

THE GROUND LAYER OF ALLUVIAL FOREST AS A HABITAT FOR STAPHYLINIDAE AND CARABIDAE (COLEOPTERA) AT THE GEARAGH (COUNTY CORK), IRELAND

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Abstract

A total of 93 species (62 Staphylinidae and 31 Carabidae) were recorded from alluvial forest in the relict anastomosing ecosystem of the Gearagh during 1989 and 2021, at three different flood-duration levels characterised by ‘*Caltha mud*’ (mostly bare soil with *Caltha palustris*, etc.), *Allium ursinum* dominated vegetation, and drier soil with *Hedera helix* cover. An additional 17 species (12 Staphylinidae and 5 Carabidae) were recorded from similar ‘*Caltha mud*’ levels at two other alluvial woodlands in Counties Cork and Offaly. A relatively high proportion of the Gearagh species (9%) were considered indicators of well-developed alluvial forest habitat. This is despite the finding that the fine-textured soils of the Gearagh islands appear to be relatively recently formed. However, there are extremely few carabid or staphylinid species in north-west Atlantic Europe which are totally restricted to alluvial forest. Most of the characteristic or indicator species are better described as being restricted to shaded wetlands, which would include reed-beds, dense herbaceous wetland and/or willow carr. This type of habitat is likely to have been more extensive in the Gearagh in the past. Saprophytic, mycetophilous, exposed river sediment, peat-soil wetland and herbaceous riparian assemblages still need to be examined, and other sampling techniques need to be used, to obtain a complete view of the Gearagh carabid and staphylinid fauna.

Key words: The Gearagh, alluvial woodland, alluvial forest, Carabidae, Staphylinidae.

Introduction

Alluvial forests (including alluvial forests with *Alnus* and *Fraxinus* (EEA, 2007) and alluvial hardwood forests (Schnitzler, 1994)) are habitats of high conservation importance in Europe (Council of Europe, 2019; European Commission, 2013). One of the best physiographic examples in north-west Europe is the Gearagh (*an Gaorthadh*) in County Cork, Ireland, a residual piece of anastomosing alluvial forest at the confluence of the Lee and Toon Rivers, the rest of which was felled in the mid-1950s and then flooded for a hydroelectric scheme in 1956 (O’Mahony, 2009; Corcoran, 2021). The extent of the residual and regenerating forest is shown in the aerial photographs in O’Mahony (2009: 234), and aerial photographs of the now drowned

forest area, before and after flooding, are shown in Mitchell (1976: Plate 12) and Little *et al.* (2017: Fig. 4), and Cabot (1999: 264), respectively.

Botanical data were collected prior to the construction of the hydroelectric scheme (O'Reilly, 1955); however, pre-construction entomological data were confined to the Odonata (Hewetson and O'Rourke, 1960). After damage to the residual forest in 1983 and 1984, involving in-channel works in part of the Toon River (Hamilton, 2017), biogeographical interest in the site was renewed. White (1985) provided a botanical and phytosociological account of the site, concluding that the residual forest, upstream from the flooded zone, remained ecologically well-developed. Following an Irish Biogeographical Society field meeting at the Gearagh in 1985, more entomological data were collected (e.g. see Menzel, Smith and Chandler (2006) for sciarid Diptera collected by M. de Courcy Williams in 1990). These included a sample of Staphylinidae from soils with *Allium ursinum* dominated cover, collected by the author in 1989, which are reported here. In 2021, a more detailed survey, focussing on carabid and staphylinid samples from fine-textured soils at a lower level characterised by *Caltha palustris*, was undertaken. The latter also included samples from similar habitat on the Rivers Bandon (County Cork) and Shannon (County Offaly).

The term 'woodland' is more usually used in Ireland to refer to wooded habitats than 'forest'. Consequently, although the term 'alluvial woodland' has a specific meaning (European Commission, 2013), 'alluvial woodland' is used below to mean the broader habitat concept of 'alluvial forest'.

Methods

Carabid and staphylinid sampling was carried out in two parts of the Gearagh woodland (on the Lee and Toon rivers), in the relict area upstream of the reservoir which is not directly affected by the flooding by the Lee hydroelectricity scheme. Two other alluvial woodland sites were also briefly sampled, one on the River Bandon (near Dunmanway, County Cork), and one on a side channel of the River Shannon (Lavagh, County Offaly). All sampled areas were in the wet pedunculate oak-ash woodland with willows habitat type, as described by Little *et al.* (2017). Sampling was mostly focussed on silty sparsely-vegetated soil at a level with more frequent and longer-duration flooding, usually characterised by the presence of *Caltha palustris* (marsh marigold), and referred to below, by way of abbreviation, as 'Caltha mud'. In the Gearagh, samples were also taken from the two next levels upslope in the flood-vegetation sequence, which were dominated (in spring) by *Allium ursinum* (ramsons), and by *Hedera helix* (ivy), respectively.

Suction sampling was carried out in May 1989, using a D-vac suction sampler (Dietrick, 1961) in *Allium* dominated vegetation on one of the alluvial islands. One set of pitfall traps

(plastic cups with ethylene glycol as preservative) was also set in May 1989. In 2021, pitfall traps were also used, which were glass containers with ethylene glycol as preservative. Pitfall trapping commenced in early June (commencing in May was precluded because of a flood) until late July. Two emergence traps (as described by Owen (1989) but without the base) were also briefly used in the Gearagh. Details of sampled sites and dates are given in Table 1. Carabidae were identified using Luff (2007) and Schmidt (2004), as well as Madison and Anderson (2016), Trautner and Geigenmüller (1987) and Lindroth (1974). Staphylinidae were identified, with most specimens being dissected, using Lott and Anderson (2011), Lott (2009), Assing and Schülke (2012), Lohse (1974), Benick and Lohse (1974), Strand and Vik (1964), Palm (1970, 1972), Brundin (1942), Tronquet (2014a), and a range of other papers. Beetle nomenclature follows Duff (2018), and plant nomenclature follows Stace (1997).

Species were selected as indicators of well-developed habitat if: (1) they have a restricted preference for flooded wetlands which include alluvial woodlands; and (2) they are reported in the literature as being local or rare, from which it is assumed that they are less likely to survive in historically degraded ecosystems. ‘Well-developed habitat’ means that the ecosystem is sufficiently undisturbed by human land use to allow it to retain many local or rare characteristic species.

Results

In total, 31 carabid species (Tables 2, 3 and 8), and 62 staphylinid species (Tables 5, 6 and 8) were recorded from the Gearagh alluvial woodland, of which eight species (9%) are considered as indicator species. Both the carabid and staphylinid pitfall trapped assemblages were dominated, respectively, by a single species: *Limodromus* (= *Platynus*) *assimilis* and *Anotylus rugosus*. The suction sample assemblage was dominated by the parthenogenetic staphylinid *Atheta fungi*.

The smaller sample from near Dunmanway (County Cork) contained 14 carabid and 20 staphylinid species, of which two (6%) were considered to be indicator species. Another smaller sample from Lavagh (County Offaly) contained 14 carabid and 15 staphylinid species, of which five (17%) were considered to be indicator species. There were five carabid and 12 staphylinid species, respectively, from these two sites (Tables 4 and 7), not recorded from the Gearagh. The Dunmanway (River Bandon) sample was again dominated by *Limodromus assimilis* and *Anotylus rugosus*, but the Lavagh (River Shannon) sample was dominated by *Pterostichus minor* rather than *L. assimilis*.

Indicator and other species

Limodromus assimilis is one of the most habitat-specific species of those recorded in the

Gearagh, limited to wet woodland and carr habitat, although occurring throughout much of Ireland (Anderson *et al.*, 2000). However, as it is not local in distribution, it is not classed as an indicator species here.

Agonum emarginatum (= *afrum* (Duftschmid)) occurs only locally in Ireland, being restricted to eutrophic lakeshores, or under alder in carr or fens, according to Anderson *et al.* (2000). Lindroth (1992) described its microhabitat requirements as “wet, more or less soft soil ... and the rich vegetation of *Phragmites* and similar plants”. It occurred in ‘*Caltha mud*’ habitat throughout the Gearagh (Tables 2 and 3), and also in the same habitat near Dunmanway (Table 4). *A. emarginatum* is very closely related to *A. viduum* (Holloway *et al.*, 2019), and the specimens were determined using the keys and descriptions (including illustration of the ♂ genital ring and ♀ gonocoxites) in Schmidt (2004), as well as in Luff (2007).

Agonum micans is very local in Ireland, being associated with lakeshore alder carr (Anderson *et al.*, 2000). In Fennoscandia, it is particularly associated with “loamy-slimy” soil and oozy mud (“*gyttya*”) (Lindroth, 1992). Like *A. emarginatum*, it occurred throughout the Gearagh in ‘*Caltha mud*’ habitat (Tables 2 and 3), but, in contrast, was absent from the Dunmanway site (Table 4), reflecting its much more local distribution elsewhere in Ireland. Representative specimens were compared with reference material of English *A. scitulum* (Dejean) from the National Museum of Ireland collections to determine that it was not this species. *A. scitulum* was removed from the Irish list, having been previously erroneously recorded from Killarney (Anderson *et al.*, 2000); two Killarney specimens standing under the label *A. scitulum* in the NMI were also determined (by JAG) and found to be misidentified. *A. micans* is not restricted to alluvial woodland, also occurring in tall *Scirpus*, *Carex* and other herbaceous cover, as well as under *Salix* (Lindroth, 1992; Jachtenfuchs and Wagner, 2012).

A single female *Atheta aquatilis* was recorded from ‘*Caltha mud*’ habitat in the Gearagh (Table 6). It has been recorded from reedbeds in Counties Donegal and Clare (Good, 2004), Counties Antrim, Armagh, Down, Tyrone, Fermanagh, Londonderry (Derry), North Tipperary and North Kerry (R. Anderson, pers. comm.). It is a fairly stenotopic species restricted to moss and litter in flooded shaded habitats, springs, flushes and wet woodland (Palm, 1970; Koch, 1989; Hyman and Parsons, 1994), but also fungi in broadleaf woods, cut grass and carrion in Ireland as well as montane meadows in Poland (Burakowski *et al.*, 1981).

There are only a few records of *Atheta hygrobia* (= *magniceps* Sahlberg) from Ireland (Brundin, 1942; Good, 2004), and it is local in Great Britain (Hyman and Parsons, 1994) and France (Tronquet, 2014b). The species occurs in moss in wet woodland and willow carr (Koch, 1989; Hyman and Parsons, 1994) but also open riparian marshes (Koch, 1989; Greenwood *et al.*, 1991; Jachtenfuchs and Wagner, 2012) including lakeshore reedbeds (Brundin, 1942).

Two *Atheta vaga* (= *nigricornis* (Thomson)) occurred in the emergence traps. This species is

worth mentioning, not because it is local (there are many widespread records (R. Anderson, pers. comm.) but because of its method of capture. *A. vaga* is frequently found in numbers in bird's nests (83 individuals were recorded in a buzzard nest by Strand (1959), and 18 in a crow nest by Spittle (1947)). It is also reported from fungi and other vegetation debris. It is unlikely to have emerged from the ivy-dominated woodland soil, but more probably dispersing beetles flew into the oblique mesh sides of the trap, rolled down the side, crawled under the hem, and subsequently took flight within the trap.

Badister dilatatus is very local in Ireland, and local in Great Britain (Anderson *et al.*, 2000; Luff, 1998). It is a species of shaded, wet, muddy litter-covered lake or pool shore soil where the plant cover is dense and can be tall reeds, herbs, scrub or trees (Anderson *et al.*, 2000; Lindroth, 1992). Turin (2000) considered *B. dilatatus* to be a good indicator of a natural gradual transition in ecotonal riparian habitat. It was found only at the River Shannon in the present study (Table 4).

Another *Badister* species, *B. sodalis*, was recorded in a D-vac sample from the Gearagh (Table 8). It is only known locally in Ireland (Luff, 1998; Anderson *et al.*, 2000), although probably under-recorded in the south where, based on its British distribution, it would be expected to be more widespread. According to Lott (2003), it is restricted to wet woodland in Great Britain; however, Koch (1989) also mentions riparian marshes and wet heaths as preferred habitats. Lindroth (1992) summarized it as a stenotopic species of deciduous forest swamps, although both he and Turin (2000) also mentioned rich meadows or dense grasslands under bushes and trees such as *Salix* and *Crataegus*. Records collected by Anderson in Ireland comprise 28 sites of which sixteen are clearly wet woodland including alder and willow carr (R. Anderson, pers. comm.).

Bembidion assimile is very local in Ireland (Anderson *et al.*, 2000) away from coastal habitats, and was recorded only from the Shannon site (Table 4). The species occurs in both coastal and inland shorelines, in the latter case restricted to slow-moving water-bodies (Anderson *et al.*, 2000). It occurs in *Carex* and *Phragmites* stands, always near the waterline (Lindroth, 1992).

Bembidion dentellum is local in Ireland (Anderson *et al.*, 2000), but given its southerly distribution in Great Britain (Luff, 1998), this may reflect the low level of carabid recording in southern Ireland. Nevertheless, this species is exclusively riparian (Lindroth, 1992) and particularly adapted to inundation (Zulka, 1994) being found on seasonally flooded riverbanks with coarser sediments and in the inundation zone of turloughs (R. Anderson, pers. comm.). Gerisch *et al.* (2006) considered the species particularly characteristic of inundated alluvial forest in Germany. Luff (2007) mentioned its preference for shaded muddy lakeshores and Lindroth (1992) its frequent association with *Salix*, *Alnus*, etc., but it is also often recorded from

open marshes (Koch, 1989; Greenwood *et al.*, 1991; Castella *et al.*, 1994; Anderson *et al.*, 2000). A surprising result, given its flood-tolerance, was its absence from the Lee part of the woodland (Table 3) compared to its relative abundance in the Toon part (Table 2).

A single female *Oxypoda vittata* was recorded from the suction sample (Table 8), a species previously recorded from Counties Antrim (Johnson and Halbert, 1902) and Sligo (O'Mahony, 1938) (There is also at least one specimen from Killarney, County Kerry, in the E. F. Bullock collection in the National Museum of Ireland (det. JAG)). *O. vittata* is most frequently recorded in Europe in nests of the ant *Lasius fuliginosus* (Latreille), but is not strictly myrmecophilous and occurs in mammal and bumble-bee nests also (Palm, 1972), and has been recorded in Scotland outside the range of *L. fuliginosus* (Sharp, 1873). This may explain the record of *O. vittata* from County Antrim, but it is not impossible that *L. fuliginosus* could occur in the Gearagh, as the ant was recorded from several sites in Counties Cork and Kerry (O'Rourke, 1950; Collingwood, 1958). Whether *O. vittata* has a breeding population in the Gearagh alluvial woodland, despite the flooding risk to its habitat, or occurs as a 'tourist' from outside the annual floodplain, remains to be investigated.

Pterostichus anthracinus is a locally-occurring carabid species in Ireland and Great Britain (Anderson *et al.*, 2000; Luff, 1998). In Ireland, according to Anderson *et al.* (2000), it is restricted to "partially shaded clayey or humus-rich soil on the margins of eutrophic lakes and ... in fens". Lindroth (1992) describes its habitats as usually stagnant freshwater and pools "with foul-smelling water that dries up in summer", with some shade usually by trees and bushes, and with ground vegetation sparse or absent.

Stenus carbonarius, recorded from the Shannon site (Table 4), is local in Ireland and Great Britain (Anderson, 1984; Hyman and Parson, 1994; Lott and Anderson, 2011). In France, it is rare outside of the north-east (Tronquet, 2014b); Dauphin (1993) mapped no records from Brittany and Normandy. In contrast, it is common and widespread in Scandinavia and Central Europe (Renkonen, 1938; Palm, 1961; Horion, 1963). *S. carbonarius* occurs in fens, mesotrophic bog and richly vegetated lakeshores and river margins (Horion, 1963; Anderson, 1984; Lott and Anderson, 2011). As it is frequent in non-woody fens, bogs and floodplain habitats, its localised distribution in north-west Atlantic Europe may be less due to floodplain deforestation than to its preference for colder habitats (see Renkonen, 1938). This might explain its absence in samples from the Gearagh. However, speculation on causes of distribution such as this, without experimental verification, was criticised by Lindroth (1992).

Stenus europaeus occurred in pitfall traps in the Toon River part of the Gearagh (Table 5). It is a local species in Ireland and Great Britain (Anderson, 1984, 1997; Hyman and Parsons, 1994), restricted to fen vegetation near *Alnus* or *Salix*, often on lakeshores (Lott and Anderson, 2011). In Central Europe, it has been reported from similar wooded habitats as well as shaded

lake-shores and riverbanks (Koch, 1989). Derunkov (2009) made the same observation as Lott and Anderson (above) that it occurs frequently in open habitats alternating with wooded plots in the Belorussian wetland region; it is clearly not dependant on alluvial forest.

Discussion

The Gearagh alluvial woodland

The relatively high proportion of indicator species (9%) shows the high conservation value of the Gearagh alluvial woodland, and supports the conclusion of White (1985) that the relict woodland area is ecologically well-developed. Furthermore, this result is based only on samples restricted to a fine-textured soil in a few areas of the Gearagh in the early summer of just two years. Experienced manual collecting can recover many localised species not obtained in pitfall traps (Knapp *et al.*, 2020), and there are many other microhabitats in the Gearagh which will contain many species not recorded here; a case in point is *Stenus guttula*, readily found in a brief examination of the riparian *Pellia epiphylla* zone (Table 8), but not otherwise recorded. In particular, saproxylic species and those of open wooded and unwooded wetlands on peaty and coarse-textured soils have not yet been investigated.

An important insight into the habitat continuity of the Gearagh was given by Brown (1999), who investigated soil profiles of several of the wooded islands:

“The islands are underlain by woody and fibrous herbaceous peats sitting on the basal gravels, which are themselves covered by 1-1.5m of clay rich silt ... Four radiocarbon dates from wood and herbaceous peat at the base of two islands give a consistent date for the island formation of c. 1300 AD with the deposition of organic rich sediments until c. 1650 AD after which the inorganic clay rich silts are deposited. ... The stratigraphy and date of formation of the two islands [sampled] suggests that the woodland is only of High Medieval Age (14th Century) and probably associated in some way with the construction of the flood embankments which constrained the channels causing rapid in-channel and over-bank siltation.”

This recent deposition may also explain the unleached brown earth soil profile from the Gearagh woodland, illustrated by Cudmore (2012: Fig. 3.3). It is not confined to the Gearagh; the literature on Holocene geomorphology has many references to a similar recent alluvial deposition by anthropogenically-eroded soils (see Macklin, Jones and Lewin (2010: Fig. 18)).

The relatively high number of indicator species recorded should therefore be surprising, given that the fine-textured soils of the Gearagh islands appear to be relatively recently formed. However, there are extremely few carabid or staphylinid species in north-west Atlantic Europe which are completely restricted to alluvial woodland. Hammond (1998) and Lott (2003) listed only *Oxypoda nigrocincta* Mulsant and Rey, which is not recorded from Ireland, as being restricted to floodplain woodland in Great Britain. As can be seen from the species habitat

descriptions above, most of the characteristic or indicator species are better defined as being restricted to shaded wetlands, which would include other shaded muddy habitats, such as reed-beds, *Salix* carr or floodplain fens. These habitats are likely to be much more extensive in the past; for example, Corcoran (2021: 88) cited Smith (1774) referring to the regular occurrence of bitterns (*Botaurus stellaris* Linnaeus) at the Gearagh.

A further insight on the historical habitat is provided by Corcoran (2021: 91), describing the traditional flat-bottomed boats that were used to access the Gearagh islands:

“... the boats were used on an everyday basis to reach ‘working’ islands in order to collect herbs, tubers, fruit and nuts, coppice timber ...”

This suggests that the woodland channels may have been kept much more open by human activity, which would favour woodland edge herbaceous species such as *Oenanthe crocata*. It would be currently impossible to navigate most of the Gearagh channels in the relict woodland, now abandoned, due to the fallen trees and overhanging branches causing the river channel to be frequently ‘tunnelled’ (in the sense of O’Grady, 2006: 38 *et seq.*).

Both insights indicate that a much more open wetland with wooded parts on mainly peaty or coarse-textured soils, but with localised patches of silty soils occurring in reed-beds, etc., would have existed in the past. All of the indicator species of carabid or staphylinid recorded here could also survive in such habitats outside of alluvial forest, albeit for most species with shade from reeds, carices, herbaceous wetland plants, or *Salix* bushes. It remains for the saproxylics to be investigated to indicate the woodland continuity suggested by the history of the area (see Cudmore (2012) and Corcoran (2021)).

Comparison between the results (Tables 2-6) for the Toon and the Lee parts of the woodland show that *Atheta aquatilis*, *Bembidion dentellum* and *Pterostichus anthracinus* were missing from the Lee samples. Most samples from the Toon part of the woodland were deliberately taken from its margin. This was to avoid potential reductions in species diversity which might have occurred on interior islands due to flooding (see McLaughlin, Emmerson and O’Gorman, 2013). However, all the four indicator species recorded from these Toon marginal samples also occurred on a central island (‘oak’) in the Toon woodland (Table 2). It is likely that the fauna that McLaughlin *et al.* (2013) referred to belonged to a higher, more terrestrial, level of the woodland soil.

Indeed, habitat levels (in relation to flood duration) appear to be especially important in understanding the carabid fauna (Antvogel and Bone, 2001). Cudmore (2012) recorded 21 carabid species from the Gearagh woodlands and grasslands, of which eight were reported from the upstream relict woodland area, the same area where the samples reported here were taken. Of these eight species, three were dominant: *Carabus nemoralis*, *Limodromus assimilis* and *Abax parallelepipedus*, in order of abundance. In contrast, *C. nemoralis* was not recorded in

2021 in the *Caltha* mud habitat, but one individual occurred in the higher woodland soil surface dominated by ivy (*Hedera helix*) cover (Table 3). Similarly, three *Abax parallelepipedus* were recorded in the ivy-covered station, but only five in all of the nine *Caltha* mud stations (Tables 2, 3 and 8). The differences appear to be microhabitat related (although some seasonality may have affected numbers also); both *C. nemoralis* and *A. parallelepipedus* being species of drier soils, the former eurytopic, and the latter occurring in woods and heathland (Anderson *et al.*, 2000; Luff, 1998).

Dunmanway alluvial woodland

The Dunmanway samples (Tables 4 and 7) contained *Agonum emarginatum* and *Bembidion dentellum*, two indicator species also occurring in the Gearagh, but no staphylinid indicator species.

In contrast to much of the Gearagh, the 1842 O.S. map shows no wooded cover south of Dunmanway Long Bridge where alluvial woodland exists today. The sampled woodland is therefore secondary, recent and possibly partly planted. Further sampling at this site is necessary to establish the likely absence of *Agonum micans* and *Pterostichus anthracinus*, two species recorded from the Gearagh but not near Dunmanway. However, if they are absent, then this correlates with the much more restricted amount of open wetland associated with this woodland near Dunmanway, compared to the Gearagh. It is interesting that the ordination of the results from a study of alluvial gallery woodlands in the Loire valley (France) showed both these latter species to be more associated with floodplain wetland than with woodland (Castella *et al.*, 1994). Nevertheless, if the habitat was available upstream, they should be able to readily recolonize the restored woodland (see Walter *et al.*, 2017).

Shannon alluvial woodland

The sampled alluvial woodland at the River Shannon (Lavagh, County Offaly) is only recently formed, and is in a semi-regulated river being <250m downstream of the Marlborough sluices managed in coordination with Meelick Weir. As can be seen from the 1842 O.S. maps (and see also Rhodes map in Delany, 2008:87), originally there were islands in the river channel and the sampled locations were originally where the river channel itself occurred. After construction of the flood relief channel and sluices in 1884 (Delany, 2008: 152), the channel was straightened and the islands within this straightened channel apparently excavated and removed to the far (Incherky Island) bank from the sampled area. In the intervening almost 140 years, alluvial processes have deposited silt on the Lavagh side, upon which alluvial woodland has developed, although there are several mature oak which may represent the ecological residue of the original islands. Unlike the Gearagh, however, the Shannon surface alluvium

contains a significant fraction of fine-textured peat, originating from commercial peat abstraction in upstream bogs (Fitzsimons and Igoe, 2004).

Although only two sets of pitfall trap data were collected, the results (Tables 4 and 7) allow two preliminary conclusions. Firstly, the occurrence of *Badister dilatatus*, *Bembidion assimile*, *B. dentellum*, *Pterostichus anthracinus* and *Stenus carbonarius* indicate the conservation value of this recently formed woodland, which must have been recolonised from patches of riparian habitat which survived the major navigation and flood relief modifications in this part of the river in the nineteenth century. These five wetland species are not restricted to riparian woodland/carr, occurring in non-wooded marsh and fen habitats also (Lindroth, 1992; Anderson, 1984; Luff, 1998; Anderson *et al.*, 2000; Lott, 2003). Secondly, *B. dilatatus*, *B. assimile* or *S. carbonarius* were not recorded in the County Cork sites despite more intensive sampling in the same habitat, indicating a possible faunistic difference for the Shannon alluvial woodland habitat.

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TABLE 1. Details of sites and sampling of alluvial woodland in the Gearagh and other sites in Counties Cork and Offaly. Locality names are those used in 1:50 000 maps. Irish grid reference values were obtained using a Garmin hand-held GPS.

Generic abbreviations: *Ac.* - *Acer*; *An.* - *Angelica*; *Ap.* - *Apium*; *At.* - *Athyrium*; *Be.* - *Betula*; *Bl.* - *Blechnum*; *Ca.* - *Caltha*; *Cd.* - *Cardmines*; *Ch.* - *Chrysosplenium*; *Ci.* - *Circaea*; *Co.* - *Corylus*; *Cr.* - *Crataegus*; *Cx.* - *Carex*; *Dr.* - *Dryopteris*; *Fi.* - *Filipendula*; *Fr.* - *Fraxinus*; *Ga.* - *Galium*; *He.* - *Hedera*; *Ir.* - *Iris*; *Lo.* - *Lonicera*; *Ly.* - *Lythrum*; *Me.* - *Mentha*; *My.* - *Myosotis*; *Oe.* - *Oenanthe*; *Pe.* - *Pellia*; *Ph.* - *Phalaris*; *Po.* - *Polygonum*; *Qu.* - *Quercus*; *Ra.* - *Ranunculus*; *Ri.* - *Ribes*; *Ro.* - *Rorripa*; *Ru.* - *Rumex*; *Qu.* - *Quercus*; *Sa.* - *Salix*; *Se.* - *Senecio*; *So.* - *Solanum*; *Ur.* - *Urtica*; *Ve.* - *Veronica*.

Other abbreviations: *cong./sang.* - *conglomeratus/sanguineus*; *em.* - emergence; *occ.* - occasional; *sam.* - samples.

The Gearagh (R. Toon) (Co. Cork) [East] W29987065	Bare mud with <i>Ca. palustris</i> and <i>Fi. ulmaria</i> under <i>Sa. cinerea</i> , <i>Co. avellana</i> and <i>Fr. excelsior</i> , with <i>At. filix-femina</i> , <i>Ph. arundinacea</i> , <i>Cx. remota</i> , <i>Ci. lutetiana</i> , <i>Cd. flexuosa</i> , <i>Ur. dioica</i> .	4 pitfall traps 6 - 16 June; 16 June - 10 July 2021
The Gearagh (R. Toon) (Co. Cork) [West] W29977066	Bare mud with <i>Ca. palustris</i> and <i>Fi. ulmaria</i> under <i>Fr. excelsior</i> , with <i>Sa. cinerea</i> , <i>Co. avellana</i> , <i>Be. pubescens</i> , <i>At. filix-femina</i> , <i>Ph. arundinacea</i> , <i>Cx. remota</i> , <i>Cd. flexuosa</i> , <i>Ur. dioica</i> , <i>Ve. montana</i> , <i>Ch. oppositifolium</i> , <i>Oe. crocata</i> .	4 pitfall traps 6 - 16 June; 16 June - 10 July 2021
The Gearagh (R. Toon) (Co. Cork) [Oak Is.] W30107054	Bare mud with <i>Ca. palustris</i> under <i>Qu. x rosacea</i> , and <i>Fr. excelsior</i> , with <i>Co. avellana</i> , <i>Be. pubescens</i> , <i>Ru. cong./sang.</i> , <i>At. filix-femina</i> , <i>Cd. flexuosa</i> , <i>Ri. rubrum</i> .	4 pitfall traps 16 June - 10 July 2021
The Gearagh (R. Lee) Co. Cork [First Is.] W30046973	Bare mud with <i>Ca. palustris</i> under <i>Fr. excelsior</i> and <i>Cr. monogyna</i> , on level below <i>Ci. lutetiana</i> , <i>Fi. ulmaria</i> , <i>Al. ursinum</i> , <i>An. nemorosa</i> , <i>Ru. cong./sang.</i> , <i>Ve. sylvatica</i> , <i>Dr. sp.</i> , <i>Oe. crocata</i> , <i>Co. avellana</i> .	4 pitfall traps 6 - 26 June 2021
The Gearagh (R. Lee) Co. Cork [Root Is.] W30026980	Bare mud with <i>Ca. palustris</i> under <i>Fr. excelsior</i> and <i>Cr. monogyna</i> , with <i>Ci. lutetiana</i> , <i>Fi. ulmaria</i> , <i>Al. ursinum</i> , <i>An. nemorosa</i> , <i>Dr. sp.</i> , <i>Oe. crocata</i> , <i>Ru. cong./sang.</i> , <i>Ve. montana</i> , <i>Se. palustris</i> , <i>Ur. dioica</i> .	4 pitfall traps 6 - 26 June 2021
The Gearagh (R. Lee) Co. Cork [Allium] W30016987	Bare soil with litter and <i>Al. ursinum</i> , under <i>Co. avellana</i> and <i>Fr. excelsior</i> , with <i>Ac. pseudo-platanus</i> , <i>Be. pubescens</i> , <i>Cr. monogyna</i> and <i>occ. He. helix</i> .	4 pitfall traps 8 - 29 June 2021
The Gearagh (R. Lee) Co. Cork [Hedera] W30036989	<i>He. helix</i> and <i>Al. ursinum</i> under <i>Co. avellana</i> and <i>Fr. excelsior</i> , with <i>Ac. pseudo-platanus</i> , <i>Cr. monogyna</i> , <i>Qu. robur</i> , and <i>An. nemorosa</i> , <i>Fi. ulmaria</i> , <i>Dr. sp.</i> , <i>Lo. periclymenum</i> , <i>Eu. hibernica</i> , <i>Bl. spicant</i> .	4 pitfall traps 8 - 29 June; 2 em. traps 8 June - 24 July 2021
The Gearagh (R. Lee) Co. Cork. W3069	<i>Al. ursinum</i> dominated vegetation.	3 D-vac sam. 13 May 1989
Nr Dunmanway (R. Bandon) Co. Cork W241524 [West]	Bare mud under <i>Co. avellana</i> , <i>Sa. cinerea</i> , <i>Fr. excelsior</i> , <i>Cr. monogyna</i> , <i>Qu. robur</i> , with <i>occ. Al. ursinum</i> , <i>Pe. sp</i> ; mosses.	4 pitfall traps 12 June - 3 July 2021
Nr Dunmanway (R. Bandon) Co. Cork W242524 [East]	Bare mud under <i>Co. avellana</i> , <i>Sa. cinerea</i> , <i>Fr. excelsior</i> ; <i>Cr. monogyna</i> , with <i>Ca. palustris</i> , <i>Al. ursinum</i> , <i>Pe. sp</i> ; mosses.	4 pitfall traps 12 June -3 July 2021

TABLE 1. (continued)

Lavagh (R. Shannon) Co. Offaly [South] M96081400	Bare mud under <i>Sa. cinerea</i> , young <i>Fr. excelsior</i> , <i>Cr. monogyna</i> with <i>Ca. palustris</i> , <i>So. dulcamera</i> , <i>Fi. ulmeria</i> , <i>Ro. amphibia</i> , <i>Cd. flexuosa</i> , <i>Se. palustris</i> , <i>My. scorpioides</i> , <i>Ru. cong./sang.</i>	4 pitfall traps 9 June - 6 July 2021
Lavagh (R. Shannon) Co. Offaly [North] M96061407	Bare mud under <i>Sa. cinerea</i> , <i>Fr. excelsior</i> , <i>Cr. monogyna</i> , <i>Qu. robur</i> , with <i>Ca. palustris</i> , <i>So. dulcamera</i> , <i>Fi. ulmeria</i> , <i>Ci. lutetiana</i> , <i>Me. aquatica</i> , <i>Ph. arundinacea</i> , <i>Ap. nodiflorum</i> , <i>Ru. cong./sang.</i> , <i>Ly. salicaria</i> , <i>Cd. flexuosa</i> , <i>An. sylvestris</i> , <i>Ir. pseudacorus</i>	4 pitfall traps 9 June - 6 July 2021

TABLE 2. Carabidae recorded from pitfall traps from ‘*Caltha* mud’ habitat in alluvial woodland in the Toon River part of the Gearagh, Conty Cork. ‘Indicator species’ are marked with an asterisk.

Species	Toon - June		Toon - July			Total
	West	East	Oak	West	East	
<i>Abax parallelepipedus</i> (Piller & Mitterp.)	-	1	-	2	-	3
<i>Agonum emarginatum</i> (Gyllenhal)*	1	1	1	-	1	4
<i>Agonum fuliginosum</i> (Panzer)	1	-	-	-	-	1
<i>Agonum micans</i> (Nicholai)*	4	1	3	3	2	13
<i>Agonum muelleri</i> (Herbst)	1	-	-	-	-	1
<i>Agonum viduum</i> (Panzer)	2	-	-	-	-	2
<i>Bembidion dentellum</i> (Thunberg)*	5	7	5	2	1	20
<i>Bembidion guttula</i> (Fabricius)	1	-	-	-	-	1
<i>Bembidion mannerheimii</i> Sahlberg	-	2	-	1	3	6
<i>Carabus granulatus</i> Linnaeus	4	-	3	6	-	13
<i>Clivina fossor</i> (Linnaeus)	-	-	-	-	1	1
<i>Elaphrus cupreus</i> Duftschmid	3	1	-	1	1	6
<i>Limodromus assimilis</i> (Paykull)	14	4	20	5	3	46
<i>Nebria brevicollis</i> (Fabricius)	1	-	-	-	1	2
<i>Paranchus albipes</i> (Fabricius)	1	3	8	2	-	14
<i>Pterostichus anthracinus</i> (Illiger)*	1	-	1	-	1	3
<i>Pterostichus gracilis</i> (Dejean)	1	-	-	-	-	1
<i>Pterostichus melanarius</i> (Illiger)	-	-	1	1	-	2
<i>Pterostichus minor</i> (Gyllenhal)	1	4	-	1	1	7
<i>Pterostichus niger</i> (Schaller)	-	-	-	-	1	1
<i>Pterostichus nigritya</i> (Paykull)	7	1	1	1	-	10
<i>Pterostichus strenuus</i> (Panzer)	2	1	1	3	-	7
<i>Pterostichus vernalis</i> (Panzer)	-	-	-	1	-	1
Total (no.)	50	26	44	29	16	165

TABLE 3. Carabidae recorded from pitfall traps from ‘*Caltha* mud’ and ‘*Hedera* soil’ habitat in alluvial woodland in the Lee River part of the Gearagh, County Cork. ‘Indicator species’ are marked with an asterisk.

Species	June Root	June First	July Root	June <i>Allium</i>	June <i>Hedera</i>	Total
<i>Abax parallelepipedus</i> (Piller & Mitterp.)	1	-	1	-	3	5
<i>Agonum emarginatum</i> (Gyllenhal)*	2	-	1	-	-	3
<i>Agonum micans</i> (Nicholai)*	1	1	-	-	-	2
<i>Agonum viduum</i> (Panzer)	-	1	2	-	-	3
<i>Asaphidion curtum</i> (Heyden)	-	-	-	1	-	1
<i>Bembidion mannerheimii</i> Sahlberg	1	3	-	-	-	4
<i>Bembidion obtusum</i> Audinet-Servile	-	-	4	-	-	4
<i>Bembidion tetracolum</i> Say	2	-	-	-	-	2
<i>Carabus granulatus</i> Linnaeus	5	7	10	4	7	33
<i>Carabus nemoralis</i> Müller	-	-	-	-	1	1
<i>Chlaenius nigricornis</i> (Fabricius)	-	-	1	-	-	1
<i>Clivina fossor</i> (Linnaeus)	-	2	1	2	-	5
<i>Limodromus assimilis</i> (Paykull)	23	18	9	36	13	99
<i>Loricera pilicornis</i> (Fabricius)	-	-	1	-	-	1
<i>Ocys tachysoides</i> (Antoine)	1	-	-	-	-	1
<i>Paranchus albipes</i> (Fabricius)	5	5	-	-	-	10
<i>Pterostichus nigrita</i> (Paykull)	5	4	2	2	-	13
<i>Pterostichus strenuus</i> (Panzer)	-	1	2	5	6	14
Total (no.)	46	40	34	50	30	200

TABLE 4. Carabidae recorded from pitfall traps from alluvial woodland at the River Bandon at Dunmanway, County Cork, and the River Shannon at Lavagh, County Offaly. All habitat was ‘*Caltha* mud’ except for ‘moss/*Pellia* mud’ in Dunmanway (West). ‘Indicator species’ are marked with an asterisk.

Species	Dunmanway		Lavagh	
	West	East	South	North
<i>Agonum emarginatum</i> (Gyllenhal)*	-	1	-	-
<i>Agonum fuliginosum</i> (Panzer)	-	-	-	-
<i>Anchomenus dorsalis</i> (Pontopiddan)	1	-	-	-
<i>Badister dilatatus</i> Chaudoir*	-	-	1	-
<i>Bembidion assimile</i> Gyllenhal*	-	-	2	14
<i>Bembidion dentellum</i> (Thunberg)*	-	1	1	-
<i>Bembidion lampros</i> (Herbst)	5	2	-	-
<i>Bembidion mannerheimii</i> Sahlberg	-	6	6	1
<i>Bembidion obtusum</i> Audinet-Serville	-	-	-	-
<i>Bembidion tetracolum</i> Say	-	-	-	7
<i>Carabus granulatus</i> Linnaeus	2	2	-	-
<i>Clivina fossor</i> (Linnaeus)	2	4	-	-
<i>Harpalus rufipes</i> (De Geer)	-	2	-	-
<i>Limodromus assimilis</i> (Paykull)	8	2	1	2
<i>Loricera pilicornis</i> (Fabricius)	1	1	-	1
<i>Nebria brevicollis</i> (Fabricius)	3	5	-	-
<i>Notiophilus biguttatus</i> (Fabricius)	-	-	-	1
<i>Oxypselaphus obscurus</i> (Herbst)	-	-	2	4
<i>Paranchus albipes</i> (Fabricius)	-	3	1	-
<i>Pterostichus anthracinus</i> (Illiger)*	-	-	5	-
<i>Pterostichus minor</i> (Gyllenhal)	-	-	11	7
<i>Pterostichus nigrata</i> (Paykull)	-	-	2	1
<i>Pterostichus strenuus</i> (Panzer)	-	4	5	9
<i>Pterostichus vernalis</i> (Panzer)	-	-	-	-
<i>Trechus obtusus</i> Erichson	-	2	-	-

TABLE 5. Staphylinidae recorded from pitfall traps from ‘*Caltha mud*’ habitat in alluvial woodland in the Toon River part of the Gearagh, County Cork. ‘Indicator species’ are marked with an asterisk.

Species	Toon - June		Toon - July			Total
	West	East	Oak	West	East	
<i>Aloconota insecta</i> (Thomson)	1	-	8	9	1	19
<i>Anotylus rugosus</i> (Fabricius)	12	3	14	35	27	91
<i>Atheta amplicollis</i> (Mulsant & Rey)	-	-	-	1	1	2
<i>Atheta fungi</i> (Gravenhorst)	1	-	6	-	6	13
<i>Atheta hygrobia</i> (Thomson)* ♂ ♀♀	2	-	1	1	2	6
<i>Atheta (Philhygra)</i> sp. ♀	-	-	-	2	-	2
<i>Carpelimus elongatulus</i> (Erichson)	-	-	-	1	2	3
<i>Euconus hirticollis</i> (Illiger)	-	1	-	-	1	2
<i>Gyrophynus fracticornis</i> (Müller)	-	-	-	-	1	1
<i>Lathrobium fovulum</i> Stephens	-	-	-	1	1	2
<i>Megarthus depressus</i> (Paykull)	-	-	-	1	-	1
<i>Omalium caesum</i> Gravenhorst	-	1	-	-	-	1
<i>Oxypoda brevicornis</i> (Stephens)	-	-	6	1	-	7
<i>Philonthus cognatus</i> Stephens	1	-	-	-	-	1
<i>Philonthus laminatus</i> (Creutzer)	-	-	-	-	1	1
<i>Quedius curtipennis</i> Bernhauer ♂	1	-	-	-	-	1
<i>Quedius fuliginosus</i> (Gravenhorst) ♂	-	-	1	-	-	1
<i>Quedius fumatus</i> (Stephens)	-	-	-	1	-	1
<i>Stenus bimaculatus</i> Gyllenhal	2	-	-	-	1	3
<i>Stenus canaliculatus</i> Gyllenhal	1	-	-	-	-	1
<i>Stenus europaeus</i> Puthz*	1	-	-	2	1	4
<i>Stenus juno</i> (Paykull)	1	2	-	-	-	3
<i>Stenus pusillus</i> Stephens	-	-	-	-	1	1
<i>Stenus tarsalis</i> Ljungh	-	1	-	-	-	1
<i>Tachinus laticollis</i> Gravenhorst	1	-	-	-	-	1
Total (no.)	24	8	36	55	46	169

TABLE 6. Staphylinidae recorded from pitfall traps from ‘*Caltha mud*’ and ‘*Hedera soil*’ habitat in alluvial woodland in the Lee River part of the Gearagh, County Cork. ‘Indicator species’ are marked with an asterisk.

Species	June Root	June First	July Root	June <i>Allium</i>	June <i>Hedera</i>	Total
<i>Aloconota insecta</i> (Thomson)	3	2	3	-	-	8
<i>Anotylus rugosus</i> (Fabricius)	14	30	38	23	40	145
<i>Atheta amplicollis</i> (Mulsant & Rey)	-	-	4	13	3	20
<i>Atheta aquatilis</i> (Thomson)*	1	-	-	-	-	1
<i>Atheta castanoptera</i> (Mannerheim)	-	1	-	-	-	1
<i>Atheta clientula</i> (Erichson)	1	-	2	-	5	8
<i>Atheta fungi</i> (Gravenhorst)	1	3	2	4	15	25
<i>Atheta graminicola</i> (Gravenhorst)	-	1	-	1	-	2
<i>Atheta hygrobia</i> (Thomson)*	1	-	1	-	-	2
<i>Atheta laticollis</i> (Stephens)	1	-	-	-	-	1
<i>Atheta malleus</i> (Joy) ♂	1	-	-	-	-	1
<i>Atheta (Philhygra)</i> sp. ♀	-	1	-	-	-	1
<i>Bisnius fimetarius</i> (Gravenhorst)	-	-	-	1	-	1
<i>Callicerus obscurus</i> Gravenhorst	-	-	-	-	1	1
<i>Deleaster dichrous</i> (Gravenhorst)	-	1	-	-	-	1
<i>Dinaraea aequata</i> (Erichson)	-	-	1	-	-	1
<i>Geostiba circellaris</i> (Gravenhorst)	-	-	-	-	1	1
<i>Lesteva punctata</i> Erichson	-	-	1	-	-	1
<i>Omalium caesum</i> Gravenhorst	1	-	-	-	-	1
<i>Oxypoda brevicornis</i> (Stephens)	-	-	2	1	-	3
<i>Stenus bimaculatus</i> Gyllenhal	2	-	-	-	-	2
<i>Stenus boops</i> Ljungh	-	1	-	-	-	1
<i>Stenus clavicornis</i> (Scopoli)	-	-	2	-	-	2
<i>Stenus juno</i> (Paykull)	-	-	1	-	-	1
<i>Stenus latifrons</i> Erichson	1	-	-	-	-	1
<i>Tachinus laticollis</i> Gravenhorst	1	-	2	-	1	4
Total (no.)	28	40	59	42	66	235

TABLE 7. Staphylinidae recorded from pitfall traps from alluvial woodland at the River Bandon at Dunmanway, County Cork, and the River Shannon at Lavagh, County Offaly. All habitat was ‘*Caltha* mud’ except for ‘moss/*Pellia* mud’ in Dunmanway (West). ‘Indicator species’ are marked with an asterisk.

Species	Dunmanway		Lavagh	
	West	East	South	North
<i>Acrotona aterrima</i> (Gravenhorst)	-	-	-	1
<i>Aloconota gregaria</i> (Erichson)	-	1	-	-
<i>Aloconota insecta</i> (Thomson)	5	1	-	-
<i>Anotylus rugosus</i> (Fabricius)	44	24	4	22
<i>Atheta amplicollis</i> (Mulsant & Rey)	6	4	3	4
<i>Atheta aquatica</i> (Thomson)	-	3	-	-
<i>Atheta clientula</i> (Erichson)	1	-	-	-
<i>Atheta fungi</i> (Gravenhorst)	5	2	1	6
<i>Atheta graminicola</i> (Gravenhorst)	-	-	-	1
<i>Atheta indubia</i> (Sharp)	1	-	-	-
<i>Brachygluta fossulata</i> (Reichenbach)	-	1	-	-
<i>Carpelimus corticinus</i> (Gravenhorst)	-	-	1	1
<i>Carpelimus elongatulus</i> (Erichson)	2	-	1	-
<i>Dinaraea aequata</i> (Erichson)	1	-	-	-
<i>Euconnus hirticollis</i> (Illiger)	-	1	-	-
<i>Gabrius ?-trossulus</i> (Nordmann) ♀	-	1	-	-
<i>Geostiba circellaris</i> (Gravenhorst)	-	-	-	3
<i>Lathrobium fulvipenne</i> (Gravenhorst)	-	-	-	1
<i>Megarthritis depressus</i> (Paykull)	1	-	-	-
<i>Oxypoda brevicornis</i> (Stephens)	2	-	1	16
<i>Oxypoda elongatula</i> Aubé	-	1	-	-
<i>Proteinus laevigatus</i> Hochhuth	-	-	-	1
<i>Stenus bifoveolatus</i> Gyllenhal	1	-	-	-
<i>Stenus bimaculatus</i> Gyllenhal	2	1	-	2
<i>Stenus carbonarius</i> Gyllenhal*	-	-	3	1
<i>Stenus ?-formicetorum</i> Mannerheim ♀	1	-	-	-
<i>Stenus junco</i> (Paykull)	1	-	1	-
<i>Tachinus laticollis</i> Gravenhorst	-	-	4	3

TABLE 8. Staphylinidae and Carabidae recorded in alluvial woodland in the Lee River part of the Gearagh, County Cork: D-vac suction samples and pitfall traps from *Allium ursinum* dominated vegetation; emergence traps from soil with *Hedera helix* cover; and from ‘splash-sampling’ riparian banks with *Pellia epiphylla* (23 April 1989). ‘Indicator species’ are marked with an asterisk. n.d. = no data.

Species	<i>Allium</i> D-vac	<i>Allium</i> traps	Em. traps	<i>Pellia</i>
STAPHYLINIDAE				
<i>Aloconota insecta</i> (Thomson)	-	1	-	-
<i>Amischa analis</i> (Gravenhorst)	1	-	-	-
<i>Anotylus rugosus</i> (Fabricius)	8	2	-	-
<i>Atheta amplicollis</i> (Mulsant & Rey)	16	2	-	-
<i>Atheta aquatilis</i> (Thomson)*	-	1	1	-
<i>Atheta elongatula</i> (Gravenhorst)	1	-	-	-
<i>Atheta fungi</i> (Gravenhorst)	95	2	-	-
<i>Atheta graminicola</i> (Gravenhorst)	-	2	-	-
<i>Atheta vaga</i> (Heer)	-	-	2	-
<i>Bryaxis bulbifer</i> (Reichenbach)	1	-	-	-
<i>Geostiba circellaris</i> (Gravenhorst)	1	-	-	-
<i>Lesteva punctata</i> Erichson	6	1	-	-
<i>Lesteva sicula</i> Erichson	8	-	-	-
<i>Ocalea picata</i> (Stephens)	-	3	-	-
<i>Omalium rivulare</i> (Paykull)	-	1	-	-
<i>Omalium rugatum</i> Mulsant & Rey	1	-	-	-
<i>Oxypoda brevicornis</i> (Stephens)	1	-	-	-
<i>Oxypoda elongatula</i> Aubé	13	-	-	-
<i>Oxypoda vittata</i> Märkel*	1	-	-	-
<i>Quedius fumatus</i> (Stephens)	-	1	-	-
<i>Sepedophilus nigripennis</i> (Stephens)	-	-	1	-
<i>Stenus brunnipes</i> Stephens	1	-	-	-
<i>Stenus cicindeloides</i> (Schaller)	2	-	1	-
<i>Stenus clavicornis</i> (Scopoli)	1	-	-	-
<i>Stenus flavipes</i> Stephens	8	-	-	-
<i>Stenus fulvicornis</i> Stephens	1	-	1	-
<i>Stenus guttula</i> Müller	-	-	-	3
<i>Stenus junco</i> (Paykull)	3	-	-	-
<i>Stenus latifrons</i> Erichson	1	-	-	-
<i>Stenus lustrator</i> Erichson	3	-	-	-
<i>Stenus nitidiusculus</i> Stephens	2	-	-	-
<i>Stenus picipes</i> Stephens	8	-	-	-
<i>Tachinus laticollis</i> Gravenhorst	2	5	-	-
<i>Tachinus rufipes</i> (Linnaeus)	-	5	-	-
<i>Tachyporus obtusus</i> (Linnaeus)	1	-	-	-
<i>Tachyporus tersus</i> Erichson	1	-	-	-
<i>Tinotus morion</i> (Gravenhorst)	-	-	1	-

TABLE 8 (continued)

species	<i>Allium</i> D-vac	<i>Allium</i> traps	Em. traps	<i>Pellia</i>
CARABIDAE				
<i>Badister sodalis</i> Duftschmid*	1	n.d.	-	-
<i>Bembidion mannerheimii</i> Sahlberg	3	n.d.	-	-
<i>Trechus obtusus</i> Erichson	1	n.d.	-	-