NARDURUS MARITIMUS (L.) MURB. IN BRITAIN

By CLIVE A. STACE

1. INTRODUCTION AND DESCRIPTION

This grass has been found in a sufficient number of places in the past few years in England to be considered, at least by some, a native.

In habit, the slender upright culms, bearing a narrow long-awned one-sided panicle, resemble those of certain other British grasses, notably *Vulpia* species. It also bears a superficial resemblance to *Nardus stricta* L., from which it is easily distinguished by its lax annual (not stiff and densely tufted perennial) habit, and by its spikelet characters, which are typical of the Festuceae to which it belongs, i.e., spikelets with several pinnately arranged florets (not one-flowered as in *Nardus*).

Since a description of *Nardurus maritimus* does not appear to have been previously published in English, one is given here. It has been compiled both from living and herbarium material of British plants which the author has examined.

DESCRIPTION OF NARDURUS MARITIMUS (L.) MURB. (See Fig. 1.)

Plant annual; mostly glabrous, smooth or somewhat scabrous in the upper parts; variously suffused with purplish colour—usually present at base of culms on stems and sheaths, occasionally reaching the panicle axis or even the glumes. *Culms slender,* solitary or few and then loosely tufted, 3 to about 40 cm. high, erect or ascending or sometimes geniculate at the base; nodes 2-3, blackish or purplish-brown. Leaf-sheaths wider than the blade when opened out, subglabrous, smooth; ligule short, up to 1 mm. long, truncate, equally lengthed along its width, membranous; leaf-blades green or sometimes purplish, soon browning, short, 1-4 cm. long, the upper ones shorter than the lower, narrow, more or less pointed, not stiff, inrolled usually, glabrous without, shortly pubescent within.

Panicle far exserted from topmost sheath at anthesis, *very narrow and slender,* erect or slightly nodding in taller specimens, 1-10 cm. long, usually more or less one-sided, with c. 3-18 *spikelets nearly always borne singly at each node.* Rhachis green or purplish, angular, slightly scabrous.

Spikelets stalked; peduncle stout, very slightly thickened at apex, 1-1·5 mm. long; rest of spikelet 4-7 mm. long (excl. awns), 3-6 flowered, readily breaking up at maturity below each floret. *Glumes* 2, shorter than the lowest lemma on each side, unequal, narrowly lanceolate and very finely pointed, rather obscurely nerved, smooth on the back; *lower 1·5-3·5 mm. long, 1-nerved; upper 3-5 mm. long, 3-nerved. Lemmas* greatly overlapping, ovate-lanceolate, inrolled around palea, *2-4 mm. long,* tipped with

a minutely scabrous *awn up to 5 mm. long* (very often longer than the lemma), 5-nerved, minutely scabrous on back with spinules apically directed. Palea slightly shorter or as long as lemma, lanceolate, pointed and then very slightly notched at apex, with two raised green keels, hyaline in the midline and at the edges, keels scabrous with apically directed hairs. *Stamens 3*; anthers 0·75-1·25 mm. long, exserted at anthesis (*fls. chasmogamous*). Grain enclosed by the palea and the inrolled lemma, usually still attached to the next higher internode of the spikelet axis, small and narrow, c. 2·5 × 0·5 mm., obtuse, smooth and glabrous.

Nardurus maritimus is thus seen to differ from *Vulpia* in its three-anthered chasmogamous flowers, in its simple panicle, and in its shorter lemmas. In *Vulpia* there is usually only one anther (although there may be two or three) and the lemmas (often greatly) exceed 4 mm., at least in the British species. It may usually be distinguished from the four British species of *Vulpia* by its much slenderer habit, but it may rather closely resemble some forms of *V. ambigua* (Le Gall) More (which differs additionally from *Nardurus* in its one-nerved upper and nerveless lower glume), of *V. myuros* (L.) C. C. Gmel. which differs further in the lower glume being only one-sixth to one-half as long as the upper, and of *V. bromoides* (L.) Gray (which may sometimes differ only in its longer lemmas and single anther).

The identity of the Linnaean plant, *Festuca maritima* L., with the present species is discussed by Hubbard (1936). It was first transferred from this genus to *Nardurus* (which had already been made for other species formerly included in *Festuca*) by Murbeck (1900). *Nardurus* and *Vulpia* differ from *Festuca* in being annuals rather than perennials.

Continental and British authors in the past have used a considerable number of synonyms for *N. maritimus* (L.) Murb. The plant has been referred to most frequently by the following specific and varietal epithets: *unilateralis, tenella, hispanica, tenuiflora,* and *tenuiflora* var. *aristata.* Authorities and citations are not included as it appears that some work is needed on the genus as a whole in order to discover which names are true synonyms and which are misapplications to our plant. The genus consists of about four or five species widely distributed throughout the North Temperate Old World, from Portugal to East Asia.

Besides *N. maritimus,* a second species, *N. salzmannii* Boiss.,* has been recorded from Britain, as a casual (*Rep. Bot. Soc. & E.C.,* **4**, 1916). This species differs from *N. maritimus* in having awnless lemmas and obtuse glumes, and in general habit the very slender culms resemble those of a *Parapholis* rather than of *Nardus* or *Vulpia.* It is a native of S. France and Spain, and of N. Africa. There appears to be only one British record, namely: "Esparto grass alien, near Musselburgh, Midlothian, v.c. 83, July

*A good illustration of *N. salzmannii* is given in *Voyage Botanique dans le Midi de l'Espagne,* vol. **1**, 178, 1839-45, by E. Boissier.

18th, 1914, J. Frazer". A specimen with these details is present in Hb. J. E. Lousley. The published record, however, gives 1915.

2. History and Records

Nardurus maritimus was first recorded in Britain in S. Lincoln (v.c. 53) on 9th June 1903, on an excursion of the Lincolnshire Naturalists' Union. The discovery, which was determined by Hackel, was reported in at least four journals at the time, and was mentioned in many more articles and notes at later dates. Even so, the details which should accompany such a discovery were not noted as fully as might be expected and, furthermore, certain variations are present in the different accounts at hand. The details which follow are compiled from various accounts published in certain journals, and from manuscript notes by Rev. E. A. Woodruffe-Peacock and W. W. Mason, which were kindly communicated to me by Miss E. J. Gibbons.

The record has usually been attributed to Peacock, but it seems clear that Miss S. C. Stow was, in fact, the original discoverer, and that she pointed it out to companions with her on the excursion. The discovery was actually reported by Peacock (1903) and by Bennett (1903), neither of whom gave an individual recorder, but the former author, in manuscript notes at Cambridge and in a manuscript copy of the 'Botany' chapter for the projected 'Victoria History of Lincolnshire', attributes the record to Stow. Peacock (1909) later cites 'L.N.U., 1904', the date being erroneous. Several specimens were collected on the excursion, and are present in various herbaria. The plant was discovered on a stone-heap by a wall-side on the Cornbrash (a very arid limestone) where it 'feathers-out' thinly over the Great Oolite Clay between Careby Wood, Careby and Monk's Wood, Carlby, three-quarters of a mile from the nearest house in 'the most countrified country'. More precise details of the locality are lacking. The dividing parish boundary of Careby and Carlby, two small villages about two miles apart, runs approximately half-way between the two woods, and the precise locality of the discovery, or even if the parish concerned was Careby or Carlby, is unknown. To exemplify the uncertainty here, Peacock (1903) in his original notice, mentions the locality as Careby, but in an MS note accompanying a specimen in Lees' 'Outline Flora of Lincolnshire' (1892) he cites Carlby. Furthermore, Mason's specimen in Hb. Mus. Brit. is labelled Careby, but in two MS registers he gives Carlby. The other notices also refer about equally to the two parishes. Although the plant was found with *Festuca sciuroides* (= *Vulpia bromoides*) and other native plants, it was not generally considered a native, either by Peacock (1904, etc.) or by Druce (1910). Lees (*Rep. Bot. Soc. & E.C.*, **2**, 1910), however, did not agree with this conclusion. Whatever its status, however, it has never been seen since, although it was searched for in 1904 and 1905 (Peacock's MS notes at Cambridge), and at least three times since 1950.

The second record for the plant in Britain was, it appears, never published. It is represented by two herbarium specimens, one in Hb. Kew and one in Hb. Mus. Brit. The Kew specimen was sent from Wye, Kent (v.c. 15), by F. Escombe on 9th July 1906. It apparently came up in a row of grass labelled *'Festuca eu-ovina'*, which was sent from Kew as seed and grown in the garden of the Wye Agricultural College. The *Nardurus* was undoubtedly a contaminant of the Kew seed. The other specimen (Hb. Mus. Brit.) was collected in the same place by C. J. Alexander a year later, on 7th June 1907. The collector was apparently unaware of its previous discovery, and sent it as a natural weed of beds of fescues and rye-grasses under cultivation. The collector had provisionally identified it as *Festuca ovina* × *Lolium perenne*, and it remained thus labelled until Dr. A. Melderis recently discovered its true identity.

If the above record for v.c. 15 is to be discredited because of the plant's unnatural origin then it may be replaced by the third British record, collected at Littlestone-on-Sea in May 1909 by Lady Davy. The *Nardurus* was growing in sandy soil not far from a railway with such native species as *Catapodium rigidum* and *C. marinum*, and was identified by Druce and confirmed by Hackel. Druce (1910) considered that the grass was possibly native in Kent, but probably introduced in Lincolnshire. Only one specimen from Littlestone has been traced.

There appear to be just two further pre-war British records for *Nardurus*, both from a third area of Britain, namely the South-West. The first of these is from South Devon (v.c. 3), collected by G. T. Fraser and Rev. T. S. Stephenson on 22nd June 1935, near Torbryan, S.W. of Newton Abbot. Three separate patches were discovered, all on the top of a wall between a pasture and a road. This record appears to have re-instigated a good deal of interest in *Nardurus maritimus*: it was reported in several places, and eight specimens have been traced. Hubbard (1936), who identified the Devon plant, concluded that the foreign distribution of the species suggested that it was possibly native in Britain.

The last pre-war record of *Nardurus* was from a Bristol rubbish-tip, North Somerset (v.c. 6), where it was collected by J. P. M. Brenan and C. I. Sandwith in 1937. It was recorded in two places in the literature, and the first named recorder possesses a specimen.

Nardurus is recorded as being found once during the last war (in 1941 onwards), on cinders in Clifton goods yard, Derbyshire (v.c. 57), by K. M. Hollick. The record does not appear to have been published, but several herbarium specimens have been traced.

From 1949 onwards *Nardurus maritimus* has been found in a considerable number of new localities in Britain but, although these comprise ten new vice-county records, the known range of the plant in Britain has not been extended. This range is Devon and Kent to Derby and Lincolnshire.

The British records of *Nardurus* are perhaps best summarized in the following list, which includes both published and unpublished records as well as notes of herbarium specimens. The numbers in parentheses refer to the references, and additional abbreviations are K (Hb. Kew) and BM (Hb. Mus. Brit.). * denotes that the plant was found in *totally* un-natural conditions.

S. DEVON, *v.c. 3.* *On wall-top near Torbryan, S.W. of Newton Abbot, 22 and 30 June 1935, *G. T. Fraser & T. S. Stephenson* (11, 19, 22, K (2)); Ibid., May 1936, *T. S. Stephenson*, comm. *J. Chapple* (12, K, BM, HB. LOUSLEY, HB. WALLACE); Origin ibid., cult. at Kew from seed, leg. *C. E. Hubbard*, 1937 (HB. CANTAB., HB. OXON. (3)), June 1938 (K).

N. SOMERSET, *v.c. 6.* *On Bristol rubbish tip at Ashton Gate Iron Works, 30 May 1937, *J. P. M. Brenan & C. I. Sandwith* (13, 22, 31, HB. BRENAN).

S. HANTS. *v.c. 11.* With typical chalkland flora by old bomb craters, Pitt Down, nr. Winchester, Oct. 1956, *W. M. M. Baron* (pers. comm.); Ibid., June 1957 (HB. BARON, HB. OXON.); Ibid., 1960 (*Baron*, pers. comm.).

N. HANTS., *v.c. 12.* (1) *On chalk spoil heaps near Micheldever rly. stn., 20 June 1955, *W. E. Warren & E. C. Wallace* (4, HB. WALLACE); The Scrubs, Micheldever, 24 June 1956, *J. E. Lousley & E. C. Wallace* (K, HB. CANTAB., HB. LOUSLEY, HB. WALLACE, HB. LEICESTER, HB. STACE); not seen recently (*Baron*, pers. comm.).

(2) Nr. Abbotstone Down, May 1957, *E. Milne-Redhead* (K, fide *M.-Redhead*).

E. KENT, *v.c. 15.* (1) *In row of *Festuca ovina* sent from Kew, Wye Agricultural College, 9 July 1906, *F. Escombe* (K); Weed in rows of fescues and ryes, Wye A. C., 7 June 1907, *C. J. Alexander* (BM).

(2) On sandy soil not far from rly., Littlestone-on-Sea, May 1909, *Lady Davy* (8, 11, 16, 19, HB. OXON.).

(3) In old parts of the chalk-pit at Hollingbourne, on bare chalk patches, 24 May 1959, *J. F. & P. C. Hall* (6, 18, BM, HB. HALL); Ibid., June 1960, *F. Rose* (HB. ROSE); Ibid., May 1961, *Miss M. E. Milward & Mrs. B. H. S. Russell* (comm. *P. C. Hall*).

W. KENT, *v.c. 16.* (1) Bare chalk at foot of downs, Trottiscliffe, 23 May 1959, *J. F. & P. C. Hall* (6, 18, BM, HB. HALL); Ibid., 31 May 1959, *J. E. Lousley, J. F. & P. C. Hall* (K, HB. LOUSLEY); Downs above Wrotham Water, June 1960, *F. Rose* (HB. ROSE); Ibid., 27 May 1961, *C. A. Stace, J. F. & P. C. Hall* (HB. STACE).

(2) Bare chalk on chalk escarpment, Halling Warren, 23 May 1959, *J. F. & P. C. Hall* (6, 18, HB. HALL); Ibid., 31 May 1959, *J. E. Lousley, J. F. & P. C. Hall* (K, HB. LOUSLEY); Ibid., 27 May 1961, *C. A. Stace, J. F. & P. C. Hall* (HB. STACE).

(3) *On topsoil by the side of Halling Quarry, 14 May 1961, *J. F. & P. C. Hall*

(†) *In fair quantity, with *Epilobium*, in a recent woodland clearing above Upper Halling, 24 May 1961, *J. P. M. & R. A. F. Brenan* (HB. BRENAN, K).

SURREY, *v.c. 17.* (1) Top edge of fallow field on downs at Chipstead, 7 June 1960, *J. F. & P. C. Hall* (BM. HB. HALL); Ibid., 15 June 1960, *J. E. Lousley* (HB. LOUSLEY); Ibid., 29 June 1960, *U. K. Duncan* (comm. *F. H. Perring*); Ibid., August 1960, *E. C. Wallace* (pers. comm.); Ibid., 4 June 1961, *C. A. Stace, et al.* (HB. STACE).

MIDDLESEX, *v.c. 21.* *Plentiful and well established on rly. tracks between Denham and Uxbridge, 9 June 1951, *D. H. Kent* (3, 20, HB. KENT); Ibid., 26 May 1960, *Lady Anne Brewis* (HB. LOUSLEY).

BERKS., *v.c. 22.* Craters, paths and burrow edges on chalk grassland at Fairmile, nr. Streatley, 18 June 1954, *W. M. M. Baron & R. F. O. Kemp* (HB. OXON., HB. BARON); Ibid., 2 June 1955, *W. M. M. Baron* (BM, K); On barish places among short chalk turf, between the Fair Mile and Celtic Field, nr. Streatley, 9 June 1956, *R. A. Graham & E. F. Warburg* (K); Cholsey Downs, nr. Streatley, 20 June 1956, *D. McClintock* (HB. LOUSLEY).

OXFORD, *v.c. 23.* (1) On bare chalk in chalk grassland, Bald Hill Rifle Range, nr. Watlington, 10 Nov. 1955, *W. M. M. Baron* (HB. BARON); Ibid., 27 Nov. 1955, *R. S. R. Fitter* (HB. LOUSLEY); In disturbed ground over a considerable area, valley between Shirburn Hill and Bald Hill, nr. Lewknor, c. 1957, *E. F. Warburg* (HB. CANTAB., HB. OXON.); Bald Hill, 8 June 1958, *J. E. Lousley* (HB. LOUSLEY).

(2) Near Christmas Common, 1960, *Mrs. Paul* (29).

BUCKS., *v.c. 24.* On anthills and by paths, Dancer's End Nature Reserve, nr. Tring, 3 June 1957, *E. F. Warburg* (HB. OXON.); Ibid., 27 June 1957, *J. E. Dandy* (BM).

BEDFORD, *v.c. 30.* *? Waste ground, Goldington, nr. Bedford, 10 June 1957, *B. E. Juniper* (HB. OXON.).

S. LINCOLN, *v.c. 53.* *(First Record) On arid limestone between Careby Wood, Careby and Monk's Wood, Carlby, 9 June 1903, *S. C. Stow, E. A. W. -Peacock, W. W. Mason, et al.* (2, 11, 16, 19, 21, 26, 27, 28): Lincs., *Peacock* (BM); Careby, *Mason* (BM); Carlby, *Peacock* (BM, HB. OXON., spec. in Lees' Flora at Cambridge); Carlby, *Mason* (HB. OXON.); Careby, *Stow* (HB. Stow at Grantham Museum).

RUTLAND, *v.c. 55.* (1) *On Lincs. limestone floor of Bloody Oaks Quarry, Roundstone Hill, in recent workings only, 12 June 1949, *E. K. Horwood* (K, HB. CANTAB., HB. LEICESTER); Ibid., 7 July 1956, *J. E. Lousley* (K, HB. LOUSLEY); Ibid., 9 May 1960, *J. H. Chandler* (HB. CHANDLER).

(2) *? On oolitic floor of quarry, Clipsham Quarry, 3 June 1956, *E. K. Horwood* (7, HB. LEICESTER).

DERBY, *v.c. 57.* *On cinders of rly. track, well established, Clifton Goods Yard, June 1941, *K. M. Hollick* (HB. HOLLICK); Ibid.,

†This is apparently the same locality as 3.

1947, *K. M. Hollick* (K); Ibid., 10 June 1948, *K. M. Hollick* (HB. LOUSLEY); Ibid., 10 June 1951, *K. M. Hollick* (K); Ibid., 20 May 1961, *K. M. Hollick* (BM, HB. STACE).

3. ECOLOGY AND STATUS

From an examination of the above mentioned records it can be seen that *Nardurus* has a fairly well defined ecological preference. It has mostly been found on barish waste or rubbly places on dry or very dry chalk or limestone. These conditions are typically exemplified by the habitats at Hollingbourne, Chipstead, Winchester, Watlington, Streatley and elsewhere. Many other plants are typical of these localities, and often accompany *Nardurus*. A simple vegetation analysis was carried out in three localities, and similar data were very kindly supplied on two further localities by W. M. M. Baron. This information is summarized in Table 1.

TABLE 1

	I	II	III	IV	V
Bare Ground	15%	25%	18%	<5%	10%
NARDURUS MARITIMUS	2	1-2	2		2
Constancy 5/5					
POTENTILLA REPTANS	+	R	+	+	R
FRAGARIA VESCA	+	+	R	2	+
PRUNELLA VULGARIS	2	+	R	+	+
CATAPODIUM RIGIDUM	1	1-2	1	R	R
CAMPTOTHECIUM LUTESCENS	R-+	R	1	R	+
Constancy 4/5					
RANUNCULUS REPENS	+	+	0	R	R
LINUM CATHARTICUM	R	0	1	+	+
POTERIUM SANGUISORBA	R	0	1	+	2
VERONICA CHAMAEDRYS	R	0	R	R	R
TARAXACUM OFFICINALE	R	+	+	0	R
T. LAEVIGATUM	+	R	1	0	+
Constancy 3/5					
VIOLA HIRTA	0	0	R	1	+
HYPERICUM PERFORATUM	0	0	R	+	R
CERASTIUM HOLOSTEOIDES	0	0	+	+	R
MEDICAGO LUPULINA	0	0	1	+	R
ORIGANUM VULGARE	0	0	1	+	+
THYMUS DRUCEI	0	1-2	2	0	+
FESTUCA OVINA	R	1	0	0	R
PSEUDOSCLEROPODIUM PURUM	R	0	+	R	0
Constancy 2/5					
IBERIS AMARA	R	+-1	0	0	0
HELIANTHEMUM CHAMAECISTUS	0	R	0	0	2
GERANIUM COLUMBINUM	R	0	0	0	+
LOTUS CORNICULATUS	0	0	2	1-2	0
RUBUS FRUTICOSUS	0	0	0	2	1
SEDUM ACRE	2	+	0	0	0
CENTAURIUM ERYTHRAEA	R	0	+	0	0
GENTIANELLA AMARELLA	0	R	R	0	0
VERONICA ARVENSIS	0	0	+	0	R

	I 15%	II 25%	III 18%	IV <5%	V 10%
Euphrasia nemorosa	0	0	1	0	+
Plantago lanceolata	R	0	1	0	0
Asperula cynanchica	R	R	0	0	0
Galium mollugo	R	0	R	0	0
Bellis perennis	R	0	1	0	0
Cirsium arvense	R	R	0	0	0
Leontodon hispidus	0	R	1	0	0
Hieracium pilosella	0	R	1	0	0
Crepis capillaris	R	R	0	0	0
Festuca rubra	0	+	0	+	0
Lolium perenne	0	0	+	0	R
Vulpia bromoides	0	0	0	+	+
Brachypodium sylvaticum	0	0	2	2	0
Agrostis stolonifera	2	R	0	0	0
Barbula unguiculata	R	+	0	0	0
Bryum sp.	R	R	0	0	0
Eurhynchium swartzii	0	0	0	R	R
Constancy 1/5					
Polygala vulgaris	0	0	1	0	0
P. calcarea	0	0	R	0	0
Cerastium arvense	R	0	0	0	0
Cerastium sp.	0	R	0	0	0
Arenaria serpyllifolia	0	0	0	0	R
Chenopodium sp.	+	0	0	0	0
Trifolium repens	0	0	R	0	0
T. dubium	0	0	1	0	0
Aphanes microcarpa	0	0	0	0	R
Crataegus monogyna	0	0	0	R	0
Thelycrania sanguinea	0	0	1	0	0
Pastinaca sativa	R	0	0	0	0
Rumex acetosella	0	0	0	0	R
Rumex sp.	0	R	0	0	0
Blackstonia perfoliata	0	0	R	0	0
Gentianella germanica	R	0	0	0	0
Euphrasia pseudokerneri	0	0	R	0	0
Thymus pulegioides	0	0	0	0	R
Acinos arvensis	R	0	0	0	0
Glechoma hederacea	0	0	0	R	0
Teucrium botrys	0	0	0	0	R
Galium verum	0	R	0	0	0
Viburnum lantana	0	0	0	R	0
Senecio jacobaea	0	0	0	0	R
Inula conyza	0	0	0	R	0
Carlina vulgaris	0	0	0	R	0
Cirsium acaulon	R	0	0	0	0
Hypochaeris radicata	0	0	0	0	R
Carex flacca	0	+	0	0	0
Poa annua	0	0	R	0	0
Dactylis glomerata	0	0	R	0	0
Bromus mollis	0	0	R	0	0
B. thominii	0	0	R	0	0
Trisetum flavescens	0	0	0	1	0
Holcus lanatus	0	R	0	0	0
Agrostis tenuis	0	0	2	0	0
Phleum pratense	0	R	0	0	0
Fissidens cristatus	0	0	0	0	+
Aloina aloides	0	0	0	0	R
Pottia davalliana	R	0	0	0	0
Bryum bicolor	R	0	0	0	0

	I	II	III	IV	V
	15%	25%	18%	<5%	10%
THUIDIUM HYSTRICOSUM	0	0	R	0	0
ACROCLADIUM CUSPIDATUM	R	0	0	0	0
Total No. of Species	36	30	43	28	36

TABLE 1—ASSOCIATED SPECIES

The relative abundance of the species associated with *Nardurus* is given for the five following localities:—

I—Watlington (Baron & Kemp, 1955) Average of four quadrats each of 1 sq. m.
II—Fairmile (Baron & Kemp, 1955) Four quadrats
III—Trottiscliffe (Hall & Stace, 1961) Two quadrats
IV—Halling Warren (Hall & Stace, 1961) One quadrat
V—Chipstead (Stace *et al.*, 1961) One quadrat

In each case sufficient quadrats were estimated to give a figure embracing all the main types of microhabitat which supported *Nardurus*. In the table the associates are given in order of constancy. The percentage cover of each species was transferred to the following scale:

2—Frequent, 5-25% cover.
1—Occasional, 1-5% cover.
+—Very scattered, under 1% cover.
R—Very rare.
0—Absent.

On the Continent *Nardurus* usually occurs in very similar situations—dry barish soils often on calcareous substrata (Masclef, 1886; Vicq, 1883; Süssenguth, 1935). It is also found on sand-dunes on the coast of Pas de Calais, opposite Kent (Masclef, 1886), and Good (1928) cites *Nardurus* as being one of the plants of the Pas de Calais not found in Kent, although one record for Kent had already appeared in print. It is very likely, in fact, that the Littlestone-on-Sea record (Davy, 1909) also referred to a sand-dune area.

Thus, although these barish calcareous soils may be argued as not being 'natural' habitats anywhere in south England, it seems that *Nardurus* in Britain occupies the typical Continental habitats. It is quite possible that *Nardurus* arrived naturally in Britain at a relatively late date, after the North Downs had been cleared and barish places had been established (by landslips, grazing animals and early man, for example). Any dunes present on the East Kent coast might have provided a primary foothold for this 'invasion'. It is perhaps significant that of the twenty-two recorded localities for *Nardurus,* six belong to Kent.

By no means always does *Nardurus* exist in these typical habitats, however. The only record for v.c. 6 is from a rubbish-dump, for v.c. 3 a wall-top, and for v.c. 21 and 57 railway tracks. In these localities *Nardurus* is certainly alien, although it has survived in v.c. 57 for about twenty years. In addition it is possible that the first British record was of alien origin, since it was found only on a heap of stones, and for a single season. If all these undoubtedly alien records are excluded, then the range of *Nardurus* in Britain becomes much smaller—from Hampshire

and Kent to Rutland (and S. Lincolnshire?). Even in this restricted area *Nardurus* often occurs in unnatural, alien conditions.

It is not surprising that *Nardurus* should be found in many localities as a chance introduction, as the records from Wye show that the grass so increased from one year to the next that it appeared to be a natural garden weed. Mr. D. McClintock informs me that the plant now infests his rockery, the seed originating from Streatley. The grains are very small and light and could easily be a contaminant of many products, such as corn grain. This is the likely origin of the Devon record, where *Nardurus* was found on a wall on either side of a gate leading from a road to a cultivated field! Other annual grasses, such as *Catapodium rigidum* and *Vulpia bromoides,* with which it often occurs, show the same features.

In considering the status of this grass it is obvious that only the more restricted area of British distribution referred to above should be taken into account. Even so it might be argued that *Nardurus* is probably an introduced species, since it is found only in semi- or un-natural habitats. It is quite clear from an examination of several localities (both first-hand and from communicated accounts) that *Nardurus* cannot compete very successfully in mature chalk grassland with such species as *Festuca rubra, F. ovina* and the more robust calcicolous species. Where all types of habitat exist, *Nardurus* is usualy confined to the barer rubbly areas of chalk or limestone. However, this argument would seem of little value since exactly the same is true of many other undoubted natives.

For further assessment of the status the general distribution as shown in Fig. 2, must be considered. *Nardurus maritimus* occurs commonly in the Mediterranean area, both in Europe and Africa, extending eastwards to Asia Minor and Syria (at least), and westwards to Spain and Portugal. Its extension northwards is much greater in the west than in the east. In Russia, for example, it is only found in the Crimea, whilst on the Atlantic coast it extends to Belgium (and Britain). In north France and Belgium, however, it becomes rather sparse, although there are ten records from the French Departments of Somme and Pas de Calais (Vicq, 1883; Masclef, 1886) prior to 1886.

Druce (1910) concluded that *Nardurus* was very likely to be a native, at least in Kent, and Hubbard (1936), assessing the evidence after the Devon record had been added, came to a rather similar conclusion: namely that, although the grass could be introduced with grain, it was very possibly a native of Britain. Hubbard does not, however, include *Nardurus* in his recent excellent monograph of British grasses (*Grasses,* 1955). Dandy (1958) also included *Nardurus* as a native, but this is not the opinion of all modern workers.

Although *Nardurus* is often considered part of the Mediterranean Element, this does not appear to the author to be so. It

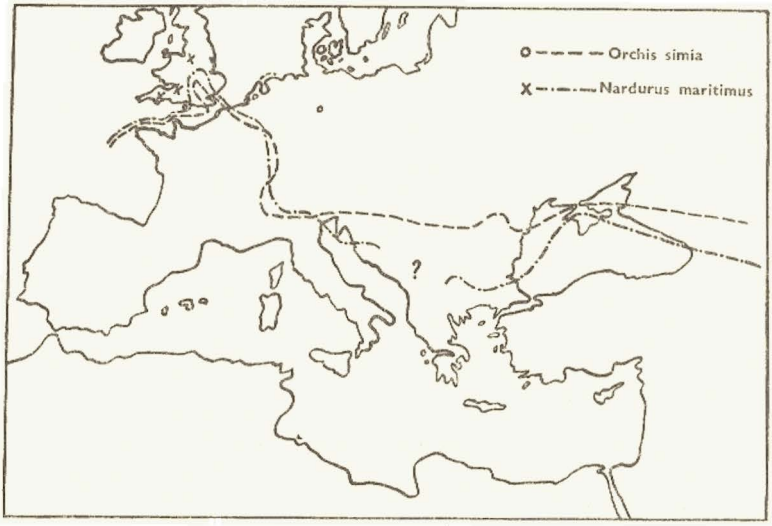

Fig. 2.—European Northern Limits of *Nardurus maritimus* and *Orchis simia*.

O—Outlying Stations (Holland and E. Germany) of *O. simia*.
X—Outlying (casual) Stations (England) of *N. maritimus*.

appears that it falls closer to one of those members of the Continental Southern Element (cf. Matthews, 1955) which are more restricted in range, showing a connection with the Oceanic Southern Element by extending much further north in the west than in the east, and being almost sub-Mediterranean in nature. In this element plants of dry sandy or calcareous soils predominate, a feature also shown by *Nardurus*. The distribution in Britain of such species is, however, quite different from that of Mediterranean or Oceanic Southern species, which are commoner in or restricted to the South-West. Continental Southern species, as shown by *Nardurus*, are commoner in or confined to south-east Britain (Matthews, 1955).

It thus appears that *Nardurus* has a British and European distribution which might be expected of a restricted example of the Continental Southern Element. A parallel to *Nardurus* was searched for, and was found in *Orchis simia*, although there are doubtless other examples. *Orchis simia* has an extremely similar European distribution to *Nardurus maritimus*, as shown in Fig. 2. In Britain it also has a similar range, although it is much more local, being confined to v.c. 15, 16, 22 (extinct) and 23. It is also a plant of chalk hills. The most serious disagreement in the two areas of distribution is in the west Balkans, especially in Jugoslavia. Here the floras do not give an adequate picture of the distribution of *Nardurus*, and the northern limit of its range is thus not certain. It certainly does not extend as far

north as *Orchis simia,* however. In western Asia, however, both plants extend north to the Crimea and the Caucasus, and in western Europe the similarity in distribution is quite remarkable.

Since *Nardurus* has a British and European distribution closely similar to that of an undoubted native British plant, it seems legitimate to presume that *Nardurus* is most probably also native in Britain, although absolutely conclusive evidence is, and probably always will be, lacking. It is often concluded that some of the very rare orchids and broomrapes of the south-east chalk downs (e.g. *Ophrys fuciflora*), which are mostly also members of the Continental Southern Element, invaded Britain relatively recently—after the formation of the Channel and after parts of the North Downs were cleared (Rose, 1957), although there are some challengers of this view. It is possible that *Nardurus* is a further example of this group of plants, although it has extended further into Britain.

It is quite impossible, of course, to say whether *Nardurus* has been overlooked in the past, or whether it is now increasing. It is perhaps relevant here that the known range of the plant in Britain has not increased since 1941. It is possible that many of the 'casual' records for Britain, e.g. Clifton and Uxbridge, do not represent independent origins, but have become dispersed from areas where *Nardurus* may be native.

Nardurus may be expected to be recorded from several new vice-counties in the near future, and in this connection the most conspicuous omissions at the present are v.c. 10, 13, 14, 18, 19, 20, 29, 31 and 32.

The circumstances surrounding *Nardurus maritimus* in Britain have a quite unusual parallel in *Tortella inflexa* (Bruch) Broth., a moss recently (1951→) discovered to be locally not uncommon on bare chalk in south-east England (Wallace, 1957). Its present known distribution is Kent and Dorset to Oxfordshire and Bedfordshire—almost identical with that of *Nardurus*! The continental distribution of *Tortella inflexa* strongly suggests that it belongs to the Mediterranean Element, in which case, if it is native in Britain, its distribution in this country is quite unusual (see above). It is possible, however, that it is a member of the Continental Southern Element, so far overlooked in north France as it had been in England. It should be mentioned that alien mosses are distinctly unusual phenomena in this country. This parallel between *Tortella* and *Nardurus* is not, of course, put forward as even a tentative suggestion, but merely as a possibility.

It is sincerely hoped that this paper has done something towards pointing out the situation regarding *Nardurus maritimus,* and that botanists may be prompted to search for it elsewhere in suitable parts of England.

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It is hoped that the bibliography which follows is given with some degree of completeness. MS. lists and notes are not included, and the many European Floras used for the investigation of distributions are also omitted. Numbers in brackets refer to the vice-counties concerned in the article, being a cross-reference to the list of records.

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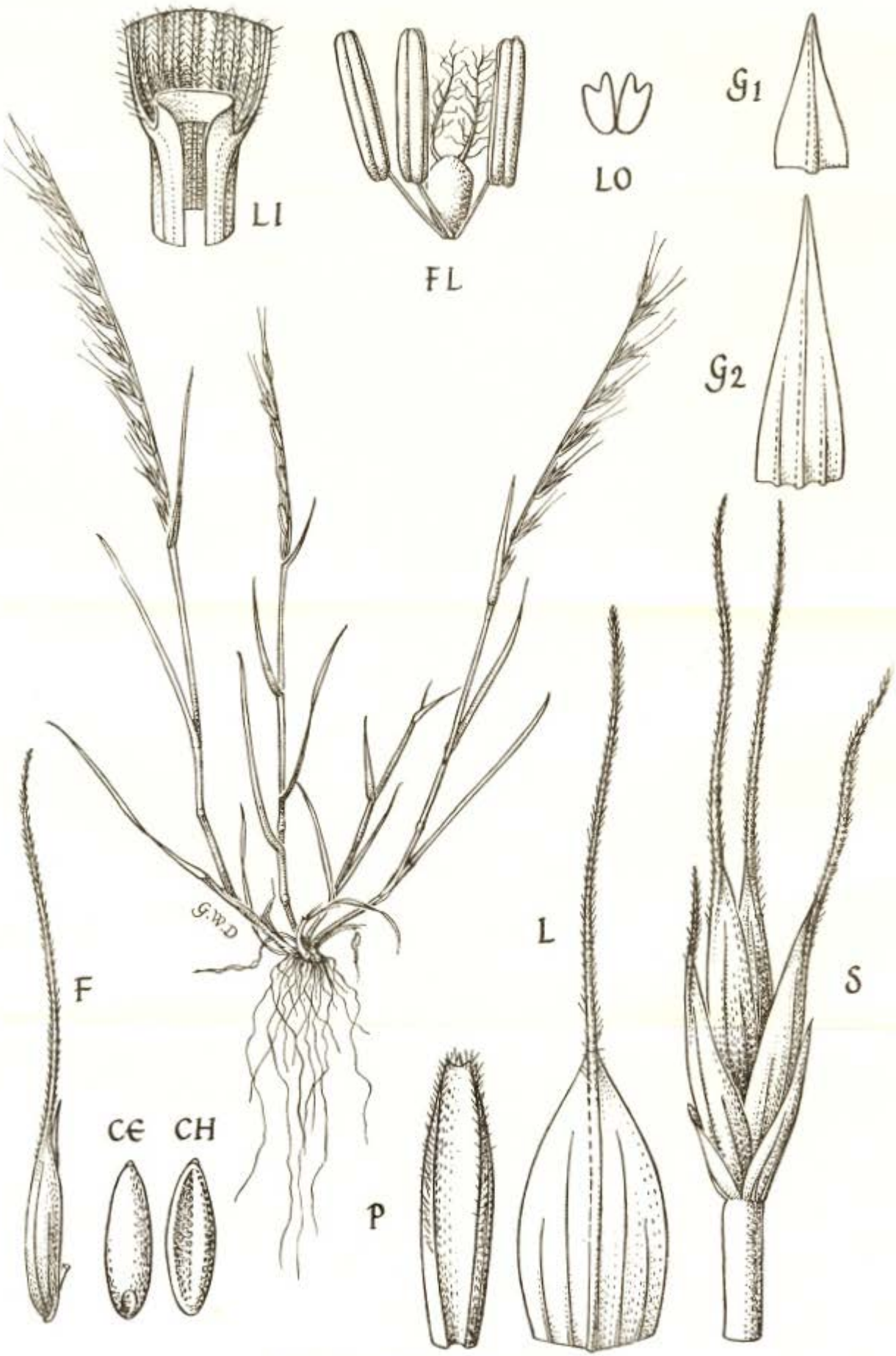

FIG. 1—NARDURUS MARITIMUS (L.) Murb.

General Habit × 1½; Ligule (LI) × 13½; Spikelet (S) × 9; Lower Glume (G_1) × 13½; Upper Glume (G_2) × 13½; Lemma (L) × 13½; Palea (P) × 13½; Flower (FL) × 27; Lodicules (LO) × 27; Floret (F) × 9; Caryopsis, back view (CE) × 9; Caryopsis, front view (CH) × 9.