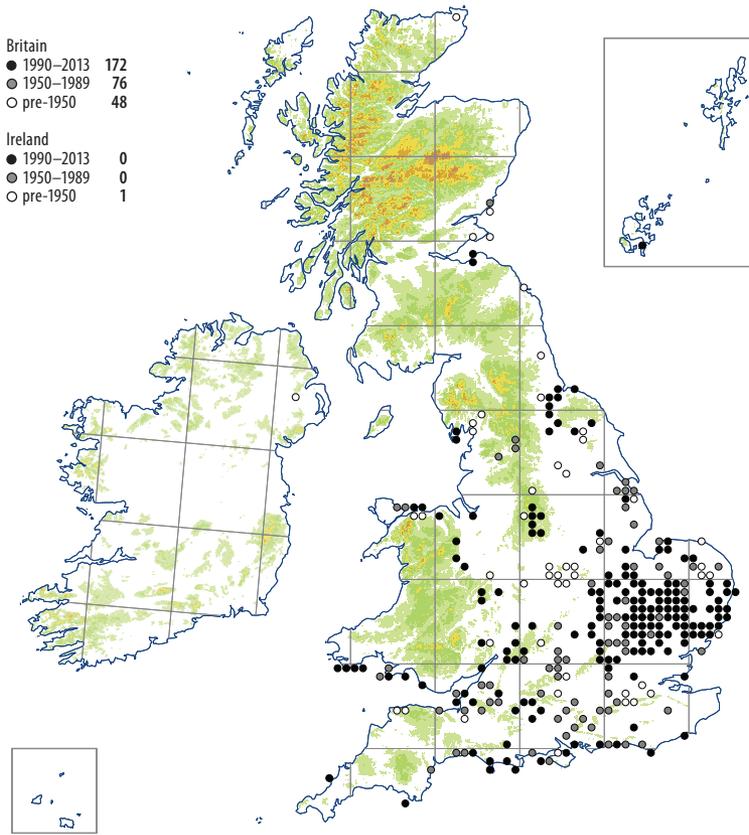


Tortula protobryoides



A winter annual of open communities on freely draining basic soil, usually occurring in small quantity but sometimes locally abundant. It is often found in calcareous habitats, including thin soil and turf over limestone rocks, compacted ground in chalk and limestone quarries, chalky banks, tracks and paths, bare patches and ant-hills in chalk grassland, disturbed chalky soil by roads and (formerly) mud-capped walls. It also grows on sandy soil and sandstone cliffs by the sea. Associated species include *Microbryum rectum*, *Tortula modica*, *T. lanceola* and *T. truncata*, and it may occur with *T. atrovirens* and *T. viridifolia* near the coast in S Wales (Bosanquet, 2010). In eastern England it has a wider habitat range, extending into mundane habitats such as gravel and rubble paths, the cracks between paving stones, thin layers of soil over tarmac pavements and disturbed soil on roadside verges; it is usually found with *Bryum*

dichotomum in such places and other associates include *Barbula unguiculata*, *Bryum argenteum*, *B. ruderale*, *Phascum cuspidatum* and *Pseudocrossidium hornsuschianum*.
Altitudinal range: 0–270 m.

Overall the records show an increasing trend, with a peak in the 1990s. This probably reflects greater attention paid to ruderal habitats. The increase in records in East Anglia, where many colonies are in ruderal habitats, is particularly striking.

Autoicous; capsules are abundant, maturing in winter and spring. Rhizoidal tubers have been found in a Belgian specimen, and were viable after two years' dry storage (Arts, 1987b); protonemal gemmae are produced in culture (Duckett *et al.*, 2004).

European Temperate. W, C and E Europe, north to S Sweden and NW Russia, east to the S Urals, rare in the Mediterranean region. Canary Islands. Turkey, Syria, east to Tajikistan and Kyrgyzstan. Western N America (east to Minnesota), Mexico.

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