Observations on the status and ecology of *Acaeroplastes melanurus* (Budde-Lund) (Crustacea: Oniscidea) at Howth Head, Dublin

ROY ANDERSON

Department of Agricultural and Environmental Science, Queen's University, Newforge Lane, Belfast BT9 5PX

Contrary to reports of its extinction on Howth Head, Ireland, a substantial population of the xerothermic isopod *Acaeroplastes melanurus* (Budde-Lund), has been re-discovered at this locality. Its preferred niche is drier (xeric) niches such as growths of the fruticose lichen *Ramalina siliquosa* (Huds.) Smith on siliceous boulders from the upper shore to about 40m asl. The occurrence of *Acaeroplastes melanurus* at Howth is anachronistic, the site being over 1300km north of its main range on the Mediterranean littoral with no known intermediate localities on Atlantic coasts. Despite this, there is no evidence for its having been introduced. The Howth population comprises individuals of much smaller size (to 6mm) than is typical of Mediterranean populations (to 12mm) which is probably a response to the large differences in latitude and climate at this northern outlier of its main range.

Acaeroplastes melanurus (Budde-Lund) is a small oniscidean woodlouse with a restricted distribution centred on the Mediterranean littoral between north-west Italy and the Spanish border in south-west France, and including Corsica and Sardinia. Although primarily a coastal species, its range extends inland in the Languedoc and the Haute-Garonne in southern France (Vandel 1962). It has also been recorded from the Algerian littoral and is known as an accidental introduction in the Azores. There are several isolated stations outside this range, for instance Puig on the Mediterranean coast of Valencia in Spain (Vandel 1962), the Balearic Islands (Garcia and Cruz 1996) and a coastal headland at Howth, Ireland. Despite its extreme isolation, Vandel (1962) regarded the Howth locality as part of its natural range though he didn't elaborate or justify this interpretation. The mainland Spanish site is probably relict and there are indications that it had a wider range in Europe during the Postglacial climatic optimum, but whether this would have extended to Ireland is debatable.

A fuller history of *A. melanurus* at Howth is given elsewhere (Oliver and Meechan 1993, Wickenberg and Reynolds 2002). Essentially it was discovered there by J. N. Halbert in 1909 and found repeatedly between the Lighthouse and Doldrum Bay, until 1934. Since that date it appeared to go extinct but was rediscovered in 2002, from a single specimen taken on sea bluffs just west of the Lighthouse (Wickenberg and Reynolds 2002).

The rediscovery of *Acaeroplastes* at Howth (Wickenberg and Reynolds 2002) is interesting after so long without records (68 years). While underlining its apparent rarity at the site this also suggested that a more substantial population could have survived, though inexplicably overlooked. The period without records saw at least two severe northern winters (1947 and 1963), and a long period when climate was characterized by relatively high precipitation and low insolation in July and August (Armagh Observatory 2006). Perhaps there was a mid-century decline from which it is only now recovering?

Alternatively, could its ecology or even precise location have been misunderstood by later workers? I was involved with one of the searches attempting to re-find it in the early 1980s. Areas below gardens westwards into Doldrum Bay were examined closely. In particular, the cliffs at Doldrum Bay were searched thoroughly and its apparent absence there certainly seemed to suggest that it had disappeared from this part of its former range. But could it have been overlooked on seaward slopes east of Doldrum Bay, in particular on the steeper, less easily scalable slopes to the west of the Lighthouse? The single specimen

Figure 1. Map showing the location of Howth Head, Ireland.

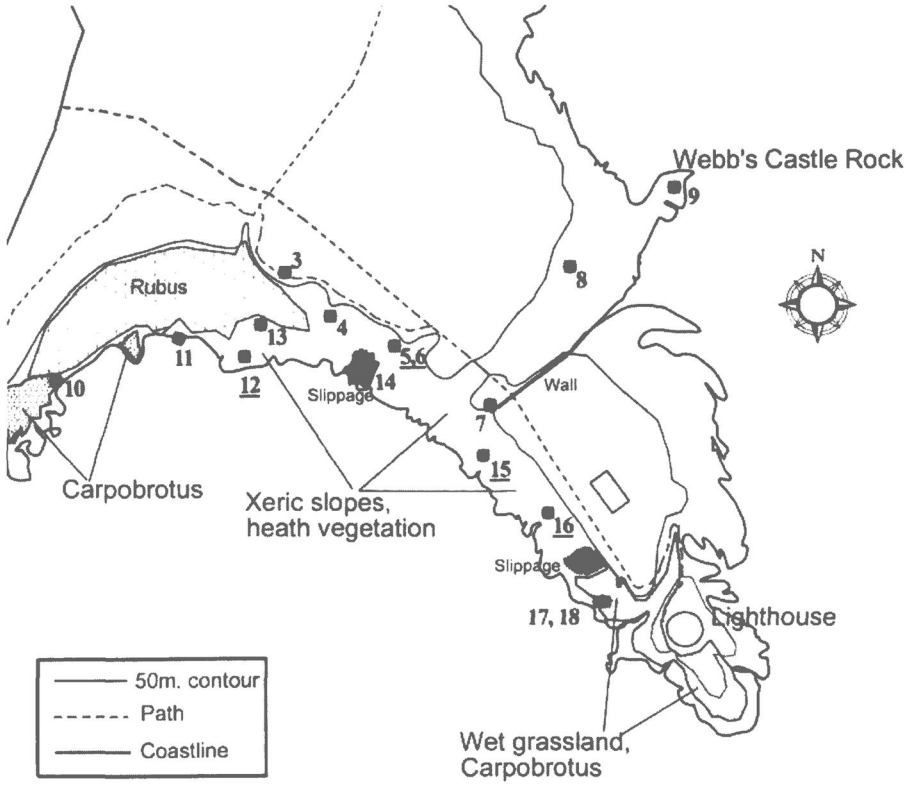

Figure 2. Map of the Baily Lighthouse and surrounding area at Howth Head, Co Dublin.

Table 1. Numbers or frequency of individuals of isopod species collected at Howth Head on 25 November 2006.

Species	Subsite								
	1	2	3	4	5	6	7	8	9
Acaeroplastes melanurus	-	-	-	-	-	31	-	-	-
Armadillidium vulgare (Latr.)	-	-	-	*	-	-	-	-	-
Eluma caelatum (Miers)	**	-	-	**	***	-	-	-	-
Halophiloscia couchii (Kin.)	25	-	-	-	-	-	-	-	-
Ligia oceanica (L.)	***	-	-	-	-	-	-	-	-
Philoscia muscorum (Scop.)	-	-	-	-	1	-	-	-	-
Porcellio scaber Latr.	***	*	*	***	*	**	*	*	*
Trichoniscus pusillus Brandt	-	-	-	6	4	-	-	-	-

*scarce ** occasional *** frequent

taken by Wickenberg and Reynolds (2002) was in the latter area and prompted the present study.

Materials and methods

Part of the area where this species has been recorded historically, between Doldrum Bay (O2836) on the south side of Howth Head and the Great Baily west of the Lighthouse boundary wall (O295366), a distance of about 1km, was examined on 25 November 2006 (Figs. 1 and 2). Webb's Castle Rock (O297367) on the north side of Lighthouse Peninsula was also visited. About 30 minutes was spent in each subsite visited (Table 1).

Samples collected from the various subsites on 25 November were retained for laboratory examination. Smaller isopods were mainly collected by pootering. The following subsites were sampled, with all except the first two shown on Figure 2:

1. Loose soil under plants growing on rock surfaces and the undersides of boulders in the middle part of Doldrum Bay (O28843662)
2. Lichenous tops of boulders eastwards of this, including those with dense *Ramalina siliquosa* (Hudson) Smith growths; undersides of *Carpobrotus edulis* (L.) Br. growths on exposed rocks (O28963656)
3. Fruiting bodies of the agarics *Lepista nuda* (Bull. ex Fr.) Cooke and *Macrolepiota procera* (Scop. ex Fr.) Singer from a grassy sward at the summit of slopes west of the Lighthouse boundary wall (O29353668)
4. Soil, stones and plant roots in slippage areas between 1m and 5m below the summit of these slopes (O29403664)
5. Soil under a large quartzite/grit boulder protruding about 6m below the summit of a south-facing slope (O29463661) mid-way between last house and the Lighthouse boundary wall
6. Exposed surface of the same boulder, approximately $4m^2$ in area, with dense growth of the lichen *Ramalina siliquosa*, examined by pulling lichen from two areas approximately 15x15cm
7. Growths of *R. siliquosa* on the top 70cm of the Lighthouse boundary wall at its southern edge (O29573654)

8. Growths of *R. siliquosa* on siliceous rock outcrops at the top of seaward slopes north of the Great Baily (O29593667)

9. Growths of *R. siliquosa* and shoreline rocks on Webbs Castle Rock(O29753676)

On 17 February 2007 the search was concentrated on the steeper slopes to the east of subsite 5 up to the Baily Lighthouse. The following subsites were visited:

10. Wet cliffs just above HWM at the most westerly point of Glenaveena Bay in soil under heavy growths of *Carpobrotus edulis* (O29113657)

11. Shingle in the middle of Glenaveena Bay; undersides of large stones embedded in the shingle (O29243660)

12. A large siliceous boulder just above HWM at the eastern end of Glenaveena (O29303659); this had strong growths of *R. siliquosa* and was in contact with dryish soil on the steep, sparingly vegetated slopes above it.

13. Large outcrop of rock about 15m asl with dryish sandy/gravelly soils; directly above subsite 12 (O29333664)

14. Rocks and slippage at the base of steep slopes below subsite 5; exposed rock did not have *R. siliquosa* (O29433658)

15. Steeply-shelving rock surfaces with *R. siliquosa* running from sea level up to 15m asl slightly to the east of the Lighthouse boundary wall (O29533649)

16. Steeply-shelving rock running from about sea level to about 20m asl, 35m to the east of the last (O29613646)

17. Steep, eroding slopes below a headland on the landward side of the Baily, facing the Lighthouse promontory (O29683634); wet soils and roots of grassy vegetation

18. Sods pulled away from outcropping rocks near 17 and about 10m asl

Lichen on rock surfaces was examined as before. Soils were excavated in several places to a depth of about 15cm and examined carefully on a white tray. Dry vegetation was uprooted and beaten on to a tray and the soil underneath examined. Sods at the margins of large rocks were also pulled back and examined. Isopods determinable as *Acaeroplastes* in the field were on this occasion released immediately. Vouchers were retained of most other species.

Results

Survey results are summarized in Tables 1 and 2 and in Figure 2.

The frequency of occurrence of *Porcellio scaber* and the apparent absence of the more hygrophilous *Oniscus asellus* L. at these sites suggests relatively dry (xeric) conditions. Soils are shallow, vegetation sparse on steeper slopes and the geology disposed towards a sandy or gravelly siliceous till. *Trichoniscus pusillus*, another hygrophilous soil species, was very local, and restricted to shaded or damp, humic soil. *Eluma caelatum* (= *purpurascens* Budde-Lund), a Lusitanian pillbug woodlouse which is common on sand dunes on the Irish coast north of Dublin, was common in soil at these sites. There is some doubt about the status of *Eluma* but other woodlice listed in Table 1 are probable Irish natives. *Eluma* was the commonest woodlouse present in soil.

Boulders with strong growths of the *Ramalina siliquosa* in the splash zone of Doldrum Bay were searched but produced only a few juvenile *Porcellio scaber*. Stones and boulders at the top of this shore yielded numbers of the thermophilic halobiont *Halophiloscia couchii* which occupies the supralittoral zone on some boulder and shingle beaches in the south and

Table 2. Numbers or frequency of individuals of isopod species collected at Howth Head on 17 February 2007

Species	Subsite								
	10	11	12	13	14	15	16	17	18
Acaeroplastes melanurus	-	-	7	-	-	2	1	-	-
Armadillidium vulgare	*	-	-	-	-	-	-	-	-
Eluma caelatum	**	-	-	4	***	-	***	*	-
Halophiloscia couchii	-	6	-	-	-	-	-	-	-
Haplophthalmus danicus Budde-Lund	-	-	-	1	-	-	-	-	-
Haplophthalmus mengii (Zadd.)	-	-	-	-	-	-	-	-	12
Ligia oceanica	-	**	-	-	-	-	-	-	-
Philoscia muscorum	-	-	-	-	-	-	-	***	-
Porcellio scaber	***	-	12	6	**	*	*	*	-
Porcellionides cingendus (Kin.)	-	-	-	12	5	-	*	-	-
Trichoniscus pygmaeus	-	-	-	-	-	-	-	-	3

*scarce ** occasional *** frequent

east of Ireland. Apart from Howth, two sites are known on the Waterford coast (Cawley 2001).

Examination of *Ramalina siliquosa* on the top of a large boulder at subsite 6 on bluffs west of the Lighthouse wall revealed a large number of small (<8mm) woodlice. These could not be determined immediately because of weather conditions and were all retained. Later examination revealed 31 *Acaeroplastes melanurus* mixed with smaller numbers of juvenile *Porcellio scaber*. No trace could be found of *Acaeroplastes* in soil and litter at the base of the boulder where the humidity was presumably higher. The *Acaeroplastes* were pootered from approximately 500cm^2 of rock surface (Table 1). Some 7-8 specimens were swept away in the strong winds and 10 juveniles were ignored, making a total of 50. Extrapolating this to the total area of denser lichen growth on the boulder, in excess of 100 specimens may have been present. Similar sites on the north side of the Baily and at Webb's Castle Rock, as at Doldrum Bay, yielded only juvenile *Porcellio scaber.*

Of the 31 specimens obtained, 17 arrived in the laboratory dead (a day later), probably through mechanical damage sustained when being pootered, and were preserved in alcohol. Five of these were deposited in the National Museum collection, Dublin, seven in the author's collection and five were donated to the British Millipede and Isopod Study Group which hold collections in the Field Centre at Dinton Pastures Country Park, Berkshire.

Experience gained from the first site visit and observations *in vivo* were applied to the second visit, on 17 February 2007. This indicated that while the target organism prefers xeric niches, it may also be found at some depth in the soil, depending upon surface conditions. Prevailing weather was, therefore, considered when deciding which niches to concentrate on.

A total of ten *Acaeroplastes* was collected. Weather conditions were unusually sunny and warm (13-15°C) for February. *Acaeroplastes* was found early in the day among *Ramalina* on a boulder at subsite 13 but, possibly due to the sun's heat, similar niches were entirely unproductive later in the day. On lichenous rocks at subsite 15, for instance, only 2 *Acaeroplastes* were found, and these were concealed in crevices under fractured rock which

was pulled off the cliff face. Despite the absence of isopods under lichen at subsite 15, the lichen-feeding wall snail *Balea heydeni* von Maltzan was present in numbers.

Despite considerable effort, only one *Acaeroplastes* was found in soil at subsite 16, where a small bank of bare soil, galleried by ant activity, was excavated. *Acaeroplastes* was expected in the dryish, well-drained soils at subsites 12-16, and some effort was made to find it there but with little success. *Porcellionides cingendus* occurred in moderate numbers on the soil surface and at the roots of vegetation, and *Eluma* and *P. scaber* were common within ant-galleried soil at these places. A sod pulled back from a rock face at subsite 13 yielded a single *Haplophthalmus danicus*. In the wetter soils at subsite 18 pulling back sods from rock faces produced *H. mengii* and *T. pygmaeus*. *Philoscia muscorum* was common on soils at subsites 17 and 18 where conditions were wetter and more humic than elsewhere, with a dense thatch of grassy vegetation.

Behaviour of Acaeroplastes *in captivity*

Fourteen specimens were maintained at room temperature (~20°C) in a 25x14x10cm plastic container along with a smaller number of *Eluma caelatum*. Lichen-covered stones were used as cover and the base around them infilled with gravel and pebbles, covered in turn with several cm of sieved humic soil. Natural foods in the form of detached lichen and dry alder leaves were left on the soil surface and supplemented with a small amounts of a mixture comprising proprietary fish food (Tetramin), dry porridge oats and crushed tufa. A similar support regime has proved successful in maintaining cultures of a wide range of terrestrial isopods, including tropical species (*Reductoniscus costulatus* Kesselyák) and Mediterranean natives (*Porcellionides sexfasciatus* (Koch), *Armadillidium granulatus* Brandt) over a period of years.

Animals were often seen on the soil surface but the tops of rocks were rarely visited. An extensive tunnel system in the soil, created by the burrowings of *Eluma*, was apparent within a week or two and was extensively used by *Acaeroplastes*. Burrows served as bolt holes when disturbed or as more permanent shelter. Some day-time feeding and foraging activity was observed but most surface activity probably occurred at night. Once or twice proprietary food on the soil surface was seen to be picked up and carried into burrows. Alder and cherry leaves sitting on the soil surface were at first ignored but after completely drying out became much used as resting and ultimately feeding sites. Moist leaves and soil were generally avoided.

Of the 14 adults, 6 were male and 8 female. A male died on 6 January 2007, two males on 3 February and a gravid female with young some time prior to 20 February. Several females had become gravid by the beginning of February and juvenile *Acaeroplastes* were observed on 19 February, numbering about 22 individuals.

Description of Acaeroplastes *from Howth*

Oliver and Meechan (1993) remark that vouchers of *Acaeroplastes melanurus* from Howth are on average substantially smaller than Mediterranean specimens; *i.e.* up to 6mm in length compared to 12mm length. The size of specimens collected here differed between the sexes. Males averaged 5.4mm, and females 6.0mm, with a maximum length of 6.4mm recorded.

Published illustrations of this species are few. A drawing of a Howth specimen is reproduced in Pack Beresford and Foster (1911). A line drawing of a male from Mediterranean France in Vandel (1962) is, however, rather more accurately proportioned and patterned. A male and a female specimen from Howth are illustrated here (Plates 7 and 8).

The surface texture and colouration is described in detail by Vandel (1962). *In situ* it appears as a rather narrow, parallel-sided isopod with a yellow-brown to grey-brown colouration;

Plate 7. Male specimen of *Acaeroplastes melanurus* (Budde-Lund) from Howth Head.

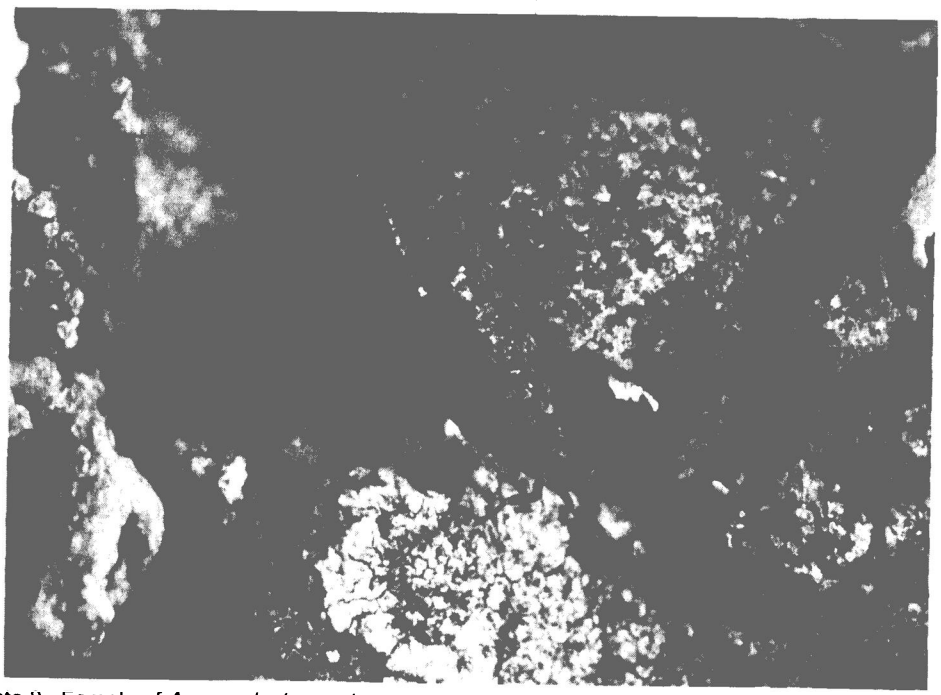

Plate 8. Female of *Acaeroplastes melanurus* (Budde-Lund) from Howth Head.

i.e. reminiscent of a small, dull *Philoscia muscorum* (Scop.) but more flattened and narrow. Females are broader in proportion than males, and less parallel-sided. The head and pleon are darker than the rest of the dorsum. Vandel (1962) describes the head colouration of Mediterranean examples as black but the Howth specimens are not as dark as this and both cephalon and pleon are shades of purplish-brown. The dark colouration of the pleon, both dorsally and ventrally, is passed over by Vandel but is noteworthy and visible in the field. The pereon is mottled in a regular fashion by interconnected areas of darker pigment. The eye registers this as a pattern of spotting when viewed without magnification. The mid-line is dark but lightened by a column of yellow spots in a median-anterior position on each pereonite. The epimera are pale, with a conspicuous, inner yellow mark flanked by paler, more diffuse buff or reddish areas towards the outer margins.

The upper surface is smooth but appears dull and is significantly less shiny than that of *Philoscia muscorum*. It has an irregular surface sculpture which gives the illusion of roughness and, therefore, similar to the tuberculated upper surface of juvenile *Porcellio scaber*. Small *P. scaber* found near the shoreline often have light, yellow or red-spotted, colour patterns, and could be mistaken for *Acaeroplastes*.

Discussion

The results indicate that: (a) notwithstanding a considerable dearth of records over the last 70 years, a sizeable population of *Acaeroplastes melanurus* survives at Howth Head; (b) the ecology is consistent with the properties of its wider distribution, *i.e.* xeric-thermic; (c) the land area occupied has contracted significantly since the early 20th century and now comprises about 250m of seaward slopes and cliffs on the south side of the Great Baily promontory.

Within this area it was mainly found on the tops of lichenous boulders. This niche was shared with similarly-sized (juvenile) individuals of *Porcellio scaber*. In southern Europe it is said to prefer sandy coastal habitats but can also be found in humic soils and under the bark of plane *Platanus* sp trees (Vandel 1962). Pack Beresford and Foster (1911) found it "in some numbers, living under tufts of grass and *Silene maritima* on the face of the cliff" at Howth. This cliff vegetation niche was examined at Doldrum Bay and Glenaveena, but without success. It seems likely that the species has disappeared from Doldrum Bay since the 1930s. Cliff niches between the eastern end of Glenaveena and a point directly beneath the cottages inside the Lighthouse compound, were still occupied, however.

Despite observations in captivity, soil niches appeared not to be favoured. This may relate to the timing of the visits and to the prevailing weather. The single specimen taken in soil on 17 February suggests that this niche is not entirely vacant and that it may be more productive in settled summer weather. The preference for lichen growths on rock outcrops could be a response to wet conditions in the soil and fits with observations in captivity where it has been observed to prefer hiding sites with relatively low humidity; *e.g.* gravelly/open soil or dried out leaves on the surface.

The comparatively low annual precipitation and sunny disposition of the Howth coastal area in general encourages the development of a xerothermic fauna. *Porcellio laevis* has been found in garden compost in this area for most of the 20th century (Doogue *et al.* 1977), being one of its few consistent Irish sites, and the area is known as the only Irish site for the immigrant Mediterranean carabid *Trechus subnotatus* Dejean (O'Mahony 1940). The long-term survival of *Acaeroplastes* at Howth testifies to the favourable climate. *Acaeroplastes* may also be fairly mobile and may depend upon finding suitable xeric resting sites under differing weather conditions. Resting sites can be difficult to detect and may partly explain why it has evaded detection for so long. Adverse weather in the middle of the 20th century may also have caused a reduction in numbers with the contraction of range confirmed here. Low population densities and cryptic behaviour in combination could explain the difficulty in locating it in the 1970s and 1980s.

Differences in rainfall and soil humidity produce seasonal changes in the niche selection of many woodlice species. Seasonal migration between vegetation zones and soil types has been noted for *A. melanurus* in a saline area of the Languedoc in southern France. Lagarrigue (1965) observed seasonal changes in distribution which correlated closely with changes in atmospheric humidity: calcareous, coarsely particulate, sparsely vegetated soils were preferred in the colder months; and finer-particled, more vegetated saltmarsh sites in the warmer months. Migration is unlikely to be wide-ranging at Howth because of the limited supply of suitable habitat, but it is noticeable that the species was found mainly or entirely in areas of dryish, xeric soils with sparse vegetation and especially where these occurred close to lichenous rock outcrops. Much use is clearly made of lichenous rocks as a retreat during adverse weather. In warm, low rainfall, conditions, mimicked in laboratory culture, some movement into the soil seems likely. It may not venture on to the soil surface much during daylight hours in the wild as specimens held in captivity remained entirely out of sight for some weeks after capture.

It is concluded that a viable population of *Acaeroplastes melanurus* continues to exist at Howth although the range occupied is probably narrower than formerly and does not now include Doldrum Bay. Its reputation for rarity at this site is probably due both to the restricted range, and to its fastidious behaviour and niche selection in response to changing humidity.

References

ARMAGH OBSERVATORY (2006) Monthly data averages 1865-2000. On line at: http://climate.arm.ac.uk/averages.html. October 2006.

CAWLEY, M. (2001) Notes and records on the Irish woodlice (Crustacea: Isopoda), including new sites for *Halophiloscia couchi* (Kinahan). *Bulletin of the Irish Biogeographical Society* **25**: 211-217.

DOOGUE, D., REARDON, N. M. & HARDING, P. T. (1977) Some additional records of uncommon Irish woodlice. *Irish Naturalists' Journal* **19**: 120-122.

GARCIA, L. & CRUZ, A. (1996) Els isopòdos terrestres (Crustacea: Isopoda: Oniscidea) de les Illes Balears: catàleg d'espècies. *Bolletí de la Societat d' Història natural de les Balears* **39**: 77-99.

LAGARRIGUE, J. G. (1965) Répartition et migrations saisonnières d'*Acaeroplastes melanurus* (Budde-Lund) dans la sansouire sud de l'étang du Grec en fonction de l'humidité. *Vie et Milieu* **16**: 532-542.

OLIVER, P. G. & MEECHAN, C. J. (1993) *Woodlice*. Linnean Synopsis of the British Fauna (New Series) No. 49. Field Studies Council, Shrewsbury.

O'MAHONY, E. (1940) *Trechus subnotatus* Dej. (Col., Carabidae) in Co. Dublin. *Entomologist's Monthly Magazine* **76**: 136.

PACK BERESFORD, D. R. & FOSTER, N. (1911) The woodlice of Ireland. *Proceedings of the Royal Irish Academy* **29**B: 165-190.

VANDEL, A. (1962) *Isopodes terrestres (Deuxième partie)*. Faune de France Vol. 66. Éditions Paul Lechevalier, Paris.

WICKENBERG, M. & REYNOLDS, J. D. (2002) A recent Irish record of the woodlouse *Acaeroplastes melanurus* (Budde-Lund, 1885) (Isopoda: Porcellionidae), considered to be extinct in the British Isles. *Bulletin of the Irish Biogeographical Society* **26**: 60-63.