

## *Tephroseris integrifolia* (L.) Holub subsp. *integifolia*

### Field Fleawort

*Tephroseris integrifolia* is a densely hairy perennial with a basal rosette of oblong-ovate leaves, lanceolate stem leaves and bright yellow flowers. The number of flowering stems at a site can vary substantially from year to year depending on climate and herbivory. In Britain and Ireland the species is restricted to southern England on open, nutrient-poor chalk downland and oolitic limestone, with core areas in the Sussex and Wiltshire Downs. The main threat remains a lack of management, leading to rank vegetation and closed conditions. It is assessed as Vulnerable in England due to substantial declines in the 20<sup>th</sup> Century.



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#### IDENTIFICATION

*Tephroseris integrifolia* has a basal rosette of oblong-ovate coarsely-toothed (denticulate) and rather fleshy, tough leaves (2.5 – 5 cm) that are petiolate and densely covered in hairs on both sides. The rosette lies flat to the ground, partially suppressing the surrounding vegetation and so aiding detection when plants are vegetative.

The inflorescence is a terminal corymb with short-stalked capitula (rarely more than six, usually three or four) measuring between 1.5 and 2.5 cm across (Stace, 2010). They arise from an erect, faintly ridged and densely hairy stem, typically between 10 and 15 cm tall, sometimes up to 30 cm in

luxuriant vegetation, and exceptionally more than 60 cm (Pete Stroh, pers. obs.). Stems have less than six lanceolate leaves, and usually no more than three or four.

The capitula is surrounded by a single row of leaf-like involucral bracts (phyllaries) that are long (6 – 8.5 mm), linear, acute, equal sized and with hairy tufts at the tips (Smith, 1979). Ray florets (c. 13; 10–20 mm long), tubular disc florets and ligules are all bright yellow. When in fruit the pappus of disc florets is as long or longer than the corolla, and the use of a hand lens will reveal obviously ribbed achenes (2–4 mm long, 0.5 – 1 mm wide; Smith, 1979).

#### SIMILAR SPECIES

Both *Tephroseris* and *Senecio* have a single row of phyllaries, but *Senecio* also has smaller bracts at the bottom of the capitulum which are not present in *Tephroseris*.

Although usually found at inland locations, *T. integrifolia* subsp. *integifolia* is similar to the very rare coastal subsp. *maritima*, a British endemic. This taxon is so far only known along slopes from South Stack to Porth Ruffydd in Anglesey. Subsp. *maritima* differs from subsp. *integifolia* in being a generally larger and sturdier plant which has obviously toothed (dentate) basal leaves that are more rounded than subsp. *integifolia*, more than six stem leaves, larger phyllaries (8–12 mm) and often more than six capitula (Smith, 1979; Stace, 2010).



Species-rich turf with *Tephroseris integrifolia* at Knocking Hoe, Bedfordshire (foreground) with Deacon Hill, also an extant site for the species, in the background (top left). © Pete Stroh.

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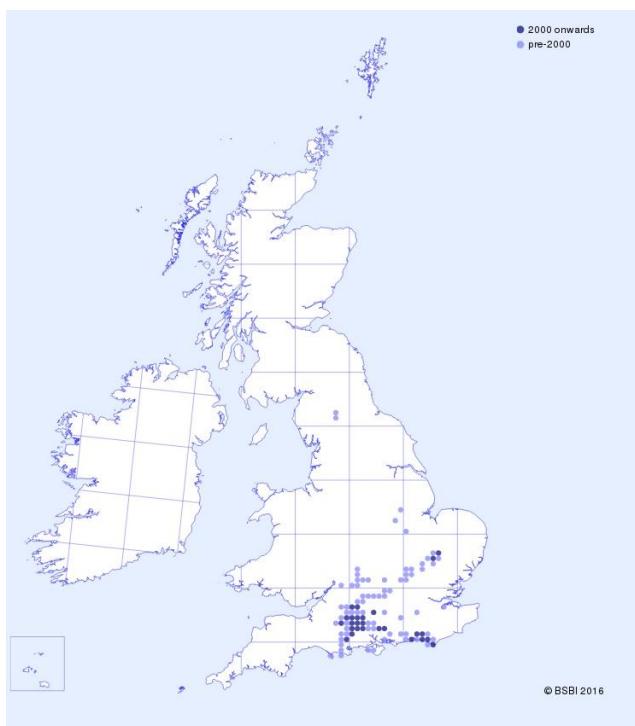
## HABITATS

*Tephroseris integrifolia* occurs on shallow rendzina soils over chalk and, more rarely, oolitic limestone that have a pH of 7 or above (Smith, 1979). Soils also have high calcium carbonate content and are deficient in nitrate and phosphate (Smith, 1979). Plants tend to favour warm, dry, south-facing sites on unimproved downland, ancient earthworks and track banks.

*Tephroseris integrifolia* is recorded as an associate of two NVC types in Rodwell (1992); CG2 *Festuca ovina* – *Avenula pratensis* grassland and CG3 *Bromopsis erecta* grassland. It has also been recorded within CG5 *Bromopsis erecta* – *Brachypodium pinnatum* grassland and coastal CG1 *Festuca ovina* – *Carlina vulgaris* grassland during surveys for the BSBI Threatened Plants Project (Walker *et al.*, in prep.), with common associates including *Briza media*, *Carex flacca*, *Cirsium acaule*, *Helianthemum nummularium*, *Leontodon hispidus*, *Potentilla sanguisorba* and *Thymus polytrichus*. Its preference for thin, nutrient-poor and open habitat means that it also occurs with a number of nationally rare or threatened species, including *Hypochaeris maculata*, *Neottia ustulata* and *Pulsatilla vulgaris*.

## BIOGEOGRAPHY

*Tephroseris integrifolia* s.l. has a circumpolar wide-boreal distribution (Preston & Hill, 1997), scattered across Eurasia from Great Britain to Japan (Smith, 1979) and encompassing Denmark, Sweden, Finland, Estonia, Karelia, Germany, the Swiss Jura, Austria, the Apennines, and suitable habitat in eastern Europe and southern Russia (Rose, 1994). It is absent from northern France, where its place is taken by the closely



Distribution of *Tephroseris integrifolia* subsp. *integrifolia* in Great Britain and Ireland.

related *T. helenitis*.

In Britain *T. integrifolia* subsp. *integrifolia* is confined to the chalk and limestone of southern England, with presence often correlated with the construction of camps and earthworks of the Iron Age (Smith, 1964). Its historical distribution once ranged across 23 vice-counties (VCs), but by 1970 it persisted at just 16 VCs, and this figure currently stands at 15 after the confirmed loss of the last remaining East Kent population at Burham Down (Kitchener, 2012). In addition, *T. integrifolia* has suffered considerable retractions in range since 1970 across many of the 15 counties where the species is still present, although core areas across the Sussex and Wiltshire Downs, where it has always been frequent and locally plentiful, appear to be stable.

## ECOLOGY

*Tephroseris integrifolia* is a densely pubescent, rosette-forming, long-lived perennial of open, infertile calcareous grassland, flowering from May to late June. Individual plants have a vertical rootstock (10–12 cm) that bears a single erect flowering stem, although the number of stems produced across a population can vary considerably from year to year (Smith, 1979; Isaksson, 2009). For example, in a demographic study in southern Sweden, Widén (1987) reported that less than 50% of adult plants flowered more than once during a study period of five years. It follows that if the management and habitat appear to be suitable, the failure to detect flowering spikes in any one year does not necessarily equate with the loss of a population.

*Tephroseris integrifolia* is capable of producing lateral buds in the axils of basal leaves which later develop into small shoots (ramets), occasionally detaching from the parent plant (Smith, 1979) and producing new leaves the following winter. However, the primary means of reproduction is by seed. Being self-incompatible (Widén, 1993), the species relies on cross-pollination for seed production. Its flowers are visited by a wide range of pollen feeding insects including syrphids, muscids, and to a lesser extent bees, beetles and butterflies (Widén, 1993).

The fruits (achenes) ripen and are dispersed via wind (and perhaps also by animals via epizoochory) by mid-summer, usually only a metre or two from the parent plant (Smith, 1979). Seeds most readily germinate in bare soil during the first autumn after dispersal (Smith, 1964), although in wet summers seeds may germinate immediately. However, plants will not flower until at least the fourth year following establishment (Widén, 1987). Seedling survival has been reported to be limited by drought, overgrazing in the summer months, undergrazing leading to shaded conditions and browsing by snails, slugs and woodlice (Fenner, 1975; Smith, 1979).

Extant plants die back by early autumn, but overwintering cottony buds persist at ground level and new leaves are formed from these in late winter. Populations can be long-lived under a suitable grazing regime, with Widén (1987)

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calculating an expected population turnover time ranging from 13 to 58 years (average half-life of an individual c. 40 years) for studied populations in Sweden, although in lightly grazed, semi-shaded conditions half-life was much lower, calculated at just c. 7 years.

## THREATS

The primary threat to extant *T. integrifolia* populations in England is linked to a lack of management, resulting in increased competition, a rank, closed sward and the invasion of scrub. Such conditions will inhibit and ultimately completely suppress flowering, seed set and recruitment and will also restrict light levels to adult vegetative plants, resulting in reduced vigour (Widén, 1987, 1991; Andersson & Widén, 1993) and eventual death. If suitable restoration management in a highly degraded system is instigated, the opportunities for re-colonisation by seed are severely limited by a transient soil seed bank (Widén, 1987) and by habitat loss and fragmentation at the local and landscape-scale (Widén, 1993; Isaksson, 2009). Consequently it is probable that neglect will lead to the permanent loss of a population within the lifespan of one generation.

Adult plants are highly susceptible to drought (Smith, 1979), and grazing at high stocking rates can damage rosettes, although moderate grazing regimes are essential for enhancing opportunities for germination and seedling recruitment.

## MANAGEMENT

*Tephroseris integrifolia* requires a short, open sward with high light levels for optimum flowering and seed production. Management at sites in southern England with healthy populations adheres to a grazing regime that allows for the presence of livestock in late winter/early spring. Cattle or sheep are then removed until late summer.

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## AUTHOR VERSION

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## SUGGESTED CITATION

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