

FIRST RECORD OF THE PREDATORY SEMI-SLUG *DAUDEBARDIA RUFa* (DRAPARNAUD, 1805) FROM THE UK (EUPULMONATA: DAUDEBARDIIDAE)

The South Wales Valleys are a densely populated but topographically complex region of the UK, in which many areas, including former industrial sites and quarries, were planted with conifers or mixed woodland under 20th century afforestation programmes. A number of non-insect invertebrates new to the UK have been discovered in these woodlands in recent years (e.g. Telfer *et al.*, in press), including two arionid slug species (Rowson *et al.*, 2014). Here we report the semi-slug *Daudebardia rufa* (Draparnaud, 1805) as yet another unexpected species from this region.

The population was discovered by C. Owen on 31 October 2015 near Wern Ddu Claypits, a geological SSSI, SW of Caerphilly at approx. 150m above sea level. The small workings supplied a brickworks from the late 19th century to the 1960s and lie in a stream valley with a variety of soils crossing several geological strata. The pit area is now wooded with a variety of broadleaved species, and surrounded by Forestry Commission plantations, largely of conifers. The semi-slugs were found approx. 5m from the Scouring Brook stream (ST 16890 86150) in a stand of tall Norway Spruce *Picea abies* with an irregular understorey of broadleaved saplings, ferns, ivy and herbs. The litter layer consisted mainly of spruce needles, with the presence of Hard Fern *Blechnum spicant* suggesting soil conditions are locally acidic. The animals were readily found under loose mats of moss (*Thuidium tamariscinum*, *Kindbergia praelonga* and *Eurhynchium striatum*) covering large (>0.5m diameter) old logs supporting Sulphur Tuft *Hypholoma fasciculare*. At least six additional individuals were found on the same logs during a second visit on 8 November 2015. Further searching in the immediate area suggested the species is either very localised, or perhaps surfaces unpredictably. Additional specimens were found on 11 November within 200m of the first find: in the centre of a pulpy, decaying conifer log supporting Honey Fungus *Armillaria* sp. (ST 16778 86075) and under a log in a stand of Ash *Fraxinus excelsior* (ST 16729 85958). Weather throughout this period and for the week preceding 31 October were typically wet, but

unseasonably mild, which may have aided in finding the animals. Additional searches further into the broadleaved woodland in the clay pit have not yet yielded specimens. Forestry records indicate the spruce stand was planted in 1966, with other species and stands planted at various dates between the 1940s–2000s. A larger survey of the Wern Ddu / The Warren forestry complex could perhaps reveal any habitat associations.

No empty *D. rufa* shells have been found at the site, but the large number of individuals and occurrence in several parts of the woodland strongly suggests they are established, i.e. breeding. Other molluscs in the vicinity on 8 November were the slugs *Arion flagellus*, *A. cf. iratii*, *A. circumscriptus circumscriptus*, *A. distinctus*, *A. owenii*, *A. intermedius*, *Deroceras reticulatum*, *Deroceras laeve*, *Limax maximus* and *Boettgerilla pallens* and the snails *Columella aspera*, *Euconulus fulvus*, *Aegopinella pura*, *A. nitidula*, *Oxychilus alliarius*, *O. navarricus helveticus* and *Zenobiella subrufescens*. The presence of *A. cf. iratii* is notable, this species being known in the UK only from other coniferous and broadleaved woodlands in South Wales (Rowson *et al.*, 2014). The other species (including *B. pallens*) are common throughout woodlands in the Valleys region.

The Caerphilly semi-slugs certainly belong to Daudebardiidae (sometimes ranked as a subfamily of Oxychilidae or Zonitidae) and to *Daudebardia* Hartmann, 1821. Extended animals are up to 18mm long (Fig. 1) with light brown pallial organs and a dark grey-blue dorsum, fading to pale cream at the sides and sole. Shells are red-brown, glossy, very thin, and flat or weakly concave with a flared lip, up to 4.4×2.6mm in width (Fig. 2). The umbilicus is widely open, ruling out the other daudebardiid genera in Schileyko (2003) including the other European genus *Carpathica* Wagner, 1895. Shells were compared against *D. rufa* from Pieniny (Poland), Lake Ohrid (Albania) and Mavrovi Hanovi (Macedonia); *D. brevipes* (Draparnaud, 1805) from Pieniny, Crna Gora (Montenegro) and Bavaria (Germany); and *D. langi* (Pfeiffer, 1846) from Herkulesfürdő (Romania). The closest



Figure 1 Living *Daudebardia rufa* from near Caerphilly, 8 November 2015 (NMW.Z.2015.23.01). Photographs by James Turner.

resemblance was to *D. rufa* regardless of locality. The Caerphilly shells consist of approx. 2.5 whorls with the body whorl completely encircling the first, and giving the shell an oblong outline when viewed from above, ruling out *D. brevipes* or other *Daudebardia* species (Kerney & Cameron, 1979; Welter-Schultes, 2012). Internally, they match Schileyko's (2003) figure and description of *Daudebardia*, as represented by *D. rufa*: The pharyngeal retractors connect to the columellar muscle, the vas deferens enters the penis virtually at the apex, and a bursa copulatrix and vaginal gland are present. Thus on current evidence it appears the Caerphilly population should be referred to *D. rufa*.

Like other *Daudebardia*, *D. rufa* is a litter and soil-dwelling species that preys upon earthworms, insect larvae and small snails. It is probably the most widespread daudebardiid, found in eastern France (Alsace), northern Italy to southern Germany, and throughout the south of eastern Europe (Kerney & Cameron, 1979; Welter-Schultes, 2012) perhaps as far as Ukraine (Balashov & Gural-Sverlova, 2012). South Wales is near the northern limit of its range. In central Europe *D. rufa* is found mainly in upland, relatively natural forests and particularly near water (Welter-Schultes, 2012; Rüetschi *et al.*, 2012). In Britain and Ireland, other semi-slug species (Vitrinidae) and their shells are regularly found in wooded streamside habitats, but daudebardiids



Figure 2 Shell of *Daudebardia rufa* from near Caerphilly, 8 November 2015 (NMW.Z.2015.23).

have not previously been reported. This discovery shows that they can survive in such places and – if they were introduced – are capable of being artificially spread. There are conservation implications whether *D. rufa* is considered a threatened species (as in Switzerland; Rüetschi *et al.*, 2012), or a potential threat to the invertebrates it preys upon.

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- Christian Owen¹, Ben Rowson²,
& Karen Wilkinson³
¹53 Coed-y-moeth Road, Aberbargoed,
UK CF18 9DR
²Dept. Natural Sciences, National Museum of
Wales, Cathays Park, Cardiff, UK CF10 3NP
³Natural Resources Wales, Rivers House,
St. Mellons Business Park, Cardiff, UK CF3 0EY
- Contact author: christian.owen49@yahoo.com

