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# RELATIVE ABUNDANCE OF ROVE-BEETLES (COLEOPTERA: STAPHYLINIDAE) FROM GRASSLANDS AND PASTURES IN IRELAND AND GALICIA, SPAIN

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**Abstract**

Relative abundance data from suction sampler and pitfall trap samples of 159 species of Staphylinidae (Coleoptera) are reported from 23 sites, including improved pastures, semi-natural grasslands (turloughs, limestone and *Sesleria* grassland, fixed sand dunes, old meadow) and restored grasslands (mine tailings and spoil, road cuttings) from Ireland and Galicia (Spain). Apparent habitat preferences of some characteristic species are discussed. A number of rarely-recorded species are also reported, as are further data on the habitat differences between *Atheta* (*Mocyta*) *amplicollis* and *A. fungi*.

**Key words:** Staphylinidae, mine tailings restoration, *Sesleria* grassland, Lydacan turlough grassland fauna, *Atheta amplicollis, Atheta fungi* Ireland, Galicia, Spain.

## Introduction

Grassland covers over 55% of the land area of Ireland (Lydon and Smith, 2014), the largest percentage cover of any country in the European Union (Eurostat, 2019), even when compared to Atlantic parts of larger countries, such as Galicia (Spain) where grassland amounts to approximately 12.5% of land cover (Paz-Ferreiro, *et al*., 2010). Our knowledge of the structure of the staphylinid fauna of Irish grasslands and pastures, both improved and semi-natural, has been steadily increasing in the last four decades (e.g. Curry and O'Neill, 1979; Anderson, 1984, 1997; Good and Giller, 1990; Good and Wistow, 1997; Nash, Anderson and O'Connor, 1997; Good and Butler, 1996, 2001; Good, 1999a, b, c, 2004; Regan and Anderson, 2004; Helden *et al*., 2008, 2010, 2015; Lott and Anderson, 2011), as it has in other parts of Atlantic Europe (e.g. Welch, 1979; Desender *et al*., 1984; Bauer, 1989; Dennis *et al*., 1997, 2004). However, our knowledge of the habitat associations of grassland and pasture staphylinids remains poor. Previously unpublished relative abundance data are reported here from both Ireland and Galicia.

## Methods

Details of sites sampled and sampling techniques are given in Table 1. 'D-vac' refers to the Dietrick vacuum insect suction sampler (Dietrick, 1961); 'S-vac' to a Stihl® BR 400 leaf-blower (Andreas Stihl AG & Co., 1999) with suction conversion kit, used with a D-vac net as a suction sampler. Pitfall traps were plastic cups with ethylene glycol (commercial anti-freeze) used as preservative, generally placed in a line of four traps (or ten, for shorter periods) at 2m intervals, with particular attention being given to ensuring that the plastic lip was covered by soil or vegetation.

Composite species data reported in Helden *et al*. (2008), for 40 commercial improved pastures from Leinster and east Munster, were summarised as total numbers divided by 40 (n/40), for comparative purposes in Table 2 (species where n/40 <0.5 are excluded). Data from Wexford in Helden *et al*. (2008) (a further 11 sites) was excluded because these included field margins (Anderson *et al*., 2008). Also, data for *Stenus formicetorum* Mannerheim, 1843 cited as the third most abundant species in improved pastures by Helden *et al*. (2008), are excluded as its identity needs verification. It was found by Anderson (1997) to be uncommon and local in fens, but also occurs in wet meadows (Lott and Anderson, 2011). The only other grassland where the species was recorded as abundant was from a sheep pasture c.150m from residual bog soil in County Meath, based on dissected males (Good, 2011), although Allen (1989) also recorded it as abundant in a suburban haystack. However, the numbers (rounded mean of 21/site) mentioned in Helden *et al*. (2008) seem unlikely for this species.

Species data are tabulated according to 'dominant' species, which are those occurring in total samples at >9 individuals, 'subdominant' species, which are those occurring in total samples at <10 and >2, and 'present' species, which are those occurring in total samples as 1 or 2 only.

Staphylinidae were identified to species using keys and descriptions in a wide range of European publications, taking account of Spanish data on distribution summarised in the series of papers by Gamarra and Outerelo (2005, 2007, 2008, 2009a, b, c). Species from Galicia which could not be reliably determined are excluded from the results; these were only two species represented by one or two individuals. Aedeagi and/or (where relevant) spermathecae of representatives of most species were dissected to confirm their identity. Voucher specimens have been retained in the collection of JAG. Staphylinid nomenclature follows Löbl and Löbl (2015). Botanical nomenclature follows Stace (1997).

## Results

In total, 159 species were recorded from 23 grassland and pasture sites (Tables 2 - 10), ranging from intensively managed dairy pasture to semi-natural *Sesleria* grassland and fixed dune vegetation.

***Improved pastures***

The two fields at Randalstown (County Meath) were ryegrass (*Lolium perenne* L.), meadow-grass (*Poa* sp.) and clover (*Trifolium repens* L.) pasture, grazed by both dry cattle and sheep. The structure of the staphylinid fauna (Table 2) was broadly similar to the average improved pasture from southern and eastern Ireland reported by Helden *et al*. (2008). However, both *Geostiba circellaris* (Gravenhorst, 1806) and *Xantholinus linearis* (Olivier, 1795) were dominant. *X. linearis* has only occasionally been reported as abundant in improved pastures (one site in Helden *et al*., 2008), as well as in wheat fields (two sites in Good and Giller, 1990), but its co-occurrence with *G. circellaris* as a dominant (also only occasionally recorded) is unusual.

The Boora (County Offaly) site also had ryegrass/clover pasture, in this case grazed by dry cattle only. It had a typical improved pasture assemblage, dominated by *Amischa analis* (Gravenhorst, 1802), *Anotylus rugosus* (Fabricius, 1775), *Atheta* (*Mocyta*) *amplicollis* (Mulsant & Rey, 1874), *A.* (*M.*) *fungi* (Gravenhorst, 1806), *Philonthus carbonarius* (Gravenhorst, 1802), *P. cognatus* Stephens, 1832, *Tachinus rufipes* (Linnaeus, 1758), *Tachyporus pusillus* Gravenhorst, 1806 and *Stenus nanus* Stephens, 1833 (Table 3). Both *Anotylus rugosus* and *Tachinus rufipes* were dominant in the field with peat, but were in low numbers in the field without (Table 3). *Atheta fungi* was also dominant in the field with peat, but only present as a single individual in the field without peat, in contrast to *A. amplicollis* which was similarly dominant in both fields. The large number of adventive singletons associated with surrounding bog and birch wood habitats (e.g. *Aleochara brevipennis* Gravenhorst, 1806, *Atheta liliputana* (Brisout de Barneville, 1860), *A. subglabra* (Sharp, 1869), *A. zosterae* Thomson 1856) are no doubt derived from aerial plankton, and show how using species presence alone to compare sites can be misleading.

The pasture near Kenmare (County Kerry) was dominated by the three typical improved pasture *Philonthus* species and *Tachyporus pusillus* (Table 3). Compared to the Boora samples, the low numbers of the *Atheta fungi* group: *A. amplicollis* and *A. fungi* in the Kenmare site, and also at the Carrickittle (County Limerick) dairy pasture (Table 3), were as expected, given the bias of the sampling method (pitfall traps). It is clear from Table 3 how much more efficient suction sampling is for these two species. The silage field at Ardtully (County Kerry) could be distinguished from the above pastures by the high numbers of *Philonthus cognatus* (Table 6), a species which is abundant in cereal crops (Good and Giller, 1990), and readily colonises cropped nutrient-rich grasses.

***Restored grasslands: road cuttings***

The sample from the road cutting near Manorhamilton (County Leitrim) (Table 4) shows the effect of soil type (in this case gleyed fine-textured drumlin soil) on the staphylinid fauna, with *Staphylinus dimidiaticornis* Gemminger, 1851 dominant. The dominance of this species with *Stenus brunnipes* Stephens, 1833*, S. clavicornis* (Scopoli, 1763), *S. fulvicornis* Stephens, 1833 and *Tachyporus dispar* (Paykull, 1789) is characteristic of old pastures or meadows (Good and Giller, 1990), but with *Stenus picipes* Stephens, 1833 and *Tachinus rufipes* missing (as dominant).

A similar road cutting was sampled near Carrick-on-Shannon (County Leitrim), although with pitfall traps only. This sample (Table 4) had less numbers and less species, compared with Manorhamilton, but it had several *Gabrius trossulus* (Nordmann, 1837) (1♂3♀♀), a local species usually occurring in fens, cutover bogs and fluctuating floodplains (Anderson, 1997; Lott and Anderson, 2011), and probably originally derived from the seasonally flooded meadows on the nearby Shannon floodplain. The fact that the soil sampled on the cutting had been compacted by vehicle access may explain both its presence and the paucity of species. All specimens of *G. trossulus* were brachyptrous.

In contrast, the limestone till road cuttings near Tulla (County Clare) and at Ballydavid (County Galway), reported in Good and Wistow (1997), were dominated by *Drusilla canaliculata* (Fabricius, 1787), with no subdominant species (pitfall traps only), indicating seasonally dry conditions. The absence of this species from the sample near Newtownmountkennedy (County Wicklow) (Table 4) may be due to the sampling technique (suction sampler, rather than pitfall traps). The unique record (amongst the sites reported here) of the rarely-recorded *Sunius melanocephalus* (Fabricius, 1793) may indicate its establishment on the adjacent road cutting slope. This appears to be a coastal species in Ireland (Anderson, 1997), and more tolerant of dry conditions.

In between wet and dry soils were two other sites, near Moneygall (County Offaly) and Lissavoura (County Cork), both with *Tachinus rufipes* as dominant. However, they were distinctly different in that *Geostiba circellaris* was dominant near Moneygall, but absent at Lissavoura, and *Atheta amplicollis* was vice versa (Table 4). The cutting near Moneygall was botanically diverse with patches of open grass cover with *Dactylorhiza* sp. and *Anacamptis pyramidalis* (L.), and also with young ash (*Fraxinus excelsior* L.) and hawthorn (*Crataegus monogyna* Jacq.); grasses varied from *Cynosurus cristatus* L. and *Poa* sp. to *Anthoxanthum odoratum* L. and *Holcus lanatus* L. In contrast, the Lissavoura site was richer with grass/clover and *Ulex/Cystisus*; this may explain the relative abundance of *A. amplicollis* (cf. grassland with *Ulex* near Avoca (Good, 1999b)).

***Restored grasslands: mine tailings and spoil***

The sample (D-vac + pitfall traps) from the Randalstown (County Meath) tailings plot was the most productive staphylinid sample ever taken by the senior author, in any grassland. It contained 565 individuals of 38 species, of which 12 were dominant (i.e. n>10) (Table 5). The plot (450m$^2$) in question was a 2-year old ungrazed grass/clover sward established in silty-sand tailings (pH 7), amended before sowing with both a high rate (c. 40Mg/ha) organic amendment (containing a mixture of pig manure, peat, dried seaweed and sand ('Organic Gold')) and NPK fertilizer (500kg/ha 10.10.20), and sown to *Festuca rubra* L., *Agrostis stolonifera* L., *Poa compressa* L. and *Trifolium repens* (see Sassoon (1999) for details of the site). Possible explanations of this high abundance and diversity could be biotic: less predation due to delayed colonisation of ground-dispersing top arthropod predators, as the 450m$^2$ plot was isolated amongst bare tailings; or abiotic: an optimum combination of high fresh organic matter levels and sandy-silt soil.

Two generations later (October 1992), the species structure had changed considerably. Even taking into account the confounding effects on numbers that could be expected from a different season (May *versus* October), and year, as well as poorer sampling technique efficiency due to denser grass, there were clear differences in the species which were dominant in one sample, but absent in the other. The two dominant *Tachinus* species, associated with organic matter, as well as *Cypha laeviscula* (Mannerheim, 1830) and *Aloconota gregaria* (Erichson, 1839), were all absent; in contrast, *Stenus fulvicornis* Stephens, 1833, absent in the earlier sample was the most dominant species in the later sample, with dominant *Stenus ossium* Stephens, 1833 only a singleton previously, and subdominant *Ocypus olens* (Müller, O.F., 1764) absent previously (Table 5). The vegetation had distinctly changed too in response to lack of grazing, with clover-dominated patches giving way to dense *Festuca* 'thatch'.

The restored pasture on mine tailings at Gortrum (County Tipperary) also had clover-rich improved grassland established on zinc/copper/lead mine tailings with previous amendments of organic matter in the form of cattle slurry, sewage sludge and dairy industry waste. However, relative abundance was considerably lower in comparison with the Randalstown (and Boora) results (Tables 3 and 5); there were no dominant (n>10) species recorded; the most abundant species were *Amischa analis, Atheta amplicollis, Philonthus carbonarius* and *Stenus nanus*, a subset of the typical improved pasture species recorded at Boora. The elevated soil metal concentrations occuring at Gortdrum are unlikely to be directly responsible for this, as staphylinids are not generally directly inhibited by such concentrations in the soil (Hopkin, 1989), but possibly high levels of heavy metals may have affected prey populations. Another possible explanation may be the greater susceptibility of the fine-textured soil to alternate excessive flooding and drying due to poor drainage, and this may have prevented the development of populations of typical staphylinid species. At Randalstown, the plot sample was

closer to the discharge margin and thus may have had a higher sand component, and also it was younger with the decomposition of the organic matter at its peak. *Anotylus rugosus* and *Tachinus rufipes* were notably absent from the Gortdrum site, despite previous organic amendments. Also notable was the sub-dominance of *Gabrius appendiculatus* Sharp, 1910 (= *subnigritulus* sensu auct.), absent from the Randalstown sample (Table 5), although a single individual was recorded elsewhere on the site (Good, 2011). *G. appendiculatus* has been recorded from wet and floodplain grassland (Anderson, 1997; Lott and Anderson, 2011), but its exact habitat preference is not clear, and it has not been found in numbers at previously surveyed grassland sites in Ireland.

Two other species are of note. *Stenus canaliculatus* Gyllenhal, 1827 was dominant at Randalstown; it is a lakeshore species in Ireland of open silty/sandy substrate (Anderson, 1997), although it has also been recorded in numbers in improved pastures in wet soils in Belgium (Segers and Bosmans, 1982). Although *Sepedophilus nigripennis* (Stephens, 1832) was dominant in *Festuca* at Tynagh tailings (Good, 1999a: Table 6), it was in very low numbers at Randalstown and absent from Gortdrum tailings grassland.

The dominance (n = 36 & 16) of *Mycetoporus lepidus* (Gravenhorst, 1806) in the Ballymurtagh restored plots (Table 6), which would make this site an outlier due to its absence at other sites, is striking and unexpected. Anderson (1997) cites this species from silage and arable fields, but only one specimen was recorded by Good and Giller (1990) from over 40 such fields in south-west Ireland, and Helden *et al*. (2008) recorded only three individuals from over 50 agricultural grasslands in eastern Ireland. Its abundance may possibly be explained by a response to fungi growing on decaying sewage sludge incorporated into soil in this plot. Both Muouna and Rutanen (1994) and Majzlan and Fedor (2009) recorded increases in abundance of *M. lepidus* after forest fires in Finland and Slovakia, respectively, which they attribute to numerical responses to dipteran larvae and eggs developing in fungal fruiting bodies on burnt soil.

The Ballymurtagh results (Table 6) also show a significant difference in abundance between *Atheta amplicollis* (n>100) and *A. fungi* (n<10). This plot had a sewage sludge application, but no fertilizer. Another distinct characteristic of this site is the large numbers (240 in one sample) of *Tachinus rufipes*, which is a known associate of fresh organic matter such as dung (Horion, 1967).

The results from the pitfall trap sample at an old Pb/Cu mine at Ballyvergin (Table 6) was similar to that from the Carrick-on-Shannon road cutting, with poor diversity but with *Gabrius trossulus* (Nordmann, 1837) occurring in numbers (1♂3♀♀) (Table 6). Like the poorly-drained soil at the road cutting, the tailings at Ballyvergin may act as a 'stepping-stone' for dispersing *G. trossulus* from the nearbly organic-rich calcareous wetland pool soils occurring at this site. All specimens were brachypterous and would have dispersed cursorially.

***Restored grasslands: mine spoil (Galicia)***

The As Pontes site was a large active surface lignite mine, where overburden (mostly phyllite and clay) was deposited in what ultimately became a large hill, the surface of which was then restored to grasslands and young tree-plantings (Gil Bueno *et al*., 1990). The climate of this part of north-west Galicia is similar in many respects to south-west Ireland, but with greater summer temperatures and greater soil insolation in open swards. The striking point from the samples from As Pontes (Tables 7 and 8) is the similarity in species composition between the restored Galician and Irish grasslands. However, the greater insolation at As Pontes probably affected the key difference in relative abundance. Most samples were dominated by *Atheta amplicollis*, *Stenus impressus* (Germar, 1824) and *S. ossium* (Tables 7 and 8), a combination which was only observed in Irish samples from fixed dunes and island grassland on the coast of south Cork (Castlefreke and Cape Clear Island, Table 8); the common feature being higher soil temperatures at certain times of the year and an ungrazed sward. Also, notably, pitfall trap results were relatively poor compared to Irish samples (Tables 7 and 8), possibly for the same reason. In addition, only two individuals of *Tachinus rufipes* were recorded across all samples, even in fields with organic amendments, very probably due to the seasonally drier soil conditions which are inimical to its larvae (Lipkow, 1966).

***Semi-natural pasture: turloughs***

Lydacan Turlough (County Galway) had a typical turlough pasture fauna with *Carpelimus manchuricus* (Bernhauer 1938) (= *subtilicornis* (Roubal, 1946)), *Philonthus quisquiliarius* (Gyllenhal, 1810), *Platystethus nodifrons* Mannerheim 1830, *Stenus boops* Ljungh, 1810 and *S. fuscipes* Gravenhorst, 1802 as sub-dominant, and *Atheta* (*Philhygra*) *malleus* Joy, 1913, *Calodera aethiops* (Gravenhorst, 1802), *C. nigrita* Mannerheim, 1830, *Hygropora cunctans* (Erichson, 1837), and *Lathrobium quadratum* (Paykull, 1789) present (cf. Good and Butler, 2001: Table 1). A notable record is that of *Philonthus punctus* (Gravenhorst, 1802), which is only known in Ireland from a few of the many turlough/lakeshore sites in Clare, south-east Galway and Mayo which have been sampled (Owen, 1997; Good and Butler, 2001; Regan and Anderson, 2004; R. Anderson, pers. comm.). Much of Lydacan turlough pasture has poor (low nutrient) grassland vegetation according to Regan, Sheehy-Skeffington and Gormally (2007). The particular sward sampled here for rove-beetles was particularly moss-rich, and contained carices and *Hydrocotyle vulgaris* L. The relative abundance of species was generally similar to that for Garryland Turlough, sampled in the same year, but with the notable difference that *Tachinus rufipes* was dominant at Lydacan, but absent at Garryland. Lydacan was sampled slightly later in June than Garryland but this is still likely to be too early for the emergence of the next *T. rufipes* generation, so the difference may be ecological rather than sampling bias.

In contrast to Lydacan, Blackrock Turlough can be considered a semi-improved pasture, in that it is unlikely to have been ploughed and cultivated due to its slope and liability to flooding, but appears to have been improved by fertiliser and some ryegrass seed application. It was grazed by cattle and horses at the time of sampling. There are two significant differences to Lydacan Turlough. Firstly, Blackrock turlough fills and empties relatively rapidly and deeply, and as a consequence the soil does not have as stable an inundation regime as Lydacan and other turloughs. Secondly, it is partly filled by overflow eutrophic water from the Owenshree River, and the area sampled has a well-drained slightly acidic mineral soil, both combining to give a fertile soil (Sharkey *et al*., 2015). The staphylinid fauna shows the response to these combined factors by having relatively low diversity, being dominated by *Aloconota gregaria*, *Atheta fungi* and *Philonthus cognatus* (Table 9) which are rapidly dispersing species characteristic of nutrient-rich field crops, combined with relatively low numbers of characteristic turlough species, such as *Carpelimus manchuricus*, *Platystethus nodifrons* and *Stenus fuscipes* Gravenhorst, 1802 (Table 9), which are abundant in the surrounding landscape.

***Semi-natural grasslands: sand dunes***

D-vac samples from recently burnt (Table 10) and unburnt (Table 8) fixed dune vegetation at Castlefreke (County Cork) showed a dramatic change in staphylinid assemblage, with species characteristic of dry south-facing slopes (*Drusilla canaliculata* (Fabricius, 1787) and *Falagrioma thoracica* (Stephens, 1832) (see Good and Wistow, 1997) occurring in the recently burnt short sward, but absent in the unburnt sward. Contrariwise, *Stenus impressus* was dominant in the unburnt sward but absent in the recently burnt dunes.

The Doonbeg sample (Table 9) was from a winter (January) set of turf samples, so the dominance of *Amischa analis*, *Atheta amplicollis*, *Philonthus carbonarius*, *P. cognatus*, and the sub-dominance of *P. varians*, is probably due to beetles from the adjacent improved pastures overwintering in the dunes, rather than an indicator of nutrient enhancement. In contrast, the dominance of *Ischnosoma splendidum* (Gravenhorst, 1806), and the occurrence (at n>1) of *Ochthephilum fracticorne* (Paykull, 1800), *Tachyporus atriceps* (Stephens, 1832) and *T. tersus* Erichson, 1839 appear to be more characteristic of dune grassland. Anderson (1997) recorded *I. splendidum* as restricted to moss on sandy or light-textured soils.

Only one *Rugilus rufipes* (Germar, 1835) was found across all the sites, a male from Doonbeg sand dunes (Table 9), which is surprising given that Anderson (1997) mentioned it to be common in grassland in Northern Ireland. Perhaps the records of *R. similis*, from improved grassland, in Helden *et al*. (2008), a species of river and lake margins (Anderson, 1997), may refer to this species.

***Semi-natural grasslands: calcareous grasslands***

The co-occurrence of *Micropeplus staphylinoides* (Marsham, 1802) (dominant) and *Metopsia clypeata* (Müller, P.W.J., 1821), from limestone grassland at Clorhane (County Offaly) (Table 10), may be characteristic of calcareous grassland; the former has been recorded as dominant in mildly calcareous dunes (Redgate, 1981), and the latter dominant in old grassland on limestone soils (Good, 2011). This site was also at the margin of the floodplain of the River Shannon, and may also be occasionally inundated, and this proably explains the occurrence of a single individual of *Anthobium unicolor* (Marsham, 1802), a species typical of fens (Anderson, 1997) (and also the plant *Carex hostiana* DC (det. G. Doyle), a species typical of wet flushes, which was growing at this site).

The above three staphylinid species were absent from the Lough Derg lakeshore at Skehanagh (County Tipperary) (Table 10), but this site had an interesting alternative set of species, three of them myrmecophiles: *Drusilla canaliculata* (Fabricius, 1787), *Pella limbata* (Paykull, 1789) (both sub-dominant) and *Lamprinodes saginatus* (Gravenhorst, 1806) (present). The lakeshore contained a gradient from scrub and young trees (including *Sorbus hibernica* E.F. Warb.), through *Sesleria albicans* Kit. grassland with occasional *Juniperus communis* L. prostrate bushes, to *Schoenus nigricans* L. wetland. The grassland was ungrazed with a dry sward but with a moist soil surface layer with moss. *Carpelimus elongatulus* (Erichson, 1839), a local species also recorded as subdominant on the shore of Lough Gill, County Kerry (Good and Butler, 1998), indicated the lake shore flooding of the soil at this site.

The high numbers of *Tachyporus chrysomelinus* are surprising. Dominance of *T. chrysomelinus* (Linnaeus, 1758) in grassland samples is unusual; it can be dominant in samples from cereal crops (wheat, barley, etc.) (e.g. the Kanturk wheat sample in Good and Giller (1990)); also in wheat with high aphid densities in SE England (Bryan and Wratten, 1984). One possibility is that *T. chrysomelinus*, an aphid feeder, was attracted to aphid colonies on the scattered *Phragmites australis* (Cav.) plants at Skehanagh, which can be abundant on both wheat and reeds. Another possibility is that this sample was taken in April, when *T. chrysomelinus* is more abundant (Coombes and Sotherton, 1986), compared to later in the year for the other grassland samples reported here.

The occurrence of *Stenus aceris* Stephens, 1833, recorded from the lakeshore at Lough Derg by Anderson (2013) is also interesting, as this was considered to be a grassland species by Lott and Anderson (2011), and a species of open habitats on light soils in England by Reid (1985). In the Netherlands, *S. aceris* is only known from sand dunes in the south of the country (van Nunen *et al*., 2004). Perhaps the single specimen recorded by Anderson (2013) from Lough Derg shoreline derives from a population in *Sesleria/Juniperus* habitat.

***Semi-natural grasslands: old meadows and pastures***

The old meadow near As Pontes in Galicia had a distinctly different fauna to that of any other known Atlantic grassland site, characterised by dominance of *Stenus similis* (Herbst, 1784), absence of *S. ossium*, and subdominance or occurrence of a range of species rarely, or not, recorded in the restored sites at As Pontes, such as *Astenus gracilis* (Paykull, 1789), *Heterothops dissimilis* (Gravenhorst, 1802), *Rugilus geniculatus* (Erichson, 1839), *Stenus assequens* Rey, 1844 and *S. providus* Erichson, 1839 (= *rogeri* Kraatz, 1857) (Table 8). There appears to be few records of many staphylinid species from Galicia; for instance, the nearest records of *A. gracilis*, although widespread in Iberia, are from Santander (Cantabria) and Tras Os Montes (Portugal) (Gamarra and Outerelo, 2007). A range of species reported here are apparently new to Galicia; they are not recorded from Galicia by Gamarra and Outerelo (2005, 2007, 2008, 2009a, b, c). *Tachyporus dispar*, which occurred at As Pontes, has not apparently been recorded previously from the Iberian Peninsula (Gamarra and Outerelo, 2009a).

A very lightly-grazed old pasture on Cape Clear Island (County Cork) contained *Sepedophilus nigripennis* as dominant (Table 8), a species which occurs in high numbers in ungrazed and uncut dense grass swards, such as at the base of *Cytisus* and *Ulex* at As Pontes (Table 7) and at several sites in Counties Cork and Galway (Good, 1999a). Although not included in Table 8, 77 *Ocypus olens* were also recorded in 20 pitfall traps at the Cape Clear site, a result similar to that from cliff-top *Festuca rubra* grassland at Galley Head (County Cork) (Good, 1999a). An explanation for the absence of this species from similar coastal habitat at Knockmahon mine (County Waterford) (Good, 1999a: Table 6) could be the effects of higher soil copper concentrations inhibiting large invertebrates, which are predated by *O. olens*. The absence of this species from As Pontes could also be due to low numbers of invertebrate prey, which had not colonised the recently restored meadows.

***Suction samplers* versus *pitfall traps***

The most dramatic difference in effectiveness of these two techniques for *Stenus* species is shown in the sample from grass under *Cytisus/Ulex* from As Pontes (Table 7), where 130 *Stenus impressus* and 45 *Stenus ossium* were collected by S-vac, but neither occurred in pitfall traps operating at the same time. Both these, in common with some other grassland *Stenus*, possess bilobed 4$^{th}$ tarsal segments adapted for climbing grasses and other vegetation (Renkonen, 1934), and may be able to climb out of pitfall traps. Alternatively, they may simply avoid the traps, as is indicated by the significantly higher numbers of *S. canaliculatus*, a species lacking bilobed tarsi, in the D-vac sample (n = 20) compared to pitfall traps (n = 0), at Randalstown (Table 5).

Contrariwise, 17 *Staphylinus dimidiaticornis* were recorded in pitfall traps from Skehanagh, but none in D-vac suction samples (Table 10). A similar result occurred near Manorhamilton (Table 4). Relatively large, nocturnally-active, litter-layer beetles, which hide away during the

day are less likely to be captured by diurnal suction sampling. It can be seen from the tables that suction samples considerably underestimate staphylinines, *Tachinus* and *Anotylus* species.

***Tachinus rufipes***

*Tachinus rufipes* (= *signatus*) appears to be particularly related to soil organic matter across the spectrum from improved to semi-natural grassland, occurring in high numbers in sewage sludge-amended soil, dominant in some improved pastures, in one case with residual peat where it was in low numbers without, as well as in road cuttings and restored soils, and in all cases in soils with good moisture retention. High numbers were also recorded in upland *Molinia caerulea* tussock grassland in County Wicklow (Good, 1999c). The larvae of this species require moist soil with 100% relative humidity for their development (Lipkow, 1966). However, great care is needed in comparing relative abundance of *T. rufipes* between sites. For the road cuttings, it would be expected that *T. rufipes* would occur in greater numbers near Manorhamilton (County Leitrim) (drumlin clay cutting moist litter layer and dense vegetation creating organic matter) than near Moneygall (County Offaly) (moraine boulder clay with more open, sparse vegetation cover). However, the opposite was the case. This could be possibly explained by the subtle difference in sampling timing: Moneygall was sampled one week later in July than Manorhamilton, and also taking into account the more south-facing aspect and more southern location of the former, a new generation of *T. rufipes* may have emerged here at the end of the sampling period, but had not emerged yet for the earlier-concluded samples near Manorhamilton.

***Atheta amplicollis and A. fungi***

The most abundant taxon *recorded* from Irish grasslands was the *Atheta fungi* species-complex (Tables 2-9; see also Helden *et al*., 2008), of which *Atheta amplicollis* and *A. fungi* were, for the most part, separated here. (Note *recorded* is emphasised, as *Amischa analis* is under-represented in pitfall traps and suction samples, compared to soil samples (JAG, unpublished data), and may be more abundant). *A fungi* sensu stricto appears to be parthenogenetic and represented by females only in Ireland (Good, 2019). It was recently hypothesised that *A. fungi* was dependant on fresh decomposing grass with high nutrient levels (with consequential fungal and algal growth) (Good, 2019). However, the data here indicates that the habitat separation between these two sibling species is more complex.

At the As Pontes site (Tables 7 and 8), *A. fungi* was only dominant in parcels with greater nutrient availability, such as manured grassland and areas with nitrogen-fixing plants such as *Alnus glutinosa* (L.) and *Cytisus* sp. or *Ulex europaeus* L. However, this conclusion is confounded by the fact that organic rich soil and soils under tree cover may both have increased soil moisture retention. Also, contrariwise, nine *A. amplicollis* were captured under *Ulex*

*europaeus* in revegetated copper tailings at Avoca (County Wicklow) (Good, 1999b), and 28 under *U. europaeus* at the Lissavoura road cutting (Table 4), but only zero and five *A. fungi*, respectively.

At Boora (Table 3), *A. fungi* was abundant in soil with residual peat (n = 39), and much higher cover of the nitrogen-fixing clover *Trifolium repens*, but represented by only one individual in soil without residual peat and low clover. However, there was a more than 10-fold higher number of *A. amplicollis* compared to *A. fungi* in the sewage sludge-amended soil at Ballymurtagh (Table 6).

*A. amplicollis* is not listed by Gamarra and Outerelo (2005) as occurring in Spain, but it is included as a synonym of *A. fungi*. However, both appear to have not been previously recorded from Galicia (Gamarra and Outerelo, 2005).

**Discussion**

The results show distinct differences between staphylinid species relative abundance within improved, restored and semi-natural grasslands. This may sometimes be due to fresh organic matter, soil moisture, flood regime and also due to biases of sampling due to season or technique.

From a botanical perspective, Sullivan *et al.* (2010) recognised a separate category of 'semi-improved' grassland, where there are greater abundances of certain grasses and herbs not associated with the more nutrient-rich reseeded grasslands. It is likely that the staphyinid fauna will change similarly, with extra species becoming more abundant than is the case in ryegrass swards. This will especially be the case in grasslands originally reseeded to ryegrass but with subsequent lower nutrient inputs. These are perhaps better referred to as 'reverting improved grassland', an example being the Randalstown pasture (Table 2) where *Xantholinus linearis* and *Geostiba circellaris* were dominant, although generally not abundant in improved grasslands. 'Reverting improved grassland' is likely to have lower nutrient inputs, and will have a changed structure with loss of the nitrophilous species and dominance, for instance, of species such as *Stenus* species other than *nanus* and *clavicornis*; examples are the change at the Randalstown organic-amended plot over two generations (Table 5), and the fauna of the originally manured field at As Pontes (Table 8).

In general, the species composition of the restored grasslands from As Pontes (Galicia) (Tables 7 and 8) was similar to that recorded in Ireland. However, the co-dominance of *Stenus impressus* and *Stenus ossium*, which occurred in most of the samples from As Pontes (Galicia) was only recorded to occur in Ireland from two south-coast sites (Table 8). *S. impressus* was alone dominant in samples from limestone grassed cliffs in the Burren, County Clare (Good, 2004); a habitat which Jeffrey (2003) argued to be resistant to scrub invasion due to soil dryness and low fertility. This shows the similarity of edaphic conditions in sandy and rendzina soils in

southern Ireland to climatic conditions in heavier textured raw soils in north-west Spain. In contrast, natural flat loam soils in Galicia with greater water retention had a different structure, with *Stenus similis* (Herbst) dominant and *S. ossium* absent (Table 8 - 'Herb').

Old semi-natural grasslands with historical continuity possess more differentiated faunas, such as turlough pastures and limestone grasslands. Turloughs such as Lydacan are characterised by flood-adapted species with restricted distributions. Similarly, *Sesleria* grassland characteristically occurs on shallow limestone soils (O'Donovan, 1995), in the case of Skehanagh probably created by lakeshore wave-action when water levels were historically unregulated. The staphylinid fauna of lake-shore *Sesleria - Juniperus* grassland of the north-east Lough Derg (County Tipperary), as well as other suitable sites where it occurs such as at Lough Carra (County Mayo) (Praeger, 1906), would be well worth further investigation.

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**TABLE 1.** Details of sites and sampling methods for grasslands and pastures.

*Improved and reverting improved pastures*
Randalstown, Co. Meath (N852723) Moderately-grazed sheep + cattle *Lolium perenne*/*Poa* sp. pasture. Pitfall traps (n = 4) (2 subsites) - 20 May - 10 June 1992; D-vac sampler (2 subsites) - 20 May 1992.
Boora, Co. Offaly (N1622) Improved cattle-grazed *Lolium perenne*/*Trifolium repens* pasture on cut-over bog (with and without residual peat). Pitfall traps (n = 4) (2 subsites) - 28 June - 19 July 1991; D-vac sampler (2 subsites) - 19 July 1991.
Near Kenmare, Co. Kerry (V927714) Improved cattle-grazed pasture with *Agrostis stolonifera, Holcus lanatus*, *Poa* sp., *Ranunculus repens* with very occasional *Iris pseudacorus*. Pitfall traps (n = 4); 12 June - 3 July 1991.
Carrickittle, Co. Limerick (R7439) Intensively managed dairy paddock, regrowth following silage cut (early June). Pitfall traps (n = 4) - 12 - 31 July 1991.
Blackrock Turlough, Co. Galway (M49730809) Sheep/horse/cattle heavily-grazed pasture with *Potentilla anserina*. Pitfall traps (n = 4) - 2 - 23 June 1996.

*Restored grasslands - road cuttings*
Near Manorhamilton, Co. Leitrim (G867361) Road cutting: east-facing slope on cutting through drumlin gleyed soil/subsoil, with *Holcus lanatus*, *Trifolium repens*, *Cynosurus cristata*, *Anthoxanthum odoratum*, *Potentilla anserina*, *Carex flacca*, *Plantago lanceolata, Juncus conglomeratus* and *Leucanthemum vulgare*. Pitfall traps (n = 4) - 26 June - 22 July 1991; D-vac suction sampler - 22 July 1991.
Carrick-on-Shannon, Co. Leitrim (M97419819) Compacted clay at crest of road cutting, sparse grasses, *Carex flacca* and *Plantago lanceolata.* Pitfall traps (n=4) - 25 June - 20 July 1991.
Near Moneygall, Co. Offaly (S0181808) Road cutting through fine-textured boulder clay, open totussock grassland. Pitfall traps (n = 4) - 14 - 31 July 1991.
Lissavoura, Co. Cork (W58118770) South-facing road cutting slope, rough grass & *Cytisus scoparius/Ulex europaeus*. Pitfall traps (n = 4) - 12 - 31 July 1991.
Newtownmountkennedy, Co. Wicklow (O27430619) Roadside cut grass/*Trifolium repens* strip below rough grassland slope. D-vac suction sampler - 15 June 1991.

*Restored grasslands - mine tailings & spoil*
Randalstown, Co. Meath (N85387205) Ungrazed *Festuca/Agrostis/Trifolium repens* on Zn/Pb tailings with high organic amendment. D-vac suction sampler - 17 June 1991, 9 October 1992; Pitfall traps (n = 4) - 17 June - 8 July 1991, 24 September - 29 October 1992.
Gortdrum, Co. Tipperary (R86924053) *Agrostis*/*Festuca*/moss cattle pasture on Cu/Zn/Pb mine tailings. Pitfall traps (n = 4) - 5 - 26 July 1991; D-vac suction sampler - 31 June 1991.

**TABLE 1 (continued).**

Ballymurtagh, Co. Wicklow (T19348147) Two-year old grass on sewage sludge-amended topsoil on (a) heavy-duty polyethylene (HDPE) barrier over acidic mine spoil, and (b) mine spoil planted with *Betula* saplings. Pitfall traps (n = 4) (2 subsites) - 24 June - 16 July 1998.
Ardtully, Co. Kerry (V974731) Silage field (second cut crop) on Cu-enriched mine spoil soil. Pitfall traps (n = 4) - 12 June - 3 July 1991.
Ballyvergin, Co. Clare. (R4281) Patch of wet grassland (*Anthoxanthum*, *Holcus*, *Poa*) on Pb/Cu mine tailings near *Ulex europeaus* and *Juncus effusus*. Pitfall traps (n = 4) - 12 - 31 July 1991.
As Pontes de Garcia Rodriguez, La Coruña (29T 58605E 481310N) Open grassland slope with scattered scrub on topsoiled mine spoil. Pitfall traps (n = 10) - 21 - 25 June 1993; S-vac suction sampler - 24 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58601E 481331N) Meadow with *Holcus lanatusTrifolium repens* on phyllite spoil. Pitfall traps (n = 10) - 16 - 21 June 1993; S-vac suction sampler - 14 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58525E 481335N) Grassland with *Cytisus* sp. and *Ulex europaeus* scrub on topsoiled mine spoil. Pitfall traps (n = 10) - 16 - 21 June 1993; S-vac suction sampler - 14 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58791E 481330N) Grassland established for nine years on clay without topsoil. Pitfall traps (n = 10) - 16 - 22 June 1993; S-vac suction sampler - 16 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58598E 481343N) Grass with 4-year *Pinus* spp on topsoiled acidic phyllite spoil. Pitfall traps (n = 10) - 15 - 21 June 1993; S-vac suction sampler - 15 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58501E 481328N) Organic manured grassland established for 2 years on phyllite spoil. Pitfall traps (n = 10) - 15 - 22 June 1993; S-vac suction sampler - 15 June 1993.
As Pontes de Garcia Rodriguez, La Coruña (29T 58499E 481348N) Grass with 4-year *Alnus glutinosa* on topsoiled acidic phyllite spoil. Pitfall traps (n = 10) - 17 - 22 June 1993; S-vac suction sampler- 17 June 1993.

*Semi-natural grasslands*
Lydacan Turlough, Co. Galway (M438083) Moss-dominated turlough cattle pasture with carices and *Hydrocotyle vulgaris.* Pitfall traps (n = 4) - 15 May - 21 June 1996.
Doonbeg Dunes, Co. Clare (Q994688) Cattle-grazed fixed dune hollow moss-rich turf, sparse vascular plant cover. Turve samples (n = 10) - 14 January 1998.

As Pontes de Garcia Rodriguez, La Coruña (29T 59377E 480980N) Herb-rich old meadow on moist silty loam soil. Pitfall traps (n = 10) - 21 - 24 June 1995; S-vac suction sampler - 24 June 1995.

**TABLE 1 (continued).**

Castlefreke Dunes, Co. Cork (W336339) Short-turf (recovering from recent burning) and unburnt fixed acidic sand dunes. D-vac suction sampler (x 2) - 11 July 1985 (00:30 - 01:30h GMT).
Cape Clear Island, Co. Cork (V958212) Ungrazed rough grassland. D-vac suction sampler (x 2) - 23 August 1984.
Skehanagh (L. Derg), Co. Tipperary (R816914) Lake shore grassland with *Sesleria caerulea* and *Juniperus communis*, grading into *Schoenus nigricans* sward with *Pinguicula vulgaris*, etc. Pitfall traps (n = 4 x 2) - 28 April - 3 June 1993; S-vac suction sampler - 28 April 1993.
Clorhane, Co. Offaly (M98712806) Limestone pasture with rock outcrops grazed by cattle & occasionally flooded in winter. Pitfall traps (n = 4) - 12 August - 20 September 1986.

**TABLE 2.** Staphylinid beetles recorded from improved pastures at Randalstown (Co. Meath), compared with derived mean abundance/site from Helden *et al*. (2008) from 40 commercial improved pastures in Leinster and east Munster (see Methods). Many Aleocharinae were not determined by Helden *et al*. (2008); these are represented by '?'. * = *A. fungi* s.l. (sensu lato) includes *A. amplicollis* and *A. fungi*, which were not differentiated by Helden *et al.* (2008).

| ***Species*** | ***Randalstown 1*** | | | ***Randalstown 2*** | | | ***Helden et al. (2008)*** |
|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* | *Total/site* |
| *Amischa analis* | 25 | 25 | **50** | 40 | 10 | **50** | **77** |
| *Atheta amplicollis* | 27 | 29 | **56** | 51 | 14 | **65** | } |
| *Atheta fungi* | 38 | 5 | **43** | 102 | 4 | **106** | }**102*** |
| *Geostiba circellaris* | 1 | 9 | **10** | - | - | **-** | **?** |
| *Philonthus carbonarius* | - | 4 | **4** | 1 | 9 | **10** | **6** |
| *Philonthus laminatus* | - | 10 | **10** | - | 14 | **14** | **13** |
| *Tachinus rufipes* | - | 23 | **23** | 1 | 8 | **9** | **7** |
| *Tachyporus dispar* | 2 | 7 | **9** | 11 | 3 | **14** | **4** |
| *Tachyporus hypnorum* | 3 | 4 | **7** | 13 | 7 | **20** | **2** |
| *Tachyporus pusillus* | 4 | 18 | **22** | 25 | 41 | **66** | **7** |
| *Xantholinus linearis* | - | 21 | **21** | - | 10 | **10** | **1** |
| *Aloconota gregaria* | - | 1 | **1** | 2 | 2 | **4** | **16** |
| *Oligota inflata* | - | - | - | 2 | 2 | **4** | **?** |
| *Oxypoda brachyptera* | 1 | - | **1** | 1 | 2 | **3** | **?** |
| *Philonthus cognatus* | - | 3 | **3** | 1 | 8 | **9** | **17** |
| *Philonthus marginatus* | - | - | **-** | - | 2 | **2** | **1** |
| *Stenus clavicornis* | 3 | 4 | **7** | 1 | - | **1** | **7** |
| *Stenus nanus* | 1 | - | **1** | 1 | 2 | **3** | **8** |
| *Stenus picipes* | - | - | **-** | 1 | 2 | **3** | **10** |
| *Tachyp. chrysomelinus* | 2 | 1 | **3** | 1 | - | **1** | **4** |
| *Tachyporus nitidulus* | 6 | - | **6** | 6 | - | **6** | **1** |
| *Xantholinus longiventris* | - | 2 | **2** | 1 | 5 | **6** | **1** |
| *Acrotona aterrima* | - | - | - | 1 | - | **1** | **?** |
| *Aleochara lanuginosa* | - | - | **-** | - | 1 | **1** | **1** |

**TABLE 2 (continued).**

| **Species** | **Randalstown 1** | | | **Randalstown 2** | | | **Helden et al. (2008)** |
|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* | *Total/site* |
| *Amischa decipiens* | - | - | **-** | 2 | - | **2** | **14** |
| *Amischa nigrofusca* | - | - | **-** | - | - | **-** | **2** |
| *Anotylus rugosus* | - | 1 | **1** | - | - | - | **3** |
| *Anotylus tetracarinatus* | - | 1 | **1** | - | - | **-** | **1** |
| *Atheta indubia* | - | - | **-** | - | 2 | **2** | **?** |
| *Atheta nigripes* | - | - | **-** | - | 1 | **1** | **?** |
| *Callicerus obscurus* | - | - | **-** | - | 1 | **1** | **?** |
| *Carpelimus corticinus* | - | - | - | 1 | - | **1** | **-** |
| *Dinaraea angustula* | - | 1 | **1** | - | - | **-** | **?** |
| *Micropeplus porcatus* | - | - | **-** | 1 | - | **1** | **-** |
| *Philonthus varians* | 1 | - | **1** | - | - | **-** | **-** |
| *Platystethus arenarius* | - | - | - | - | - | - | **1** |
| *Quedius levicollis* | - | - | - | - | - | - | **1** |
| *Quedius schatzmayri* | - | 2 | **2** | - | - | **-** | **1** |
| *Stenus brunnipes* | - | - | - | - | - | - | **3** |
| *Stenus canaliculatus* | - | - | - | - | - | - | **1** |
| *Stenus cicindeloides* | - | - | - | 1 | - | **1** | **3** |
| *Stenus fulvicornis* | - | - | - | - | - | - | **1** |
| *Stenus juno* | - | - | **-** | - | - | **-** | **1** |
| *Stenus ossium* | - | - | **-** | - | - | **-** | **1** |
| *Stenus similis* | - | - | **-** | - | - | **-** | **1** |
| *Stenus tarsalis* | - | - | - | 1 | - | **1** | **3** |
| *Sunius propinquus* | 1 | 1 | **2** | - | - | **-** | **-** |
| *Tinotus morion* | - | 1 | **1** | 1 | 1 | **2** | **-** |

**TABLE 3.** Staphylinid beetles recorded from improved pasture: On cut-over bog with residual peat ('+ peat'), and without peat ('- peat') at Boora (Co. Offaly); on alluvial soil near woodland near Kenmare ('Knmr') (Co. Kerry); and from dairy pasture at Carrickittle ('Cittle') (Co. Limerick).

| ***Species*** | ***Boora + peat*** | | | ***Boora - peat*** | | | ***Kenmr*** | ***Cittle*** |
|---|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* | *Traps* | *Traps* |
| *Amischa analis* | 6 | 2 | **8** | 29 | 1 | **30** | 3 | - |
| *Anotylus rugosus* | - | 14 | **14** | - | 6 | **6** | - | - |
| *Atheta amplicollis* | 23 | 5 | **28** | 36 | 6 | **42** | 3 | 6 |
| *Atheta fungi* | 37 | 2 | **39** | 1 | - | **1** | - | 3 |
| *Philonthus carbonarius* | 1 | 15 | **16** | - | 8 | **8** | 37 | 20 |
| *Philonthus cognatus* | - | 16 | **16** | - | 9 | **9** | 28 | 14 |
| *Philonthus laminatus* | - | 6 | **6** | - | - | **-** | 20 | 8 |
| *Stenus nanus* | 1 | 8 | **9** | 5 | 7 | **12** | 2 | - |
| *Tachinus rufipes* | - | 11 | **11** | - | 3 | **3** | 2 | 83 |
| *Tachyporus dispar* | 6 | 9 | **15** | 3 | 3 | **3** | - | - |
| *Tachyporus pusillus* | 6 | 9 | **15** | 15 | 4 | **19** | 12 | 1 |
| | | | | | | | | |
| *Philonthus marginatus* | - | - | - | - | 5 | **5** | 2 | 2 |
| *Stenus ossium* | 1 | - | **1** | 4 | - | **4** | **-** | - |
| *Stenus picipes* | - | - | - | 8 | - | **8** | **-** | - |

**TABLE 3 (continued).**

| ***Species*** | ***Boora + peat*** | | | ***Boora - peat*** | | | ***Kenmr*** | ***Cittle*** |
|---|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* | *Traps* | *Traps* |
| *Tachyporus nitidulus* | 2 | 1 | **3** | - | 1 | **1** | - | 1 |
| *Tachinus laticollis* | - | 2 | **2** | - | - | - | 3 | 7 |
| *Acrotona parvula* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Aleochara brevipennis* | - | 2 | **2** | - | 1 | **1** | **-** | - |
| *Aleochara intricata* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Aleochara lanuginosa* | - | 1 | **1** | - | - | **-** | **-** | - |
| *Aloconota gregaria* | 1 | - | **1** | - | - | **-** | **-** | - |
| *Amischa decipiens* | - | - | **-** | 1 | - | **1** | **-** | - |
| *Atheta amicula* | - | - | **-** | 1 | - | **1** | **-** | - |
| *Atheta elongatula* | - | 1 | **1** | **-** | - | **-** | **-** | - |
| *Atheta indubia* | 1 | - | **1** | - | - | **-** | **-** | - |
| *Atheta liliputana* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Atheta longicornis* | 1 | - | **1** | - | - | **-** | **-** | - |
| *Atheta melanocera* | 1 | - | **1** | - | - | **-** | **-** | - |
| *Atheta occulta* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Atheta subglabra* | - | - | **-** | - | - | - | 1 | - |
| *Atheta triangulum* | - | - | **-** | - | - | - | 1 | - |
| *Atheta zosterae* | - | - | **-** | - | - | - | 1 | - |
| *Bisnius sordidus* | - | 1 | **1** | - | - | - | **-** | - |
| *Boreophilia eremita* | 1 | - | **1** | - | - | **-** | **-** | - |
| *Gabrius breviventer* | 1 | - | **1** | 1 | - | **1** | **-** | - |
| *Geostiba circellaris* | **-** | **-** | - | **-** | **-** | **-** | **-** | 1 |
| *Megalinus glabratus* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Meotica exilis* | - | 1 | **1** | - | - | **-** | **-** | - |
| *Micropeplus porcatus* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Ocypus aeneocephalus* | **-** | **-** | - | **-** | **-** | **-** | **-** | 2 |
| *Oxypoda exoleta* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Oxypoda brevicornis* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Philonthus decorus* | - | - | **-** | - | - | - | - | 1 |
| *Philonthus intermedius* | - | - | **-** | - | 2 | **2** | **-** | - |
| *Philonthus* ?*-micantoides* | - | - | **-** | - | 1 | **1** | **-** | - |
| *Philonthus splendens* | - | 1 | **1** | - | 1 | **1** | **-** | 2 |
| *Philonthus varians* | - | - | **-** | - | - | - | 2 | 1 |
| *Platystethus arenarius* | 1 | - | **1** | - | - | - | **-** | - |
| *Quedius levicollis* | - | - | **-** | - | 2 | **2** | **-** | .. - |
| *Quedius molochinus* | - | - | **-** | - | - | - | - | 1 |
| *Quedius schatzmayri* | - | - | **-** | - | - | - | 2 | - |
| *Stenus canaliculatus* | 1 | - | **1** | - | - | - | **-** | - |
| *Tachyporus chrysomelinus* | 1 | - | **1** | - | 1 | **1** | **-** | - |
| *Tachyporus hypnorum* | 2 | - | **2** | - | - | - | **-** | - |
| *Xantholinus linearis* | - | - | **-** | - | - | - | - | 1 |
| *Xantholinus longiventris* | - | 2 | **2** | - | 1 | **1** | 3 | - |

**TABLE 4.** Staphylinid beetles from road cutting grasslands: Near Manorhamilton (Co. Leitrim); near Carrick-on-Shannon (Co. Leitrim) ('Carrick'); near Moneygall (Co. Offaly) ('Mgall'); Lissavoura (Co. Cork) ('Lissa'); near Newtownmountkennedy (Co. Wicklow) ('Ntmk'). Traps = pitfall traps (n=4).

| ***Species*** | ***Manorhamilton*** | | | ***Carrick*** | ***Mgall*** | ***Lissa*** | ***Ntmk*** |
|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *Traps* | *Traps* | *Traps* | *D-vac* |
| *Amischa analis* | - | 1 | **1** | 2 | 7 | 10 | - |
| *Atheta amplicollis* | 3 | - | **3** | 1 | - | 28 | 3 |
| *Geostiba circellaris* | - | 1 | **1** | 5 | 26 | - | - |
| *Staphylinus dimidiaticornis* | - | 11 | **11** | 1 | - | - | - |
| *Stenus brunnipes* | 26 | 1 | **27** | - | 2 | - | - |
| *Stenus clavicornis* | 10 | 3 | **13** | 1 | - | - | - |
| *Stenus fulvicornis* | 15 | 3 | **18** | - | 1 | - | - |
| *Tachinus rufipes* | - | 6 | **6** | 1 | 23 | 20 | - |
| *Tachyporus dispar* | 13 | 1 | **14** | 1 | - | 1 | - |
| | | | | | | | |
| *Anotylus rugosus* | - | 3 | **3** | 6 | - | - | - |
| *Atheta elongatula* | - | 4 | **4** | - | 1 | - | - |
| *Atheta fungi* | 2 | - | **2** | 2 | 2 | 5 | 5 |
| *Gabrius trossulus* | - | - | - | 4 | - | - | - |
| *Megalinus glabratus* | - | - | - | - | - | 8 | - |
| *Philonthus cognatus* | - | 8 | **8** | - | 2 | - | - |
| *Quedius fuliginosus* | - | 3 | **3** | - | - | - | - |
| *Tachyporus hypnorum* | - | - | - | - | - | 1 | 7 |
| *Tachyporus nitidulus* | - | - | - | - | 1 | - | 7 |
| *Xantholinus linearis* | - | - | - | - | 3 | - | - |
| | | | | | | | |
| *Aloconota gregaria* | 1 | - | **1** | - | 1 | 1 | - |
| *Amischa nigrofusca* | 1 | - | **1** | - | - | - | 1 |
| *Atheta clientula* | - | - | - | - | 2 | - | - |
| *Atheta zosterae* | - | - | - | - | 1 | - | - |
| *Callicerus obscurus* | - | - | - | 1 | 1 | 2 | - |
| *Carpelimus corticinus* | - | 2 | **2** | - | - | - | - |
| *Cordalia obscura* | - | - | - | - | - | - | - |
| *Encephalus complicans* | 1 | - | **1** | - | - | - | - |
| *Lathrobium fulvipenne* | - | 2 | **2** | - | - | - | - |
| *Mycetoporus longulus* | - | - | - | - | - | 1 | - |
| *Ocypus olens* | - | - | - | - | - | 1 | - |
| *Philonthus carbonarius* | - | 1 | **1** | - | 1 | 2 | - |
| *Philonthus varians* | - | - | - | - | 1 | - | - |
| *Quedius fumatus* | - | 1 | **1** | - | - | - | - |
| *Quedius molochinus* | - | - | - | - | 1 | 2 | - |
| *Quedius levicollis* | - | - | - | - | - | 2 | - |
| *Quedius schatzmayri* | - | - | - | - | - | - | 1 |
| *Sepedophilus nigripennis* | - | - | - | - | 1 | - | - |
| *Staphylinus erythropterus* | - | 1 | **1** | - | - | - | - |
| *Stenus bimaculatus* | - | 1 | **1** | - | - | - | - |
| *Stenus impressus* | - | - | - | - | - | - | - |
| *Stenus ossium* | 1 | - | **1** | - | - | - | 1 |
| *Stenus picipes* | 1 | - | **1** | - | - | - | - |
| *Stenus similis* | - | - | - | - | - | - | 2 |
| *Sunius melanocephalus* | - | - | - | - | - | - | 1 |
| *Tinotus morion* | - | - | - | - | 1 | - | - |

**TABLE 5.** Staphylinid beetles recorded from restored mine tailings grasslands: Randalstown (Co. Meath) high-organic ungrazed grass plot; Gortdrum (Co. Tipperary) tailings pasture; 'Traps' - pitfall traps. * = *A. fungi* s.l. (sensu lato) includes *A. amplicollis* and *A. fungi*, which were not differentiated in this sub-sample.

| ***Species*** | ***Randals. June 1991*** | | | ***Randals. Oct. 1992*** | | | ***Gortdrum pasture*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* | *D-vac* | *Traps* | *Total* |
| *Aloconota gregaria* | 4 | 9 | **13** | - | - | **-** | - | - | - |
| *Amischa analis* | 15 | 1 | **16** | 4 | 1 | **5** | 6 | 1 | **7** |
| *Atheta amplicollis* | 25 | }215* | **}253*** | 19 | 3 | **22** | 4 | 5 | **9** |
| *Atheta fungi* | 13 | } | **}** | 14 | 1 | **15** | 2 | - | **2** |
| *Cypha laeviuscula* | 25 | 1 | **26** | - | - | **-** | - | - | **-** |
| *Stenus canaliculatus* | 20 | - | **20** | - | 1 | **1** | 1 | - | **1** |
| *Stenus clavicornis* | 9 | 4 | **13** | 5 | - | **5** | - | - | - |
| *Stenus fulvicornis* | - | - | - | 52 | - | **52** | - | - | - |
| *Stenus nanus* | 45 | - | **45** | 5 | - | **5** | 7 | 2 | **9** |
| *Stenus ossium* | 1 | - | **1** | 28 | - | **28** | - | - | - |
| *Tachinus laticollis* | - | 20 | **20** | - | - | **-** | - | - | - |
| *Tachinus rufipes* | 1 | 66 | **67** | - | - | **-** | - | - | **-** |
| *Tachyporus hypnorum* | 18 | 4 | **22** | 11 | - | **11** | - | - | - |
| *Tachyporus pusillus* | 3 | 13 | **16** | 6 | - | **6** | 1 | 3 | **4** |
| | | | | | | | | | |
| *Acrotona aterrima* | - | 5 | **5** | - | - | - | - | - | - |
| *Amischa decipiens* | 2 | 1 | **3** | - | - | - | - | - | - |
| *Atheta* (*Mocyta*) sp. | 3 | - | **3** | - | - | - | - | - | - |
| *Gabrius appendiculatus* | - | - | - | - | - | - | - | 3 | **3** |
| *Ischnosoma splendidum* | - | 3 | **3** | - | - | - | - | - | - |
| *Megarthrus denticollis* | - | 4 | **4** | - | - | - | - | - | - |
| *Metopsia clypeata* | - | - | - | 4 | - | **4** | - | - | - |
| *Ocypus olens* | - | - | **-** | - | 7 | **7** | - | - | - |
| *Oxypoda brevicornis* | - | 6 | **6** | - | - | - | - | 1 | **1** |
| *Oxypoda exoleta* | - | 3 | **3** | - | - | - | - | - | - |
| *Philonthus addendus* | - | 3 | **3** | - | - | - | - | - | - |
| *Philonthus carbonarius* | 1 | 5 | **6** | - | - | - | - | 7 | **7** |
| *Quedius schatzmayri* | - | 5 | **5** | - | 4 | **4** | - | - | - |
| *Sepedophilus nigripennis* | - | - | - | 3 | - | **3** | - | - | **-** |
| *Stenus brunnipes* | 2 | 6 | **8** | 2 | 1 | **3** | 2 | - | **2** |
| *Stenus cicindeloides* | 1 | - | **1** | 3 | - | **3** | - | - | - |
| *Stenus picipes* | 6 | - | **6** | 2 | - | **2** | - | - | - |
| *Tachyporus dispar* | 1 | - | **1** | 1 | - | **1** | 2 | 1 | **3** |
| *Xantholinus longiventris* | - | 1 | **1** | - | - | - | - | 1 | **1** |
| | | | | | | | | | |
| *Acrotona pygmaea* | 1 | - | **1** | - | - | - | - | - | - |
| *Anotylus tetracarinatus* | 1 | 1 | **2** | - | - | - | - | - | - |
| *Atheta atramentaria* | 1 | - | **1** | - | - | - | - | - | - |
| *Atheta celata* | - | 2 | **2** | - | - | - | - | - | - |
| *Atheta clientula* | - | 1 | **1** | 2 | - | **2** | - | - | - |
| *Atheta graminicola* | - | 1 | **1** | - | - | - | - | - | - |
| *Atheta orbata* | - | 1 | **1** | - | - | - | - | - | - |
| *Atheta triangulum* | 2 | 2 | **4** | - | - | - | - | - | - |
| *Autalia impressa* | - | 1 | **1** | - | - | - | - | - | - |

**TABLE 5 (continued).**

| **Species** | **Randals. June 1991** | | | **Randals. Oct. 1992** | | | **Gortdrum pasture** | | |
|---|---|---|---|---|---|---|---|---|---|
| | D-vac | Traps | Total | D-vac | Traps | Total | D-vac | Traps | Total |
| *Autalia rivularis* | - | - | **-** | - | 1 | **1** | - | - | - |
| *Geostiba circellaris* | - | 2 | **2** | - | - | - | - | - | - |
| *Oligota inflata* | - | - | - | 1 | - | **1** | - | - | - |
| *Oxypoda haemorrhoa* | - | 1 | **1** | - | - | - | - | - | - |
| *Oxytelus laqueatus* | - | - | **-** | - | - | - | - | 1 | **1** |
| *Philonthus intermedius* | - | - | **-** | - | 1 | **1** | - | - | - |
| *Philonthus laminatus* | - | - | **-** | - | - | - | - | 1 | **1** |
| *Proteinus brachypterus* | - | - | - | 1 | - | 1 | - | - | - |
| *Quedius levicollis* - | 1 | **1** | - | 2 | **2** | - | - | - | |
| *Quedius molochinus* | - | 1 | **1** | - | - | - | - | - | - |
| *Quedius nitipennis* | - | - | **-** | - | - | - | - | 1 | **1** |
| *Rugilus orbiculatus* | - | - | **-** | 1 | - | **1** | - | - | - |
| *Stenus fulvicornis* | - | - | **-** | - | - | - | 1 | - | **1** |
| *Stenus impressus* | - | - | **-** | 1 | - | **1** | - | - | - |
| *Stenus incrassatus* | 1 | - | **1** | - | - | - | - | - | - |
| *Tachyporus chrysomelinus* | 2 | - | **2** | 2 | - | **2** | - | - | - |
| *Tachyporus nitidulus* | - | 1 | **1** | 1 | - | **1** | - | - | - |
| *Tachyporus obtusus* | - | - | - | 1 | - | **1** | - | - | - |
| *Tinotus morion* | - | - | **-** | - | - | - | - | 1 | **1** |

**TABLE 6.** Staphylinid beetles recorded from restored mine spoil grassland (with sewage sludge application) at Ballymurtagh (Co. Wicklow); a silage crop on top-soiled Cu spoil at Ardtully (Co. Kerry); and naturally vegetated mine tailings at Ballyvergin (Co. Clare). All sites were sampled by pitfall traps only.

| ***Species*** | ***Ballymurtagh*** | | ***Ardtully*** | ***Ballyvergin*** |
|---|---|---|---|---|
| | *Grass* | *Saplings* | | |
| *Atheta amplicollis* | 112 | 68 | - | - |
| *Mycetoporus lepidus* | 36 | 16 | - | - |
| *Philonthus carbonarius* | - | - | 20 | - |
| *Philonthus cognatus* | 12 | 2 | 67 | - |
| *Tachinus laticollis* | - | 13 | - | - |
| *Tachinus rufipes* | 142 | 240 | 2 | 1 |
| *Aloconota gregaria* | - | - | 8 | - |
| *Amischa analis* | 1 | 3 | - | - |
| *Atheta fungi* | 8 | 5 | - | - |
| *Gabrius trossulus* | - | - | - | 4 |
| *Geostiba circellaris* | - | 1 | - | 3 |
| *Philonthus laminatus* | 1 | 2 | 4 | - |
| *Sepedophilus nigripennis* | 3 | - | - | - |
| *Stenus clavicornis* | 1 | 2 | - | - |
| *Tachyporus dispar* | 4 | 1 | - | - |
| *Xantholinus longiventris* | 3 | 1 | - | - |
| *Acrotona pygmaea* | - | 1 | - | - |
| *Aleochara lanuginosa* | - | - | 1 | - |
| *Anotylus sculpturatus* | 1 | - | - | - |
| *Cypha laeviuscula* | 1 | - | - | - |
| *Drusilla canaliculata* | - | - | - | 1 |
| *Ocypus olens* | - | - | - | 1 |
| *Othius melanocephalus* | 1 | - | - | - |
| *Oxypoda opaca* | - | 1 | - | - |
| *Quedius molochinus* | 1 | - | - | - |
| *Quedius semiobscurus* | - | 1 | - | - |
| *Rugilus erichsoni* | - | - | - | 1 |
| *Staphylinus dimidiaticornis* | 1 | - | - | 2 |
| *Stenus nanus* | - | - | 1 | - |
| *Tachinus marginellus* | - | 2 | - | - |
| *Tachyporus chrysomelinus* | - | 1 | - | - |
| *Tachyporus pusillus* | - | - | 1 | - |

**TABLE 7.** Staphylinid beetles recorded from restored mine-spoil grasslands near As Pontes de Garcia Rodriquez (Galicia). S-vac = Stihl vacuum suction sampler; Traps = pitfall traps.

| ***Species*** | ***Slope*** | | | ***Holcus/Trifolium*** | | | ***Cytisus/Ulex*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *S-vac* | *Traps* | *Total* | *S-vac* | *Traps* | *Total* | *S-vac* | *Traps* | *Total* |
| *Atheta amplicollis* | 31 | 2 | **33** | 23 | 3 | **26** | 41 | 14 | **55** |
| *Atheta fungi* | 4 | - | **4** | 1 | - | **1** | 48 | 28 | **76** |
| *Atheta orbata* | - | - | - | - | - | **-** | 10 | 2 | **12** |
| *Sepedophilus nigripennis* | 5 | - | **5** | 1 | - | **1** | 59 | 2 | **61** |
| *Stenus impressus* | 13 | - | **13** | 6 | - | **6** | 130 | - | **130** |
| *Stenus ossium* | 39 | - | **39** | 4 | - | **4** | 45 | - | **45** |
| *Tachyporus solutus* | - | - | - | - | - | **-** | 9 | 1 | **10** |
| *Amischa analis* | 1 | - | **1** | 7 | 2 | **9** | - | - | **-** |
| *Philonthus carbonarius* | - | - | - | 3 | - | **3** | - | - | - |
| *Quedius boops* | 2 | - | **2** | 1 | - | **1** | 6 | 2 | **8** |
| *Quedius nitipennis* | 2 | 1 | **3** | - | - | - | - | - | **-** |
| *Stenus fulvicornis* | 4 | - | **4** | - | - | - | - | - | **-** |
| *Tachyporus dispar* | 3 | - | **3** | 1 | - | **1** | - | 1 | **1** |
| *Xantholinus longiventris* | - | 9 | **9** | 2 | 1 | **3** | 1 | 1 | **2** |
| *Acrotona muscorum* | - | - | - | - | - | **-** | 1 | - | **1** |
| *Ischnosoma longicorne* | - | - | - | - | - | **-** | 1 | - | **1** |
| *Ischnosoma splendidum* | - | - | - | - | - | **-** | 1 | 1 | **2** |
| *Nazeris ibericus* | - | - | - | - | - | **-** | 1 | - | **1** |
| *Oxypoda haemorrhoa* | - | - | - | 1 | - | **1** | - | - | - |
| *Paederus caligatus* | - | - | - | 1 | - | **1** | - | - | - |
| *Quedius fumatus* | - | 1 | **1** | - | - | - | - | - | **-** |
| *Quedius semiobscurus* | - | - | - | 1 | - | **1** | - | - | - |
| *Rugilus erichsoni* | - | 1 | **1** | - | - | - | - | - | **-** |
| *Sepedophilus lusitanicus* | - | - | - | - | - | **-** | - | 1 | **1** |
| *Stenus assequens* | - | - | - | 1 | - | **1** | - | - | - |
| *Stenus brunnipes* | - | - | - | 1 | - | **1** | - | - | - |
| *Stenus juno* | 1 | - | **1** | - | - | - | - | - | **-** |
| *Stenus ludyi* | - | - | - | - | - | **-** | 1 | - | **1** |
| *Sunius propinquus* | 1 | - | **2** | - | - | - | 1 | - | **1** |
| *Tachinus rufipes* | - | 2 | **2** | - | - | - | - | - | - |
| *Tachyporus chrysomelinus* | - | - | - | 1 | - | **1** | - | - | - |

**TABLE 8.** Staphylinid beetles recorded from: restored grasslands and an old meadow near As Pontes de Garcia Rodriquez (Galicia) (see Table 1); from unburnt fixed sand dunes at Castlefreke (Co. Cork) ('Cfreke'); and from rough grassland at Cape Clear Island (Co. Cork) ('CClear'). 'Manur' = manured field; 'Herb' = herb-rich old meadow; 'S + T' = suction sampler + pitfall traps.

| ***Species*** | ***Clay*** | ***Pinus*** | ***Manur*** | ***Alnus*** | ***Herb*** | ***Cfreke*** | ***CClear*** | |
|---|---|---|---|---|---|---|---|---|
| | *S + T* | *S + T* | *S + T* | *S + T* | *S + T* | *D-vac* | *D-vac 1* | *D-vac 2* |
| *Atheta amplicollis* | - | 11 | 38 | 32 | 5 | 1 | 2 | - |
| *Atheta fungi* | - | 2 | 24 | 18 | 1 | 2 | - | - |
| *Sepedophilus nigripennis* | 21 | 8 | 2 | 19 | - | 45 | 20 | 67 |
| *Stenus impressus* | 35 | 45 | 54 | 71 | 2 | 36 | 1 | 20 |
| *Stenus ossium* | 76 | 11 | 65 | 8 | - | 12 | 7 | 2 |
| *Stenus similis* | - | - | - | - | 12 | - | - | - |
| *Tachyporus dispar* | 3 | 4 | 2 | 5 | 8 | 7 | 12 | 7 |
| *Tachyporus nitidulus* | 2 | - | 2 | - | - | 4 | 11 | - |
| | | | | | | | | |
| *Amischa analis* | - | 3 | 1 | - | 2 | - | 1 | - |
| *Atheta orbata* | 1 | - | 3 | - | 1 | - | - | - |
| *Heterothops dissimilis* | - | - | - | - | 4 | - | - | - |
| *Philonthus carbonarius* | - | - | 4 | - | - | - | - | - |
| *Quedius boops* | 6 | 4 | 3 | 2 | - | - | - | - |
| *Stenus flavipes* | - | - | - | - | 8 | - | - | - |
| *Stenus fulvicornis* | - | - | 1 | 1 | 6 | - | 1 | 1 |
| *Tachyporus chrysomelinus* | - | - | 5 | - | - | - | 1 | 1 |
| *Tachyporus solutus* | - | - | 4 | 3 | 2 | - | 1 | 1 |
| *Xantholinus longiventris* | - | 9 | 6 | 3 | - | - | - | - |
| | | | | | | | | |
| *Amischa decipiens* | - | - | 1 | - | - | - | - | - |
| *Astenus gracilis* | - | - | - | - | 2 | - | - | - |
| *Astenus lyonessius* | - | - | - | - | - | - | 1 | - |
| *Cypha laeviuscula* | - | - | - | - | - | 1 | - | - |
| *Gabrius* sp. (♀) | - | - | - | 1 | - | - | - | - |
| *Ischnosoma longicorne* | - | - | - | 1 | - | - | - | - |
| *Metopsia clypeata* | - | - | 1 | - | - | - | - | - |
| *Micropeplus staphylinoides* | 2 | - | - | - | - | - | - | - |
| *Ocypus aeneocephalus* | - | - | - | - | 1 | - | - | - |
| *Oligota inflata* | - | - | 1 | - | - | 1 | - | - |
| *Paederus caligatus* | - | - | - | 1 | - | - | - | - |
| *Philonthus cognatus* | - | - | 2 | - | 1 | - | - | - |
| *Quedius molochinus* | - | - | 1 | - | - | - | - | - |
| *Quedius semiobscurus* | 1 | - | 1 | - | - | - | - | - |
| *Rugilus geniculatus* | - | - | - | - | 1 | - | - | - |
| *Sepedophilus lusitanicus* | 1 | - | - | - | - | - | - | - |
| *Stenus assequens* | - | - | - | - | 1 | - | - | - |
| *Stenus brunnipes* | - | 1 | - | - | 1 | - | - | - |
| *Stenus clavicornis* | - | - | - | - | - | - | - | 1 |
| *Stenus ludyi* | - | 2 | - | - | - | - | - | - |
| *Stenus melanarius* | - | - | 1 | - | - | - | - | - |
| *Stenus providus* | - | - | - | - | 1 | - | - | - |
| *Tachyporus hypnorum* | - | - | - | - | 1 | - | - | - |
| *Tachyporus pusillus* | - | - | 1 | - | - | - | - | - |
| *Tachyporus tersus* | - | - | - | - | 2 | - | - | - |

**TABLE 9.** Staphylinidae recorded from pitfall traps in turlough pastures in south-east Galway: (Blackrock and Lydacan turloughs), and from winter sod samples from sand dune pasture in west Clare (Doonbeg dunes).

| ***Species*** | ***Blackrock*** | ***Lydacan*** | ***Doonbeg*** |
|---|---|---|---|
| *Amischa analis* | 9 | - | 14 |
| *Atheta amplicollis* | 5 | 4 | 14 |
| *Atheta fungi* | 15 | 1 | - |
| *Ischnosoma splendidum* | - | - | 15 |
| *Philonthus carbonarius* | 1 | 1 | 10 |
| *Philonthus cognatus* | 29 | 13 | 10 |
| *Gabrius breviventer* | 3 | 10 | 3 |
| *Tachinus rufipes* | - | 11 | - |
| | | | |
| *Aloconota gregaria* | 8 | 3 | - |
| *Anotylus rugosus* | 8 | 2 | 1 |
| *Atheta graminicola* | - | 6 | - |
| *Carpelimus manchuricus* | 3 | 6 | - |
| *Geostiba circellaris* | - | - | 8 |
| *Gyrohypnus angustatus* | - | - | 3 |
| *Ochthephilum fracticorne* | - | - | 3 |
| *Philonthus laminatus* | - | 5 | 2 |
| *Philonthus quisquiliarius* | - | 3 | - |
| *Philonthus varians* | - | - | 5 |
| *Platystethus nodifrons* | 5 | 6 | - |
| *Quedius semiobscurus* | - | - | 5 |
| *Rugilus erichsoni* | - | - | 6 |
| *Stenus boops* | - | 6 | - |
| *Stenus fuscipes* | 2 | 5 | - |
| *Tachyporus dispar* | 2 | 3 | 7 |
| *Tachyporus nitidulus* | 9 | 1 | - |
| *Xantholinus linearis* | - | - | 6 |
| | | | |
| *Amischa decipiens* | 1 | 1 | - |
| *Calodera aethiops* | - | 1 | - |
| *Calodera nigrita* | - | 1 | - |
| *Hygropora cunctans* | - | 1 | - |
| *Lathrobium geminum* | - | - | 1 |
| *Lathrobium quadratum* | - | 2 | - |
| *Micropeplus porcatus* | 2 | - | - |
| *Othius punctulatus* | - | - | 1 |
| *Oxypoda brevicornis* | - | 2 | - |
| *Oxytelus laqueatus* | - | 1 | - |
| *Atheta malleus* | - | 2 | - |
| *Atheta melanocera* | - | 2 | - |
| *Philonthus micans* | 1 | - | - |
| *Philonthus punctus* | - | 1 | - |
| *Platystethus arenarius* | - | 2 | - |
| *Rugilus rufipes* | - | - | 1 |
| *Stenus nanus* | 1 | - | - |
| *Stenus melanopus* | 1 | - | - |
| *Stenus similis* | 1 | - | - |

**TABLE 9 (continued).**

| ***Species*** | ***Blackrock*** | ***Lydacan*** | ***Doonbeg*** |
|---|---|---|---|
| *Tachyporus atriceps* | - | - | 2 |
| *Tachyporus chrysomelinus* | 2 | - | - |
| *Tachyporus pusillus* | 2 | 2 | - |
| *Tachyporus tersus* | - | - | 2 |

**TABLE 10.** Staphylinid beetles recorded from: *Sesleria caerulea* grassland at Skehanagh (Co. Tipperary) ('Traps' = pitfall traps); Castlefreke ('Cfreke') (Co. Cork) short-turf fixed sand dunes (recovering from burning); Clorhane (Co. Offaly) limestone outcrop pasture.

| ***Species*** | ***Skehanagh*** | | | | ***Cfreke*** | ***Clorhane*** |
|---|---|---|---|---|---|---|
| | *S-vac* | *Traps1* | *Total* | *Traps2* | *D-vac* | *Traps* |
| *Drusilla canaliculata* | - | 6 | **6** | - | 6 | 10 |
| *Falagrioma thoracica* | - | - | **-** | - | 12 | - |
| *Micropeplus staphylinoides* | - | - | **-** | - | - | 20 |
| *Staphylinus dimidiaticornis* | - | - | **-** | 16 | - | 1 |
| *Tachyporus chrysomelinus* | 17 | - | **17** | - | - | - |
| | | | | | | |
| *Amischa analis* | - | 2 | **2** | 1 | - | - |
| *Astenus lyonessius* | - | - | **-** | - | 4 | - |
| *Atheta amplicollis* | 2 | - | **2** | - | - | 5 |
| *Carpelimus elongatulus* | - | 4 | **4** | 1 | - | - |
| *Geostiba circellaris* | - | 3 | **3** | - | - | - |
| *Metopsia clypeata* | - | - | **-** | - | - | 5 |
| *Ocypus olens* | - | - | **-** | - | - | 5 |
| *Pella limbata* | - | 7 | **7** | 2 | - | - |
| *Sepedophilus nigripennis* | - | - | **-** | 1 | 4 | 1 |
| *Stenus clavicornis* | - | - | **-** | - | 3 | 2 |
| *Stenus flavipes* | 5 | - | **5** | - | - | - |
| *Stenus impressus* | 8 | - | **8** | - | - | 1 |
| *Tachinus rufipes* | - | - | **-** | - | - | 3 |
| *Tachyporus dispar* | 3 | - | **3** | - | 4 | - |
| *Tachyporus hypnorum* | 3 | - | **3** | - | - | - |
| *Tachyporus nitidulus* | 7 | 1 | **8** | - | - | - |
| | | | | | | |
| *Amischa nigrofusca* | 2 | - | **2** | - | - | - |
| *Anotylus rugosus* | - | 1 | **1** | 1 | - | - |
| *Anthobium unicolor* | - | - | **-** | - | - | 1 |
| *Lamprinodes saginatus* | - | 1 | **1** | - | - | - |
| *Lesteva sicula heeri* | - | 1 | **1** | - | - | - |
| *Liogluta microptera* | - | 2 | **2** | - | - | - |
| *Myllaena infuscata* | 1 | - | **1** | - | - | - |
| *Philonthus longicornis* | - | 1 | **1** | - | - | - |
| *Quedius humeralis* | - | 1 | **1** | - | - | - |
| *Rugilus erichsoni* | - | - | **-** | - | - | 2 |
| *Stenus latifrons* | - | 1 | **1** | - | - | - |
| *Stenus ossium* | 1 | - | **1** | - | 2 | - |
| *Tachyporus obtusus* | 1 | - | **1** | - | - | - |
| *Tachyporus pusillus* | - | - | **-** | - | 1 | - |