingle banks of the River Liza also support a rich invertebrate fauna (115 species), including a number of specialist species. The unimproved, flower-rich pastures at High Gillerthwaite provide a third area of significant value to invertebrate communities (95 species).

15 invertebrate species of high or total fidelity to exposed riverine sediments (ERS) were recorded during the survey. The shingle banks of the unconstrained River Liza are an exceptional example of exposed riverine sediments on a high velocity, upland spate river. The deposits of coarse stony sediment with braided channels are possibly unsurpassed as an example of their type in England and they support a significant specialist invertebrate community. Low numbers of organically farmed grazing stock mean that these sediments are not subjected to the harmful levels of compaction, dunging and pesticide run-off that detrimentally act on these invertebrate communities on many other rivers.

The semi-natural woodland of Side Wood supports an interesting community of woodland insects with their different life stages variously supported by a good supply of dead wood, coarse woody debris and nectar-rich blossom resources. Regeneration of native tree species within and around the wood will benefit the invertebrate fauna.

Flower-rich marshy pasture at Gillerthwaite has previously received an introduction of the Nationally Vulnerable, Marsh Fritillary butterfly and this population appeared to be very healthy in 2022 with numerous adult butterflies encountered in the fields here, and also on Gillerthwaite Mire a little further up the valley, to which the species has presumably spread under its own steam. Many other rare or scarce butterflies and other insects were recorded in the Gillerthwaite pastures during the survey, encouraged by the extensive cattle grazing regime.

Wild Ennerdale

The Wild Ennerdale Partnership is a collaboration of The National Trust, Forestry England, United Utilities and Natural England. The partnership manages the Ennerdale Valley in West Cumbria as the Wild Ennerdale National Nature Reserve. Its purpose is to implement landscape scale management with a focus on public benefits. The project vision is “to allow the evolution of Ennerdale as a wild valley for the benefit of people, relying more on natural processes to shape its landscape and ecology”.

The Wild Ennerdale partnership takes management decisions based on a series of guiding principles. These include:

- To promote nature recovery of habitats to better sustain healthy wildlife, functioning ecosystems and a more resilient ‘future natural’ landscape fit for purpose in the face of climate and biodiversity challenges, thus supporting the Lawton principles of ‘more, bigger, better and joined up’.
- Give freedom for natural processes to enable more robust, resilient and better functioning ecosystems to develop at a landscape scale.
- Celebrate and apply the learning experiences that all partners gain from their involvement in the process.

This commissioned invertebrate baseline is part of making informed decisions on the impact of current actions and future priorities and ensuring that the guiding principles and vision safeguard the invertebrate interest of the valley.

The project establishes important evidence of the approach advocated in the Government 25 Year Plan for The Environment, land use change and of low intensity land management. This can be used to demonstrate alternative land uses and models of upland management across The Lake District and elsewhere in England. The project will demonstrate and showcase the principles of Nature Recovery in Cumbria.

Introduction

A baseline survey of the invertebrate interest of the Ennerdale valley in 2022 was commissioned by the Wild Ennerdale Partnership. Information was specifically requested on the status of the Bilberry Bumblebee (*Bombus monticola*) in the valley as an indicator of the impact of heathland restoration work. The Northern Silver Stiletto fly (*Spiriverpa lunulata*) was selected for study as a representative of specialist Exposed Riverine Sediment (ERS) invertebrate communities on the River Liza. As a result of previous reports of wood ant (*Formica sp.*) nest mounds in the forest, a study of the distribution of any wood ants in the valley was also included in the specification. Other invertebrates were to be recorded incidentally in the process of surveying the target taxa.

Methodology

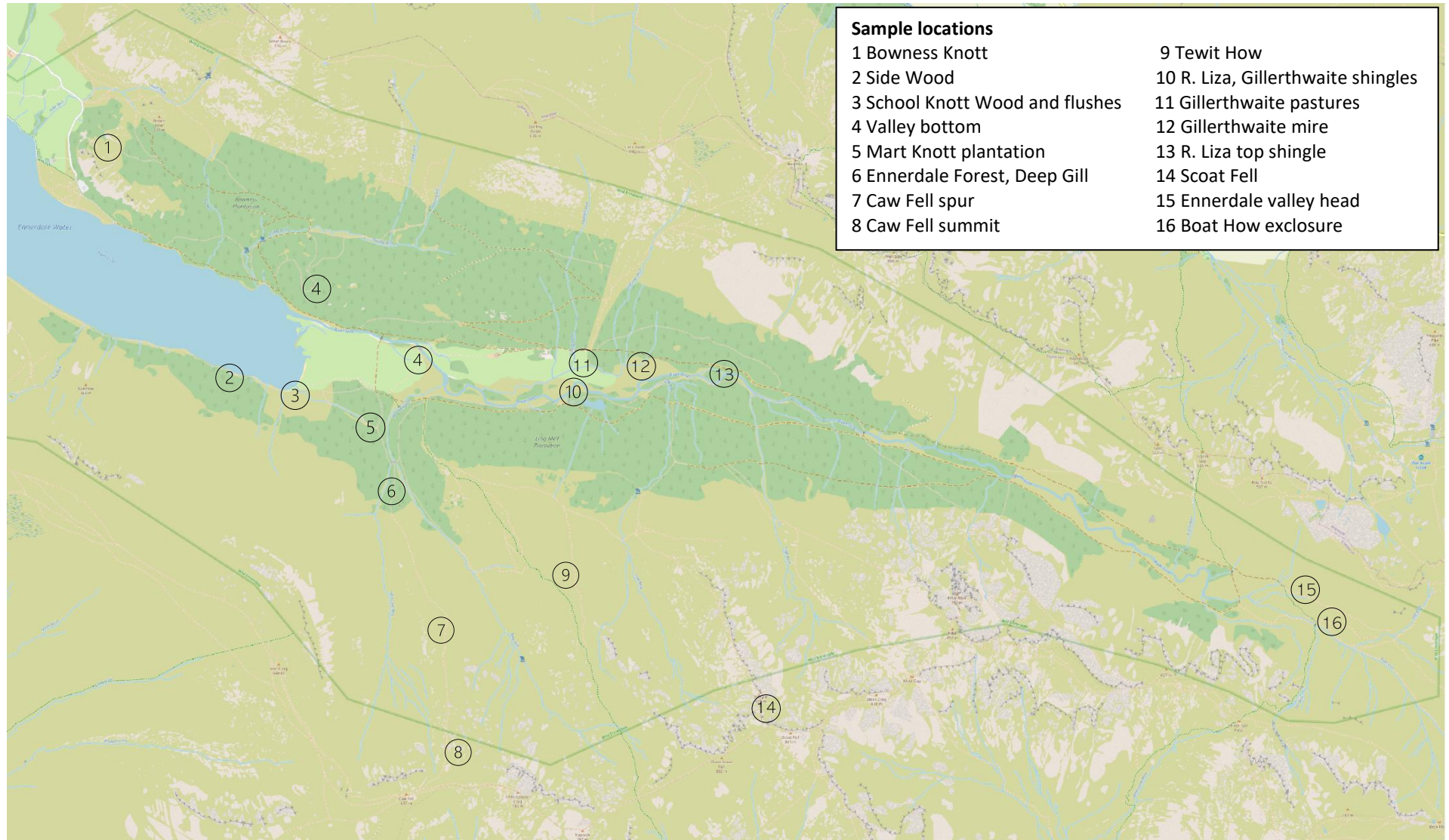
The survey of the invertebrate interest in the Ennerdale valley was approached as an initial scoping study, with a view to flagging up important habitats and species for further, more detailed study and monitoring.

The target taxa of wood ants, Bilberry Bumblebee and Northern Silver Stiletto-fly were specifically searched for and other invertebrates encountered in the different habitats in which the target species are found were also recorded. Figure 1 shows the locations of the main sample locations. Survey for target species was conducted by direct observation of adult insects, searching for the larvae of the Northern Silver Stiletto in the river shingle, counting the numbers of different bumblebee taxa during timed transects in different parts of the valley, and searching for the nests of wood ants in the vicinity of previous reports and elsewhere in the valley. Survey of other invertebrate taxa and habitats was conducted by field observation of individual insects, sweep-netting ground vegetation tree foliage, and hand-searching shingle substrates along the river.

Survey visits were made to the Ennerdale valley on 8, 20 April; 8, 18, 28 May; 15, 20 June, 21 July, 1, 21, 26 August and 21 September.

30 minute transects were undertaken to monitor bumblebee populations at various locations across the valley. The methodology was based on that used by Darvill *et al.* (2010) - Surveys were carried out when the weather was favourable for bumblebee foraging activity, avoiding high winds and rain. At all sites, the surveyor walked at a steady pace for a recorded length of time, following a zig-zag route within the defined area to maximise coverage of the habitat and counting the bees in a 2m 'box' to either side and in front.

Figure 1. Site plan – Ennerdale valley showing sampling locations



Results and analysis

A total of 781 records of some 351 different taxa have so far been collated from the survey work in 2022. The sampled sites with the greatest diversity of taxa are also those with the greatest number of records. This could be interpreted as the richest sites in the survey being due to greater recording effort rather than any intrinsically greater habitat quality. In fact the surveyor used his judgement to select the more promising sites for greater attention from the outset, although the more intensive recording effort will have further skewed the results in favour of those locations.

Table 1 shows the total number of records and taxa by sample location recorded during the survey in 2022. Side Wood returned the greatest number of different taxa (123) in the survey. The extensive shingle banks of the River Liza also support a rich invertebrate fauna (115 species), including a number of specialist species. The unimproved, flower-rich pastures at High Gillerthwaite provide a third area of significant value to invertebrate communities (95 species).

Table 1 Total number of records and taxa by sample location in Ennerdale in 2022

	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillerthwaite Mire	High Gillerthwaite Pastures	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillerthwaite shingles	R. Liza, top shinglebank	R.Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Grand Totals
Taxon records	7	7	17	45	2	23	31	6	16	135	1	21	73	158	33	12	2	143	3	40	781
Total No. taxa	7	7	14	25	2	23	27	6	16	95	1	21	66	115	33	12	2	123	3	37	351

23 Nationally Rare or Scarce insect species were recorded during the survey (Table 2 and Appendix 1). A further 65 regionally notable species were also identified (Appendix 3). 15 invertebrate species of high or total fidelity to exposed riverine sediments (ERS) were recorded during the survey (see Tables 15 & 16).

Of the target species in the survey, the Bilberry Bumblebee was found to be widespread in the valley and present in some numbers on occasion (see page 11). The Northern Silver Stiletto was found to have a strong population on the extensive deposits of high quality ERS along the Liza from the confluence with Woundell Beck upstream almost to the confluence of High Beck (see page 9). No evidence of mound-building wood ants was found in the valley, although several other ant species were recorded, together with some notable ant-associated insects (see page 17).

The data from the survey were also analysed using the *Pantheon* database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data. *Pantheon* interprets species lists by recognising assemblage types within a list and scoring each type according to its conservation value. The analyses supported by *Pantheon* can improve understanding of the resources and structures used by invertebrates within the sample locations and aid their conservation. It is also used to assess invertebrate assemblages for Common Standards Monitoring (CSM) of biological SSSI condition. The results of the *Pantheon* analysis are presented from page 36 and detailed explanation of the *Pantheon* invertebrate data analysis tool is given in Appendix 4.

Nationally Rare, Scarce and Priority species

23 Nationally Rare or Scarce and 6 S41 Priority insect species were recorded during the survey. A further 65 regionally scarce species were also identified (see Appendix 3). Table 2 lists all the Rare, Scarce and Priority Species recorded during the survey. See Appendix 1 for species accounts of the Rare and Scarce species.

Table 2 Nationally Rare, Scarce & Priority invertebrates recorded during the survey, by sample location

Taxon	Taxon Designation	Black Sail, Ennerdale valley head								
		Bowness Knott	Caw Fell	Gillertwaite Mire	Gillertwaite Pastures	Caw Fell spur (above forest)	R. Liza Shingle Banks	Side Wood, Ennerdale	Tewit How	
BEETLES										
Carabidae										
<i>Bembidion monticola</i>	Nationally Scarce: Nb							*		
Chrysomelidae										
<i>Donacia thalassina</i>	Nationally Scarce: Nb				*					
Elateridae										
<i>Fleutiauxellus maritimus</i>	Nationally Scarce: Na							*		
Staphylinidae										
<i>Lathrobium angusticolle</i>	Nationally Scarce: Nb							*		
<i>Platydracus fulvipes</i>	Nationally Scarce: Nb						*			
<i>Stenus carbonarius</i>	Nationally Scarce: Nb							*		
<i>Stenus pusillus</i>	Nationally Scarce: Nb							*		
BUTTERFLIES & MOTHS										
Marsh Fritillary (<i>Euphydryas aurinia</i>)	BAP-2007, Bern-A2, England_NERC_S.41, FEP-007_tab2, HabDir-A2*, RedList_GB_post2001-VU, WACA-Sch5				*	*				
Small Pearl-bordered Fritillary (<i>Boloria selene</i>)	BAP-2007, England_NERC_S.41, RedListGB_post2001-NT				*	*		*		
Dingy Skipper (<i>Erynnis tages</i>)	BAP-2007, England_NERC_S.41, RedList_GB_post2001-VU, W(NI)O-Sch5							*		
Small Heath (<i>Coenonympha pamphilus</i>)	BAP-2007, England_NERC_S.41 RedList_GB_post2001-NT	*	*		*	*	*		*	*
Heath Grass-veneer (<i>Crambus ericella</i>)	Nationally Scarce: Nb			*						
Cinnabar (<i>Tyria jacobaeae</i>)	BAP-2007, England_NERC_S.41					*		*		

Table 2 continued

FLIES											
Limoniidae											
<i>Cheilotrichia imbuta</i>	Nationally Scarce								*		
Northern Yellow Splinter (<i>Lipsothrix errans</i>)	BAP-2007, England_NERC_S.41, Nationally Scarce									*	
<i>Scleroprocta sororcula</i>	Nationally Scarce									*	
<i>Tasiocera robusta</i>	Nationally Scarce									*	
Sciomyzidae											
<i>Dictya umbrarum</i>	Nationally Scarce										*
Hybotidae											
<i>Leptozepe borealis</i>	Near Threatened									*	
<i>Platypalpus excavatus</i>	Nationally Scarce									*	
Pediciidae											
<i>Dicrantota robusta</i>	Nationally Scarce								*		
Therevidae											
Northern Silver Stiletto (<i>Spiriverpa lunulata</i>)	Nationally Scarce								*		
Tabanidae											
<i>Tabanus cordiger</i>	Nationally Scarce								*		
Dolichopodidae											
<i>Tachytrechus consobrinus</i>	Nationally Scarce					*		*			
TRUE BUGS											
Dipsocoridae											
<i>Cryptostemma alienum</i>	Nationally Scarce								*		
Total spp/location		1	1	1	3	6	2	14	6	2	
		Black Sail, valley head	Bowness Knott	Caw Fell	Gillerthwaite Mire	High Gillerthwaite Meadows	Caw Fell spur (above forest)	R. Liza Shingle Banks	Side Wood, Ennerdale	Tewit How	

The shingle banks of the Liza support the greatest number of rare and scarce species (14), twice the number of the second highest sites – Side Wood and Gillerthwaite Pastures with 6 species each.

Target species: Northern Silver Stiletto (*Spiriverpa lunulata*)

The River Liza supports the only known population of Northern Silver Stiletto flies in west Cumbria.

The Northern Silver Stiletto is a Nationally Scarce specialist fly of river shingle banks. It has a northern and western distribution in Britain. Formerly listed as a UK BAP species, this fly has proved to be more widespread in suitable habitat than previously realised. As a result, it has been removed from the BAP list but remains a useful indicator of high-quality river shingle of potential value to a significant community of rare and specialist insects.

Spiriverpa lunulata occurs on the tops of mature in-channel sand and shingle banks on spate rivers, usually with a mixture of thin vegetation and bare ground.

Adult males form aerial leks where several individuals 'duel' in the air 1-3m above the ground, their silvery bodies flashing in the sunlight. Between flights the males rest on the ground or perch among the vegetation. Lek sites are maintained over several days and often consist of a rough amphitheatre of bare ground surrounded by vegetation. Females perch in the vegetation around the lek and select their chosen mate before flying into the swarm to copulate.

The eel-like larvae are active predators of fly and beetle larvae in loose sand and gravel on the top of established, often partially vegetated, in-channel deposits. Larvae can be found in accumulations of finer sediment in the lee of obstacles, under stones, among plant roots and under cow-pats.



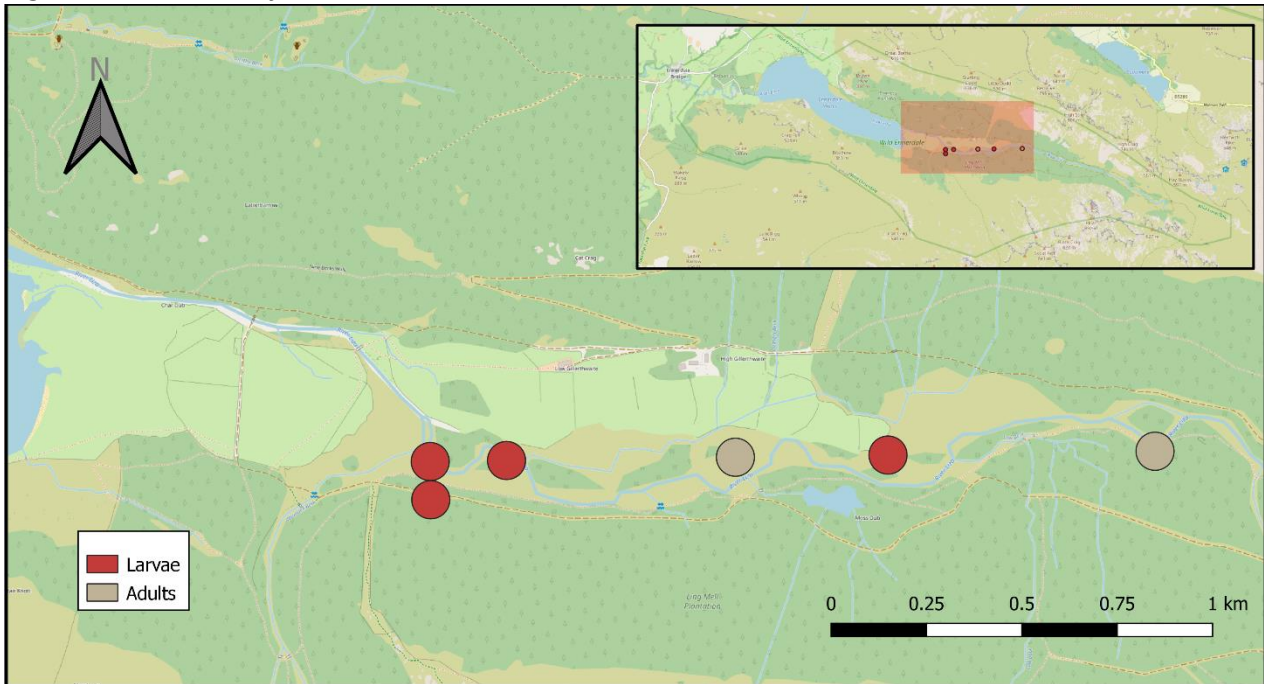
Larva of S. lunulata in shingle on R. Liza, 20 April 2022



Northern Silver Stiletto habitat on the River Liza at Gillerthwaite in 2022. Fine sediments deposited on the top of mature shingle banks provide suitable larval substrates and adult lek sites.

The most significant deposits of exposed riverine sediments on the Liza occur between the confluence of Woundell Beck upstream to the mouth of High Beck. Above this point the valley narrows and the more constrained river flows faster. As a result of these faster flows, the riverine sediments become more bouldery and unsuitable for stiletto flies and many other ERS specialist insects. On 20 April 2022, the river was walked from Woundell Beck upstream to the mouth of High Beck and suitable areas of exposed riverine sediment were searched for stiletto fly larvae. Larvae of Northern Silver Stilettoes were noted at four different locations (Figure 2). Later in the summer, adults of Northern Silver Stilettoes were noted on additional areas on this stretch of river including lekking males, and females prospecting for oviposition sites (Figure 2). These results indicate a strong population of Northern Silver Stilettoes on the River Liza.

Figure 2 Distribution of Northern Silver Stiletto on the River Liza in 2022



Furthest upstream location for *S. lunulata* at NY15481388, where an adult was caught on 28 May 2022



Male Northern Silver Stiletto at lek site on the River Liza at Gillerthwaite, 15 June 2022

Target species: Bilberry Bumblebee (*Bombus monticola*)
and other bumblebee species

The Bilberry, or Mountain, Bumblebee is widely dispersed in Ennerdale, both in the valley bottom and on the fellsides.

This distinctive bumblebee has yellow bands on the thorax and a bright orange abdomen with a black base. This is a local and declining species, associated with Bilberry and largely restricted to mountains and moorland. It has also been recorded at sea-level in northern England and Scotland. Recent research has shown a connection with grassland habitats as well as heathland.



Queen Bilberry Bumblebee, freshly emerged from hibernation with a dusting of bright yellow pollen from feeding at dandelion flowers. Ennerdale Forest, 8 APR 2022



The flower-rich grassland of the wet pastures at High Gillerthwaite support a strong population of Bilberry Bumblebee and other bumblebee species.

Over-wintered queens emerge from hibernation in April; workers are present from May onwards, and males and new females from July to early October.

Historically, the Bilberry Bumblebee was widely distributed throughout northern and western Britain. However, there has been a recent decline in the distribution of this bumblebee throughout its former range in Britain.

Although not regarded as being scarce or threatened, this bumblebee is included on Natural England's Species Recovery Programme because of recent evidence of serious decline.¹

Sightings of Bilberry Bumblebee in Ennerdale were widely scattered (Figure 3) but greater numbers were seen in the valley bottom than on the heather-clad fellsides. Whilst this may be partly a result of the greater focus on the sites in the valley during the survey, it is also likely that bumblebees are more concentrated at the flower-rich sites in the valley and that they are more dispersed across the heather and bilberry heath of the fellsides when that resource is in flower and feeding elsewhere when it is not. It was

¹ Fact sources BWARS web page: <https://www.bwars.com/bee/apidae/bombus-monticola>
Bumblebee Conservation web page: <https://www.bumblebeeconservation.org/red-tailed-bumblebees/bilberry-bumblebee/>

noticeable that the concentrations of bumblebees of several species shifted throughout the season in response to the availability of different flower resources such as willow and dandelions on woodland rides and river margins in early spring, gorse and thyme on river shingle deposits in spring and summer, or heather on

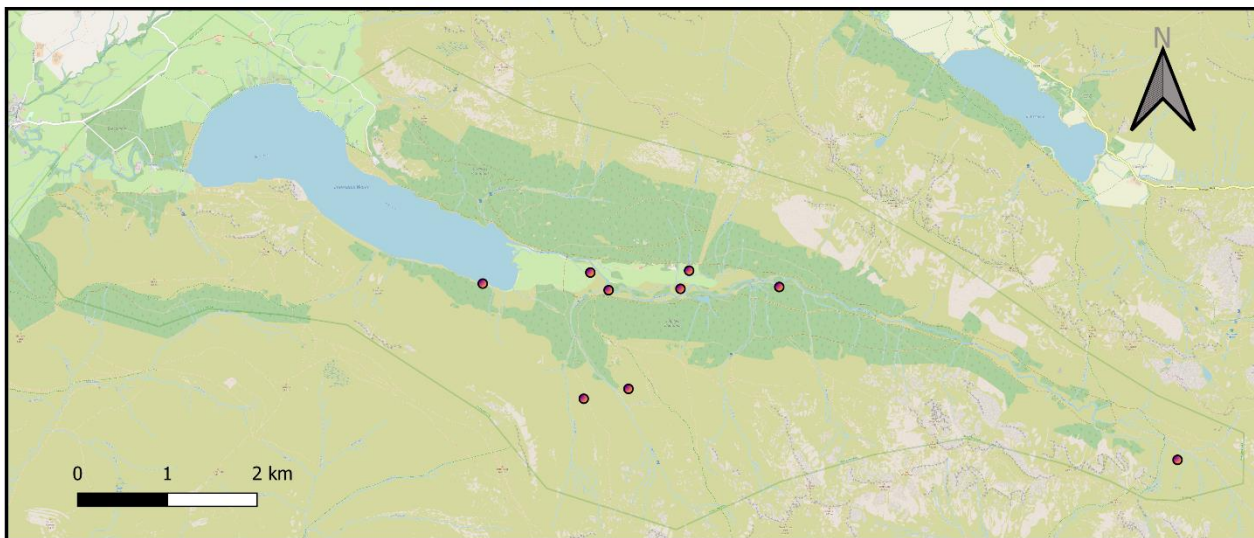


Figure 3 Distribution of Bilberry Bumblebee sightings during 2022 fieldwork

the fellsides in August. The long succession of wildflowers in the marshy pasture at High Gillerthwaite appeared particularly valuable to several bumblebee species, including Bilberry Bumblebee which was noted there in its highest numbers on 15 June.

Table 3 shows that Bilberry Bumblebee is one of the three most widespread bumblebee species in the valley, being recorded in 8 different monads during the survey along with the Heath Bumblebee and the White-tailed Bumblebee agg. Possible queens of the two cryptic species of White-tailed Bumblebee (*B. lucorum*), the Northern White-tail (*B. magnus*) and the Cryptic Bumblebee (*B. cryptarum*) were noted in spring.

Table 3 Bumblebee taxa recorded in Ennerdale in 2022 by 1km²

Bumblebee taxa	NY1114	NY1115	NY1213	NY1312	NY1313	NY1314	NY1413	NY1414	NY1513	NY1911	Total monad/sp.
<i>Bilberry Bumblebee</i>			*	*	*	*	*	*	*	*	8
<i>Buff-Tailed Bumble Bee</i>					*		*				2
<i>Bumblebee sp.</i>		*		*							2
<i>Common Carder Bee</i>		*						*	*		3
<i>Cryptic Bumblebee ?</i>			*								1
<i>Early Bumble Bee</i>			*								1
<i>Field Cuckoo Bee</i>			*	*			*	*	*		5
<i>Gypsy (Bohemian) Cuckoo Bee</i>						*					1
<i>Heath Bumble Bee</i>		*		*	*	*	*	*	*	*	8
<i>Northern White-tail ?</i>			*		*	*					3
<i>Small Garden Bumble Bee</i>			*	*	*	*	*	*			6
<i>Tree Bumblebee</i>	*		*			*		*	*		5
<i>White-tailed Bumblebee</i>		*	*	*	*	*	*	*		*	8
Total taxa/monad	1	4	8	6	6	7	6	7	5	3	

These two species are genetically distinct but morphologically almost identical to *B. lucorum* s.s.



Typical B. lucorum queen with yellow collar narrowing to a point at sides. Ennerdale Forest, 8 April 2022



Possible B. magnus queen with yellow collar extending well below the level of the wing base as a broad band broad at sides. Ennerdale Forest near Woundell Beck, 8 April 2022

The greatest diversity of bumblebees recorded during the survey was found in the valley bottom (Figure 4), particularly within the monad NY1213, which includes both Side Wood and Mart Knott plantation.

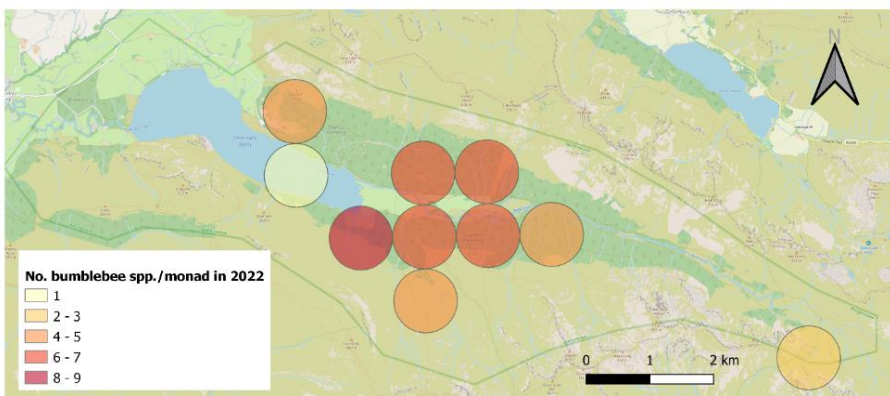


Figure 4 Species richness of Bombus spp. by 1km² in Ennerdale in 2022

Table 4 presents bumblebee diversity by sample location and again Side Wood is seen to have the greatest number of taxa recorded (8), followed by the valley bottom in general (7) and the more discrete locations of Gillerthwaite Pastures and Gillerthwaite river shingles with 6 taxa each. The high elevation locations generally had fewer species of bumblebee recorded, partly perhaps

because these locations were less visited during the survey. The greatest number of species (5) on the open fell was recorded on Lingmell on a single visit on 26 August, when the heather was in flower. Again the most widespread bumblebees are seen to be the White-tailed Bumblebee agg. (recorded at 12 different locations) followed by the Heath Bumblebee (11 locations) and the Bilberry Bumblebee (9 locations).



The Heath Bumblebee (Bombus jonellus) is one of the most widespread bumblebees in Ennerdale

Table 4. Bumblebee taxa recorded in Ennerdale in 2022 by sample location (with 1km² indicated)

Bumblebee taxa	Ennerdale valley head (NY1911)	Boat How enclosure (NY1911)	Bowness Knott (NY1115)	Caw Fell spur (NY1312)	Ennerdale Valley bottom (NY1314)	Gillerthwaite Mire (NY1414)	High Gillerthwaite Meadows (NY1414)	lakeshore track (NY1414)	Lingmell (NY1312)	Mart Knott plantation (NY1213)	R. Liza Shingle Banks (NY1313)	R. Liza, Gillerthwaite shingles (NY1413)	R. Liza, top shinglebank (NY1513)	Side Wood (NY1213)	Total locations/taxa
<i>Bilberry Bumblebee</i>	*			*	*		*		*		*	*	*	*	9
<i>Buff-Tailed Bumblebee</i>										*		*			2
<i>Bumblebee sp.</i>			*						*						2
<i>Common Carder Bee</i>			*			*	*						*		4
<i>Cryptic Bumblebee ?</i>														*	1
<i>Early Bumblebee</i>														*	1
<i>Field Cuckoo Bee</i>				*			*					*	*	*	5
<i>Gypsy Cuckoo Bee</i>					*										1
<i>Heath Bumblebee</i>	*	*	*	*	*		*		*	*	*	*	*		11
<i>Northern White-tail ?</i>					*						*			*	3
<i>Small Garden Bumblebee</i>					*		*		*			*		*	5
<i>Tree Bumblebee</i>					*	*		*					*	*	5
<i>White-tailed Bumblebee</i>	*	*	*	*	*	*	*		*	*	*	*		*	12
Total taxa/location	2	2	4	4	7	3	6	1	5	3	3	6	5	8	

An attempt was made at recording the species and number of bumblebees seen during timed transect walks of 30 minutes duration (Table 5). However, time did not allow for sufficient transects to be walked throughout the season to produce very meaningful results. Bilberry Bumblebees were frequent in June in the pastures at Gillerthwaite and on the nearby shinglebanks of the River Liza, but were not observed at these locations later in the season with the only transect record of the species in August being from the heathery slopes of Caw Fell. The few records of the Buff-tailed Bumblebee were all from sheltered valley bottom locations. The Common Carder Bee was only seen on 21 August, at two locations. The highest count of Heath Bumblebee was on Bowness Knott on 21 August and it was also seen in numbers on Caw Fell on the same date, feeding at heather blossom in both locations. The Small Garden Bumblebee was abundant in Gillerthwaite pastures on 1 August but numbers had dropped on 21 August. The only other transect record of this species was on the nearby river shingle banks at Gillerthwaite on 1 August. The White-tailed Bumblebee species aggregate was the most commonly recorded taxa during the transects with 86 individuals being recorded across both the greatest number of locations and dates. Individuals of the Field Cuckoo Bee (*B. campestris*) were also noted at three locations.

Table 5. Number of bumblebee species encountered during timed (30 min) transects by site and date

Bumblebee species by date	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur	High Gillerthwaite Meadows	Mart Knott plantation, Ennerdale	R. Liza, Gillerthwaite shingles	Grand Total
Bilberry Bumblebee	1		1		10		6	18
15/06/2022	1				10		3	14
20/06/2022							3	3
21/08/2022			1					1
Buff-Tailed Bumble Bee						1	3	4
15/06/2022							3	3
21/08/2022						1		1
Common Carder Bee			1		4			5
21/08/2022			1		4			5
Field Cuckoo Bee				1	1		1	3
15/06/2022					1			1
20/06/2022							1	1
21/08/2022				1				1
Heath Bumble Bee	1		17	8		1	4	31
15/06/2022	1						1	2
20/06/2022							3	3
21/07/2022				1				1
21/08/2022			17	7		1		25
Small Garden Bumble Bee					23		1	24
01/08/2022					21		1	22
21/08/2022					2			2
White-tailed Bumblebee agg.	1	13	9	16	19		28	86
15/06/2022	1	13			13		12	39
20/06/2022							17	17
21/07/2022				5				5
01/08/2022					3			3
21/08/2022			9	11	3			23
Grand Total	2	14	27	26	57	2	44	172

Table 6. Nos. bumblebees of different species encountered during timed (30 min.) transects at Gillerthwaite pastures on different dates.

Bumblebee species	15/06/2022	01/08/2022	21/08/2022	Grand Total
Bilberry Bumblebee	10			10
Common Carder Bee			4	4
Field Cuckoo Bee	1			1
Small Garden Bumble Bee		21	2	23
White-tailed Bumblebee	13	3	3	19
Grand Total	24	24	9	57



The flower-rich grassland at High Gillerthwaite provides a succession of pollen and nectar resources over a long season.

Table 7. Nos. bumblebees of different species encountered during timed (30 min.) transects on the riverine shingles at Gillerthwaite on different dates.

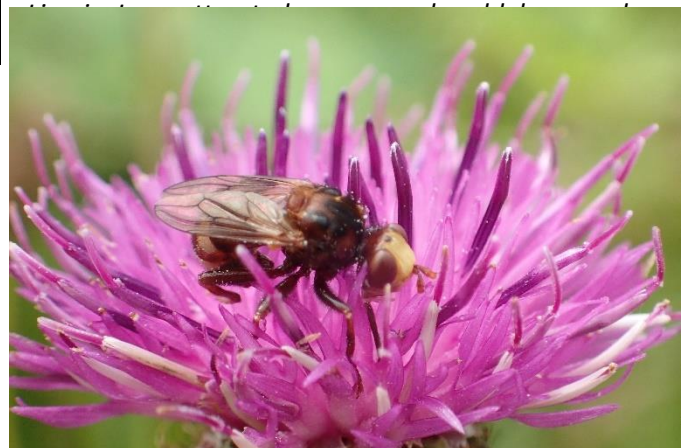
Bumblebee species	15/06/2022	20/06/2022	01/08/2022	Grand Total
Bilberry Bumblebee	3	3		6
Buff-Tailed Bumble Bee	3			3
Field Cuckoo Bee		1		1
Heath Bumble Bee	1	3		4
Small Garden Bumble Bee			1	1
White-tailed Bumblebee agg.	12	17		29
Grand Total	19	24	1	44



Flowering Thyme on the shingle banks of the River



The Gypsy Cuckoo Bee (*Bombus bohemicus*) is one of two cuckoo bumblebees found in Ennerdale during the survey. Ennerdale Forest, 8 April 2022.



The Ferruginous Bee-grabber (*Sicus ferrugineus*) Gillerthwaite Pasture, 1 August 2022.

This fly is a parasitoid of bumblebees, grasping the bee in flight and inserting an egg into its abdomen. The developing fly larva feeds internally on the bee, eventually killing it.

Target Species: Wood Ants

The area of a previous report of a wood ant nest at Bowness carpark was searched without success and although wood ant nests were looked for in suitable locations throughout the survey, none were found and their status in Ennerdale is unconfirmed.

Cleared areas, maintained by extensive grazing with cattle, create sheltered glades with diverse structure and plentiful dead wood of high value to invertebrates.



Mart Knott plantation, 18 May 2022



Tree stumps with loose bark in sunny clearings provide suitable nest sites for the ant *Formica lemani*. Mart Knott plantation, 18 May 2022.

Table 8. Ant species recorded during the survey by sample location

	Black Sail, valley head	Ennerdale Valley bottom	Gillerthwaite Pastures	Mart Knott plantation,	Caw Fell spur	R. Liza Shingle Banks	Gillerthwaite shingles	R. Liza, top shinglebank	Side Wood, Ennerdale	Total
<i>Formica lemani</i>				1	1					2
<i>Lasius alienus</i>							1			1
<i>Lasius flavus</i>		1	1			1		1	1	5
<i>Lasius niger</i>			1				1	1		3
<i>Myrmica ruginodis</i>	1				1				1	3
<i>Myrmica scabrinodis</i>		1	1						1	3
Total	1	2	3	1	2	1	2	2	3	

6 species of ant were recorded during the survey. *Lasius alienus* prefers warm, open habitats and the presence of this species on the shingle banks of the River Liza appears to be the first record for Cumbria. All the remaining species are relatively common and are widespread in suitable habitat in Ennerdale.

Old, unimproved pasture in the valley supports numerous nests of Yellow Meadow Ants (*Lasius flavus*).

These nest mounds change the structure of the soil, provide a more heterogenous micro-topography and alter the vegetation and plant communities. The ants themselves are a favoured food for birds such as Green Woodpeckers.



The nests of Yellow Meadow Ants are a distinctive feature of ancient pastureland in Ennerdale, as here near the mouth of Woundell Beck.

Yellow Meadow Ant (Lasius flavus), Woundell Beck, 8 April 2022

Yellow Meadow Ants ‘farm’ and protect root aphids beneath the ground in return for honeydew, which they feed to the developing ant grubs in the nest. The ants also obtain protein by eating excess and non-productive aphids. The predatory larvae of hoverflies in the genus *Chrysotoxum* specialise in feeding on root aphids farmed by ants. Two species of *Chrysotoxum* were found during the survey; *C. bicinctum* (pictured) was seen at Gilleshwaite pastures on 15 June and *C. arcuatum* was also seen at Gillerthaite pastures as well as on the river shingle banks and at Side Wood.



*Chrysotoxum hoverflies are good wasp mimics, with long, wasp-like antennae and bold black and yellow markings. *C. bicinctum* has two obvious yellow bands on the abdomen.*



Sphagnum hummocks in boggy ground near Gillerthwaite are potential nest sites for red ants.

In boggy areas, moss hummocks provide nest sites, clear of the water table for some species of red ant (*Myrmica* sp.). The ants make their nests on the sunny side at the top of the hummock where their developing eggs and larvae will get maximum warmth from the sun. Both *Myrmica scabrinodis* and *M. ruginodis* were found to be widely dispersed in the valley and on the fellsides above.



*Pale frass from the nest of *M. ruginodis* in boggy ground near Black Sail YHA is a tell-tale sign.*



*The specialist ant predating hoverfly *Microdon myrmicae*, Gillerthwaite Pasture 20 June 2022*

The larvae of the hoverfly *Microdon myrmicae* develop in the nests of *Myrmica scabrinodis* where they feed on the ant grubs. *M. myrmicae* is a local species, known from just a handful of sites in Cumbria. Adults of this specialist hoverfly were found resting on a *Sphagnum* hummock containing a nest of the red ant *Myrmica scabrinodis* in Gillerthwaite Pastures on 20 June 2022.



Myrmica scabrinodis nest in Sphagnum hummock © Stephen Hewitt

Sample sites in Ennerdale in 2022

Ennerdale Forest

Within Ennerdale Forest, the felling programme of coniferous trees has allowed in more light and created a rich supply of dead wood. The resulting sunny, sheltered forest rides and clearings support a variety of insect species.

Saproxyllic insects, whose larvae develop beneath the bark of conifer trees, logs and stumps are common throughout the forest due to the large amount of dead wood, both standing and fallen. Adults of many of these species feed at flowers and so it is important that there is a good flower resource as well as a continuous supply of dead wood.



Two-banded Longhorn beetle at Rowan blossom, Stair Knott 18 May 2022



The hoverfly Xylota jakutorum, Gillerthwaite, 15 June 2022

Eyed Ladybird, Mart Knott plantation, 18 May 2022. This is one of the largest ladybirds in Britain. It feeds on aphids found on coniferous trees.



Dead standing timber in Mart Knott plantation

Larvae of the Two-banded Longhorn beetle (*Rhagium bifasciatum*) bore into dead conifer wood and a valuable food source to birds such as Great Spotted Woodpeckers. The abundance of dead conifer wood in Ennerdale supports an enormous population of these beetles.

The hoverfly *Xylota jakutorum* is another specialist of dead conifer wood which is common in Ennerdale Forest. Its larvae develop in the sappy decay beneath the bark of logs and stumps.



Several scarce and local insects were found at Willow catkins and Blackthorn blossom in early spring. This resource does not seem particularly common in Ennerdale Forest and this may be a limiting factor on some insect populations in the valley. *Melangyna quadrimaculata* is a scarce spring hoverfly whose larvae feed on conifer woolly aphids (Adelgidae). An adult was collected off Blackthorn blossom by the road at the head of the lake on 8 April. Other local spring hoverflies include *Cheilosia urbana*, whose larvae have been reported to feed on Mouse-ear Hawkweed and *Dasysyrphus venustus*, a woodland species whose larvae feed on arboreal aphids. Numerous queen bumblebees were also seen feeding at dandelion flowers and sallow catkins along the roadside up the valley on this date.

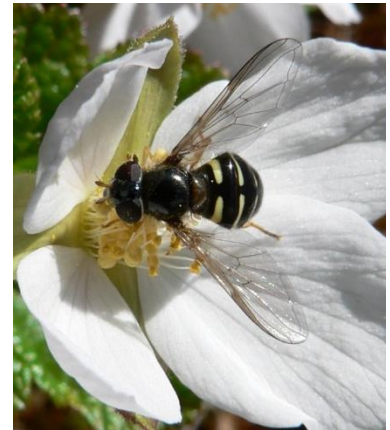


Willow and Blackthorn provide an important nectar source for early spring insects in Ennerdale.



Tachina ursina is an early species which feeds at spring flowers. This fly is a parasitoid of moth caterpillars. Ennerdale Forest, 8 April 2022

*The aphidophagous hoverfly
Dasysyrphus venustus
© Stephen Hewitt*



*The cattle dung at Mart Knott plantation on 18 May 2022 attracted dung beetles such as *Aphodius fossor* (pictured) and the Histerid beetle *Hister unicolor*.*

Bowness Knott

The area near the public car park at Bowness Knott was searched for wood ant nest mounds, one of which was reported from this vicinity some 10 years ago. However, the survey yielded no evidence of mound building wood ants here, or anywhere else in the valley.



The spring hoverfly, Melangyna lasiophthalma, likes to bask on tree trunks in deciduous woodland and several were present around the car park on 8 April. The adults feed at willow catkins and other early spring flowers, but their larvae are aphid predators.

The heather-clad summit of Bowness Knott attracts numerous insects



White-tailed Bumblebee agg. Was the most frequent and widespread bumblebee taxon in Ennerdale, including the heathery slopes of Bowness Knott



The Bumblebee Hoverfly (Volucella bombylans) mimicks bumblebees and lays its eggs in their nests, where its larvae feed on debris in the bottom of the nest

Side Wood

The remnant of semi-natural woodland on the south shore of the lake has considerable invertebrate interest, supporting 6 Nationally Rare or Scarce species (Table 6), including 2 Priority Species, and a further 24 regionally notable species.



There is a good supply of dead wood which supports a number of saproxylic beetles and flies. Some of these insects require the fruitbodies of wood-decay bracket fungi in which to develop, others utilise dead standing timber whilst fallen logs support another

community of invertebrates. The Nationally Scarce danceflies (Hybotidae) *Platypalpus excavatus* and *Leptozepe borealis* were found in Side Wood during the survey, the latter record being the first for this species in Cumbria. Both species are associated with broadleaved woodland with the former probably developing in the soil and the latter in dead wood. Two other Nationally Scarce flies recorded here are associated with wet woodland: The larvae of the Northern Yellow Splinter crane fly (*Lipsothrix errans*) develop in dead wood lying in running water. Springs and seepages in valley side woodland were found to be preferred by this Priority Species in the Lake District (Hewitt & Parker 2006). *Scleroprocta sororcula*, another crane fly, possibly develops in fungi in wet woods. The final designated species recorded in Side Wood was the Small Heath butterfly, which is a Nationally Scarce Priority Species.



The Wasp Beetle is a local species whose larvae develop in dead standing timber



The Northern Yellow Splinter is a Priority Species of crane fly which develops as a larva in saturated dead wood lying in woodland streams and seepages

Scattered hawthorn and rowan throughout the wood provide a valuable early summer nectar source for the adult stages of many insects. A number of local saproxylic species were found feeding at these blossoms in May.



Criorhina floccosa is a regionally notable hoverfly that develops as a larva in the rotten roots of mature deciduous trees. An adult of this species was seen at Rowan blossom on the edge of Side Wood on 18 May 2022

The large and handsome hoverfly, *Brachypaloides lentus* is black with a broad, blood-red band on its abdomen. The larvae of this regionally notable species develop in decaying heartwood of living oak and beech trees. Another saproxylic hoverfly associated with ancient oak woodlands, *Brachypalpus laphriformis* was found near Gillerthwaite in 2000.



The Hawthorn Shieldbug (*Acanthosoma haemorroidale*) was seen feeding at Rowan blossom at Side Wood on 18 May. This large shieldbug feeds on the developing berries of Rowan and Hawthorn. An early responder to climate change, it spread north into Cumbria in the 1940s and is now recorded up to the north coast of Scotland.

The hoverfly *Sericomyia lappona* is a rather local species of boggy heaths, where its larvae develop in saturated peat. Adults of this species were seen at Rowan blossom on the edge of Side Wood in May 2022 and at other locations in the valley during the survey



River Liza shingle banks

The River Liza in Ennerdale holds some of the most dynamic and undisturbed exposed riverine shingle (ERS) deposits in England which support a community of specialist invertebrates.

The unconstrained flow of the river has created braided channels with a range of sediment grades and the extensive forest cover in the valley results in considerable accumulations of coarse

woody debris to the river system. These elements all contribute to the value of the river to specialist invertebrates, which is further enhanced by the lack of localised pollution sources or significant trampling from high stock levels or human access, which can significantly damage ERS invertebrate populations. The reduction in sheep numbers in the valley should reduce any damaging impact of sheep-dip on invertebrate populations along water courses. The very flashy nature of the Liza means that many of the deposits are coarse shingle and boulder in nature, with many of the finer sediments being carried away downstream into Ennerdale Water. This affects the invertebrate communities, with a number of species requiring finer sediments being absent. There are however lenses of fine gravel and grit deposited on the more mature bars and these provide suitable habitat for several species including a strong population of the Northern Silver Stiletto. 15 species of ERS specialist insects were recorded during the survey (Table 15), including six Nationally Scarce species and there is no doubt that further survey work would reveal more. An investigation by Bates *et al.* (2020) reported 17 species of ERS beetle on the Liza. A further seven Nationally Rare or Scarce species not showing high fidelity to ERS were also recorded from the river in 2022.

The Liza is actively shifting its course along the valley floor and this is creating new habitat and opportunities for invertebrates. The riparian corridor in the lower reaches of the Liza is largely dominated by regenerating conifers and the scarcity of broadleaved trees on this reach of the river may be limiting opportunities for some invertebrates. Accumulations of woody debris in the river provide important invertebrate habitat but again largely consist of coniferous wood, whilst many invertebrate specialists of coarse woody debris are associated with the dead wood of broadleaved trees. The amount of broadleaved trees and deadwood along and in the river can be expected to increase as habitat regeneration continues.



The Northern Silver Stiletto fly is a good indicator of high quality shingle banks



Most of the ERS specialist species recorded are associated with coarse shingle deposits, but others such as the Northern Silver Stiletto and the tiny (3mm) click beetle *Zoroachros minimus* prefer finer sediments. Even smaller, the bug *Cryptostemma alienum* occurs in wet gravel beneath boulders at the edge of clean, fast-flowing rivers. It is covered in tiny hydrofuge hairs, giving it a felty appearance under close examination.

Table 15. Specialist invertebrates of Exposed Riverine Sediments recorded along the River Liza in 2022/23

Taxon	Taxon Designation
Coleoptera	
Carabidae	
<i>Bembidion atrocaeruleum</i>	Nationally Scarce: Nb
<i>Bembidion monticola</i>	
<i>Bembidion punctulatum</i>	
Elateridae	
<i>Fleutiauxellus maritimus</i>	Nationally Scarce: Na
<i>Zoroachros minimus</i>	
Staphylinidae	
<i>Lathrobium angusticolle</i>	Nationally Scarce: Nb
<i>Stenus guttula</i>	
Diptera	
Limoniidae	
<i>Rhabdomastix edwardsi</i>	Nationally Scarce
<i>Rhabdomastix eugeni</i>	
<i>Dicranota robusta</i>	
Tabanidae	
<i>Tabanus cordiger</i>	Nationally Scarce
Therevidae	
<i>Spiriverpa lunulata</i>	Nationally Scarce
Hemiptera	
Dipsocoridae	
<i>Cryptostemma alienum</i>	Nationally Scarce
Saldidae	
<i>Macrosaldula scotica</i>	Nationally Scarce
<i>Saldula c-album</i>	



The click beetle *Fleutiauxellus maritimus* River Liza, 20 Jun 2022. A specialist of coarse river shingles on fast-flowing rivers



The shorebug *Macrosaldula scotica* shows high fidelity to river shingle deposits but can also be found on bedrock by upland cascades and on lake shore shingles.



The plain-eyed Grey Horsefly (*Tabanus cordiger*) is a Nationally Scarce species which develops as a larva in river shingles. This ERS specialist was seen on the Liza shingles at Gillerthwaite on 1 August

The small black crane fly *Rhabdomastix edwardsi* can be found walking over shingle on fast-flowing rivers. A sibling species, *R. eugeni*, was found new to Cumbria on the Liza in 2022



Four other Nationally Scarce riparian species: two rove beetles, *Stenus carbonarius* and *S. pusillus*, the crane fly *Cheilotrichia imbuta* and the small Dolichopodid fly *Tachytrechus consobrinus* were also found on the Liza during the survey. These wetland species do not show high fidelity to ERS (see Appendix 1).



Some 35 regionally notable species were found on the Liza in 2022. Many are associated with ERS or riparian habitats, but others were 'tourists' from adjacent habitats in the valley, in some cases visiting the nectar sources on the vegetated shingle

The dance-fly Wiedemannia bistigma is a local species that lives on wet cobbles in the splash zone of fast flowing rivers where it is predatory on other small insects. R. Liza, 20 June 2022



Spider-hunting wasp, Anoplius concinnus with prey (Pardosa sp.) on shingle bank of River Liza, 20 Jun 2022. Although not considered a specialist of ERS, this local wasp species is found on shingle by rivers and pools. The female wasp excavates cells in the gravel and stocks each cell with a spider that she has paralysed with her sting. She then lays an egg on the immobilised spider and blocks up the entrance to the cell. When the wasp grub hatches it punctures the host's body and feeds on its body fluids, eventually killing the spider.



Bembidion punctulatum © Stephen Hewitt. Several species of Bembidion ground beetles are specialists of river sand and shingle deposits. B. atrocaerulum, B. punctulatum and the Nationally Scarce B. monticola were recorded on the River Liza shingles in 2022.

Vegetated shingle deposits along the Liza provide suitable habitat for species that like bare ground with sparse vegetation, where they can hunt, bask in the sun, or lay their eggs in the warm gravels. There is a strong population of Green Tiger Beetles along the riverbanks and the Nationally Vulnerable Dingy Skipper also occurs here.



Green Tiger Beetles are fast running predators of open areas and their larvae are ambush predators living in shafts excavated in bare ground.



The tiger cranefly Nephrotoma appendiculata is a species of tall grassland and was found along the R. Liza shingles in June.



The shingle bank at Gillerthwaite supports a population of the Dingy Skipper, a Nationally Vulnerable Priority Species of sparsely vegetated ground with the larval foodplant, Birds-foot-trefoil.

The jumping spider Euophrys frontalis is common in open habitats in the south of England but local in Cumbria where it becomes largely coastal. River Liza shingle, Gillerthwaite, 20 June 2022.



The Mottled Grasshopper (Mymeletettix maculatus) is a local species of dry, sparsely vegetated substrates.

Evaluation of ERS invertebrate communities on the River Liza

The present survey specification did not allow for a comprehensive study of the specialist invertebrate community of ERS and so was targeted on the distribution of the Northern Silver Stiletto (*Spiriverpa lunulata*), which is a good indicator of high quality ERS deposits. Nevertheless, a further 14 species of insect recognised as having high or total fidelity to ERS were recorded.

Table 16 shows the ERS Quality Score (ERSQS) and National Status of each high fidelity ERS species recorded during this and other surveys in different years. Whilst the number of ERS species present on a site can give an indication of its conservation interest, this is affected by recording effort and does not consider the greater conservation value of sites that support rare and scarce species. Fowles *et al.* (1999) described a method of evaluating the conservation value of woodlands for saproxylic insects based on a system of awarding 'quality scores' to high-fidelity saproxylic species according to their national rarity status, the rarer species being awarded higher values. Sadler and Bell (2002) adapted this system for use with ERS beetles. The Sadler and Bell quality scores, as further developed in Bates (2006), were adopted by Hewitt *et al.* (2007) and extended from ERS beetles to include other invertebrates with high or total fidelity to ERS. Hewitt (in prep.) has further developed the list of ERS flies.

The sum of the quality scores for ERS species present on a site provides an ERS Quality Score (ERSQS), enabling sites to be ranked according to the number and rarity of the specialist species they support and giving an evaluation of their relative conservation interest. However, this ERSQS value is sensitive to the amount of survey work undertaken and this recording effort bias can be balanced to some extent by dividing the ERSQS score by the number of high fidelity ERS species recorded, to calculate the ERS Quality Index (ERSQI).

$$\text{ERSQI} = (\text{ERSQS}/\text{count of high and total fidelity ERS species}) \times 100$$

It has been found that ERSQI values become less reliable when low numbers of species are used in the calculation, and it is recommended that ERSQI scores should be generated using a minimum of 15 qualifying species.

The scores accorded to each rarity designation are:

Common = 1, Local = 2, Very Local/Nr = 4, Nb/Notable/Nationally Scarce = 8, Na/RDBK = 16, RDB3/RDBI/Near Threatened/Data Deficient = 24, RDB2/VU and RDB1/EN = 32.

'Common', 'Local' and 'Very Local' designations are taken from Bates (2006) and Hewitt *et al.* (2007). Some species that had National designation in Bates (2006) and Hewitt *et al.* (2007) have subsequently been re-appraised and removed from the lists of designated species. These species have been attributed the status of 'Very Local' for the purposes of this report.

Previous survey visits to the shingle banks of the Liza, on 1 July 2000 (by R.W.J. Read, J. Parker and S.M. Hewitt) and in 2019 (from 24-29 May and 22-23 July, by A.J. Bates, S. Little and S.M. Hewitt) generated records of 8 and 17 specialist ERS species respectively. Whilst the total of 8 species recorded in 2000 is too low to give a valid ERSQI value, the 17 ERS species recorded in 2019 sampling returns an ERSQI value of 553. The 15 ERS species recorded in 2022 return a slightly higher ERSQI of 593 and the combined ERS records for the river generate a combined list of 27 ERS specialist species and give an ERSQI value of 607.

Table 16. All high and total fidelity ERS invertebrates reported from the River Liza by year, with ERSQI calculated for each survey year and for the combined species list for the river.

ERS specialist species	Status	ERSQS value	2000	2019	2022	Combined R. Liza list
<i>Bembidion atrocaeruleum</i>		1	*	*	*	*
<i>Bembidion decorum</i>		1		*		*
<i>Bembidion femoratum</i>		1		*		*
<i>Bembidion monticola</i>	Nb	8			*	*
<i>Bembidion punctulatum</i>		1			*	*
<i>Fleutiauxellus maritimus</i>	Nb	8	*	*	*	*
<i>Zorochochus minimus</i>		1	*	*	*	*
<i>Aloconota cambrica</i>	Local	2		*		*
<i>Aloconota currax</i>	Local	2		*		*
<i>Aloconota eichhoffi</i>	N	8		*		*
<i>Brachygluta pandellei</i>	RDBGB.IK	16		*		*
<i>Hydrosmelecta delicatula</i>	RDBGB.IK	16		*		*
<i>Hydrosmelecta eximia</i>	Very Local	4 (8)		*		*
<i>Hydrosmelecta fragilis</i>	N	8		*		*
<i>Hydrosmelecta longula</i>	N	8 (4)		*		*
<i>Hydrosmelecta subtilissima</i>	N	8		*		*
<i>Lathrobium angusticolle</i>	Nb	8		*	*	*
<i>Ochtheophilus aureus</i>		1		*		*
<i>Stenus guttula</i>		1		*	*	*
<i>Rhabdomastix edwardsi</i>	Local	2	*		*	*
<i>Rhabdomastix eugeni</i>	RDBI	24			*	*
<i>Dicranota robusta</i>	N	8			*	*
<i>Tabanus cordiger</i>	N	8			*	*
<i>Spiriverpa lunulata</i>	LR(ns)b	8	*		*	*
<i>Cryptostemma alienum</i>	NS	8	*		*	*
<i>Macrosaldula scotica</i>	Local	2	*		*	*
<i>Saldula c-album</i>		1	*		*	*
	No. ERS Species		8	17	15	27
	Total ERS QS		31	94	89	164
	ERSQI		388	553	593	607

Values in brackets indicate a different score allocated to that species in Bates et al. 2020

Gillerthwaite Pastures

The flower-rich wet pastures and mire at High Gillerthwaite provide high quality habitat supporting an important invertebrate community.

6 Nationally Rare or Scarce species, including 3 Priority Species of butterfly and 1 Research Only Priority Species of moth were noted during the survey. Additionally, 12 regionally notable species were also recorded. Of the Nationally Rare or Scarce species, the reed beetle *Donacia thalassina* feeds as a larva on the roots of club-rushes and sedges in wetlands, the small metallic fly *Tachytrechus consobrinus* is found in acid mire and wet sandy areas, the Marsh Fritillary and the Small Pearl-bordered Fritillary are butterflies of wet herb-rich grassland feeding as larvae on Devil’s-bit Scabious and Marsh Violet respectively, the Small Heath is widespread in dry, unimproved grassland where the caterpillar feed on fine grasses, and finally the Cinnabar moth also occurs in grassland where its larval foodplant, Common Ragwort, is present. The three butterflies are all Priority Species, whilst the Cinnabar moth is designated for Research Only.



Marsh Fritillaries have been reintroduced to Ennerdale and the population here is thriving and expanding.



Eristalis rupium is a local hoverfly with a northern and western distribution in the UK. It occurs in upland marshy grasslands where its ‘rat-tailed maggot’ larvae develop in saturated ground.

Chrysotoxum bicinctum, Gillerthwaite Pasture, 15 June 2022. The larvae of this wasp-mimicking hoverfly feed on root aphids tended by ants.



Small Pearl-bordered Fritillary, Gillerthwaite Pasture, June 2022

Meadow Grasshopper, Gillerthwaite Pasture, August 2022. In Cumbria, this grasshopper is usually found in wet unimproved grasslands in valleys and moors



The boggy runnels and mire habitat at the bottom of the slope in Gillerthwaite Pastures provides suitable habitat for a number of regionally notable wetland species.



Keeled Skimmer dragonfly 'hatching' from the nymphal exuvium, Gillerthwaite Pastures 15 June 2022.

Keeled Skimmer dragonflies (Orthetrum coerulescens) Gillerthwaite Pasture, 15 & 20 June 2022. The nymphs of this local dragonfly live in the boggy runnels and the adults are on the wing in mid-summer when the attractive, powder-blue males are distinctive.



Male Keeled Skimmer, Gillerthwaite Pastures 20 June 2022.



The grassbug (Teratocoris saundersi) is a local species found in wetlands with Common Spike Rush and other sedges.



Microdon myrmicae is a local species of wetland hoverfly which is only found in association with nests of the red ant Myrmica scabrinodis where its larvae feed on the ant grubs.



The Lucerne Bug (Adelphocoris lineolatus) is largely coastal in Cumbria and it was interesting to find population of this bug in the wet pasture at Gillerthwaite.

Even more surprising was to find this individual on the summit of Scoat Fell on 26 August.



Sericomyia lappona is a local hoverfly of bogs, where its 'rat-tailed' larvae develop in saturated peat.

Gillerthwaite Mire

The previously drained and forested area of mire just up the valley from Gillerthwaite Pastures is now being restored, with the ditches being blocked to raise the water table.

A brief visit on 20 June found several species of butterfly present, including the Priority Species - Small Heath, Small Pearl-bordered Fritillary and Marsh Fritillary. The latter had presumably colonised the mire from the introduced population at Gillerthwaite Pasture. Other butterflies included Dark Green Fritillary and Large Skipper. Three species of bumblebee – Tree, Common Carder and White-tailed were seen. Among the hoverflies were the Bumblebee Hoverfly and the wetland *Sericomyia silentis*. Common Darter and four-spot Chaser dragonflies were present and holding territories, indicating breeding.



Marsh Fritillary butterflies have colonised the restored mire.



Blocking drainage ditches has re-wetted the mire, creating pools that are attracting dragonflies and other insects.



*Large Skipper butterfly
Gillerthwaite Mire, 20 June
2022.*



Bumblebee Hoverfly



*Common Darter dragonfly,
Gillerthwaite Mire, 20 June
2022.*



*The Bog Hoverfly
(*Sericomyia silentis*)
© Stephen Hewitt*

Ennerdale valley head

The valley head was visited on 15 June and 30 minute bumblebee transects were conducted within and without the new Boat How Exclosure. A few bumblebees were noted, including Bilberry Bumblebee (see Table 5). Other species recorded incidentally were widespread grassland and wetland species: Small Heath butterflies (a Priority Species), Common Green Grasshopper and the grassbug *Stenodema holsata* are typical species of unimproved grasslands whilst the Large Red Damselfly, the fly *Dolichopus atratus*, the reed beetle *Plateumaris discolor* and the local Marsh Click Beetle (*Actenicerus sjaelandicus*) are wetland species.



The Garden Chafer or Bracken Clock (Phyllopertha horticola) was swarming on the day of the visit. The beetle grubs feed on grass roots and form a valuable food source for birds and mammals such as corvids and Badgers.



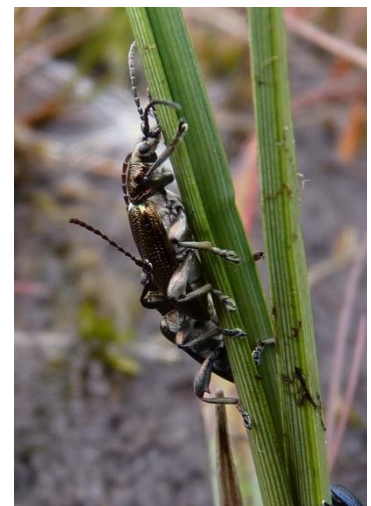
The Small Heath is a Nationally Vulnerable Priority Species, but nonetheless remains quite widespread on the Cumbrian fells.



*Bilberry Bumblebee
© Stephen Hewitt*



The Common Green Grasshopper is widespread in unimproved grasslands.



The reed beetle Plateumaris discolor is variable in colour with bronze or metallic violet reflections. It is a common species of bogs in the uplands.

Fellsides: Lingmell, Tewit How and Silver Cove Tongue

Visits to the fellsides of Silver Cove Tongue, Lingmell and Tewit How on the south side of the valley on 21 July and 26 August. These dates were timed to coincide with the heather flowering with the aim of surveying bumblebee activity. The Heath Bumblebee was particularly widespread but four other bumblebee species were recorded, including Bilberry Bumblebee. Lingmell in particular had considerable bumblebee activity on 26 August. Other insects were recorded incidentally and included three Nationally Rare or Scarce species, including the Priority Species, the Small Heath. The Nationally Scarce rove beetle *Platydracus fulvipes* was found on the heathy lower slopes of Caw Fell. This is a widespread but little-known grassland species. Another Nationally Scarce species, the snail-killing fly *Dictya umbrarum*, was found in the peaty flushes on Tewit How.



Wood Tiger moth, Silver Cove Tongue, 21 July 2022. This is a seldom recorded, local species of heathland and acid grassland. Several individuals were seen on the lower slopes of Caw Fell and Lingmell, suggesting a healthy population here.



*The small, sedge-filled tarn on Tewit How supports some interesting insects including the Nationally Scarce snail-killing fly *Dictya umbrarum*, the local upland grassbug *Teratocoris viridis* and the local upland Dolichopodid fly *Dolichopus rupestris*. A Common Hawker dragonfly was also observed egg-laying in the tarn on 26 August.*



Dictya umbrarum is a Nationally Scarce, snail-killing fly of northern hills associated with peaty flushes where its larvae are probably parasitoids of aquatic snails.

Fell tops: Caw Fell and Scoat Fell

The top of Caw Fell was visited on 21 July and the summit of Scoat Fell on 26 August. Both visits were brief and survey work was rudimentary. However, one Nationally Scarce and three regionally notable species were noted. **The Nationally Scarce Heath Grass-veneer moth was recorded on Caw Fell and the small patch of Dwarf Willow growing on the summit of Scoat Fell supports a population of the regionally notable montane sawfly, *Eura herbaceae*.**



*Pea-sized galls on the leaves of Dwarf Willow growing on the summit of Scoat Fell are formed by the larvae of the montane sawfly *Eura herbaceae*. Scoat Fell, 26 August 2022*



*The montane sawfly *Eura herbaceae* © Stephen Hewitt*

Heath Grass-veneer, Caw Fell 21 July 2022. This Nationally Scarce grass-moth is a moorland species of northern England and Scotland.



Eana osseana Caw Fell, 21 July 2022. This small tortricid moth is widespread on grasslands and moorlands where its larvae feed on a range of herbaceous plants.

The local plant bug, *Adelphocoris lineolatus* is largely restricted to coastal grasslands in Cumbria, so it was a surprise to find this individual crawling over the Dwarf Willow on the summit of Scoat Fell on 26 August 2022. Presumably this was a dispersing individual, assisted up the fell by a warm breeze. It does however give an insight into how the population of this bug became established at Gillerthwaite Pasture in the valley below.



Pantheon analysis of results


The data from the survey were also analysed using the *Pantheon* database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data.

Pantheon interprets species lists by recognising assemblage types within a list and scoring each type according to its conservation value. The analyses supported by *Pantheon* can improve understanding of the resources and structures used by invertebrates within the sample locations and aid their conservation. It is also used to assess invertebrate assemblages for Common Standards Monitoring (CSM) of biological SSSI condition. It should be noted that the sampling methodology required to conform to CSM is more involved than the scope of the present survey allowed and so **although the *Pantheon* outputs generated in this report provide useful insight into the potential conservation interest of invertebrate assemblages in Ennerdale, the reported ‘condition assessments’ cannot be relied upon, and the analysis cannot be compared those of other sites.** Further information on the *Pantheon* tool, which will aid interpretation of the presented *Pantheon* reports, is provided in Appendix 4.

Table 17 shows the greatest number of species recorded during the survey are those associated with open habitats (137 species) and this broad biotope also had the highest number of species with conservation status (17). This biotope is represented in the flower-rich pastures, forest clearings, on the vegetated areas of the shingle banks on the River Liza and on the open fell. The wetland biotope (122 spp.) is represented by the River Liza and the wet areas of the Gillerthwaite pastures, as well as Gillerthwaite Mire, seepages in Side Wood and areas of mire on Tewit How. The tree-associated biotope (98 spp.) occurs throughout the plantations of the valley, as well as the semi-natural woodland of Side Wood. Species can be allocated to more than one category.

Table 17. Pantheon report on invertebrate association with broad biotopes from Ennerdale 2022 survey

No. of species = Number of species associated with the relevant assemblage type recorded in the survey; % representation = percentage of the full list of characteristic species for the assemblage type represented by the number of species for that biotope recorded during the survey; Species with conservation status = number of species with a threat and rarity status from Conservation published reviews; SQI = Species Quality Indices - each species recorded from the sample is given a Species Quality Score (SQS) based on its conservation status (see table in Appendix 2). The SQI is equal to the sum of all SQSs in any given resource, divided by the number of species. This score is then multiplied by 100 to give a 3 figure (Any SQI score derived from a small number of species should be treated with caution. It is suggested that scores derived from 15 or less species should not be used).

Habitats & resources: broad biotopes					
Broad biotope i	No. of species	% representation	SQI	Conservation status i	Species with conservation status
open habitats i	137	3	109	9 LC (Global) i ; 4 Section 41 Priority Species; 1 (LR); 2 NS i ; 1 Nb i ; 1 NT i ; 4 VU i ; 1 Legal Protection i ; 1 Section 41 Priority Species - research only	17
wetland i	122	4	137	4 Notable i ; 7 NS i ; 2 Nb i ; 1 Section 41 Priority Species; 1 (LR)	13
tree-associated i	98	3	115	3 Notable i ; 4 LC (Global) i ; 1 Nb i ; 1 NS i ; 1 Section 41 Priority Species	9
coastal i	1	<1	 100		

The relative strengths of the broad biotopes are reflected in the results for more narrowly defined habitats (Table 18), with ‘tall sward and scrub’ found on Gillerthwaite pastures and shingle banks being represented by the greatest number of associated species (97). This habitat also has the highest number (12) of species with conservation status, due largely to the number of rare and scarce butterflies and moths found at Gillerthwaite pastures and on the adjacent vegetated shingle deposits of the R. Liza. The next most species rich habitats were the tree-associated ‘shaded woodland floor’ and two wetland habitats, ‘acid & sedge peats’ and ‘running water’, with 58, 56 and 49 associated species respectively. The running water habitat has the highest Site Quality Index (SQI) score (147) due to the number of rare and scarce river shingle specialists. Other high scoring habitats are ‘wet woodland’ and ‘marshland’, each with an SQI of 141 but these two scores are based on fewer species (26 and 22 respectively, compared to the 49 species representing ‘running water’). SQI scores are calculated to adjust for recording effort and so can give an indication of relative conservation value between sites. However, when calculated using a small number of species the results become increasingly unreliable. A minimum of 15 species is the recommended cut-off.

Table 18. Pantheon analysis of Habitats and Resources using Ennerdale 2022 survey data

Broad biotope ⁱ	Habitat ⁱ	No. of species	% representation	SQI	Species with conservation status	Conservation status ⁱ
open habitats ⁱ	tall sward & scrub ⁱ	97	4	109	5	1 Section 41 Priority Species - research only; 1 Nb ⁱ ; 1 (LR); 1 NS ⁱ ; 2 Section 41 Priority Species; 2 VU ⁱ ; 1 Legal Protection ⁱ
tree-associated ⁱ	shaded woodland floor ⁱ	58	5	124	5	3 Notable ⁱ ; 1 Nb ⁱ ; 1 NS ⁱ ; 1 Section 41 Priority Species
wetland ⁱ	acid & sedge peats ⁱ	55	5	118	3	1 Nb ⁱ ; 1 Notable ⁱ ; 1 NS ⁱ
wetland ⁱ	running water ⁱ	50	5	152	9	4 NS ⁱ ; 4 Notable ⁱ ; 1 Section 41 Priority Species; 1 Nb ⁱ
open habitats ⁱ	short sward & bare ground ⁱ	30	2	110	3	2 Section 41 Priority Species; 1 NS ⁱ ; 2 NT ⁱ
wetland ⁱ	wet woodland ⁱ	26	10	141	4	2 Notable ⁱ ; 1 NS ⁱ ; 1 Nb ⁱ ; 1 Section 41 Priority Species
tree-associated ⁱ	wet woodland ⁱ	25	10	141	4	1 Nb ⁱ ; 2 Notable ⁱ ; 1 Section 41 Priority Species; 1 NS ⁱ
tree-associated ⁱ	decaying wood ⁱ	24	2	100		
wetland ⁱ	marshland ⁱ	22	3	141	2	5 NS ⁱ ; 4 DD ⁱ
tree-associated ⁱ	arboreal ⁱ	19	1	100		
open habitats ⁱ	upland ⁱ	8	5	⚠100		
coastal ⁱ	sea cliff ⁱ	1	2	⚠100		

Table 19. Pantheon analysis of Habitat scores using Ennerdale 2022 survey data

Number of species	350
Number of species with habitat scores	327
Rarity score (SQI)	122
Conservation statuses	
GB Conservation Status (old & new)	1 [Nb]; 1 NA; 3 Nb; 5 Notable; 1 NR; 8 NS
GB Red List	2 (LR); 130 LC; 2 NT; 3 VU
Global Red List	12 LC (Global)
Legal Protection	1 Legal Protection
Section 41 Priority Species	5 Section 41 Priority Species
Section 41 Priority Species - research only	1 Section 41 Priority Species - research only
Scores	
acid mire	2 acid mire obligates, 8 acid mire specialists, 9 acid mire preferential
calcareous grassland	2 Moderate, 3 Low
coarse woody debris	1 obligate xylophages, 1 obligate xylophages/possible obligate xylophages, 4 facultative xylophages, 3 probable xylophages, 1 probable xylophages/non xylophages, 5 non xylophages
ERS (Coleoptera)	6 ERS dependent, 1 ERS associated
ERS (Diptera)	1 total fidelity, 2 strong fidelity, 4 moderate fidelity
grazing marsh - salinity	8 Freshwater species tolerant of only mildly brackish water
grazing marsh - status	1.00
seepage (acid-neutral)	1 seepage obligates, 3 seepage specialists, 4 seepage associates
seepage (calcareous)	3 seepage specialists
seepage (soft rock cliff)	1 seepage specialists, 1 seepage associates
seepage (woodland)	1 seepage obligates, 5 seepage specialists, 2 seepage associates
Wadensee Saltmarsh fidelity index	2 hal-2-3

Table 19 shows the number of species associated with various habitats and their fidelity to those habitats. *Pantheon* recognises 19 acid mire species from the survey data and there are also 15 species associated with coarse woody debris. 14 species are scored as having high fidelity to ERS, although these species are not all the same as the 15 ERS species recognised elsewhere in this report (Based on Bates (2006) and Hewitt et al (2007)) and also does not include 3 species of Hemiptera which are nonetheless recognised as members of the ‘shingle banks’ SAT.

Although *Pantheon* recognises 14 ERS specialist species recorded in the survey, these species are variously attributed to different SATs (Table 20), including the ‘shingle banks’ ‘riparian sand’ and ‘stream & river margin’ SATs. As a result, none of these riverine sediment SATs is considered to reach the threshold for ‘favourable’ condition for an ERS assemblage. This reinforces the point that because the various CSM sampling protocols for the different SATs were not complied with in this broad-brush survey, a *Pantheon* reported condition of ‘unfavourable’ does not necessarily mean that the feature is not in good condition. When data from additional studies (Hewitt et al, 2007; Bates et al, 2020) are included in the analysis (Table 21 below), the River Liza does meet the favourable condition threshold for the shingle banks SAT.

Table 20. Pantheon analysis of Specific Assemblage Types (SATs) using Ennerdale 2022 survey data

Habitat = assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites; SAT = Specific Assemblage Type, SATs are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value; No. of species = number of species associated with the relevant SAT, recorded in the survey; % representation = percentage of the full list of characteristic species for the SAT represented by the number of species for that SAT recorded during the survey; Species with conservation status = number of species with a threat and rarity status from Conservation published reviews; Conservation status = each conservation category, and the number of species for recorded for it, during the survey; Condition = 'favourable' indicates that the threshold score for SSSI favourable condition of the relevant assemblage type has been reached.

Broad biotope	Habitat	SAT	No. of species	% reprsntn.	Species with conservation status	Conservation status	Reported condition
open habitats		rich flower resource	24	10	1	1 LC (Global)	Favourable (24 species, 15 required)
open habitats		scrub-heath & moorland	12	3	2	2 LC (Global)	Favourable (12 species, 9 required)
tree-associated	decaying wood	bark & sapwood decay	8	2			Unfavourable (8 species, 19 required)
wetland	running water	shingle banks	8	15	3	1 Nb, 2 NS	Unfavourable (8 species, 9 required)
open habitats		scrub edge	8	4	1	1 LC (Global)	Unfavourable (8 species, 11 required)
wetland	acid & sedge peats	Sphagnum bog	5	5	1	1 NS	Unfavourable (5 species, 8 required)
open habitats	short sward & bare ground	bare sand & chalk	4	<1			Unfavourable (4 species, 19 required)
open habitats	short sward & bare ground	open short sward	3	2	1	1 Section 41 Priority Species, 1 VU	Unfavourable (3 species, 13 required)
tree-associated	decaying wood	heartwood decay	3	2			Unfavourable (3 species, 6 required)
wetland	running water	riparian sand	2	3	1	1 NS	Unfavourable (2 species, 5 required)
wetland	running water	seepage	2	4	1	1 Notable	Unfavourable (2 species, 6 required)
wetland	acid & sedge peats	reed-fen & pools	1	<1	1	1 Nb	Unfavourable (1 species, 11 required)
open habitats	short sward & bare ground	exposed sea-cliff	1	2			
open habitats	tall sward & scrub	montane & upland	1	<1			Unfavourable (1 species, 8 required)
wetland	running water	stream & river margin	1	2	1	1 NS	Unfavourable (1 species, 6 required)
wetland	marshland	northern lakes & lochs	1	6	1	1 NS	Unfavourable (1 species, 3 required)

Table 21. Pantheon analysis of Specific Assemblage Types (SATs) using ERS species (as recognised by Bates (2006) and Hewitt et al. (2007)) data (27 spp.) for the R. Liza from this and previous surveys

Broad biotope	Habitat	SAT	No. of species	% representation	Species with conservation status	Reported condition
wetland	running water	shingle banks	18	34	9	Favourable (18 species, 9 required)
wetland	running water	stream & river margin	1	2	1	Unfavourable (1 species, 6 required)
wetland	running water	riparian sand	1	2	1	Unfavourable (1 species, 5 required)

Table 22 shows the broad biotope, habitat and resources associated with the 24 species from the survey with a designated conservation status. There are 13 species associated with wetland, 8 with open habitats and 5 are tree-associated. 10 species are found in running water, 3 in peatland, 5 in tall-sward & scrub, 3 in short-sward & bare ground, 4 in wet woodland and 5 on shaded woodland floor.

Table 22. Nationally Rare and Scarce species with resources data (Pantheon output)

Species	Taxon Group	Conservation Status	Broad biotope	Habitat	Resources
<i>Bembidion monticola</i>	a ground beetle	NS	wetland	running water	exposed riverine sediments >> riparian shingle
<i>Donacia thalassina</i>	a reed beetle	NS	wetland	marshland	shallow freshwater pond >> aquatic: well vegetated, wetland vegetation
<i>Fleutiauxellus maritimus</i>	a click beetle	NA	wetland	running water	exposed riverine sediments >> riparian shingle
<i>Lathrobium angusticolle</i>	a rove beetle	Nb	wetland	running water	exposed riverine sediments >> riparian shingle
<i>Platydracus fulvipes</i>	a rove beetle	Nb	open habitats	tall sward & scrub	habitats >> litter & ground layer, soil humidity >> variable humidity
<i>Stenus carbonarius</i>	a rove beetle	Nb	tree-associated ; wetland	acid & sedge peats; shaded woodland floor; wet woodland	conifer or broadleaved >> broadleaved only, deep litter, humidity >> wet, shadiness >> heavy shade
<i>Tachytrechus consobrinus</i>	a long-legged fly	NS	wetland	acid & sedge peat	sphagnum/moss lawn, wet/damp peat
<i>Leptozepe borealis</i>	a dance fly	NR; NT			
<i>Platypalpus excavatus</i>	a dance fly	(LR); NS	open habitats	tall sward & scrub	habitats >> litter & ground layer
<i>Cheilotrichia imbuta</i>	a crane fly	Notable	wetland	running water	drawdown zone: mud/shallow litter, seepages >> shaded seepage, seepages >> unshaded seepage, wetland vegetation
Northern Yellow Splinter <i>Lipsothrix errans</i>	a crane fly	Notable; Section 41 Priority Species	tree-associated ; wetland	running water; shaded woodland floor; wet woodland	coarse woody debris, conifer or broadleaved >> broadleaved only, flow >> slow flow, humidity >> wet, seepages >> shaded seepage, shadiness >> heavy shade, woodland stream

Table 21. (continued)					
Species	Taxon Group	Conservation Status	Broad biotope	Habitat	Resources
<i>Scleroprocta sororcula</i>	a crane fly	Notable	tree-associated	shaded woodland floor	conifer or broadleaved >> broadleaved only, humidity >> wet, shadiness >> heavy shade
<i>Dicranota robusta</i>	a crane fly	Notable	wetland	running water	flow >> fast flow
<i>Tasiocera robusta</i>	a crane fly	Notable	tree-associated ; wetland	running water; shaded woodland floor; wet woodland	conifer or broadleaved >> broadleaved only, flow >> slow flow, humidity >> wet, seepages >> base rich seepage, seepages >> unshaded seepage, shadiness >> heavy shade, woodland stream
<i>Dictya umbrarum</i>	a snail-killing fly	Notable	wetland	acid & sedge peats	base status >> acid, shallow freshwater pond >> aquatic: well vegetated, wet/damp peat, wetland vegetation
<i>Tabanus cordiger</i>	a horsefly	NS	tree-associated ; wetland	running water; shaded woodland floor; wet woodland	broadleaved only, mud/shallow litter, wet, heavy shade, unmodified fast flowing streams, woodland stream
Northern Silver Stiletto <i>Spiriverpa lunulata</i>	a stiletto fly	NS	open habitats; wetland	running water; short sward & bare ground	exposed riverine sediments >> riparian sand, exposed riverine sediments >> riparian shingle, habitats >> exposed sand, soil humidity >> dry, soil type >> sand
<i>Cryptostemma alienum</i>	a true bug	NS	wetland	running water	exposed riverine sediments >> riparian shingle
<i>Crambus ericella</i>	a moth	[Nb]			
Dingy Skipper <i>Erynnis tages</i>	a butterfly	Section 41 Priority Species; VU	open habitats	tall sward & scrub	habitats >> sward/field layer
Small Pearl-bordered Fritillary <i>Boloria selene</i>	a butterfly	Section 41 Priority Species; VU	open habitats	short sward & bare ground	habitats >> sward/field layer
Small Heath <i>Coenonympha pamphilus</i>	a butterfly	Section 41 Priority Species; VU	open habitats	short sward & bare ground	habitats >> sward/field layer, soil humidity >> dry
Marsh Fritillary <i>Euphydryas aurinia</i>	a butterfly	Legal Protectn; Section 41 Priority Species; VU	open habitats	tall sward & scrub	habitats +A128:F328>> sward/field layer
Cinnabar <i>Tyria jacobaeae</i>	a moth	LC (Global); Section 41 Priority Species - research only	open habitats	tall sward & scrub	habitats >> sward/field layer, soil humidity >> dry

Table 23. Pantheon output of Ennerdale sample locations ranked by Site Quality Index (SQI)

	No. visits	No. Species recorded	No. Spp. with habitat scores	GB Cons. Status	GB Red-List	SQI
Ennerdale Fells	2	58	55	3 NS	1 VU	122
Side Wood	2	123	111	5 NS, 1 NR	2 LR, 1 NT, 1 VU	119
Liza shingles	9	178	168	10 NS	1 VU	121
Gillerthwaite mire	1	16	15		1 NT, 3 VU	119
Gillerthwaite meadows	5	96	93	2 NS	3 VU	113
Ennerdale Forest pln. n.	3	73	67		1 VU	104
Valley Head	1	18	17		1 VU	100

Table 23 shows the Ennerdale Fells return an SQI value of 122 from 58 species, just above the Liza Shingles (SQI = 121 from 178 species) and Side Wood (SQI of 119 from 123 species). Gillerthwaite Meadows have a slightly lower SQI of 113 from 96 species. The SQI for Gillerthwaite Mire is higher at 119, but this is derived from just 15 species and so is unreliable, as is that for the Valley Head.

Discussion

With 781 records of 351 invertebrate taxa recorded during the survey, the diverse habitats of the Ennerdale valley clearly support a broad range of invertebrate species. Natural processes operating in the valley, enable invertebrate populations to thrive in robust, dynamic systems where habitats develop, shift, and renew in a natural pattern. Not surprisingly, the most long-established and natural habitats in the valley bottom: Side wood, the Liza shingles and Gillerthwaite Pastures, have retained the richest invertebrate communities. The sampled sites with the greatest diversity of taxa are also those with the greatest number of records. This could be interpreted as the sites returning the highest number of species in the survey being the purely result of greater recording effort. In fact, the surveyor used his judgement to select the most promising sites for more attention from the outset, although the greater recording effort will have further skewed the results in favour of those locations. This variability in recording effort does mean that comparisons between sample locations must be treated with caution and the areas of high quality for invertebrates highlighted in this report are not necessarily the only important locations for invertebrate communities in the valley. This report aims to provide an initial overview of the invertebrate interest of the valley and further survey will reveal further insights and understanding.

24 Nationally Rare, Scarce or Priority Species of insect were recorded during the survey. A further 65 regionally scarce species were also identified. Again, Side wood, the Liza shingles and Gillerthwaite Pastures are the top scoring locations, but with the Liza shingles having double the number of species of conservation interest (14) compared to the other two locations (6 each). Whilst this reflects the real invertebrate conservation value of ERS, it is also true that the shingle banks received more survey time than the other locations and further survey work in Side Wood in particular would no doubt reveal further species of conservation interest.

No attempt has been made to measure invertebrate abundance or biomass during the survey and species diversity cannot be equated with abundance or biomass. As an illustration of this, the emergence of swarms of Garden Chafers (*Phyllopertha horticola*) in the valley head on 15 June, provided a significant level of flying invertebrate abundance and biomass in this relatively species poor area. Whilst direct relationships cannot be drawn between invertebrate diversity and food supply for insectivores, it can be inferred that those sites with the greatest invertebrate diversity will offer the greatest range of niches and year-round food supply for insectivores.

Forest habitats

Extensive grazing with cattle is having a positive impact on the value to invertebrates of habitats in the valley, through the maintenance of sunny glades in the forest, greater diversity of vegetation structure and an increase in the flower resource. Populations of dung feeding insects are also responding to organic farming methods and absence of worming pesticides in the cattle dung.

Saproxylic insects whose larvae develop beneath the bark of decaying conifer wood, are common throughout the forest due to the large amount of dead wood, both standing and fallen. Adults of many of these species feed at flowers and so it is important that there is a good, well distributed, flower resource as well as a continuous supply of dead wood.

Ancient broadleaved woodland is hugely rich in invertebrate species and the semi-natural woodland of Side Wood supports a good diversity of invertebrates with 123 different taxa recorded from just 2 visits. This is second only to the River Liza shingles which generated records of 178 taxa, but from 9 visits. The different life stages of the woodland invertebrate community in Side Wood are variously supported by a good supply of

dead wood, coarse woody debris, and nectar-rich blossom. Regeneration of native tree species within and around the wood will certainly benefit the invertebrate fauna.

There is a considerable amount of conifer regeneration along the valley floor and the river corridor where dense stands of young spruce are developing in areas where the plantation has been previously cleared. Conifers are also self-seeding onto some of the shingle areas left as the river shifts its course. In some places, these thickets are shading out good invertebrate habitat on bare or sparsely vegetated ground along the river. In others, the conifers are crowding the saplings of native trees. Arboreal insects generally require sunlit canopy where they feed on the foliage and developing flower and seed buds or hunt the phytophagous insects that do so. For this reason, the invertebrate diversity and productivity is far greater in open woodland or woodland edge than in dense woodland.

Removal of some of these developing conifer stands could enable native tree species to establish, to the benefit of invertebrate populations. Planting more willow along the river corridor would be beneficial to some phytophagous insects and the catkins would provide a valuable pollen and nectar source to many other species in early spring. The Nationally Scarce, BAP-listed Northern Yellow Splinter crane fly (*Lipsothrix errans*) develops in the coarse woody debris (CWD) of broadleaved trees lying in running water. This species was found in Side Wood but not further up the Liza where the lack of mature broadleaved trees may be limiting the supply of suitable CWD into the system. The number of mature broadleaved trees and their CWD can be expected to increase along the river as habitat regeneration continues.

In some areas, stands of planted and/or suckering Aspen are getting established in and around areas of wet woodland along the river corridor. This tree species is of high value to a number of phytophagous and saproxylic insect species and will be of long-term benefit to invertebrate conservation in Ennerdale.

Open grassland habitats

The Bilberry Bumblebee (*Bombus monticola*) was recorded widely in the valley bottom and sides, from April through to August. Bumblebees were generally widely, but sparsely, distributed in the valley, appearing in numbers only when flower-rich resources were present. The blooming heather in late summer is also important to bumblebee populations, but the bees were more dispersed in those situations. Although the Bilberry Bumblebee is an upland species, most individuals were observed in the valley bottom. This will be in part because most of the survey work was conducted in the valley, although the Heath Bumblebee (*B. jonellus*) did show more of a preference for the heathy fellsides. It was noticeable that the concentrations of bumblebees of several species shifted throughout the season in response to the availability of different nectar resources. The long succession of wildflowers in the marshy pasture at High Gillerthwaite appeared particularly valuable to several bumblebee species, including Bilberry Bumblebee.

The flower-rich marshy pasture at Gillerthwaite has previously received an introduction of the Nationally Vulnerable, Marsh Fritillary butterfly and this population appeared to be very healthy in 2022 with numerous adult butterflies encountered in the fields here and also on Gillerthwaite Mire a little further up the valley, to which the species has presumably spread under its own steam. Several other rare or scarce butterflies and other insects were recorded in the Gillerthwaite pastures during the survey, encouraged by favourable conditions sustained by the extensive cattle grazing regime.

The distinctive nest mounds of Yellow Meadow Ants (*Lasius flavus*) are widespread in the valley bottom pastures and on the lower fellsides. These nest mounds are indicative of long-established unimproved grassland and create their own topography and soil structure, affecting vegetation and invertebrate communities in the immediate vicinity. Several myrmecophilous insects were found at various locations during

the survey, indicating long-established invertebrate communities associated with various species of ant in the valley.

Exposed riverine sediments

The Northern Silver Stiletto (*Spiriverpa lunulata*) was present widely on the shingle banks of the River Liza between the confluences of Woundell Beck and High Beck. Here the valley floor widens and levels and the river is less constrained, allowing it to spread out and slow down sufficiently to drop its sediment load and develop the required habitat for this fly. Larvae of *S. lunulata* were found in finer sands and gravels on the shingle banks at four locations. Later in the summer, adults were noted in some numbers on these and other areas of shingle on this stretch of river including lekking males, and females prospecting for oviposition sites. These results indicate a strong population of Northern Silver Stilettoes on the Liza, with no adverse factors, such as excessive trampling, pollution, or siltation preventing the *S. lunulata* from fully utilising the naturally available habitat on the river.

The shingle banks of the unconstrained River Liza are an exceptional example of exposed riverine sediments on a high velocity, upland spate river. The deposits of coarse stony sediment with braided channels, in their variety and extent, are possibly unsurpassed as an example of their type in England. These sediments support an important community of specialist invertebrates which merits further study. 15 species of high-fidelity ERS insects were recorded during the 2022 survey, giving a total of 27 ERS specialist species when combined with previous studies. Relatively low visitor pressure and low numbers of organically farmed grazing stock mean that these sediments are not subjected to the harmful levels of trampling, dunging, pollution and pesticide run-off that detrimentally impact these invertebrate communities on many other rivers.

The ERSQI value of 607 for the Liza compares well with rivers elsewhere in Cumbria where rivers such as the Petteril and the Derwent have generated ERSQI values of 452 and 415 respectively. Higher ranking rivers are in the Eden catchment where the sandy strata deliver finer fluvial sediments and provide a wider range of niches for ERS invertebrates. The Eden (ERSQI = 755 based on 89 qualifying species recorded post-1989), the Caldew (ERSQI = 816 based on 70 qualifying species) and the Irthing (ERSQI = 853 based on 102 qualifying species) are the most important rivers in Cumbria and among the best in the country for their ERS invertebrate value. Consequently, ERS invertebrates are a designated feature of the River Eden SSSI. The lower ERSQI of the Liza compared to the Eden catchment rivers may be due in part to lack of survey effort, but the lack of sandy substrate in Ennerdale compared to the Eden catchment will also be a factor since many ERS specialist flies in particular require sandy substrates. Nonetheless, Bates *et al.* (2020) reported 17 specialist ERS beetles from the Liza in 2019 and stated that based on the generated ERSQI value, the river ranked among the top 20 rivers in the UK and third best in Cumbria, for its ERS beetle community.

The unconfined course of the Liza means that it shifts its course back and forth across the valley bottom in a natural process. These shifts in course often occur in dramatic fashion in response to the frequent flood events on the system, leaving large areas of bare shingle abandoned by the river to be colonised by ruderal plants and scrub in a natural succession. These early successional areas are scarce in the wider countryside and provide essential habitat for invertebrate species that require bare ground with sparse vegetation, where they can hunt, bask in the sun, or lay their eggs in the warm substrate. These invertebrates do not generally have a high fidelity to ERS since they are found in suitable conditions in other situations such as post-industrial sites or sand dunes, but they are under pressure from habitat loss nationally. The Nationally Vulnerable Dingy Skipper butterfly, which was found on vegetated shingle by the Liza in 2022, has greatly declined across the UK in recent years.

Upland habitats

Upland and montane habitats generally support a more limited number of invertebrate species, although some of these can be very specialised and of high conservation value. This is reflected in the *Pantheon* Site Quality Index values (Table 23) where the Ennerdale Fells return an SQI of 122 (derived from 58 species recorded), which is just higher than Side Wood with an SQI of 119 from 123 species and the Liza Shingles (SQI = 121 from 178 species). This relatively high SQI value may be due to the relatively short list of species from which the Ennerdale Fells SQI is derived, compared to the other high scoring sites. Targeted searching for scarce upland species, which will have scored more highly in the *Pantheon* analysis, at the expense of recording more widespread species may also have contributed to this surprisingly high SQI value.

Pantheon analysis

Pantheon is a database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data. It interprets species lists by recognising assemblage types within a list and scoring each type according to its conservation value. The analyses supported by *Pantheon* can improve understanding of the resources and structures used by invertebrates within the sample locations and aid their conservation. It is also used to assess invertebrate assemblages for Common Standards Monitoring (CSM) of biological SSSI condition. It should be noted that the sampling methodology required to conform to CSM is more involved than the scope of the present survey allowed and so although the *Pantheon* outputs generated in this report provide useful insight into the potential conservation interest of invertebrate assemblages in Ennerdale, the reported 'condition assessments' cannot be relied upon, and the analysis cannot be compared to those of other sites. It is nonetheless interesting for example to see that two SATs were found to be in favourable condition (rich flower resource and scrub-heath & moorland) and a third SAT (shingle banks) also meets favourable condition when all available recent data is included. It is also useful to note some other SATs flagged up in the *Pantheon* analysis which, although they do not meet the threshold for favourable condition using the survey data, targeted sampling using CSM protocols could result in additional indicator species being recorded and might find them to be in favourable condition. These SATs include bark & sapwood decay, heartwood decay, stream & river margin, scrub edge, montane & upland and *Sphagnum* bog.

Whilst *Pantheon* indicates the greatest number of species in the survey are associated with open habitats, followed by wetland and then tree-associated species; analysis of the nationally rare and scarce species reported in the survey shows 13 species associated with wetland, 8 with open habitats and 5 are tree-associated, with 10 of these species found in running water, 3 in peatland, 5 in tall-sward & scrub, 3 in short-sward & bare ground, 4 in wet woodland and 5 on shaded woodland floor. Again, the targeted nature of the survey towards river shingles, flower-rich bumblebee habitats and open habitats for ants, will have skewed these results.

The *Pantheon* list of ERS species does not correspond exactly to that used in other ERS studies. *Pantheon* also allocates ERS species to subdivisions of ERS such as 'sandy rivers' or 'river shingle' so that no overall analysis of ERS invertebrate value is returned. Although *Pantheon* uses a similar system to calculate SQI scores as used to calculate ERSQI in this report, species rarity is scored on a different scale in *Pantheon* and so the resulting values are very different. These differences in approach are in part responsible for the *Pantheon* analysis of 2022 survey data returning an 'unfavourable condition' assessment for the Liza shingles, whilst the analysis used in this and other published studies finds the Liza to be of high quality for ERS invertebrates. Even so, were the specified *Pantheon* sampling protocols to be followed in the survey methodology, it is very likely that the Liza would return a favourable condition assessment for the shingle banks SAT. Indeed, when the results of a

previous study of ERS beetles on the Liza (Bates *et al.* 2020) are incorporated, *Pantheon* does return a favourable condition assessment.

Whilst SQI scores are fun to produce and can be helpful in evaluating the relative conservation value between sites, they are affected unpredictably by a number of different factors, especially when derived from too few qualifying species. Consequently, SQI and ERSQI values should be treated cautiously, whatever system is used to generate them.

Suggestions for further invertebrate survey work in Ennerdale:

- **Riparian woodland and scrub habitats** - Focussing on the invertebrate habitats most likely to be immediately affected by a beaver reintroduction with the aim of establishing a baseline from which to monitor change.
- **Gillerthwaite mire restoration** - Following on from the brief visit to the area of restored mire at Gillerthwaite in 2022, further survey could provide baseline data on the invertebrate community for use in effectively monitoring change over future years.
- **River shingle** - The 2022 survey identified the River Liza shingles as holding specialist invertebrate communities of exposed riverine sediments (ERS) that are of significant interest for nature conservation. Following on from this, a more thorough survey, including pitfall trapping, is recommended to assess the full specialist ERS invertebrate community on the Liza and enable better comparison with ERS communities on other rivers at a regional and national level.
- **Bumblebee transects** - To develop a methodology for ongoing bumblebee monitoring and establish baseline data on bumblebee populations at selected monitoring sites in the valley.
- **Side Wood** - The 2022 survey identified Side Wood as supporting invertebrate communities of significant interest for nature conservation. Further, survey could usefully identify the extent of the invertebrate interest of this semi-natural woodland and provide data of use in strategic and practical management of the woodland.
- **Montane habitats** - The Wild Ennerdale Project includes some important areas of montane habitat which are recognised to support a valuable upland flora. However, there is no corresponding data on the invertebrate communities of these habitats. Survey work could usefully establish the interest of montane invertebrate communities in the project area, including flower-rich ledges on Pillar, montane heath on Scoat Fell and Caw Fell, upland mires and high-level springs and flushes.

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Appendix 1 Accounts of Nationally Rare, Scarce and Priority species

BEMBIDION MONTICOLA NOTABLE B

A ground beetle Order COLEOPTERA Family CARABIDAE

Distribution South East, South, South West, West Midlands, North East, North West, Dyfed-Powys, North Wales, South East Scotland and South West Scotland.

Habitat and ecology Shaded places, usually near running water. Predatory. Found mainly in cracks and crevices in clay banks on rivers, though also recorded from river shingle and under the bark of tree stumps on river banks. Adults have been recorded from March to October.

Status Widespread but local, not recorded in the far north of Scotland. This species is difficult to identify and may be confused with a other species of the Subgenus Peryphus (Bembidion). Consequently, the exact status of this species is hard to assess.

Threats River engineering, including dredging, level regulation by damming and flood alleviation schemes. In some areas colonisation by Himalayan balsam *Impatiens glandulifera* can reduce the available habitat. Livestock access can damage shingle structure. River pollution is a further threat.

Management and conservation An under-valued habitat. Activities that hinder the natural flow of rivers and streams should be prevented.

Fact source Hyman, P.S. & Parsons, M.S. - 1992, *A review of the scarce and threatened Coleoptera of Great Britain*. Part 1. UK Nature Conservation No. 3.

DONACIA THALASSINA NOTABLE B

A reed beetle Order COLEOPTERA Family CHRYSOMELIDAE

A reed beetle. Larvae feed at the roots of *Scirpus spp.* in standing water. Vulnerable to dredging.

Distribution England, Dyfed-Powys, North Wales and Scotland.

Habitat and ecology Aquatic and semi-aquatic habitats, such as freshwater lakes, ponds and ditches. Phytophagous. Associated with club-rushes and sedges. On the Continent, this species has been recorded from common spike-rush *Eleocharis palustris*. Larvae develop at the roots of the foodplants. In Britain, adults are found on emergent and marginal vegetation, and have been recorded in May and June.

Status Widespread and very local. Recorded from southern England, through northern England to the Outer Hebrides in Scotland.

Threats Loss of habitat through falling water tables because of water abstraction schemes, and the infilling of lakes and ponds. Water pollution and natural succession may be further threats.

Management and conservation Water tables should be maintained at high levels. Water bodies should be isolated from pollution and eutrophication. Clearance of emergent vegetation may be needed to maintain open conditions, this should be undertaken on a rotational basis and be aimed at maintaining the plant populations.

Fact Source Hyman, P.S. & Parsons, M.S. - 1992, *A review of the scarce and threatened Coleoptera of Great Britain*. Part 1. UK Nature Conservation No. 3.

FLEUTIAUXELLUS MARITIMUS NOTABLE A

A click beetle Order COLEOPTERA Family ELATERIDAE

Small black click beetle living among shingle on river banks (not coastal as the name would suggest). Northern and western species. Very local.

Distribution Recorded from Monmouthshire, Breconshire, Caernarvonshire, Denbighshire, West Lancashire, Mid-west Yorkshire, North-west Yorkshire, Cumberland, Dumfriesshire, Ayrshire, Lanarkshire, South Aberdeenshire, East Inverness & Nairn and Argyll Main before 1970 and Radnorshire, Carmarthenshire, Cardiganshire, South-east Yorkshire, South Northumberland, Dumfriesshire, Selkirkshire, Moray, Dunbartonshire and West Ross from 1970 onwards. A map is given in Mendel (1988).

Habitat and ecology River shingle and lakeside shingle. Adults and larvae live in open areas of river shingle where there are very few or no plants. Adults are found under larger pebbles, among finer particles and on the surface of the shingle. Larvae occur among the shingle and may be predatory. Adults have been recorded from May and June.

Status A northern and western species. Very local, though possibly under-recorded.

Threats River engineering, including dredging, level regulation by damming and flood alleviation. In some areas colonisation by Himalayan balsam *Impatiens glandulifera* can reduce the available habitat. Livestock access can damage the shingle structure. River pollution is a further threat.

Management and conservation An under-valued habitat. Shingle tends to be mobile and relies on the free-flow of river and stream systems. Activities that hinder this flow should be prevented.

Fact Source Hyman, P.S. & Parsons, M.S. - 1992, *A review of the scarce and threatened Coleoptera of Great Britain*. Part 1. UK Nature Conservation No. 3.

LATHROBIUM ANGSTICOLLE NOTABLE B

A rove beetle Order COLEOPTERA Family STAPHYLINIDAE

8mm long red and black rove beetle. Specific ecology uncertain, other members of the genus live in grass tussocks and in dead vegetation. Has been recorded from river gravels in mid Wales. Widespread but very local.

Distribution West Midlands, North East, North West, Wales, South East Scotland, South West Scotland and North East Scotland.

Habitat and ecology Recorded from river shingle. This beetle has been found on stream or river margins under flat stones and in river shingle to a depth of about 10 centimetres, in both wet and fairly dry conditions. Adults have been recorded in April, June, July and October.

Status This is a widespread but very local species which is distributed from Herefordshire, north to Easternness in Scotland. Widely recorded in Wales.

Threats River engineering, including dredging, level regulation by damming and flood alleviation schemes. In some areas colonisation by Himalayan balsam *Impatiens glandulifera* can reduce the available habitat. River pollution may be a further threat.

Management and conservation An under-valued habitat. Shingle and sand banks tend to be mobile and rely on the free flow of river and stream systems. Activities that hinder this flow should be avoided. The presence of scrub or rank grassland adjacent to areas of river shingle may enable this beetle to escape floods.

Fact Source Hyman, P.S. & Parsons, M.S. - 1994, A review of the scarce and threatened Coleoptera of Great Britain. Part 2. UK Nature Conservation No. 12.

PLATYDRACUS FULVIPES NOTABLE B

A rove beetle Order COLEOPTERA Family STAPHYLINIDAE

Large metallic bluish black rove beetle with red legs. Under stones and in litter, sometimes found walking in short grassland. Widespread but very uncommon.

Distribution South East, South, South West, East Midlands, West Midlands, North West, Wales, South West Scotland and South East Scotland.

Habitat and ecology Found in woodland, parkland, wet woodland in fens, near a lake edge, limestone grassland and on chalk. This species has also been recorded from the sandy edge of a golf course. It has been recorded in moss, at the roots of plants, under stones, in a tussock, in sheep droppings and with ants (Hymenoptera). Adults have been recorded from April to July and in December.

Status This species is widespread but local in Great Britain, although not recorded in northern Scotland.

Fact source Hyman, P.S. & Parsons, M.S. - 1994, A review of the scarce and threatened Coleoptera of Great Britain. Part 2. UK Nature Conservation No. 12.

STENUS CARBONARIUS NOTABLE B

A rove beetle Order COLEOPTERA Family STAPHYLINIDAE

Rove beetle found most often on mud and in litter in marshes and reedbeds. Widespread but very local.

Distribution South East, South, East Anglia, East Midlands, West Midlands, North East, North West, North Wales and South West Scotland.

Habitat and ecology A wetland species found in marshes, fens and river banks. It has been recorded from reed litter, tussocks and under willow bark. Adults have been recorded in February, March and from August to October.

Status This species is widespread but local in England. It has also been recorded in North Wales and South West Scotland.

Threats Drainage for reasons such as agricultural improvement and development is the primary cause of the loss of wetlands. Falling water tables because of water abstraction and river engineering schemes, and pollution may also threaten this species.

Management and conservation Water tables should be kept at an adequate level in order to maintain wet conditions. Water bodies should be isolated from sources of eutrophication and pollution.

Fact source Hyman, P.S. & Parsons, M.S. - 1994, A review of the scarce and threatened Coleoptera of Great Britain. Part 2. UK Nature Conservation No. 12.

STENUS PUSILLUS

NOTABLE B

A rove beetle

Order COLEOPTERA

Family STAPHYLINIDAE

A small (2-3mm) rove beetle found in a variety of marshes, ditches and pond margins. Also synanthropic in silage and hay swards, in roadside grass cuttings and on arable land.

Distribution Widespread in England and Wales, but probably commoner in the south.

Fact source Lott, D.A. & Anderson, R (2011) *The Staphylinidae of Britain and Ireland, parts 7 & 8*. Handbooks for the Identification of British Insects 12.7. Royal Entomological Society.

SMALL PEARL-BORDERED FRITILLARY*Boloria selene*

NEAR THREATENED

a butterfly

Order LEPIDOPTERA

Family NYMPHALIDAE

Fairly widespread throughout Cumbria, but commoner in the south. The caterpillars feed on violets growing in damp grassy situations. Good weather conditions during the flight period in recent years have favoured populations of early summer butterflies.



*Small Pearl-bordered Fritillary
Gillerthwaite, 15 June 2022*

MARSH FRITILLARY*Euphydryas aurinia*

VULNERABLE

a butterfly

Order LEPIDOPTERA

Family NYMPHALIDAE

The Marsh Fritillary was formerly widespread in Britain and Ireland but has declined severely over the last century, a decline mirrored throughout Europe. Its populations are highly volatile and the species probably requires extensive habitats or habitat networks for its long term survival.

The Marsh Fritillary was once common in north Cumbria but by 2004 the last remaining Cumbrian colony had dwindled to just two larval webs. These were taken into captivity to form the basis for a captive breeding and habitat restoration programme that has now seen the successful re-establishment of this butterfly at several sites in the north of the county, including Ennerdale where the colonies are doing well and expanding.



*Marsh Fritillary,
Gillerthwaite pasture, 15 June 2022*

SMALL HEATH
THREATENED

Coenonympha pamphilus NEAR

a butterfly Order LEPIDOPTERA Family NYMPHALIDAE

This relatively widespread dainty little pale brown and orange butterfly can occupy a range of habitat types and, although its range has changed little, many colonies have disappeared in recent decades. Widespread in Britain and Ireland.



Occurs on grassland where there are fine grasses, especially in dry, well-drained situations where the sward is short and sparse. Typical habitats include; heathland, downland and coastal dunes, but it is also found on woodland rides.

Small Heath © Stephen Hewitt

The Small Heath is widespread throughout Cumbria, particularly on the fells of the Lake District, south Cumbria and the Howgills. It is rather less frequently recorded in the Pennines, Solway plain and Border uplands in the north and east of the county. The caterpillars feed on fine grasses and the butterfly is often found on short, sheep-grazed grasslands of the fells, as well as coastal grasslands. Adults can be seen from May through to September. Adults were widespread across the Ennerdale valley in 2022.

Fact source Butterfly Conservation web page: <https://butterfly-conservation.org/butterflies/small-heath>

DINGY SKIPPER

Erynnis tages VULNERABLE

a butterfly Order LEPIDOPTERA Family HESPERIIDAE

A small butterfly with a low, darting flight, The Dingy Skipper is locally distributed throughout Britain and Ireland but has declined seriously in recent years.



Dingy Skipper on the River Liza shingles 15 JUN 2022

The Dingy Skipper often basks on bare ground with wings spread wide. In dull weather, and at night, it perches on the tops of dead flowerheads in a moth-like fashion with wings curved in a position not seen in any other British butterfly. Common Bird's-foot-trefoil (*Lotus corniculatus*) is the usual foodplant in all habitats. Horseshoe Vetch (*Hippocrepis comosa*) is also used on calcareous soils, and Greater Bird's-foot-trefoil (*L. pedunculatus*) is used on heavier soils.

Habitat Colonies occur in a wide range of open, sunny habitats including chalk downland, woodland rides and clearings, coastal habitats such as dunes and undercliffs, heathland, old quarries, railway lines and waste ground. Suitable conditions occur where foodplants grow in a sparse sward, often with patches of bare ground in a sunny, sheltered situation. Taller vegetation is also required for shelter and roosting.

The Dingy Skipper occurs in discrete colonies, many of which are very small and consist of fewer than 50 adults at the peak of the flight period. It is a sedentary species that is unlikely to colonise new areas of habitat unless they are close to existing populations. However, observations of natural colonisations reveal that a few individuals may move several kilometres.

Management and conservation The recommended management is to maintain a sparse sward interspersed with plenty of bare ground. Some areas of tall vegetation should be retained. Sites need not be large providing high quality habitat is present and other habitats occur nearby. The dynamic nature of the Liza ensures these requirements are met without the need for any intervention.

Distribution Found throughout Britain, but in Scotland, it is very restricted and found mainly on the coasts in the far south and in the Moray Firth area in the north. Distribution Trend Since 1970's = Britain: -61%

Fact source Butterfly Conservation Factsheet <https://butterfly-conservation.org/sites/default/files/dingy-skipper-psf.pdf>

HEATH GRASS-VENEER

Crambus ericella

NATIONALLY SCARCE: Nb

a moth
CRAMBIDAE

Order LEPIDOPTERA Family

A distinctive dark-coloured Crambid, with clearly defined white markings, this is a rather local species, occurring on moorland in parts of Scotland and northern England.

The larval stages are undescribed, but the adults fly during late afternoon and evening in July and August, and can be attracted by bright lights.

Fact source UK Moths website
<https://www.ukmoths.org.uk/species/crambus-ericella/>



Heath Grass-veneer on Caw Fell, 21 JUL 2022

CINNABAR *Tyria jacobaeae*

UK BAP: Priority species (Research only)

a moth
Order LEPIDOPTERA Family ARCTIIDAE

A distinctive, medium sized black and red coloured moth, which is easily disturbed by day and flies in sunshine. The caterpillars feed on the leaves and flowers of Common Ragwort (*Senecio jacobaea*) and are occasionally found on other ragworts and groundsels.

The Cinnabar is frequent in open grassy habitats including waste ground, railway banks, gardens and woodland rides but perhaps most frequent on well drained rabbit-grazed grassland, mature sand-dunes and heathland.

Distribution England, Wales, Scotland, Ireland. Common and well distributed throughout most of England, Wales and Ireland, the Isle of Man and the Channel Islands. More confined to predominantly coastal habitats in northern England and Scotland.

Fact source Butterfly Conservation web page: <https://butterfly-conservation.org/moths/cinnabar>



Cinnabar © Stephen Hewitt

CHEILOTRICHIA IMBUTA

NATIONALLY SCARCE

A crane fly Order DIPTERA

Family TIPULIDAE

Crane fly mainly associated with Phalaris or Phragmites growing on river banks in sheltered situations, rarely in other wet habitats. The larvae are assumed to be semi-aquatic (RECORDER 3 species account).

DISTRIBUTION Very local with records widely scattered in England, Wales and Scotland.

HABITAT Usually associated with Phalaris or Phragmites stands beside rivers and streams in sheltered situations.

ECOLOGY Life history unknown. Adults recorded from May to August.

STATUS About 25 known post 1960 sites scattered widely throughout the range.

THREAT The degrading of marginal vegetation along streams and rivers through canalisation and ditching to produce steep sided banks; excessive trampling of banks; pollution such as agricultural run-off and resultant eutrophication.

MANAGEMENT Maintain a rich marginal vegetation alongside rivers and ditches, including stands of Phalaris or Phragmites, and trees for shade and shelter. When ditches require management, undertake this on a small-scale, rotational basis, and retain a shallow marginal profile.

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.

NORTHERN YELLOW SPLINTER SPECIES

Lipsothrix errans

NATIONALLY SCARCE, UK BAP PRIORITY

A crane fly Order DIPTERA

Family

TIPULIDAE

A crane fly of wooded streamsides in upland areas. Widespread in Scotland, but also recorded from Durham and several sites in Wales (RECORDER 3 species account).

DISTRIBUTION Essentially a northern species, recorded widely in Scotland including Mull; also Durham (1898) and scattered localities in Wales (within Breconshire, Cardiganshire, Merionethshire, Denbighshire).

HABITAT Wooded streamsides in upland districts.

ECOLOGY Biology unknown. The larvae of this genus are generally assumed to develop in wet, rotten wood. Adults recorded from May to July.



Northern Yellow Splinter © Stephen Hewitt

STATUS Some 18 known post 1960 sites, widely scattered and with comparatively few older records.

THREAT The clearance of broadleaved woodland for agriculture or intensive forestry; also ditching of streams, excessive trampling of banks and pollution such as agricultural run-off.

MANAGEMENT Maintain wooded streambanks in a natural state, retaining any marshy areas and dead wood.

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.

SCLEROPROCTA SORORCULA

NATIONALLY SCARCE

A crane fly Order DIPTERA

Family TIPULIDAE

Crane fly of wet woodlands. Biology unknown. Widespread, but very local. There has been confusion over nomenclature which may affect the validity of literature records (RECORDER 3 species account).

DISTRIBUTION Records widely dispersed in England, Wales and Scotland (including Arran and Mull).

HABITAT Wet woodlands.

ECOLOGY Biology unknown. Related species develop in fungi. Adults recorded in May and June.

STATUS About 25 known, widely scattered post 1960 sites. There has been some confusion surrounding the nomenclature of this species. In Edwards (1938) this species was called *S. pentagonalis*. Status revised from RDB3 (Shirt 1987).

THREAT Clearance of woods for agriculture or intensive forestry.

MANAGEMENT Maintain habitat diversity in woodlands, retaining any marshy areas, streams, dead wood and old or diseased trees which may provide breeding sites.

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.

TASIOCERA ROBUSTA

NATIONALLY SCARCE

A crane fly Order DIPTERA

Family TIPULIDAE

A small crane fly, associated with damp woodland. Probably overlooked (RECORDER 3 species account). Though remaining a poorly known species, it is now known to be widespread, but mainly in northern and western districts. Wales seems to be one of the more favoured areas (Stubbs, 2021).

DICRANOTA ROBUSTA

NATIONALLY SCARCE

A crane fly Order DIPTERA

Family TIPULIDAE

DISTRIBUTION A very local and clumped distribution in north and west England, and Scotland.

HABITAT Fast-flowing streams with banks of sand or gravel and occurring as high as 750m in the Cairngorms.

ECOLOGY Larvae aquatic and develop in sand and gravel in streams where they are probably predatory on smaller invertebrates. Adults are almost flightless but can aquaplane across water and may be found beside streams and under stones between April and July.

STATUS A widespread but very local species with post 1960 sites including the River Monnow, Herefordshire (1988); Dartmeet, Devon (1970s); several sites in the Bolton area of Lancashire (1982); Sinking Wood, Yorkshire (1985) and the Sanquhar area of Dumfriesshire. It has been found in abundance beneath stones in Lancashire recently and its rather secretive habits means it is unlikely to be found unless specifically searched for. Status revised from RDB3 (Shirt 1987).

THREAT Disturbance of sand or shingle riverbanks through ditching of streams, gravel extraction, pollution such as agricultural run off, excessive trampling and adjacent afforestation.

MANAGEMENT Maintain upland streams in a natural, undisturbed state retaining any sand or shingle banks

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.

DICTYA UMBRARUM

NATIONALLY SCARCE

A snail-killing fly Order DIPTERA Family SCIOMYZIDAE

A snail-killing fly found around ponds and in marshes. Larvae are vigorous aquatic predators which feed on *Lymnaea* spp. in the lab. Multivoltine.

DISTRIBUTION Records widely dispersed in upland areas in the north of England and Scotland extending to North Wales and isolated records from the south west, especially the New Forest and Dorset bogs.

HABITAT Marshes, bogs and vegetation around ponds and lakes; also dune slacks in North Wales and at Culbin Sands, Elgin. Most localities are on peat, where adults are typically found in association with flushes.

ECOLOGY Larvae probably parasitoids of aquatic pulmonate snails and have been reared in laboratory conditions using *Lymnaea palustris* and *L. tomentosa*. Adults recorded from May to September.

STATUS About 50 post 1960 sites, mainly from northern upland areas, though still present in small numbers in the New Forest.

THREAT The drainage of wetlands for agriculture or intensive forestry; pollution such as agricultural run-off; complete or extensive clearance of marginal vegetation from water edges such as through river improvement schemes and the ditching of streams; recreational pressure on dunes; mis-management of water levels with a loss of breeding sites and subsequent scrub invasion.

MANAGEMENT Prevent any drainage of sites and ensure a range of vegetation types including ditches, ponds and their marginal vegetation. Prevent scrub invasion though isolated shrubs or areas of carr may be beneficial.

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.



Dictya umbrarum © Stephen Hewitt

LEPTOPEZA BOREALIS

NEAR THREATENED

A dancefly Order DIPTERA Family HYBOTIDAE

Small predatory fly of moist shady places. Northern montane species, known mainly from mountains of Scotland (RECORDER 3 species account).

Distribution Records for this species are from northern England (Cheshire, Yorkshire), and Scotland (Stirlingshire).

Habitat The Yorkshire sites are tree-fringed banks of fastflowing upland rivers.

Ecology The larvae of the closely related species *Leptopeza flavipes* (Mg.) have been bred from rotten wood. The adults are probably predatory on other small insects.

Status This is a little-known species with only four recent records, one of these being Goyt Valley, Cheshire, and the others are from widely separated Yorkshire sites. The extent of occurrence is too wide for Vulnerable status, but any possible threats to recent sites need to be checked. Status revised from RDB 1 (Shirt 1987).

Threats The clearance of damp broad-leaved woodland for intensive forestry or agriculture, the removal of dead wood and old or diseased trees, and river improvement schemes, are all likely to pose threats to this species.

Management and conservation It is desirable to retain any dead wood and old or diseased trees, commensurate with public safety considerations, ensuring continuity in the future.

Fact source Falk, S.J. & Crossley, R. 2005. *A review of the scarce and threatened flies of Great Britain. Part 3: Empidoidea*. Species Status 3: 1-134. Joint Nature Conservation Committee, Peterborough.

PLATYPALPUS EXCAVATUS

LEAST CONCERN: Nationally Scarce

a dancefly Order DIPTERA

Family HYBOTIDAE

A small predatory fly which runs over foliage in search of prey. Larvae are probably predators in damp soil.

Distribution This species is recorded from scattered localities throughout Great Britain (Somerset, Wiltshire, Sussex, Kent, Oxfordshire, Cambridgeshire, Yorkshire and Westmorland in England, Glamorgan in Wales and Arran in Scotland).

Habitat Sites include chalk downland, lowland heath, fenland and old broad-leaved woodland.

Ecology The immature stages are unknown, but larvae of some species have been found in soil or under moss, and they are probably predaceous (Chvála 1975). Adults of this genus are found running amongst ground vegetation or, more usually, over the surfaces of leaves on bushes and trees where they search for small insects upon which they prey.

Status This is a localised species with about twelve known post-1960 sites, some of which are on the chalk downs of Sussex and Kent. There may have been some confusion in the past with the common species *Platypalpus nigratarsis* (Fall.) and this may have resulted in the under-recording of *P. excisus*. The wide extent of occurrence indicates Nationally Scarce. Status revised from RDB 1 (Shirt 1987).

Threats In view of the variety of habitats from which this species has been reported it is not possible to identify any single potential threat. However, any action, or even lack of action, which will lead to a drastic change at existing sites are obvious dangers.

Management and conservation Maintain known sites in a natural state and avoid actions which will cause deterioration of the existing habitats.

Fact source Falk, S.J. & Crossley, R. 2005. *A review of the scarce and threatened flies of Great Britain. Part 3: Empidoidea*. Species Status 3: 1-134. Joint Nature Conservation Committee, Peterborough.

NORTHERN SILVER STILETTO*Spiriverpa luntulata*

LEAST CONCERN: Nationally Scarce

a stiletto fly Order DIPTERA

Family THEREVIDAE

DISTRIBUTION *Spiriverpa luntulata* is associated with river shingle banks. It has a northern and western distribution in Britain, where the topography leads to the development of extensive shingle banks in the deposition zones of spate rivers.

HABITAT *S. luntulata* occurs on the tops of mature, in-channel sand and shingle banks on spate rivers, usually with a mixture of thin vegetation and bare ground.

ECOLOGY Adult male *S. luntulata* form aerial leks where several males 'duel' in the air, their silvery bodies flashing in the sunlight. Lek sites often consist of a rough amphitheatre of bare ground surrounded by vegetation.

The eel-like larvae are active predators of fly and beetle larvae in loose sand and gravel on the top of established, often partially vegetated, in-channel deposits.



Northern Silver Stiletto, R. Liza, Gillerthwaite, 15 JUN 2022

STATUS Formerly listed as a UK BAP species, this fly has proved to be more widespread on shingle banks in suitable condition than previously realised. As a result it has been removed from the BAP list and is now designated as Nationally Scarce. It remains however, a valuable indicator of high-quality habitat of importance to a significant community of rare and specialist insects.

MANAGEMENT This species may be threatened by river engineering and flood prevention schemes that alter sediment deposition, sand and gravel extraction, afforestation, excessive trampling and agricultural pollution.

PLAIN-EYED GREY HORSEFLY*Tabanus cordiger*

LEAST CONCERN: Nationally Scarce

a horsefly Order DIPTERA

Family TABANIDAE

A large horsefly found throughout Britain. Very scarce and local (RECORDER 3 species account). Larvae develop in shingle and sand at the edge of rivers and streams. An adult of this horsefly was observed on the R. Liza shingles at Gillerthwaite on 1 August.

DISTRIBUTION A disjunct distribution is shown with scattered localities in southern England from Surrey to Devon, several localities in Wales and then in the Scottish Highlands, mainly from the Spey Valley but extending to Sutherland, Perthshire, Fifeshire. Single records are also present from Cumberland and Durham.

HABITAT Typically recorded in old broadleaved woodland and forest in the south, possibly inhabiting areas of both broadleaved and Caledonian pine woodland in Scotland. There is probably a requirement for gravelly streams in these old woodland areas for breeding. Mature larvae and pupae have been found in unvegetated river shingle on unshaded stretches of rivers in Wales, in situations well above normal summer water levels (Stubbs &



Tabanus cordiger © Stephen Hewitt

Drake, 2014). An adult was reared from a pupa collected from a sandbank by the River Dee at Wrexham in 2007.

ECOLOGY In Britain this species has been reared on at least two occasions from the gravel of streams in or near to woods. One record refers to a typical moorland stream at forest edge, whilst the other refers to a chalk rubble stream near to a spring head. In France the larva was found in a soft but not rotten stump of a recently felled poplar, but this report may be the result of a misidentification. Adults recorded in June and July and females suck the blood of a range of grazing animals and man.

STATUS Locally frequent and widespread in the New Forest with numerous recent records, though the only other English post 1960 localities known are Bramshill Plantation and Ashford Hangers in Wealden Hampshire. A few post 1960 sites occur in Wales (within Carmarthenshire, Cardiganshire, Radnorshire and Denbighshire) and it may prove to be under recorded here. It used to be widespread though rather scarce in Scotland, though no post 1960 records are known.

THREAT The clearance of old woodland and forest areas, especially in the New Forest, the Welsh Valleys and the Scottish Highlands for intensive forestry or agriculture. Pollution of formerly clean streams and disturbance to any shingle banks through ditching, gravel extraction etc.

MANAGEMENT Retain any undisturbed gravelly streams, and especially any shingle banks. Retain animal grazing in the vicinity of potential breeding sites.

Fact Source Falk, S.J. - 1991, *A review of the scarce and threatened flies of Great Britain (Part 1)*. Research and survey in nature conservation, No. 39.

In Cumbria, there are early 20th century records from Currock in Carlisle (NY4054), Great Salkeld (NY5536) and Melkinthorpe (NY5525). The species was not reported again until the 1990s when adults and hatched pupae were found on open shingle on the Caldew at Cummersdale, south of Carlisle (NY3952) and adults were found resting on fence posts along a woodland edge above the Roe Beck at Low Wood, Middlesceugh (NY4040) where hatched pupae were also found in the river shingle. Adults were also recorded at Braithwaite Moss (NY2325) in 1997, Nichols Wood (SD4282) in 2013 and on shingle on Swindale Beck, Great Musgrave (NY7713) in 2005 and the Caldew at Dalstonhall (NY3851) in 2018.

TACHYTRECHUS CONSOBRINUS

LEAST CONCERN: Nationally Scarce

a long-headed fly

Order DIPTERA

Family DOLICHOPODIDAE

A small metallic fly found on sandy ground near water and possibly in bogs. Biology unknown. Has been found in south-west England and northern Scotland (RECORDER 3 species account).

Recorded only strongly in SW England and S Wales on acid mire and wet sandy areas, with scattered records elsewhere in Britain (some coastal ones may be errors for insignis), not declining.

Fact source DRAKE, C.M. 2018. *A review of the status of the Dolichopodidae flies of Great Britain - Species Status No.30*. Natural England Commissioned Reports, Number195.

CRYPTOSTEMMA ALIENUM

Nationally Scarce

a true bug Order HEMIPTERA

Family DIPSOCORIDAE

A river-shingle species, commonest in the north and west. Probably under-recorded, and frequent in at least some parts of its range (RECORDED 3 species account). These tiny (2mm long) bugs live in wet gravel beneath large cobbles at the edge of fast flowing, clean rivers. Their wings are covered in a dense coat of short hydrofuge hairs, giving them a velvety appearance when examined closely. *C. alienum* is widespread but local along the stony, upland rivers of Cumbria. Several individuals were noted at various locations along the Liza in 2022.

Appendix 2. All Invertebrate species recorded in Ennerdale in 2022 by site

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillerthwaite Mire	High Gillerthwaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillerthwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
COLEOPTERA	1			3			1	3		7		4	22	12	2			13		4	72
Aphodiidae												1									1
<i>Aphodius fossor</i>												1									1
Cantharidae				1						1								3			5
<i>Cantharis cryptica</i>																		1			1
<i>Cantharis livida</i>										1											1
<i>Malthodes marginatus</i>				1																	1
<i>Rhagonycha lignosa</i>																		1			1
<i>Rhagonycha limbata</i>																		1			1
Carabidae													8	6	1						15
<i>Bembidion atrocaeruleum</i>													2	2							4
<i>Bembidion monticola</i>													1								1
<i>Bembidion punctulatum</i>													1	1							2
<i>Cicindela campestris</i>													3	2	1						6
<i>Loricera pilicornis</i>														1							1
<i>Paranchus albipes</i>													1								1
Cerambycidae													1					3			4
<i>Clytus arietis</i>																		1			1
<i>Rhagium bifasciatum</i>																		2			2
<i>Rhagium mordax</i>													1								1
Chrysomelidae				1				1		2								1		1	6
<i>Donacia thalassina</i>										1											1
<i>Plateumaris discolor</i>				1				1		1								1		1	5
Coccinellidae										1		2	1					1			5
<i>Adalia decempunctata</i>																		1			1
<i>Anatis ocellata</i>												1									1

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records	
<i>Aphidecta obliterata</i>													1									1
<i>Coccinella septempunctata</i>										1												1
<i>Harmonia axyridis</i>												1										1
Curculionidae							1															1
<i>Hylobius abietis</i>							1															1
Elateridae								2		1			4	5					5			17
<i>Actenicerus sjaelandicus</i>								1		1									1			3
<i>Aplotarsus incanus</i>																			1			1
<i>Athous haemorrhoidalis</i>								1						1								2
<i>Ctenicera cuprea</i>																			1			1
<i>Dalopius marginatus</i>													1						1			2
<i>Denticollis linearis</i>																			1			1
<i>Fleutiauxellus maritimus</i>														1								1
<i>Hypnoidus riparius</i>													1									1
<i>Zorochros minimus</i>													2	3								5
Histeridae												1										1
<i>Hister unicolor</i>												1										1
Rutelidae	1														1							2
<i>Phyllopertha horticola</i>	1														1							2
Staphylinidae				1						2			8	1							3	15
<i>Anotylus rugosus</i>													1									1
<i>Lathrobium angusticolle</i>													1	1								2
<i>Lobrathium multipunctum</i>													1									1
<i>Platydracus fulvipes</i>				1																		1
<i>Stenus carbonarius</i>													1									1
<i>Stenus cicindeloides</i>										1											1	2
<i>Stenus flavipes</i>																					1	1
<i>Stenus guttula</i>													1									1

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records	
<i>Stenus nitidiusculus</i>										1										1	2	
<i>Stenus pusillus</i>													1									1
<i>Stenus tarsalis</i>													1									1
<i>Xantholinus linearis</i>													1									1
Diplura														1								1
Campodeidae														1								1
<i>Campodea sp.</i>														1								1
DIPTERA	1	1	7	9		12	11	2	4	62		6	36	88	12	12		95	3	23	384	
Asilidae																		1				1
<i>Leptarthrus brevisrostris</i>																		1				1
Bombyliidae							1															1
<i>Bombylius major</i>							1															1
Brachystomatidae													1									1
<i>Heleodromia sp.</i>													1									1
Clusiidae																		1				1
<i>Clusiodes gentilis</i>																		1				1
Conopidae										2												2
<i>Sicus ferrugineus</i>										2												2
Dolichopodidae				2		4		1		9			8	1				5		7		37
<i>Argyra leucocephala</i>										1												1
<i>Campsicnemus curvipes</i>														2								2
<i>Campsicnemus loripes</i>														1							1	2
<i>Campsicnemus scambus</i>																					1	1
<i>Dolichopus atratus</i>								1		2				1				1			2	7
<i>Dolichopus atripes</i>						1				2												3
<i>Dolichopus discifer</i>						1												2				3
<i>Dolichopus plumipes</i>				1																	1	2
<i>Dolichopus rupestris</i>				1																	1	2

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillerthwaite Mire	High Gillerthwaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillerthwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
<i>Dolichopus signatus</i>										1											1
<i>Dolichopus vitripennis</i>																				1	1
<i>Gymnopternus aerosus</i>						1				1								1			3
<i>Gymnopternus cupreus</i>													1	1				1			3
<i>Hercostomus nigripennis</i>						1				1											2
<i>Sympycnus pulicarius</i>													1								1
<i>Syntormon denticulatum</i>													1								1
<i>Tachytrechus consobrinus</i>										1			1								2
Drosophilidae																		1			1
<i>Leucophenga maculata</i>																		1			1
Empididae						1				2		9	15	3				16		2	48
<i>Chelifera precatatoria</i>																		1			1
<i>Clinocera fontinalis</i>												1	2							1	4
<i>Dolichocephala irrorata</i>													1								1
<i>Empis albohirta</i>												1						1			2
<i>Empis borealis</i>												2									2
<i>Empis tessellata</i>										1			2					2			5
<i>Hilara anglodanica</i>																		1			1
<i>Hilara bistriata</i>																		1			1
<i>Hilara chorica</i>										1			3	1				1		1	7
<i>Hilara intermedia</i>													1	1							2
<i>Hilara interstincta</i>																		1			1
<i>Hilara maura</i>																		1			1
<i>Hilara pilosa</i>														1							1
<i>Phyllodromia melanocephala</i>						1															1
<i>Rhamphomyia albipennis</i>												1	1					1			3
<i>Rhamphomyia crassirostris</i>																		1			1
<i>Rhamphomyia erythrophthalma</i>													1								1

Taxon	Black Sail, valley head	Boat How exclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
<i>Rhamphomyia nitidula</i>																		1			1
<i>Rhamphomyia pilifer</i>																		1			1
<i>Rhamphomyia stigmosa</i>													1					2			3
<i>Rhamphomyia tibialis</i>													1								1
<i>Rhamphomyia tibiella</i>																		1			1
<i>Rhamphomyia umbripennis</i>													2	1							3
<i>Rhamphomyia variabilis</i>														1							1
<i>Weidemannia bistigma</i>														1							1
<i>Wiedemannia insularis</i>														1							1
Ephydriidae														1							1
<i>Ochthera mantis</i>														1							1
Hybotidae				1		1				5			1	10	1			10		1	30
<i>Bicellaria intermedia</i>															1						1
<i>Bicellaria nigra</i>																		1			1
<i>Bicellaria vana</i>										1				2				1			4
<i>Euthyneura myrtilli</i>														1				1			2
<i>Hybos culiciformis</i>						1				1				1							3
<i>Hybos femoratus</i>										1				1						1	3
<i>Leptozepe borealis</i>																		1			1
<i>Oedalea flavipes</i>																		1			1
<i>Platypalpus clarandus</i>										1				1							2
<i>Platypalpus excavatus</i>																		1			1
<i>Platypalpus longicornis</i>																		1			1
<i>Platypalpus nigratarsis</i>				1																	1
<i>Platypalpus notatus</i>										1				2							3
<i>Platypalpus verralli</i>														1				1			2
<i>Tachypeza nubila</i>													1					2			3

Taxon	Black Sail, valley head	Boat How exclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
<i>Trichina clavipes</i>														1							1
Limoniidae		1					1			4			6	6		6		17	3		44
<i>Austrolimnophila ochracea</i>																		1			1
<i>Cheilotrichia imbuta</i>																1					1
<i>Dicranomyia fusca</i>																		1			1
<i>Dicranomyia mitis sensu lato</i>																		1			1
<i>Dicranomyia morio</i>							1														1
<i>Dicranomyia quadra</i>												1				1		1			3
<i>Dicranophragma adjunctum</i>																		1			1
<i>Dicranophragma nemorale</i>																1		1	1		3
<i>Eloeophila submarmorata</i>																		1			1
<i>Euphylidorea</i>													1								1
<i>Euphylidorea meigenii</i>										1										1	2
<i>Limonia nubeculosa</i>																1		1			2
<i>Lipsothrix errans</i>																		1			1
<i>Molophilus ater</i>		1																			1
<i>Molophilus bifidus</i>																		1			1
<i>Molophilus flavus</i>														3				1			4
<i>Molophilus medius</i>														1							1
<i>Molophilus occultus</i>										1											1
<i>Neolimonia dumetorum</i>													1					1			2
<i>Ormosia aciculata</i>													1								1
<i>Phylidorea ferruginea</i>										1								1			2
<i>Phylidorea squalens</i>										1								1	1		3
<i>Pseudolimnophila lucorum</i>														1							1
<i>Rhabdomastix eugeni</i>																1					1
<i>Rhabdomastix edwardsi</i>													2	1		1					4
<i>Rhipidia maculata</i>																		1			1

Taxon	Black Sail, valley head	Boat How exclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R.Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
<i>Scleroprocta sororcula</i>																		1			1
<i>Tasiocera robusta</i>																		1			1
Lonchopteridae													1	2							3
<i>Lonchoptera bifurcata</i>														2							2
<i>Lonchoptera lutea</i>												1									1
Micropezidae														2							2
<i>Calobata petronella</i>														1							1
<i>Neria cibaria</i>														1							1
Muscidae																		1			1
<i>Mesembrina meridiana</i>																		1			1
Odiniidae																		1			1
<i>Odinia boletina</i>																		1			1
Opomyzidae						1				1				1							3
<i>Opomyza germinationis</i>						1				1				1							3
Pediciidae													1	1		3		2			7
<i>Dicranota bimaculata</i>																1					1
<i>Dicranota claripennis</i>																		1			1
<i>Dicranota exclusa</i>														1	1						2
<i>Tricyphona immaculata</i>																		1			1
<i>Tricyphona schummeli</i>													1			1					2
Platyppezidae																		1			1
<i>Callomyia speciosa</i>																		1			1
Platystomatidae														1							1
<i>Rivellia syngenesiae</i>														1							1
Rhagionidae	1			1		1						1		1	1			1			7
<i>Rhagio lineola</i>						1															1
<i>Rhagio scolopaceus</i>	1			1								1		1	1			1			6
Sciomyzidae																				2	2

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records	
<i>Dictya umbrarum</i>																				1	1	
<i>Tetanocera elata</i>																					1	1
Syrphidae			7	5		4	8	1	4	33		5	10	26	4			32		7	146	
<i>Brachypalpoidea lentus</i>																		1				1
<i>Cheilosia bergenstammi</i>																		1				1
<i>Cheilosia fraterna</i>										1								2				3
<i>Cheilosia longula</i>						1																1
<i>Cheilosia proxima</i>																		1				1
<i>Cheilosia urbana</i>							1															1
<i>Chrysogaster virescens</i>																		1				1
<i>Chrysotoxum arcuatum</i>										1		1	1					1				4
<i>Chrysotoxum bicinctum</i>										1												1
<i>Criorhina berberina</i>														1								1
<i>Criorhina floccosa</i>																		1				1
<i>Dasysyrphus venustus s.l.</i>							1															1
<i>Episyrphus balteatus</i>										1		1								1		3
<i>Eristalis horticola</i>												1		2				2				5
<i>Eristalis nemorum</i>														1								1
<i>Eristalis pertinax</i>				2			1		1			1	1	1				2				9
<i>Eristalis rupium</i>										1												1
<i>Eristalis tenax</i>			1	1						2				1								5
<i>Eupeodes corollae</i>				1						1												2
<i>Helophilus pendulus</i>										1				1								2
<i>Melangyna lasiophthalma</i>			1				1															2
<i>Melangyna quadrimaculata</i>							1															1
<i>Melanogaster aerea</i>														1				1		1		3
<i>Melanogaster hirtella</i>										1												1
<i>Melanostoma mellinum</i>						1								1				1		1		4

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<i>Melanostoma scalare</i>						1	1						2	1	1			2				8
<i>Meliscaeva cinctella</i>										1												1
<i>Microdon myrmicae</i>										1												1
<i>Neoascia podagrica</i>										1												1
<i>Neoascia tenur</i>																				1		1
<i>Paragus haemorrhous</i>														2								2
<i>Platycheirus albimanus</i>							1											2				3
<i>Platycheirus ambiguus</i>												1										1
<i>Platycheirus clypeatus</i>																		1				1
<i>Platycheirus podagratus</i>																				1		1
<i>Platycheirus rosarum</i>										1												1
<i>Platycheirus tarsalis</i>																		1				1
<i>Rhingia campestris</i>												1										1
<i>Scaeva pyrastris</i>			1																	1		2
<i>Sericomyia lappona</i>			1							1								2				4
<i>Sericomyia silentis</i>			2	1				1	5		1		4	1				1		1		17
<i>Sphaerophoria interrupta</i>										1												1
<i>Sphaerophoria philanthus</i>												1	1					2				4
<i>Sphegina clunipes</i>												2						1				3
<i>Sphegina sibirica</i>												1	1	1								3
<i>Sphegina verecunda</i>																		1				1
<i>Syrirta pipiens</i>										1												1
<i>Syrphus ribesii</i>												1	1					2				4
<i>Syrphus torvus</i>							1			2												3
<i>Volucella bombylans</i>			1					1	1	3				1								7
<i>Volucella pellucens</i>									1	1				2								4
<i>Xylota jakutorum</i>										2								1				3
<i>Xylota segnis</i>						1				3			3	1				2				10

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R.Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
Tabanidae										3				3							6
<i>Chrysops relictus</i>										2				1							3
<i>Haematopota pluvialis</i>										1				1							2
<i>Tabanus cordiger</i>														1							1
Tachinidae							1			2		1						2			6
<i>Eriothrix rufomaculata</i>										1											1
<i>Tachina fera</i>										1											1
<i>Tachina grossa</i>																		1			1
<i>Tachina ursina</i>							1					1						1			3
Tephritidae										1		1								1	3
<i>Chaetostomella cylindrica</i>										1											1
<i>Sphenella marginata</i>																				1	1
<i>Tephritis conura</i>												1									1
Therevidae												4	5	1							10
<i>Spiriverpa lunulata</i>												4	5	1							10
Tipulidae												1	6	1	3			4		3	18
<i>Dolichopeza albipes</i>																1		1			2
<i>Nephrotoma appendiculata</i>														2	1						3
<i>Nephrotoma submaculosa</i>																1					1
<i>Tipula confusa</i>														1						1	2
<i>Tipula lateralis</i>																		1			1
<i>Tipula montium</i>												1	1								2
<i>Tipula pagana</i>													1								1
<i>Tipula paludosa</i>																				2	2
<i>Tipula variicornis</i>													1		1			2			4
Hemiptera		1		1		5	1			12			5	21	3		1	7		3	60
Acanthosomatidae														1				4			5
<i>Acanthosoma haemorrhoidale</i>																		2			2

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<i>Elasmotherus interstinctus</i>														1				2			3
Anthoridae							1								1			1			3
<i>Anthocoris nemoralis</i>							1								1			1			3
Aphrophoridae						1															1
<i>Philaenus spumarius</i>						1															1
Cicadellidae										2											2
<i>Cicadella viridis</i>										2											2
Dipsocoridae												1	3								4
<i>Cryptostemma alienum</i>												1	3								4
Lygaeidae												2	1					1			4
<i>Cymus glandicolor</i>																		1			1
<i>Kleidocerys resedae</i>												1	1								2
<i>Scolopostethus grandis</i>												1									1
Miridae		1		1		3				8			7	1			1	1		3	26
<i>Adelphocoris lineolatus</i>										2				1			1				4
<i>Blepharidopterus angulatus</i>														1							1
<i>Leptopterna ferrugata</i>										1				1	1						3
<i>Neolygus contaminatus</i>														1							1
<i>Orthotylus virescens</i>														1							1
<i>Pachytomella parallela</i>						1														1	2
<i>Pithanus maerkelii</i>										1										1	2
<i>Plagiognathus chrysanthemi</i>										1											1
<i>Stenodema calcarata</i>										1				1				1			3
<i>Stenodema holsata</i>		1				1															2
<i>Stenodema laevigata</i>														1							1
<i>Stenotus binotatus</i>						1															1
<i>Teratocoris saundersi</i>										1											1
<i>Teratocoris viridis</i>																				1	1

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<i>Trigonotylus ruficornis</i>				1						1											2
Nabidae						1				2											3
<i>Nabis flavomarginatus</i>										1											1
<i>Nabis limbatus</i>						1				1											2
Pentatomidae														3							3
<i>Palomena prasina</i>														1							1
<i>Pentatoma rufipes</i>														1							1
<i>Piezodorus lituratus</i>														1							1
Saldidae												2	4	1							7
<i>Macrosaldula scotica</i>													3	1							4
<i>Saldula c-album</i>												2	1								3
Tingidae													2								2
<i>Dictyonota strichnocera</i>													2								2
Hymenoptera	3	3	4	27			14		3	19		4	11	15	9		1	22			141
Andrenidae							1						3					1			5
<i>Andrena bicolor</i>							1						1								2
<i>Andrena lapponica</i>													1								1
<i>Andrena scotica</i>													1					1			2
Apidae	2	3	4	25			11		3	15		3	4	12	5			13			100
<i>Apis mellifera</i>		1								1											2
<i>Bombus sp.</i>			1	1																	2
<i>Bombus bohemicus</i>							1														1
<i>Bombus campestris</i>				1						1				1	1			1			5
<i>Bombus cryptarum ?</i>																		1			1
<i>Bombus hortorum</i>				2			2			2				1				1			8
<i>Bombus hypnorum</i>							2		1						1			1			5
<i>Bombus jonellus</i>	1		1	10			1			1		1		3	1						19
<i>Bombus lucorum sensu lato</i>							2						1	1				1			5

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<i>Bombus lucorum s.l./terrestris agg.</i>	1	1	1	9					1	5		1	1	3							23
<i>Bombus magnus ?</i>							2						1					2			5
<i>Bombus monticola</i>		1		2			1			2			1	2	1			2			12
<i>Bombus pascuorum</i>			1						1	3					1						6
<i>Bombus pratorum</i>																		1			1
<i>Bombus terrestris</i>												1		1							2
<i>Nomada flava</i>																		1			1
<i>Nomada marshamella</i>																		1			1
<i>Nomada panzeri sensu lato</i>																		1			1
Colletidae														1							1
<i>Colletes succinctus</i>														1							1
Formicidae	1			2			2			3		1	1	2	2			3			17
<i>Formica lemani</i>				1								1									2
<i>Lasius alienus</i>														1							1
<i>Lasius flavus</i>							1			1			1		1			1			5
<i>Lasius niger</i>										1				1	1						3
<i>Myrmica ruginodis</i>	1			1														1			3
<i>Myrmica scabrinodis</i>							1			1								1			3
Halictidae									1				3					4			8
<i>Halictus tumulorum</i>																		1			1
<i>Halictus rubicundus</i>													1								1
<i>Lasioglossum albipes</i>									1												1
<i>Lasioglossum cupromicans</i>													1					1			2
<i>Lasioglossum fratellum</i>																		2			2
<i>Sphecodes geoffrellus</i>													1								1
Ichneumonidae																		1			1
<i>Netelia cristata</i>																		1			1
Pompilidae															1						1

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Anoplius concinnus															1						1
Tenthredinidae																	1				1
<i>Euura herbaceae</i>																	1				1
Vespidae															1						1
Ancistrocerus oviventris															1						1
Lepidoptera	1	1	6	4	2	4	4		6	17	1	4	2	12	2			4		8	78
Crambidae					1																1
<i>Heath Grass-veneer (Crambus ericella)</i>					1																1
Erebidae				1						1	1			1				1			5
<i>Wood Tiger (Parasemia plantaginis)</i>				1							1										2
<i>Phytometra viridaria</i>																		1			1
<i>Cinnabar (Tyria jacobaeae)</i>										1				1							2
Geometridae		1	1			1				2				1							6
<i>Cabera pusaria</i>						1															1
<i>Ematurga atomaria</i>		1	1																		2
<i>Water Carpet (Lampropteryx suffumata)</i>												1									1
<i>Odezia atrata</i>										2											2
<i>Pseudopanthera macularia</i>														1							1
Hesperiidae									1	2			1	1	1						6
<i>Dingy Skipper (Erynnis tages)</i>													1	1							2
<i>Large Skipper (Ochlodes sylvanus)</i>									1						1						2
<i>Small Skipper (Thymelicus sylvestris)</i>										2											2
Lasiocampidae																				2	2
<i>Fox Moth (Macrothylacia rubi)</i>																				2	2
Lycaenidae										2				1							3
<i>Small Copper (Lycaena phlaeas)</i>										2				1							3
Noctuidae				1		1								2						1	5
<i>Beautiful Yellow Underwing (A. myrtilli)</i>				1										2							3

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<i>Silver Y (Autographa gamma)</i>						1														1	2	
Notodontidae														1								1
<i>Buff-tip (Phalera bucephala)</i>														1								1
Nymphalidae	1		5	1		2	2		5	9		3		5	1			2		5	41	
<i>Pecock (Aglais io)</i>							1				1			1				1		1	5	
<i>Small Totoiseshell (Aglais urticae)</i>							1			1											2	
<i>Ringlet (Aphantopus hyperantus)</i>						1			1											1	3	
<i>Small Pearl-bordered Fritillay (Boloria selene)</i>									1	2					1						4	
<i>Small Heath (Coenonympha pamphilus)</i>	1		1	1					1	1								1		1	7	
<i>Marsh Fritillary (Euphydryas aurinia)</i>									1	2											3	
<i>Meadow Brown (Maniola jurtina)</i>										2										1	3	
<i>Speckled Wood (Pararge aegeria)</i>						1				1		1		1							4	
<i>Dark Green Fritillary (Speyeria aglaja)</i>									1												1	
<i>Red Admiral (Vanessa atalanta)</i>			2									1		1						1	5	
<i>Painted Lady (Vanessa cardui)</i>			2											2							4	
Pieridae				1			2			1		1	1					1			7	
<i>Orange Tip (Anthocharis cardamines)</i>							1						1								2	
<i>Green-veined White (Pieris napi)</i>				1			1			1		1						1			5	
Tortricidae					1																1	
<i>Eana osseana</i>					1																1	
Neuroptera													1					1			2	
Hemerobiidae													1					1			2	
<i>Hemerobius humulinus</i>													1								1	
<i>Micromus variegatus</i>																		1			1	
Odonata		1				2			2	12		3	1	5	3			1		1	31	
Aeshnidae												1								1	2	
<i>Aeshna juncea</i>												1								1	2	

Taxon	Black Sail, valley head	Boat How enclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
Coenagrionidae		1								2			1	3	2			1			10
<i>Enallagma cyathigerum</i>														2	1						3
<i>Ischnura elegans</i>														1							1
<i>Pyrrhosoma nymphula</i>		1								2		1		1				1			6
Cordulegastridae						1				1	1			1							4
<i>Cordulegaster boltonii</i>						1				1	1			1							4
Lestidae														1							1
<i>Lestes sponsa</i>														1							1
Libellulidae						1			2	9	1			1							14
<i>Libellula quadrimaculata</i>								1	2												3
<i>Orthetrum coerulescens</i>									3												3
<i>Sympetrum danae</i>									2		1										3
<i>Sympetrum striolatum</i>						1		1	2				1								5
Orthoptera	1			1					1	6				4	2					1	16
Acrididae	1			1					1	6				4	2					1	16
<i>Chorthippus brunneus</i>									1												1
<i>Chorthippus parallelus</i>									2												2
<i>Myrmeleotettix maculatus</i>														4	1						5
<i>Omocestus viridulus</i>	1			1				1	3						1					1	8

Taxon	Black Sail, valley head	Boat How exclosure, valley head	Bowness Knott	Caw Fell spur (above forest)	Caw Fell summit	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwhaite Mire	High Gillertwhaite Meadows	Lingmell, Ennerdale	Mart Knott plantation	R. Liza Shingle Banks	R. Liza, Gillertwhaite shingles	R. Liza, top shinglebank	R.Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes	Tewit How	Total No. records
Total records	7	7	17	45	2	23	31	6	16	135	1	21	73	158	33	12	2	143	3	40	781
Total taxa	7	7	14	25	2	23	27	6	16	95	1	21	66	115	33	12	2	123	3	37	351

Appendix 3. Regionally Notable species recorded in 2022

Taxon	Black Sail, Ennerdale valley head	Boat How enclosure, Ennerdale valley head	Bowness Knott	Caw Fell	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwaite Mire	Gillertwaite Pastures	Lingmell, Ennerdale	Mart Knott plantation, Ennerdale	Caw Fell spur (above forest)	R. Liza Shingle Banks	R. Liza, Gillertwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes, Ennerdale	Tewit How	Total No. records	
<i>Bembidion punctulatum</i>													1	1								2
<i>Cicindela campestris</i>													3	2	1							6
<i>Clytus arietis</i>																		1				1
<i>Hylobius abietis</i>						1																1
<i>Actenicerus sjaelandicus</i>							1		1									1				3
<i>Hister unicolor</i>											1											1
<i>Lobrathium multipunctum</i>													1									1
<i>Platydacus fulvipes</i>												1										1
<i>Stenus guttula</i>													1									1
<i>Stenus tarsalis</i>													1									1
<i>Leptarthrus brevirostris</i>																		1				1
<i>Dolichopus rupestris</i>												1									1	2
<i>Syntormon denticulatum</i>														1								1
<i>Leucophenga maculata</i>																		1				1
<i>Empis borealis</i>													2									2
<i>Hilara anglodanica</i>																		1				1

Taxon	Black Sail, Ennerdale valley head	Boat How enclosure, Ennerdale valley head	Bowness Knott	Caw Fell	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwaite Mire	Gillertwaite Pastures	Lingmell, Ennerdale	Mart Knott plantation, Ennerdale	Caw Fell spur (above forest)	R. Liza Shingle Banks	R. Liza, Gillertwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes, Ennerdale	Tewit How	Total No. records
<i>Hilara bistrinata</i>																		1			1
<i>Hilara pilosa</i>															1						1
<i>Rhamphomyia albipennis</i>													1	1							2
<i>Rhamphomyia nitidula</i>																		1			1
<i>Rhamphomyia tibialis</i>													1								1
<i>Weidemannia bistigma</i>														1							1
<i>Wiedemannia insularis</i>														1							1
<i>Ochthera mantis</i>														1							1
<i>Platypalpus excavatus</i>																		1			1
<i>Cheilotrichia imbuta</i>																1					1
<i>Molophilus bifidus</i>																		1			1
<i>Rhabdomastix eugeni</i>																1					1
<i>Rhabdomastix edwardsi</i>													2	1		1					4
<i>Scleroprocta sororcula</i>																		1			1
<i>Odinia boletina</i>																		1			1
<i>Dicranota exclusa</i>														1		1					2
<i>Brachypalpoidea lentus</i>																		1			1
<i>Cheilosia proxima</i>																		1			1
<i>Cheilosia urbana</i>						1															1

Taxon	Black Sail, Ennerdale valley head	Boat How exclosure, Ennerdale valley head	Bowness Knott	Caw Fell	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwaite Mire	Gillertwaite Pastures	Lingmell, Ennerdale	Mart Knott plantation, Ennerdale	Caw Fell spur (above forest)	R. Liza Shingle Banks	R. Liza, Gillertwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes, Ennerdale	Tewit How	Total No. records
<i>Chrysotoxum arcuatum</i>									1				1	1				1			4
<i>Chrysotoxum bicinctum</i>									1												1
<i>Criorhina berberina</i>														1							1
<i>Criorhina floccosa</i>																		1			1
<i>Dasysyrphus venustus</i>						1															1
<i>Eristalis rupium</i>									1												1
<i>Melangyna lasiophthalma</i>			1			1															2
<i>Melangyna quadrimaculata</i>						1															1
<i>Melanogaster aerosa</i>														1				1	1		3
<i>Microdon myrmicae</i>									1												1
<i>Platycheirus ambiguus</i>													1								1
<i>Platycheirus tarsalis</i>																		1			1
<i>Sericomyia lappona</i>			1						1									2			4
<i>Sphegina sibirica</i>													1	1	1						3
<i>Sphegina verecunda</i>																		1			1
<i>Xylota jakutorum</i>									2									1			3
<i>Chrysops relictus</i>									2					1							3
<i>Nephrotoma appendiculata</i>														2	1						3
<i>Nephrotoma submaculosa</i>																1					1

Taxon	Black Sail, Ennerdale valley head	Boat How enclosure, Ennerdale valley head	Bowness Knott	Caw Fell	Ennerdale Forest, Deep Gill	Ennerdale Valley bottom	Ennerdale Valley Head	Gillertwaite Mire	Gillertwaite Pastures	Lingmell, Ennerdale	Mart Knott plantation, Ennerdale	Caw Fell spur (above forest)	R. Liza Shingle Banks	R. Liza, Gillertwaite shingles	R. Liza, top shinglebank	R. Liza, lower shingles	Scoat Fell	Side Wood, Ennerdale	Stair Knott Wood & flushes, Ennerdale	Tewit How	Total No. records	
<i>Cryptostemma alienum</i>													1	3								4
<i>Scolopostethus grandis</i>													1									1
<i>Adelphocoris lineolatus</i>									2					1			1					4
<i>Teratocoris saundersi</i>									1													1
<i>Teratocoris viridis</i>																				1		1
<i>Macrosaldula scotica</i>														3	1							4
<i>Saldula c-album</i>													2	1								3
<i>Dictyonota strichnocera</i>														2								2
<i>Bombus cryptarum ??</i>																		1				1
<i>Bombus jonellus</i>	1		1			1			1		1	10		3	1							19
<i>Bombus magnus ?</i>						2							1					2				5
<i>Nomada flava ?</i>																		1				1
<i>Lasius alienus</i>														1								1
<i>Euura herbaceae</i>																	1					1
<i>Wood Tiger (Parasemia plantaginis)</i>										1		1										2
<i>Phytometra viridaria</i>																		1				1
<i>Orthetrum coerulescens</i>									3													3
<i>Myrmeleotettix maculatus</i>														4	1							5

Appendix 4. Invertebrate data analysis using the *Pantheon* database tool

The data from the survey were analysed using Pantheon. Pantheon is a database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data. The analyses supported by Pantheon will improve understanding of the resources and structures used by invertebrates within the sample locations and aid their conservation.

Users import lists of invertebrates (called “samples”) into Pantheon, which then matches the species to the preferred name in the UK Species inventory before analysing the sample, attaching associated habitats and resources, assemblage types (adapted from the Invertebrate Species-habitat Information System (ISIS), habitat fidelity scores and other information against them. The analysis then displays a lot of this data as numerical scores. This information can be used to determine site quality by revealing whether the species list is indicative of good quality habitat, inform on species ecology and assist in management decisions by revealing the key ecological resources. Pantheon will also help to establish a shared terminology for describing invertebrate interest which will greatly augment invertebrate nature conservation.

Not all the macro-invertebrate taxa are included in the database. To date over c13,000 species have been typed, this being about a quarter of the total macro-invertebrate fauna (estimated at 37,000). It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, true bugs, moths, bees and many more.

Pantheon has been developed from ISIS (Invertebrate Species-habitat Information System), which was born from a requirement for Natural England to undertake monitoring. Its original purpose was to use strict survey protocols to sample for notified invertebrate assemblages (e.g. a dead wood assemblage recognised in a SSSI citation). See Drake *et al.* (2007) and Lott, (2008) for further detail on ISIS.

The following explanation of ISIS reporting is taken from Lott (2008): ISIS is a computer application for recognising invertebrate assemblage types in species lists collected at scales ranging from management compartment to landscape character area. The assemblage types are labelled in terms that relate to their favoured habitats in order to make them accessible to non specialists. However, they are actually defined by lists of characteristic species that are generally found together in nature. Two levels are recognised in the classification. Broad Assemblage Types (now replaced by the term Habitat) are comprehensive series of assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites. Specific Assemblage Types (SATs) are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value.

SATs have intrinsic value for nature conservation and are designed to be used in setting invertebrate conservation objectives on SSSIs. They can be selected as features of interest when they are well expressed in existing data. The “% of national species pool” score can be used to do this when a large body of data exists for a SSSI. A score of over 10% for most wetland SATs and over 6% for most terrestrial SATs indicates that it is of national significance.

Explanation of Pantheon report column headings:

SAT	Specific Assemblage Types (SATs) are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value.
Habitat	Comprehensive series of assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites.
No. spp.	Number of species belonging to the relevant assemblage type recorded in the survey.
Condition	'favourable' indicates that the threshold score for favourable condition of the relevant assemblage type has been reached.
% of national species pool	Percentage of the full list of characteristic species for an assemblage type represented by the number of species (No. spp.) for that assemblage type recorded during the survey. High scores suggest that the sample includes a high proportion of characteristic species, which can be an indicator of quality. Scores of between 10-20% may indicate good quality; scores of 21%+ certainly suggest a good proportion of characteristic species. Caution should be applied when the total number of species coded to any given category is low (10 or less) or are coded to categories that do not necessarily indicate quality (e.g. ubiquitous, synanthropic).
No. Species with status	Number of species with a threat and rarity status from Conservation published reviews.
SQI	Species Quality Indices. Quality indicators such as this have been used in the past on a number of assemblages (dead wood and riparian). Each species recorded from the sample is given a Species Quality Score (SQS) based on its conservation status (see table in Appendix 1). The SQI is equal to the sum of all SQSs in any given resource, divided by the number of species. This score will then be multiplied by 100 to give a 3 figure value without decimal places (e.g.100 rather than a 1.00). Any SQI score derived from a small number of species should be treated with caution. It is suggested that scores derived from 15 or less species should not be used.

Once a SAT has been identified as a feature of interest the "No. spp." score can be used as a measure of species richness.

Some important invertebrate assemblages on SSSIs do not fit into the schedule of SATs and have to be covered by the more comprehensive broad assemblage type (Habitat) classification (Lott 2008). The conservation value of Habitats is expressed by a SQI score, based on the species conservation status. Habitats are wide-ranging assemblages which can produce different rarity scores in different biotopes. This makes it difficult to prescribe thresholds for conservation significance cross the whole Habitat. The Habitat % representation score may be better suited as an assemblage attribute for condition monitoring, especially when dealing with small units. The habitat representation score is the proportion of species coded to the subject habitat as a percentage of the total sample. It is affected by small changes in habitat and so is sensitive to habitat diversity. A low score is not necessarily a bad score. Effective targets may involve relative targets for two or more BATs which naturally compete with each other (Lott 2008).

Common Standards Monitoring and Invertebrates

The condition of biological SSSIs is assessed using the Common Standards Monitoring (CSM) protocols developed by country nature conservation agencies in conjunction with the JNCC.

A protocol for assessing invertebrate assemblages in CSM has been developed using Pantheon, a database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data. Pantheon is a computer application developed by Natural England. It interprets species lists by recognising assemblage types within a list and scoring each type according to its conservation value. The assemblages are composed of a pool of species with a statistical affinity to a "habitat". Pantheon recognises 17 Specific Assemblage Types (SATs) for invertebrates in the UK. Each SAT has a specific number of species associated with it and each has been allocated a threshold species number which defines favourable condition for the assemblage following a standard sampling protocol

Pantheon Scoring systems

One of the principal aims of Pantheon is to help assess sample quality for nature conservation purposes. Absolute certainty over site quality cannot be properly resolved without a systematic and comparable survey of all sites throughout England. As one is not forthcoming in the foreseeable future, caution should be applied when interpreting results. Despite this, evaluation is possible with high quality survey data and site inventories, and, in particular, if there is comparable data from other sites to hand.

It should also be noted that:

- a long species list may indicate a rich site or a well-worked site; just because a site has a long list does not necessarily mean it is a rich site;
- representation across taxonomic groups in biotopes, habitats and their nested resources is very variable (e.g. a list of moths sampled from a wetland will show a very different output from a list of beetles). Care should be taken with samples consisting of limited taxonomic groups;
- a list with a high proportion of rare species may indicate a site that supports an unusually high proportion of rare species (a high quality site) or a site that is quite average but has been well-worked or a site where nobody has made much effort to record the common species;
- a site may be important for invertebrates by virtue of a single rare species with a very restricted distribution (e.g. Tadpole Shrimp, New Forest Burnet) though it may appear not to be a high quality site if looking at measures such as species richness, Species Quality Indices, or number of species with a conservation status.

The scoring systems below make use of species richness, threat status, rarity and characteristic species for each broad biotope, habitat and resource.

More work is required to refine these scores and produce benchmarks and site ranking. The four current scoring systems are described below.

1. Count – the number of species within each category

This is the simplest of all the scores. Low counts may mean that SQI scores (see section 4 below) are not reliable. High counts can be used to assign quality based purely on species richness.

2. Conservation Status – threat and rarity status from published reviews

The conservation status of species is complicated by the fact that there are two different systems in place – an ‘old’ system, that combines both threat and rarity, and a ‘new’ system that separates these. New reviews replace the old conservation status. The conservation status is also used to generate the Species Quality Indices (see section 4 below).

Sample quality can simply be derived from the overall number of species with a conservation status, and the number of species within each type of status.

Please note - some statuses are reported in square brackets. This is to indicate that these are considered out of date and should be used with caution.

The ‘New’ system is a two-pronged approach that separates rarity from threat. Threat is calculated using internationally recognised post-2001 IUCN criteria:

- EX - Extinct
- RE - Regionally Extinct
- CR - Critically Endangered
- CR(PE) - Critically Endangered (Possibly Extinct)
- EN - Endangered
- VU - Vulnerable
- NT - Near Threatened
- DD - Data Deficient
- LC - Least Concern
- NA - Not Assessed
- NE - Not Evaluated

The spiders and micro-moths are marked with a p before the status, to indicate that these are provisional statuses.

Two groups of flies (Empidoidea and some Nematocera and Aschiza) were assessed using post-1994 IUCN criteria. The abbreviations for these are in brackets.

Rarity is calculated using the Great Britain Rarity Status:

- Nationally Rare - Those which have been recorded from between 1-15 British hectads (10 km x 10 km squares) within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectads.
- Nationally Scarce - Those which have been recorded from between 16-100 hectads within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectads.

Species can have a status in both the threat and rarity categories above (e.g. *Carabus intricatus* is both Near Threatened and Nationally rare).

The 'old' system - species having been evaluated using the pre-1994 criteria:

- Extinct - Listed as RDB App or Extinct
- RDB 1 - Endangered
- RDB 2 - Vulnerable
- RDB 3 - Rare
- RDB K - Insufficiently Known
- RDB I - Indeterminate
- Na - Notable A
- Nb - Notable B
- Notable - Notable or Nationally Scarce
- NR (marine) - Nationally Rare (marine species)
- NS (marine) - Nationally Scarce (marine species)
- Unknown - A few micromoths are listed as status Unknown
- None - Not rare or scarce
- Not reviewed - The taxon was not assessed for rarity in the review
- New to Britain - Recently added to the British list and not yet reviewed, but it is still rare as far as we know
- Not native - The taxon is thought not to be native

3. % representation (Percentage Representation)

For any given broad biotope, habitat or resource, % rep is calculated by:

- the number of species in that resource in the sample / the total number of species in that resource in the Pantheon database

E.g. if sample X had 30 saltmarsh species and Pantheon has 302 saltmarsh species in total, then the % representation = $30/302 = 10\%$.

High scores suggest that the sample includes a high proportion of characteristic species, which can be an indicator of quality. Scores of between 10-20% may indicate good quality; scores of 21%+ certainly suggest a good proportion of characteristic species. Caution should be applied when the total number of species coded to any given category is low (10 or less) or are coded to categories that do not necessarily indicate quality (e.g. ubiquitous, synanthropic).

4. SQI - Species Quality Indices

Quality indicators such as this have been used in the past on a number of assemblages (dead wood and riparian). Each species recorded from the sample are given a Species Quality Score (SQS) based on their conservation status (see table below). However, where there is robust recent information to show that the official status is no longer appropriate, the SQS assigns a rare or scarce status using the more recent information (see note below table). The source of this information is given in the Source of Rarity column.

The SQI is equal to the sum of all SQSs in any given resource, divided by the number of species. This score will then be multiplied by 100 to give a 3 figure value without decimal places (e.g.100 rather than a 1.00).

Any SQI score derived from a small number of species should be treated with caution. It is suggested that scores derived from 15 or less species should not be used.

Status and Description	Species Quality Score	Old reviews	New review IUCN Threat		New review rarity
Species that have no Great Britain Rarity Status. This includes widespread species, even if they are classed as IUCN threatened. <small>NOTE 1</small>	1	None, RDB 4, RDB - Endemic	LC, NE, NA, DD, NT, VU, EN, CR, CR(PE)	and	None, Introduced.
Species currently classed as Nationally Scarce but not threatened. <small>NOTE 2</small>	4	RDB I, RDB K, N, Na, Nb	NA, NE, LC, DD, NT	and	NS
Species currently classed as Nationally Rare but not threatened. <small>NOTE 3</small>	8	RDB 2, RDB 3	LC, NE, NA, DD, NT.	and	NR
Species currently classed as Nationally Rare or Scarce that are also considered IUCN Vulnerable. <small>NOTE 4</small>	8	<i>Not applicable</i>	VU	and	NS, NR
Species currently classed as Nationally Rare or Scarce that are also considered IUCN Endangered. <small>NOTE 4</small>	16	RDB 1, RDB - App	EN	and	NS, NR
Species currently classed as Nationally Rare or Scarce that are also considered IUCN Critically Endangered, Critically Endangered (Provisionally Extinct), Regionally Extinct, Extinct in the Wild, or Extinct. <small>NOTE 5</small>	32	<i>Not applicable</i>	CR, CR(PE), RE, EW, EX	and	NS, NR, Extinct

Appendix 5.

List of UK invertebrate with high or total fidelity to Exposed Riverine Sediments

The list is derived from lists prepared by Sadler and Bell (2002), Bates (2006), Hewitt *et al.* (2007) and Hewitt (2017).

SPECIES	STATUS	SCORE
ARANEAE		
<i>LINYPHIDAE</i>		
Caviphantes saxetorum (Hull, 1916)	Lr(NT)	24
Diplocephalus connatus Bertkau, 1889	RDB2-VU	32
<i>LYCOSIDAE</i>		
Arctosa cinerea (Fabricius, 1777)	NS	8
Pardosa agricola (Thorell, 1856)	Local	2
<i>AEGIALIDAE</i>		
Aegialia sabuleti (Panzer)= insularis Pittino, 2006	Notable B	8
COLEOPTERA		
<i>CARABIDAE</i>		
Acupalpus flavicollis (Sturm.)	RDB3	24
Agonum micans Nicolai	Common	1
Amara fulva (Mueller)	Notable B	8
Amara quenseli (Schoenherr)	RDB3	24
Asaphidion flavipes (L.)	Common	1
Asaphidion pallipes (Duft.)	Notable B	8
Bembidion andreae (F.)	Local	2
Bembidion articulatum (Panz.)	Very Local	4
Bembidion atrocoeruleum Steph.	Common	1
Bembidion bipunctatum (L.)	Notable B	8
Bembridion bualei (Jacquelin du Val (= cruciatum Schiolte))	Common	1
Bembidion decorum (Zenk.)	Common	1
Bembidion dentellum (Thun.)	Local	2
Bembidion femoratum Sturm	Common	1
Bembidion fluviatile Dejean	LR(nt)	24
Bembidion geniculatum Heer	Notable B	8
Bembidion litorale (Ol.)	Notable B	8
Bembidion lunatum (Duft.)	Notable B	8
Bembidion monticola Strm.	Notable B	8
Bembidion prasinum (Duft.)	Local	2
Bembidion punctulatum Drap.	Common	1
Bembidion quadripustulatum Serville	Notable B	8
Bembidion saxatile Gyll.	Notable B	8
Bembidion schueppeli	Notable B	8
Bembidion semipunctatum	RDB3	24
Bembidion stomoides Dej.	Notable B	8
Bembidion testaceum	RDB2	32
Bembidion tibiale (Duft.)	Common	1
Bembidion virens	RDB3	24
Chlaenius vestitus (Payk.)	Local	2
Clivina collaris (Hbst.)	Common	1
Dyschirius aeneus (Dejean)	Notable B	8
Dyschirius angustatus (Ahrens)	RDB3	24

Lionychus quadrillum (Duft.)	RDB3	24
Pelophilus borealis (Payk.)	RDB3	24
Perileptus areolatus (Creutz.)	Notable B	8
Tachys bistriatus (Duft.)	Notable B	8
Tachyura parvula Dej.	Notable B	8
Blemus discus (Fabricius, 1792)	Notable B	8
Thalassophilus longicornis	Notable A	16
COCCINELLIDAE		
Coccinella quinquepunctata L.	Notable B	8
CURCULIONIDAE		
Baris lepidii Germ.	Notable A	16
DYTISCIDAE		
Bidessus minutissimus (Germ.)	RDB3	24
DRYOPIDAE		
Dryops nitidulus (Heer)	RDB3	24
ELATERIDAE		
Fleutiauxellus maritimus (Curt.)	Notable B	8
Negastrius arenicola (Boheman)		
Negastrius pulchellus (L.)	RDB2	32
Negastrius sabulicola (Boh.)	RDB2	32
Zorochros minimus (Bois.& Lac)	Common	1
GEORISSIDAE		
Georissus crenulatus (Rossi)	Notable B	8
HELOPHORIDAE		
Helophorus arvernicus Muls.	Common	1
HETEROCERIDAE		
Heterocerus marginatus (F.)	NS	8
HYDROCHIDAE		
Hydrochus nitidicollis Muls.	RDB3	24
HYDRAENIDAE		
Hydraena gracilis Germar	Common	1
Hydraena nigrita Germar	Local	2
Hydraena rufipes Curt.	Notable B	8
Ochthebius bicolon Germar	Common	1
PTILIDAE		
Actidium aterrimum (Motschulsky)	RDB.IK	16
Ptenidium brenskei Flach	Notable	8
Ptenidium longicorne Fuss	Local	2
STAPHYLINIDAE		
Acrotona exigua (Erichson)	RDB.IK	16
Aloconota (s.str.) cambrica (Woll.)	Local	2
Aloconota (s.str.) currax (Kr.)	Local	2
Aloconota eichhoffi (Scriba)	Notable A	16
Aloconota (s.str.) insecta (Thomson)	Local	2
Aloconota planifrons Waterhouse	RDBI	24
Aloconota (s.str.) sulcifrons (Steph.)	Local	2
Biblopectus minutissimus (Aube)	RDBK	16
Bledius annae Sharp	Very Local	4
Bledius arcticus Sahlberg	Notable RDBI	24
Bledius defensus Fauvel	Notable RDBK	16
Bledius erraticus Erichson	RDBK	16
Bledius longulus Erichson, 1839	Local	2

<i>Bledius pallipes</i> (Gravenhorst)	Common	1
<i>Bledius subterraneus</i> Erichson	Local	2
<i>Bledius terebrans</i> (Schiodte)	RDB.IK	16
<i>Brachygluta pandellei</i> (Saulcy)	RDB.IK	16
<i>Carpelimus gracilis</i> (Mannerheim, 1830)	Local	2
<i>Carpelimus obesus</i> (Kiesenwetter)	Notable	8
<i>Carpelimus similis</i> (Smetana)	Notable B	8
<i>Carpelimus manchuricus subtilicornis</i> (Erichson)	Local	2
<i>Carpelimus subtilis</i> (Erichson)	Notable	8
<i>Deleaster dichrous</i> (Grav.)	Notable B	8
<i>Erichsonius signaticornis</i> Muls. & Rey	Notable B	8
<i>Gabrius astutooides</i> Strand	RDB3	24
<i>Gnypeta carbonaria</i> (Mann.)	Local	2
<i>Gnypeta rubrior</i> Tottenham, 1939	Local	2
<i>Gnypeta velata</i> (Erichson)	Notable	8
<i>Hydrosmeeta delicatula</i> (Sharp)	RDB.IK	16
<i>Hydrosmeeta eximia</i> (Sharp)	Very Local	4
<i>Hydrosmeeta fragilis</i> (Kr.)	Notable B	8
<i>Hydrosmeeta thinobioides</i> (Kr.)= <i>longula</i> (Heer, 1839)	Notable	8
<i>Hydrosmeetina delicatissima</i> Bernhauer	RDB.IK	16
<i>Hydrosmeetina septentrionum</i> Benick = <i>subtillissima</i> (Kraatz, 1854)	Notable B	8
<i>Ilyobates bennetti</i> Donisthorpe	Notable	8
<i>Ilyobates propinquus</i> (Aube)	Notable	8
<i>Ischnopoda</i> (=Tachyusa) <i>umbratica</i> Erichson		2
<i>Ischnopoda</i> (=Tachyusa) <i>scitula</i> Erichson	RDB.IK	16
<i>Lathrobium angusticolle</i> Bois.	Notable B	8
<i>Lathrobium dilutum</i> Erichson	RDB3	24
<i>Lathrobium ripicola</i> Czwal.= <i>pallidipenne</i> Hochhuth, 1851	Notable B	8
<i>Medon ripicola</i> (Kraatz)	Notable A	16
<i>Meotica anglica</i> Benick	Notable A	16
<i>Neobisnius prolixus</i> Er.	Notable A	16
<i>Ocalea latipennis</i> Sharp	Notable	8
<i>Ochtheophilus andalusiacus</i> (Fagel)	Notable B	8
<i>Ochtheophilus angustior</i> (=venustus) (Bernhauer)	Notable	8
<i>Ochtheophilus aureus</i> (Fauv.)	Common	1
<i>Ochtheophilus omalinus</i> (Er.)	Local	2
<i>Oxypoda exoleta</i> Erichson	Notable B	8
<i>Philhygra debilis</i> (Erichson)	Notable	8
<i>Philhygra scotica</i> (Elliman)	Notable	8
<i>Philonthus rubripennis</i> Steph.	Very Local	4
<i>Quedius plancus</i> Erichson	Notable A	16
<i>Scopaeus gracilis</i> (Sperk)	RDB3	24
<i>Stenus biguttatus</i>	Notable B	8
<i>Stenus comma</i> LeConte	Local	2
<i>Stenus fossulatus</i>	RDB3	24
<i>Stenus guttula</i> Mueller	Common	1
<i>Stenus incanus</i> Erichson	RDB3	24
<i>Tachyusa coarctata</i> Erichson	Notable B	8
<i>Tachyusa constricta</i> Erichson	Local	2
<i>Tachyusa leucopus</i> (Marsham)	Local	2
<i>Tetralaucopora</i> (=Chiloporata) <i>longitarsis</i> (Erichson)	Local	2
<i>Tetralaucopora</i> (=Chiloporata) <i>rubicunda</i> (Erichson)	Notable	8

<i>Thinobius bicolor</i> Joy	Notable A	16
<i>Thinobius ciliatus</i> (=praetor) Keisenwetter	Notable A	16
<i>Thinobius longipennis</i> (Heer)	RDB.IK	16
<i>Thinobius major</i> Kraatz	RDB3	24
<i>Thinobius newberyi</i> Scheerpeltz	RDB I	24
<i>Thinobius strandi</i> (=crinifer) Smetana	Notable A	16
<i>Thinodromus arcuatus</i> (Stephens)	Local	2
<i>Thinonoma</i> (=Tachyusa) <i>atra</i> (Gravenhorst)	Very Local	4
DIPTERA		
<i>ANTHOMYIDE</i>		
<i>Myopina myopina</i>	Local	2
<i>ASILIDAE</i>		
<i>Rhadiurgus variabilis</i>	pRDB3	24
<i>ATHERICIDAE</i>		
<i>Ibisia marginata</i>	NS	8
<i>DOLICHOPODIDAE</i>		
<i>Asyndetus latifrons</i>	Data Deficient	24
<i>Diaphorus hoffmannseggii</i>	LR(nt)	24
<i>Dolichopus longicornis</i>	Local	2
<i>Rhaphium fractum</i>	LR(ns)	8
<i>Rhaphium gravipes</i>	LR(ns)	8
<i>Rhaphium nasutum</i>	Local	2
<i>Rhaphium patulum</i>	LR(ns)	8
<i>Rhaphium penicillatum</i>	LR(nt)	24
<i>Rhaphium riparium</i>	Local	2
<i>Rhaphium suavis</i>	Data Deficient	24
<i>Sciapus basilicus</i>	Data Deficient	24
<i>EMPIDIDAE</i>		
<i>Hilara albiventris</i>	Notable/Nb	8
<i>Hilara aartseni</i>	Data Deficient	24
<i>Hilara biseta</i>	Notable	8
<i>Hilara pseudochorica</i>	Notable/Nb	8
<i>EPHYDRIDAE</i>		
<i>Athyroglossa glabra</i>	Local	2
<i>Athyroglossa ordinata</i>	pRDB1	32
<i>Ditrichophora palliditarsis</i>	Local	2
<i>Hecamedoides unispinosus</i>	pRDB2	32
<i>Scatella obsoleta</i> (=callosicosta)	pRDB2	32
<i>HYBOTIDAE</i>		
<i>Platypalpus aliterolamellatus</i>	Data Deficient	24
<i>Platypalpus melancholicus</i>	LR(nt)	24
<i>Platypalpus ochrocera</i>	Data Deficient	24
<i>Platypalpus subtilis</i>	NS	8
<i>Tachydromia acklandi</i>	LR(nt)	24
<i>Tachydromia calcarata</i>	Data Deficient	24
<i>Tachydromia costalis</i>	LR(nt)	24
<i>Tachydromia edenensis</i>	Data Deficient	24
<i>Tachydromia halidayi</i>	Nb	8
<i>Tachydromia morio</i>	Local	2
<i>Tachydromia rhyacophila</i>	pRDB I	24
<i>Tachydromia woodi</i>	LR(nt)	24
<i>Symbalophthalmus pictipes</i>	LR(ns)	8

LIMONIIDAE		
<i>Arctoonopa melampodia</i>	LR(nt)	24
<i>Dicranomyia omissinervis</i>	LR(nt)	24
<i>Gonomyia edwardsi</i>	pRDBK	16
<i>Hexatoma bicolor</i>	Local	2
<i>Hexatoma fuscipennis</i>	Local	2
<i>Hoplolabis areolata</i>	Local	2
<i>Hoplolabis vicina</i>	Local	2
<i>Hoplolabis yezoana</i>	pRDBK	16
<i>Rhabdomastix edwardsi</i>	Local	2
<i>Rhabdomastix eugeni</i>	RDBI	24
<i>Rhabdomastix inclinata</i>	RDB2	32
<i>Rhabdomastix laeta</i>	RDBI	24
<i>Rhabdomastix japonica</i>	RDB3	24
<i>Symplecta meigeni</i>	RDB3	24
<i>Symplecta pusilla</i>	RDB1	32
LONCHOPTERIDAE		
<i>Lonchoptera nigrociliata</i>	Notable/Nb	8
PEDICIIDAE		
<i>Dicranota gracilipes</i>	Notable/Nb	8
<i>Dicranota guerini</i>	Notable	8
<i>Dicranota robusta</i>	Notable/Nb	8
<i>Dicranota simulans</i>	RDB3	24
<i>Dicranota subtilis</i>	Local	2
SCATOPSIDAE		
<i>Anapausis talpae</i>	Local	2
<i>Rhegmoclemina lunensis</i>	Data Deficient	24
STRATIOMYIDAE		
<i>Oxycera terminata</i>	RDB2	32
TABANIDAE		
<i>Tabanus cordiger</i>	Notable/Nb	8
THEREVIDAE		
<i>Clorismia rustica</i>	LR(ns)a	16
<i>Spiriverpa lunulata</i>	LR(ns)b	8
TIPULIDAE		
<i>Nephrotoma aculeata</i>	pRDB2	32
<i>Nephrotoma analis</i>	Local	2
<i>Nephrotoma dorsalis</i>	LR(ns)b	8
<i>Nephrotoma lunulicornis</i>	LR(ns)b	8
<i>Tipula bistilata</i>	RDB2	32
<i>Tipula laetabilis</i>	RDB2	32
<i>Tipula nodicornis</i>	RDB3	24
HEMIPTERA		
DIPSOCORIDAE		
<i>Cryptostemma alienum</i>	Nationally Scarce	8
SALDIDAE		
<i>Macrosaldula scotica</i>	Local	2
<i>Saldula c-album</i>	Common	1
<i>Saldula fucicola</i>	Nationally scarce	8
<i>Saldula melanoscela</i>	VU	32