A new section and species of *Festuca* (Poaceae) naturalized in England

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ABSTRACT

An introduced species of *Festuca*, well naturalised in a limestone quarry in N.W. Yorkshire for at least 70 years, is identified as *F. gautieri* (Hack.) K. Richt. subsp. *scoparia* (A. Kern. & Hack.) Kerguélen. The same taxon occurred on a roadside in S. Devon. A description and chromosome counts are given, and the origin of the plants is discussed.

KEYWORDS: Fescue, grass.

INTRODUCTION

British species of *Festuca* L. are usually placed in three sections: *Bovinae* Hack. (*F. pratensis* Huds., *F. arundinacea* Schreb. and *F. gigantea* (L.) Vill.), *Montanae* Hack. (*F. altissima* All.) and *Festuca* (*Ovinae* Hack.; the *F. rubra* L. and *F. ovina* L. aggregates). Species of section *Eskia* Willk. (*Variae* Hack.) resemble those of sect. *Festuca* in being relatively small plants with fine leaves, but as natives they do not approach Britain closer than the Jura, Alps and Pyrenees.

Herbarium material (well past flowering) of an unknown *Festuca* was sent from N.W. Yorkshire to C.A.S. in 1993 by Mr R. M. Payne, and living material as well as fully flowering herbarium material of the same plant by Mrs D. Millward in 1994. This was studied at Leicester in 1994 and 1995 by R.F. and C.A.S., and identified as *F. gautieri* (Hack.) K. Richt. subsp. *scoparia* (A. Kern. & Hack.) Kerguélen, a member of section *Eskia* from the Pyrenees. An introduced *Festuca* discovered in S. Devon in 1990 by Mr R. Takagi-Arigho had been confirmed by Dr T. A. Cope as *F. gautieri*, and herbarium material (well before flowering) was sent to Leicester in 1994. Living material was sent to C.A.S. in 1994 by Mr L. J. Margetts. This was also identified as *F. gautieri* subsp. *scoparia*. The Yorkshire site was also visited by R.F.

MATERIAL

As well as the living and herbarium material from the two English localities, herbarium material of *F. gautieri* subsp. *gautieri* and subsp. *scoparia* and of related species in **BM**, **K** and **LTR** was used for comparative purposes.

METHODS

Leaf-sections were cut on a freezing microtome either from fresh leaves or from dried leaves resuscitated by boiling in water for 5 min.

Chromosome counts were obtained from root-tip mitoses using standard squash techniques. Pretreatment was with saturated α -bromonaphthalene at 4°C for 24 hr, fixation in ethanol: ethanoic acid (3 : 1) for 30 min, hydrolysis with 5M HCl for 10 min at room temperature, and staining with aceto-orcein. Giemsa C-banding techniques were those used by Bailey & Stace (1992), and DAPI staining techniques were those used by Bailey *et al.* (1993).

RESULTS

CYTOLOGY

Good squashes were obtained of the S. Devon and N.W. Yorks plants and the number 2n = 14 found in both. Mitotic C-banding of the chromosomes with Giemsa staining, and staining with DAPI, showed most of the chromosomes with one or two narrow interstitial bands. This contrasts strongly with species of section *Festuca (F. ovina* agg. and *F. rubra* agg.), which have thick terminal bands following both of these techniques (Bailey & Stace 1992, Bailey *et al.* 1993). These bands are considered to represent AT-rich heterochromatin (Bailey *et al.* 1993).

IDENTIFICATION

Although superficially resembling a segregate of *F. ovina* agg., the then unknown Yorkshire *Festuca* was quickly recognized as a member of section *Eskia* rather than of section *Festuca* by the following two characters:

1.Lemmas scarious for most part, with only a narrow central part green or purplish-green;

2. Caryopsis not adherent to the lemma or palea.

The following additional characters also distinguish the Yorkshire plant from any British taxa of the *F. ovina* aggregate:

1.Growth habit a spreading, springy cushion, not a firm dense tuft;

- 2.Leaf-blades pungent (sharply pointed) at the apex. The combination of the sharp leaf-tips and the springy cushions give the growing plant the feel of a live hedgehog;
- 3.Ligules of culm-leaves at least 0.5 mm long;
- 4.Anthers at least 3 mm long;
- 5.0vary and caryopsis pubescent at apex (in the British taxa of section *Festuca* this character is found only in *F. heterophylla* Lam., a member of the *F. rubra* aggregate).

Use of the keys in Markgraf-Dannenberg (1980) and Kerguélen & Plonka (1989) unequivocally identified the plant as *F. gautieri*. The combination of ligule less than 2 mm, panicle less than 7 cm, leaves less than 0.7 mm wide and with 5(-7) (not more) vascular bundles, spikelets often >9 mm, and leaves pungent at the apex distinguish it from other European species of section *Eskia*.

Markgraf-Dannenberg (1980) did not recognise any infraspecific taxa in *F. gautieri*, but "*F. scoparia* A. Kerner ex Nyman" was cited in the index as a synonym of *F. gautieri*. Kerguélen & Plonka (1989) recognized two subspecies under *F. gautieri*: subsp. *gautieri* and subsp. *scoparia* (A. Kern. & Hack.) Kerguélen. The differences between those concern chromosome numbers, habitat preferences, and rather minor quantitative features. Table 1 lists the differentiating characters given by Kerguélen & Plonka for the two subspecies, and our measurements of these characters for herbarium material of the two subspecies from the Pyrenees and for plants from the two English localities.

The diploid chromosome number of the English plants clearly identifies them as subsp. *scoparia*. With regard to the morphological characters said by Kerguélen & Plonka (1989) to distinguish the two subspecies, the majority indicate that the Yorkshire plant is subsp. *scoparia*. According to our measurements of herbarium material, lemma length (up to $6\cdot 2$ mm) appears to be the best discriminant (see Discussion). Unfortunately the flowering material of the Devon plant was too immature to provide comparative measurements.

HABITAT

Kerguélen & Plonka (1989) described subsp. *scoparia* as "often calcicole in the Pyrenees", and said that G. Claustres claimed that it is a strict calcicole in Dép. Ariège (central French Pyrenees). On the other hand they state that subsp. *gautieri* occurs on siliceous soils. Both grow in short turf and scree in the Pyrenees and eastern Spanish mountain ranges south to the Sierra Nevada and Morocco (Küpfer 1974).

	Subsp. gautieri fide Kerguélen & Plonka (1989)	Subsp. <i>scoparia</i> fide Kerguélen & Plonka	Subsp. gautieri (Pyrenees) fide Fletcher	Subsp. scoparia (Pyrenees) fide Fletcher	Subsp. scoparia ex Yorkshire	Subsp. <i>scoparia</i> ex Devon
Ligule of culm leaves (mm)	0.5-1	c. 2·5	0.5-1.2	0.4-1	0.7-1.2	0.6–1.1
Panicle length (cm)	4.5-7	7-9	3.7-4.7	5.2-6.7	5.6-7.3	-
Spikelet length to tip of 4th lemma (mm)	(9.5) 10–12	up to 9 (10)	9.5-12.5	8.6-10.6	9.5–11.5	-
Upper glume length (mm)	4.1-4.5	4.5-5	3.5-4.6	4.1-5.6	3.4-4.3	-
Lemma length (mm)	6-7.7	5.2-6.2	5.5-7.1	4.9-6.2	4.3-6.2	-
Anther length (mm)	2.9-3.5	(2.1) 2.2–3 (4)	1.7-3.3	3.4-3.6	2.9-4.1	-
Chromosome number	2n = 28	2n = 14	-	-	2n = 14	2n = 14

TABLE 1. CHARACTERS OF THE TWO SUBSPECIES OF FESTUCA GAUTIERI ACCORDING TO KERGUÉLEN & PLONKA (1989) AND THE PRESENT AUTHORS

In Yorkshire the plant grows in Seata Quarry, Aysgarth, N.W. Yorks., colonizing a flat limestone slab at the edge of the quarry, which must to some degree mimic the Pyrenean habit of subsp. *scoparia*. There is a single patch measuring about 4.5×1.5 m.

In Devon the plant grew on a road embankment near Exeter, S. Devon.

ORIGIN AND HISTORY IN ENGLAND

The S. Devon plant was "fairly obviously an introduction" (Margetts 1993), and presumably a recent one. We have not been able to ascertain whether it still exists there.

Although *F. gautieri* makes an excellent and decorative rock-garden plant it is not mentioned in The European Garden Flora (Walters *et al.* 1984); however, its relative (also with pungent leaf apices and from the Pyrenees), *F. eskia* DC., is and it is possible that *F. gautieri* could be supplied under that name. In addition, *F. gautieri* is now listed in The Plant Finder (Philip, 1999) as being available from several nurseries.

The N.W. Yorks. plant occurs in Seata Quarry with two other notable aliens, *Erinus alpinus* L. and *Hypericum nummularium* L., which also are native in the Pyrenees. The long exserted anthers of *F. gautieri* indicate that it is an outbreeder, since most such festucoids are self-incompatible (Barker & Stace 1982). Hence the lack of seed-set in the Yorkshire plant is what would be expected from a single clone introduction. If that is the case, a patch now measuring 4.5 m across will be far from a recent arrival.

Mrs D. Millward has informed us that the quarry ceased to be worked around the early 1920s, and that as far as local knowledge goes the "aliens" (*Erinus* and *Hypericum*) were there then. It is possible that they were introduced deliberately by the Backhouses, who were planting "The Rockery" (now a listed building despite being a rock-garden!) not far away in the middle of the 19th century.

NOMENCLATURE

This species was first described as *F. varia* Haenke subsp. *scoparia* A. Kern. & Hack. in 1881 at a time when only two species of section *Eskia* were recognized in Europe (Hackel 1882). Hackel (1882) recognized three varieties of subsp. *scoparia*: var. *genuina*, the new var. *gautieri* Hack., and var. *lutea* Hack. The last (from calcareous areas in the Romanian Carpathians) was completely ignored by Markgraf-Dannenberg (1980), but probably represents a distinct species. At the species level *F. scoparia* (A. Kern. & Hack.) Nyman was created also in 1882, but this name is pre-dated by *F. scoparia* Hook. f. (1844). *Festuca gautieri* (Hack.) K. Richt. was created in 1890, and is therefore the correct name at species level for the two taxa together; Kerguélen (1983) combined *scoparia* as a subspecies of *F. gautieri*.

DESCRIPTION OF ENGLISH PLANTS

F. gautieri (Hack.) K. Richt. subsp. scoparia (A. Kern. & Hack.) Kerguélen

Stems spreading, \pm stoloniferous and forming dense springy cushions or mats up to 30 cm high; rhizomes 0; innovations all intravaginal. Leaf-blades up to 9 cm, 0.4–0.6 mm diameter, glabrous abaxially, often curved, sharply and stiffly pointed at apex, setaceous, distinctly 5–7-angled, with a discrete abaxial sclerenchyma girder in each angle, with 5 (–7) vascular bundles, with 2 grooves; ligule 0.6–1.2 mm; leaf-sheaths glabrous, with free overlapping edges in distal half, with distinct rounded auricles. Culms up to 45 cm, erect, glabrous; panicles 5–7.5 cm, with rather few (up to 15) spikelets, rather compact, with scabridulous branches and pedicels. Spikelets 5.9–11.5 mm (to tip of 4th lemma), with 3–6 florets, glabrous; lower glume 2.9–3.5 mm, with 1 vein, hyaline for most part; upper glume 3.4–4.3 mm, with 3 veins, hyaline for most part; lemma 4.3–5.5 mm (excl. awn), with 5 veins, rounded on back, hyaline for most part, with awn 0.25–0.6 mm; palea shorter than lemma, 2-keeled and 2-veined, bifid, with scabrid apex and ciliate keels; lodicules 2, bifid; stamens 3, with blackish-purple, long-exserted anthers 2.9–4.1 mm; ovary obovoid, pubescent in apical part. 2n = 14.

DISCUSSION

The distinction between the two subspecies of F. gautieri is not easy to make, and probably it would not merit subspecific rank if the differences in chromosome number and habitat preferences did not exist. The main differences noted by Hackel (1882) were the thinner, green (not glaucousgreen), 3-ribbed (not 1-ribbed) leaves with 5 (not 7) veins, a more angular (not more rounded) abaxial surface and discrete bundles (not a continuous band) of abaxial sclerenchyma, and spikelets 9-10 mm (not 10-12 mm) in subsp. scoparia compared with subsp. gautieri. These discriminants are partly corroborated (e.g. spikelet length, leaf angularity in section) but partly contradicted (e.g. leaf colour and sclerenchyma distribution) by Kerguélen & Plonka (1989), and our observations do not all coincide with either (Table 1). It seems clear that all three sets of measurements are based on an insufficient number of specimens, and firm conclusions cannot yet be drawn as to the best diagnostic characters that can be used to separate the two subspecies. However, there is agreement between Kerguélen & Plonka and ourselves that subsp. scoparia has a longer panicle and shorter spikelets, upper glumes and lemmas than subsp. gautieri, although the actual measurements do not agree. Our measurements of the Yorkshire plant agree with our measurements of Spanish herbarium material of subsp. scoparia more than with those of subsp. gautieri with respect to panicle and lemma length, but not with respect to spikelet and upper glume length. The different habitat of the Yorkshire plant might at least partly account for this anomaly.

The Yorkshire plant almost certainly originated from a deliberate planting at least 75 and probably well over 100 years ago. With the increased use of foreign grass-seed mixtures on roadsides, etc., and the introduction of ever more exotic and esoteric garden ornamentals, it seems likely that further records of *F. gautieri* will be made in the wild in Britain.

ACKNOWLEDGMENTS

We are grateful to R. M. Payne, D. Millward, L. J. Margetts and R. Takagi-Arigho for sending us material and supplying us with information, and to Dr J. P. Bailey for help with the cytological work.

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(Accepted April 1999)