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## OV38

### *Gymnocarpium robertianum*-*Arrhenatherum elatius* community

### *Gymnocarpietum robertianae* (Kuhn 1937) R.Tx. 1937

#### Constant species

*Arrhenatherum elatius*, *Festuca rubralovina*, *Geranium robertianum*, *Gymnocarpium robertianum*, *Teucrium scorodonia*, *Ctenidium molluscum*.

#### Physiognomy

The *Gymnocarpietum robertianum* comprises more or less open stands of fern- and grass-dominated vegetation disposed over the distinctive topography of limestone screes and pavement. Scattered fronds of *Gymnocarpium*, arising separately from the creeping rhizomes, begin to emerge rapidly in late spring, their rather stately forms attaining up to 40 cm or so in height. Among these, occasionally in some abundance, are loose tussocks of *Arrhenatherum* and, less commonly, *Festuca ovinalrubra* (not distinguished in available data) and *Brachypodium sylvaticum*. In sunnier situations, which the fern seems to tolerate well, perhaps because of its somewhat mealy surface (Page 1982), the *Brachypodium* often has a rather lurid yellow-green tinge. *Sesleria albicans* does not appear in the table because samples of the community were not collected within the range of this grass but it can figure prominently in this vegetation in the Yorkshire Dales and southern part of the Lake District.

Other very frequent components are *Geranium robertianum*, commonly showing a reddish hue to its stems with the typically impoverished nature of the substrate, *Teucrium scorodonia*, *Mycelis muralis* and *Mercurialis perennis*. Where clonal patches of the last plant thicken up, the *Gymnocarpium* seems to suffer and be gradually eclipsed (Page 1982). Less common vascular associates include *Origanum vulgare*, *Carex flacca*, *Viola riviniana*, *Senecio jacobaea*, *Oxalis acetosella*, *Arabis hirsuta* and, in the northern Pennines, *Galium sternerii*. Locally, *Rubus saxatilis* may be abundant. Where stands occur among limestone exposures with smaller shaded crevices, *Asplenium trichomanes*, *A. viride*, *A. ruta-muraria*, *Cystopteris fragilis* and *Phyllitis scolopendrium* can be found.

Bryophytes are quite numerous and varied and they may be locally plentiful, particularly where the grasses and fern cover give some shade. The commonest and most abundant species are *Ctenidium molluscum*, *Homalothecium sericeum*, *Dicranum scoparium*, with, less commonly, *Tortella tortuosa*, *Fissidens cristatus*, *Neckera crispa*, *Calliergon cuspidatum*, *Rhytidium rugosum*, *Hylocomium splendens* and *Grimmia apocarpa*. Lichens, by contrast, are scarce.

#### Habitat

This is a local community confined to sunny exposures of calcareous bedrocks at lower altitudes, mostly Carboniferous Limestone, in England and Wales, in situations where there is freedom from grazing but no advanced colonisation by shrubs and trees.

*Gymnocarpium* is a calcicolous fern which thrives in the warmer, drier climate of south-east Britain: apart from a very few far-flung records in Scotland, it is entirely restricted to calcareous bedrocks in regions with a mean annual maximum temperature of more than 25°C (Conolly & Dahl 1970) and annual precipitation less than 1600 mm (*Climatological Atlas* 1952). In such situations, the intolerance this fern shows of dense shade and stagnant air conditions (Page 1982) means that it is characteristically a coloniser of open, rocky ground which has been kept free or cleared of woodland. Its rhizomatous habit means that it is well able to spread among coarse talus and in fissures of limestone exposures, habitats that are widespread on the hard Carboniferous Limestone of the Mendips, Derbyshire Dales, around Morecambe Bay and in north and south Wales. Elsewhere in south-east England, where calcareous bedrocks are common in suitable climate but weather to gentler topographies, *Gymnocarpium* is confined to scattered occurrences on railway ballast and mortared walls (Jermy *et al.* 1978).

The associates of the fern in its typical habitat are species similarly tolerant of sunny, calcareous situations free of grazing. *Arrhenatherum* is especially successful in

this community: it is a ready invader of limestone screes and rocky ground where grazing has been withdrawn (Hope-Simpson 1940b). *Gymnocarpium* itself also seems susceptible to grazing, particularly by sheep, maybe also by rabbits and deer. There is also a strong floristic similarity between this community and the herbaceous vegetation of clearings in calcicolous woodlands. However, wherever either strongly-shading associates such as *Mercurialis* or woody species begin to overshadow this vegetation, the vigour of the fern and other light-demanding plants suffers. This means that, where there is a continuing potential for invasion by shrubs and trees, the community is a temporary feature.

Although intolerant of too much shade themselves, species like *Gymnocarpium* and *Arrhenatherum* provide sufficient protection from the sunlight to encourage an associated flora of more shade-bearing small herbs and bryophytes.

### Zonation and succession

The *Gymnocarpietum* typically occurs among patchworks of grassland, scrub and woodland on colonising screes and rocky limestone slopes.

This vegetation often appears to be a colonising community on coarser limestone talus and, where grazing is absent, it can be overtaken by invasion of woody plants. Typically, over the warmer and drier limestones of southern England and Wales, the kind of woodland which develops in such situations is the *Fraxinus-Acer-Mercurialis* woodland. The eventual dominants of this community can include *Fraxinus*, *Ulmus glabra*, *Acer pseudoplatanus*, *A. campestre* and *Quercus robur* with often a rich understorey of shrubs among which *Corylus avellana* and *Crataegus monogyna* figure prominently. However, early stages in the development of this kind of woodland, and of the *Crataegus-Hedera* scrub which often precedes it, are quite diverse and strongly dependent on which seed-parents are available locally and also on the particular terrain conditions (Merton 1970). Various forms of this scrub and woodland can therefore be found in close association with the *Gymnocarpietum*, species like *Geranium robertianum*, *Mercurialis perennis*, *Mycelis muralis* and *Viola riviniana* running on with undiminished frequency and often in some abundance under the shrubs and trees. With increasing shade,

however, the two dominants of the fern community are quickly overwhelmed by the closing canopy. The various elements in this kind of pattern survive best on sunnier slopes with coarser talus and rocky outcrops where woodland development is more patchy. In some such situations, the fern community grows among the distinctive *Teucrium* sub-community of the *Fraxinus-Acer-Mercurialis* woodland (cf. Oberdorfer 1977). Where talus becomes finer and surrounding slopes sustain calcicolous pasture to which stock have access, the sward is typically of the *Festuca-Avenula* type but this is characteristically sharply marked off from the fern stands on the coarser scree. One further element in the mosaics can be provided by the *Asplenietum* which replaces the *Gymnocarpietum* on limestone exposures with smaller crevices. A variety of bryophytes occur in both assemblages.

In the Yorkshire Dales, where the climate is somewhat cooler and moister away from sunny south-facing slopes, the *Fraxinus-Acer-Mercurialis* woodland is replaced in such sequences by the *Fraxinus-Sorbus-Mercurialis* woodland and the *Festuca-Avenula* grassland by the *Sesleria-Galium* grassland.

In many of its localities, the *Gymnocarpietum* should probably be seen as a secondary colonising community following woodland clearance. Where it becomes surrounded by subsequent regrowth of scrub or where the talus is especially coarse, this vegetation may benefit from the protection from grazing and persist for some time.

### Distribution

The community is of local occurrence on limestones in southern Britain.

### Affinities

Only in Shimwell's (1968a) survey of British calcicolous grasslands and related vegetation has this kind of fern vegetation been described from Britain. He allocated his samples to the *Gymnocarpietum robertianae* (Kuhn 1937) R.Tx. 1937 which Oberdorfer (1977) had described from Germany. This is placed among the fern assemblages of base-rich screes from the sub-montane and montane zones of central Europe and Scandinavia in the alliance *Stipion calamagrostis* (Valachovic *et al.* 1997).

Floristic table OV38

<i>Arrhenatherum elatius</i>	V (1–7)	<i>Campanula rotundifolia</i>	I (1–3)
<i>Geranium robertianum</i>	V (1–5)	<i>Tussilago farfara</i>	I (1–3)
<i>Gymnocarpium robertianum</i>	IV (2–9)	<i>Festuca arundinacea</i>	I (1–3)
<i>Teucrium scorodonia</i>	IV (1–7)	<i>Dactylis glomerata</i>	I (1–2)
<i>Festuca rubra</i> <i>ovina</i>	IV (1–7)	<i>Saxifraga tridactylites</i>	I (1)
<i>Ctenidium molluscum</i>	IV (1–8)	<i>Geranium molle</i>	I (1–2)
<i>Mercurialis perennis</i>	III (1–3)	<i>Holcus lanatus</i>	I (1)
<i>Homalothecium sericeum</i>	III (2–5)	<i>Aquilegia vulgaris</i>	I (1)
<i>Mycelis muralis</i>	III (1–2)	<i>Rubus saxatilis</i>	I (7–8)
<i>Brachypodium sylvaticum</i>	II (1–5)	<i>Centaurea nigra</i>	I (1–3)
<i>Dicranum scoparium</i>	II (2–5)	<i>Avenula pratensis</i>	I (1–5)
<i>Origanum vulgare</i>	II (1–5)	<i>Poterium sanguisorba</i>	I (1)
<i>Tortella tortuosa</i>	II (2–4)	<i>Poa pratensis</i>	I (1–2)
<i>Fissidens cristatus</i>	II (1–3)	<i>Vicia sepium</i>	I (2)
<i>Cladonia pocillum</i>	II (1–3)	<i>Pseudoscleropodium purum</i>	I (2–6)
<i>Oxalis acetosella</i>	II (2–4)	<i>Distichium capillaceum</i>	I (2)
<i>Carex flacca</i>	II (2–5)	<i>Encalypta streptocarpa</i>	I (2)
<i>Viola riviniana</i>	II (1–5)	<i>Bryum capillare</i>	I (2)
<i>Hylocomium splendens</i>	II (1–3)	<i>Rosa pimpinellifolia</i>	I (4)
<i>Neckera crispa</i>	II (1–3)	<i>Thalictrum minus</i>	I (2)
<i>Senecio jacobaea</i>	II (1–3)	<i>Asplenium trichomanes</i>	I (2)
<i>Calliergon cuspidatum</i>	II (1–4)	<i>Campylium chrysophyllum</i>	I (1)
<i>Galium sternerii</i>	II (1–5)	<i>Asplenium viride</i>	I (2)
<i>Rhytidium rugosum</i>	II (1–6)	<i>Cystopteris fragilis</i>	I (2)
<i>Hypnum cupressiforme</i>	II (1–5)	<i>Eurhynchium stratum</i>	I (2)
<i>Schistidium apocarpum</i>	II (1–3)	<i>Grimmia pulvinata</i>	I (2)
<i>Arabis hirsuta</i>	II (1–3)	<i>Racomitrium lanuginosum</i>	I (4)
<i>Leontodon hispidus</i>	I (1–2)	<i>Dryopteris filix-mas</i>	I (2)
<i>Fragaria vesca</i>	I (1–2)	Number of samples	28
<i>Hieracium pilosella</i>	I (1–2)	Number of species/sample	13 (6–22)