

Variation in *Asperula cynanchica* L. (Rubiaceae) in the British Isles

R. B. CODD

40 Highfields, Llandaff, Cardiff CF5 2QB

and

T. C. G. RICH

Department of Biodiversity and Systematic Biology, National Museum of Wales,
Cardiff CF10 3NP

ABSTRACT

Variation in *Asperula cynanchica* L. (Rubiaceae) in the British Isles has been studied from herbarium material, field observations and limited cultivation experiments. Morphological analyses indicate that all British and Irish material is referable to subsp. *cynanchica* with two varieties present: subsp. *cynanchica* var. *cynanchica* is widespread, subsp. *cynanchica* var. *densiflora* usually occurs near the coast and includes material from the British Isles previously referred to subsp. *occidentalis*. Subsp. *occidentalis* occurs in south-west France and northern Spain but does not occur in the British Isles.

KEYWORDS: *Asperula occidentalis* Rouy, infra-specific variation, France, Spain.

INTRODUCTION

Contenjean (1865) drew attention to what he thought to be a curious hybrid between *Asperula cynanchica* L. and *Galium arenarium* Lois. from the French coast at Biarritz and on the Basque coast in Spain. A specimen he collected was later described by Rouy (1903) as a new taxon, *Asperula occidentalis*, characterised by having short prostrate stems, small, obovate leaves, dense inflorescences and corolla lobes about half as long as the tube. Rouy followed Contenjean's (1865) suggestion that it was a hybrid (it is unlikely Rouy knew the plant in the field), but it is now regarded as a species of *Asperula* in its own right and there is no evidence that it is of hybrid origin (Ehrendorfer & Krendl 1976). *Asperula occidentalis* is part of the complex *A. cynanchica* group, and has been reported as a rare species of south-west France, northern Spain, south-west Britain and Ireland.

Asperula occidentalis was first reported in the British Isles by Tutin & Chater (1974), who had found two specimens which appeared to be *A. occidentalis* whilst working through herbarium material using the draft *Asperula* account in *Flora Europaea* (subsequently published as Ehrendorfer & Krendl 1976). The specimens were sent to Ehrendorfer who confirmed the identification. Since then, *A. occidentalis* has been reported in the British Isles from coastal sites in Alderney, Dorset, Wales and Ireland (Preston *et al.* 2002).

Various accounts of *Asperula* in the British Isles have suggested that the relationship of *A. occidentalis* to *A. cynanchica* requires further study (Tutin & Chater 1974; Ehrendorfer & Krendl 1976; Clapham *et al.* 1987; Rich & Jermy 1998; Sell & Murrell 2006). Stace (1989) relegated *A. occidentalis* to *A. cynanchica* subsp. *occidentalis* (Rouy) Stace, commenting that subspecific status was wholly appropriate for the slight and quantitative differences between them. In the most recent taxonomic treatment, Sell & Murrell (2006) recognised three taxa within *A. cynanchica* in the British Isles: subsp. *cynanchica* var. *cynanchica*, subsp. *cynanchica* var. *densiflora* Gren. & Godr., and subsp. *occidentalis*. We have undertaken morphological studies and limited cultivation experiments to investigate the variation within these taxa.

METHODS

Asperula specimens from Britain and Ireland held in the Welsh National Herbarium (NMW), including much material seen by T. G. Tutin and A. O. Chater in the 1970s), National Botanic Gardens, Glasnevin (DBN), Cambridge Botanic

Garden (CGE, material of subsp. *occidentalis* and var. *densiflora* as revised by P. D. Sell) and European material in Madrid (MA, material revised for *Flora Iberica* by A. Ortega) and Paris (P) were selected, representing a wide range of geographic localities and morphology. British material in Reading University (RNG) and images of French material in Lyon (LY) have also been seen during the course of the work. *Asperula* material has also been observed in Britain, Ireland and France 1999–2005, but could not be found in Spain.

Characters regarded as important were scored for 149 specimens using the treatments by Ehrendorfer & Krendl (1976) and Sell & Murrell (2006), which were also used to check or allocate names for the specimens. The presence or absence of stolons was noted (together with their colour if present). The length, width and the distance along the leaf to the widest point were measured on the longest leaf of each whorl at the lower, middle and upper stem to 0.1 mm accuracy using a graduated lens. The length of the internode above the middle stem leaf whorl was measured. Pedicel length was measured on the terminal flower of the main central axis (this was not always easy to see). The corolla tube, and corolla lobe length and width at the widest point were measured for one accessible flower on each plant. The presence or absence of an appendage to the corolla lobe was assessed under the microscope.

Characters used for the Principal Components Analysis (PCA) are listed in Table 1. Ratios were calculated for leaf length:width, middle internode length:middle leaf length, corolla lobe:tube length and lobe length:width from the measurements. The length to the widest points of the lower, middle and upper leaves was converted into percentages. The data were analysed using Principal Components Analysis with normalised variance-covariance in PAST v1.62 (Hammer *et al.* 2001).

Plants referable to subsp. *occidentalis* were collected from Portland Bill and Ballard Down (v.c. 9), Port Eynon (v.c. 41), Penally Burrows, Shrinkle Haven and Stackpole (v.c. 45), and subsp. *cynanchica* var. *cynanchica* from Banstead Downs (v.c. 17) and Westonbirt (v.c. 33). They were grown in John Innes potting compost in a greenhouse in Cardiff. They flowered freely in cultivation but were mostly short-lived. Unfortunately, the only voucher of all the cultivated plants collected and pressed was one from Penally Burrows (NMW).

TABLE 1. *ASPERULA* CHARACTERS USED IN PRINCIPAL COMPONENTS ANALYSIS

A.	Stolons (present/absent)
B.	Lower leaf length
C.	Lower leaf length to widest point
D.	Lower leaf position of widest point
E.	Lower leaf width
F.	Lower leaf length to width ratio
G.	Middle leaf length
H.	Middle leaf length to widest point
I.	Middle leaf position of widest point
J.	Middle leaf width
K.	Middle leaf length:width ratio
L.	Length of middle internode
M.	Middle internode:leaf length ratio
N.	Upper leaf length
O.	Upper leaf length to widest point
P.	Upper leaf position of widest point
Q.	Upper leaf width
R.	Upper leaf length:width ratio
S.	Pedicel length
T.	Corolla lobe length
U.	Corolla tube length
V.	Corolla lobe:tube ratio
W.	Corolla lobe width
X.	Corolla lobe length:width ratio
Y.	Lobe appendages (present/absent)

RESULTS

It was possible to name most of the plants using existing *Asperula* accounts, but four British specimens were intermediate between subsp. *cynanchica* and subsp. *occidentalis* and could not be named with confidence. Material of subsp. *occidentalis* from Spain and France appeared to be larger and distinct from material called subsp. *occidentalis* in the British Isles.

With few exceptions, scoring of most of the characters was straightforward. It was often difficult to decide if the lateral 'stems' without leaves were stolons or rhizomes; where these organs were obviously underground in the original situation, they lacked adventitious roots and were probably best regarded as subterranean stolons rather than rhizomes. The stolons were most prevalent in mat-forming plants ascribed to subsp. *occidentalis*, but the colour was also quite variable and inconsistent, and whilst some roots of subsp. *occidentalis* were strongly and distinctively orange-coloured, some were not. Some underground stolons also

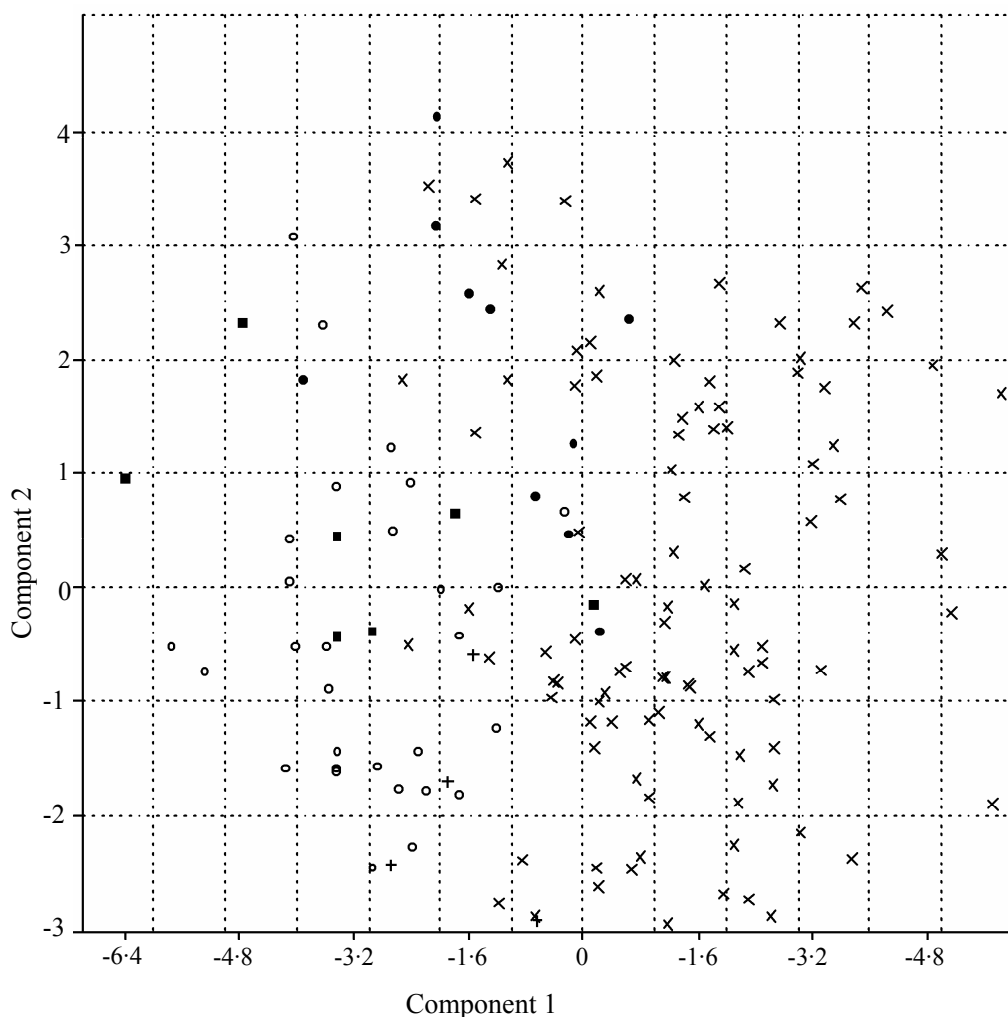


FIGURE 1. PCA of *Asperula cynanchica* taxa. ×, *A. cynanchica*, British Isles and Europe. ●, Subsp. *occidentalis*, Spain/France. ○, 'Subsp. *occidentalis*', British Isles. ■, *A. cynanchica* var. *densiflora* sensu Sell & Murrell, British Isles. +, Intermediate between *A. cynanchica* and *A. occidentalis*, British Isles.

clearly bore leaves at some stage, and had presumably been buried by sand or soil, resulting in further upward growth. We do not regard the stolons as providing reliable taxonomic characters. The corolla appendage was not always well defined, even when corollas were soaked in hot water and laid out for careful examination.

The Principal Components Analysis of the all taxa is shown in Figure 1. Axis 1 accounts for 28% of the variation and is the most important for separating the taxa, the major variables being (in decreasing order of importance):

middle leaf length, upper leaf length:width ratio, middle leaf length:width ratio, upper leaf length and length of middle internode. Axis 2 accounts for 13% of the variation but provides little separation between the taxa, the main variables being the lower leaf length:width ratio, and the upper leaf length to widest point. Axis 3 accounts for 9% of the variation and contributed little to separating the taxa.

There is a strong pattern to the variation in Figure 1. Material of Spanish and French subsp. *occidentalis*, including material from the type locality at Biarritz, forms a reasonable cluster

in the top centre, largely distinct from British and Irish material named subsp. *occidentalis* on the left, but overlapping to a degree with subsp. *cynanchica* (British, Irish and continental Europe) on the right. The outlier to the left is a small, dense plant from Biarritz, but is otherwise similar to other subsp. *occidentalis* from the same locality. There is good separation of British and Irish material named subsp. *occidentalis* from subsp. *cynanchica*. There is complete overlap of British and Irish subsp. *cynanchica* var. *densiflora* with British and Irish material named subsp. *occidentalis*. The intermediate plants from England are largely in an area of overlap at the bottom of the figure between subsp. *cynanchica* and British and Irish subsp. *cynanchica* var. *densiflora* and subsp. *occidentalis*.

Separate Principal Components Analyses comparing subsp. *cynanchica* with British and Irish subsp. *occidentalis*, and comparing French/Spanish subsp. *occidentalis* with British and Irish subsp. *occidentalis* show better separation compared to Figure 1 (as might be expected for simpler data sets), whilst French/Spanish subsp. *occidentalis* still cluster within the variation in subsp. *cynanchica* when compared separately (data not presented).

All plants flowered and fruited freely in cultivation. The subsp. *occidentalis* plants retained their prostrate, dense habit and looked very similar to the wild plants, other than becoming slightly larger. Both subsp. *cynanchica* plants became larger and sprawling.

DISCUSSION

The morphological analyses indicate that there are three taxa which differ mainly in quantitative characters: subsp. *cynanchica*, subsp. *occidentalis* from France/Spain, and a third taxon which includes subsp. *cynanchica* var. *densiflora* and British and Irish material which has been called subsp. *occidentalis*. We do not accept that subsp. *occidentalis* occurs in the British Isles.

Asperula cynanchica is a variable taxon, and it remains to be seen whether true subsp. *occidentalis* from France and Spain is best retained within *A. cynanchica* or restored to a species in its own right. Its relegation to subspecific status was based on observations of

material from both the continent and the British Isles (pers. comm. C. A. Stace 2007), but the latter part of that material we now refer to subsp. *cynanchica* var. *densiflora*. Although our Principal Components Analysis shows that subsp. *occidentalis* is nested within the variable subsp. *cynanchica*, it is based on relatively few specimens of subsp. *occidentalis* and the inclusion of further samples might improve its definition. Rouy (1903) described two varieties of *A. occidentalis* at Biarritz, α *galiiformis* and β *cynanchiciformis*, the former small and dense, the latter more lax. This variation is also evident in the duplicates collected there later by E. J. Neyraut (LY, MA, P). These seem to be forms of the same taxon related to growth conditions, which could be verified by cultivation experiments. We suggest that no further taxonomic changes are made until a wider review of *A. cynanchica* and its close relatives throughout Europe is undertaken.

We also suggest that the name var. *densiflora* (as used by Sell & Murrell 2006) can be used for the third taxon (i.e. including British and Irish material which has been called subsp. *occidentalis*) until the full infraspecific variation in *A. cynanchica* has been reviewed. Var. *densiflora* was described by Grenier & Godron (1852) as having "Fleurs plus nombreuses; tiges plus courtes, plus ramassées et plus étalées" [Flowers more numerous; stems shorter, more branched and prostrate], and they recorded its habitat as dunes of the Atlantic and Mediterranean coasts. This description fits the British and Irish plants reasonably well, but we have not attempted to trace types. Rouy (1903) also listed nine other varieties in France.

Although var. *densiflora* maintains its growth form in cultivation, some populations look slightly different one to another, with Irish material in particular being somewhat variable. The South Wales material is relatively uniform. Our current feeling is that the dense, prostrate growth form may have originated a number of times from local *A. cynanchica* in response to the strong environmental selection pressure in coastal habitats, and is thus polyphyletic. This could be easily tested using molecular methods.

Diagnostic descriptions of the taxa from our data are given below. Measurements are presented as (minimum–) 10 percentile–90 percentile (–maximum).

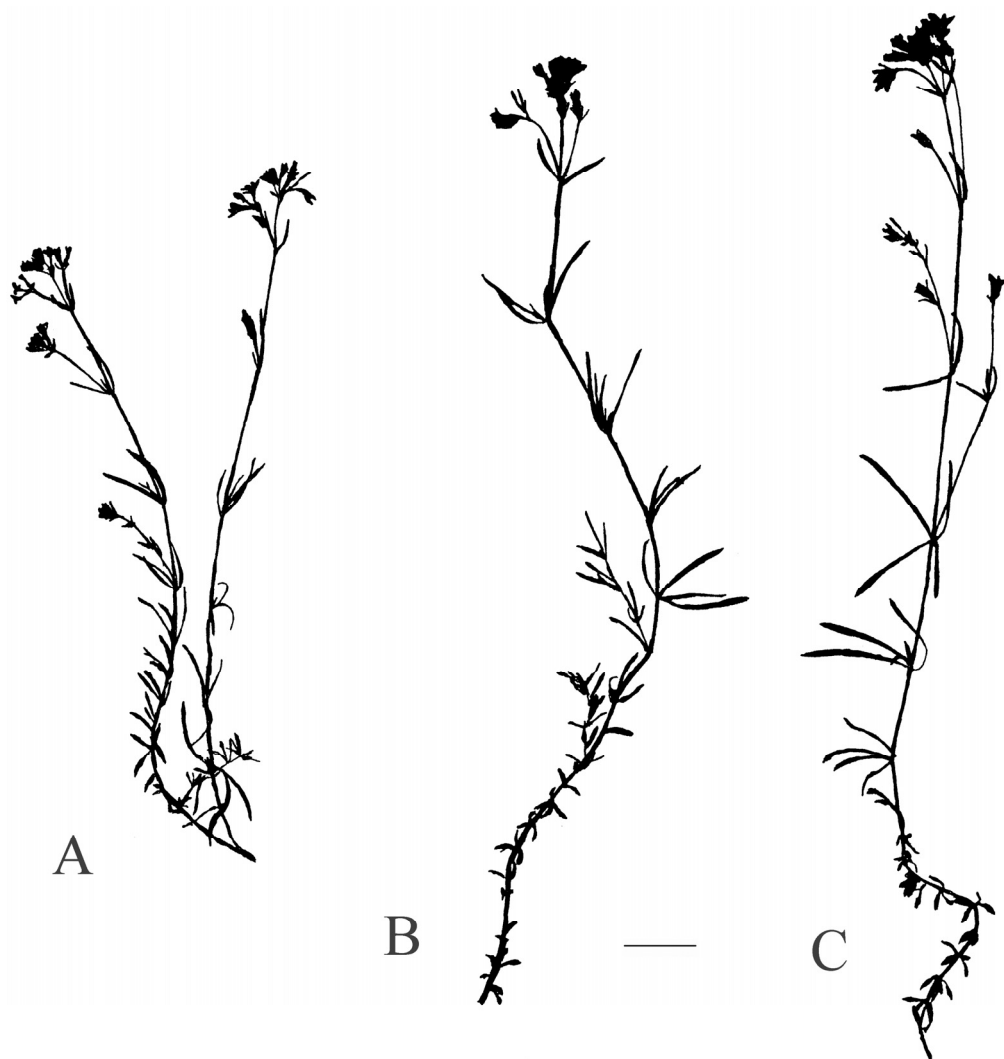


FIGURE 2. *Asperula cynanchica* var. *cynanchica* silhouettes. A, Petersfield (v.c. 12). B, Babraham (v.c. 29). C, White Horse Hill (v.c. 22). Scale bar 1 cm.

Asperula cynanchica L. subsp. *cynanchica* var. *cynanchica* (Fig. 2).

Plant slender, lax, stems weakly ascending, stolons sometimes present, brownish. Lower stem leaves (2.5–)3–7(–13) mm × (0.3–)0.5–1.2(–2.1) mm, (1.7–)3–13(–20) times as long as wide. Middle stem leaves (5.6–)7–19(–26) mm × (0.3–)0.5–1.1(–2) mm, (4.6–)9–28(–45) times as long as wide. Middle internode (4–)8.6–27(–44) mm, (0.5–)0.9–2.4(–4.4) times as long as adjacent leaf. Upper stem leaves (5–)8–19(–35) mm × (0.4–)0.5–1(–1.5), (6.4–)10–32

(–50) times as long as wide. Inflorescence lax. Terminal pedicel (0–)0.4–1.1(–1.6) mm. Corolla tube (0.4–)0.6–1.1(–1.5) mm, (0.3–)0.4–0.7(–0.9) times as long as lobe. Corolla lobe (1–)1.3–2.2(–2.8) mm × (0.4–)0.5–1.1(–1.4), lobe (1.3–)1.6–3.2(–4.5) longer than wide. Lobe appendages usually present.

Distribution: Widespread in Europe on calcareous grasslands and occasionally on dunes. The map in Preston *et al.* (2002) shows its distribution in southern Britain and Ireland, though it is rarer in South Wales than var. *densiflora*.

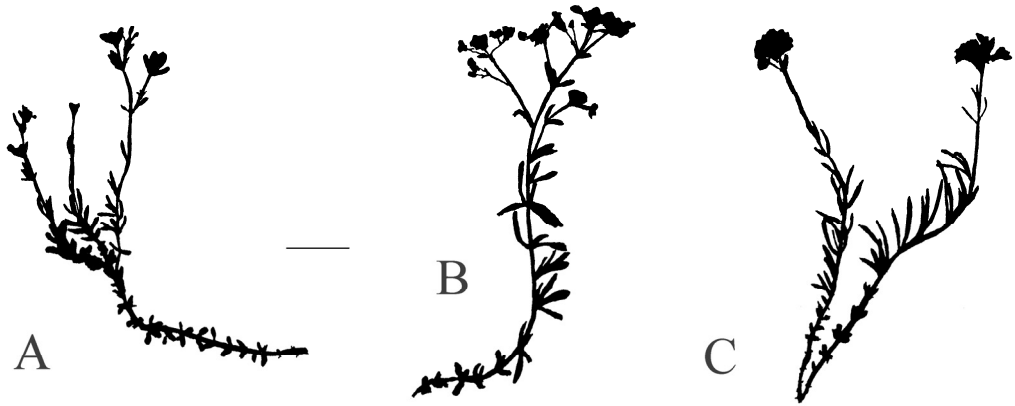


FIGURE 3. *Asperula cynanchica* var. *densiflora* silhouettes. A, B, Whorlebury Hill (v.c. 6). C, Bembridge (v.c. 10). Scale bar 1 cm.

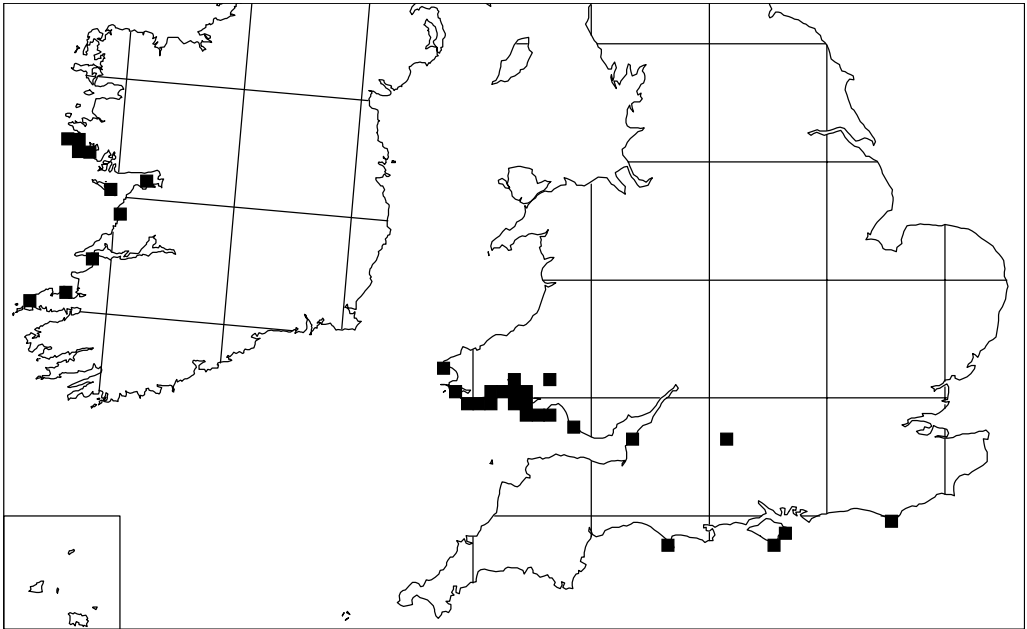


FIGURE 4. Distribution of *Asperula cynanchica* var. *densiflora* in the British Isles.

Asperula cynanchica L. subsp. *cynanchica*
var. *densiflora* Gren. & Godr. (Fig. 3).

Plant small, compact, often mat-forming, prostrate, stolons brown or brownish-orange, or absent. Lower stem leaves (1-)2.3-4.2(-4.6) mm × (0.4-)0.6-1.4(-2.0) mm, (1.9-)2.1-5.7(-9.8) times as long as wide. Middle stem leaves (3.2-)4.2-9(-14) mm × (0.4-)0.6-1.4(-2) mm, (3-)4-11(-18) times as long as wide. Middle

internode 3-12(-16) mm, (0.5-)0.6-1.5(-2.3) times as long as adjacent leaf. Upper stem leaves 4-10(-15) mm × (0.4-)0.5-1.3(-1.7) mm, (4-)5.5-13(-19) times as long as wide. Inflorescence crowded. Terminal pedicel (0.2-)0.3-1.6(-1.7) mm. Corolla tube (0.8-)1-1.5(-1.6) mm, (0.4-)0.6-1 times as long as lobe. Corolla lobe (1-)1.3-1.9(-2.3) mm × (0.4-)0.6-1.3 mm, (1.2-)1.3-2.5(-2.8) times as long as wide. Lobe appendages distinct, weak or absent.

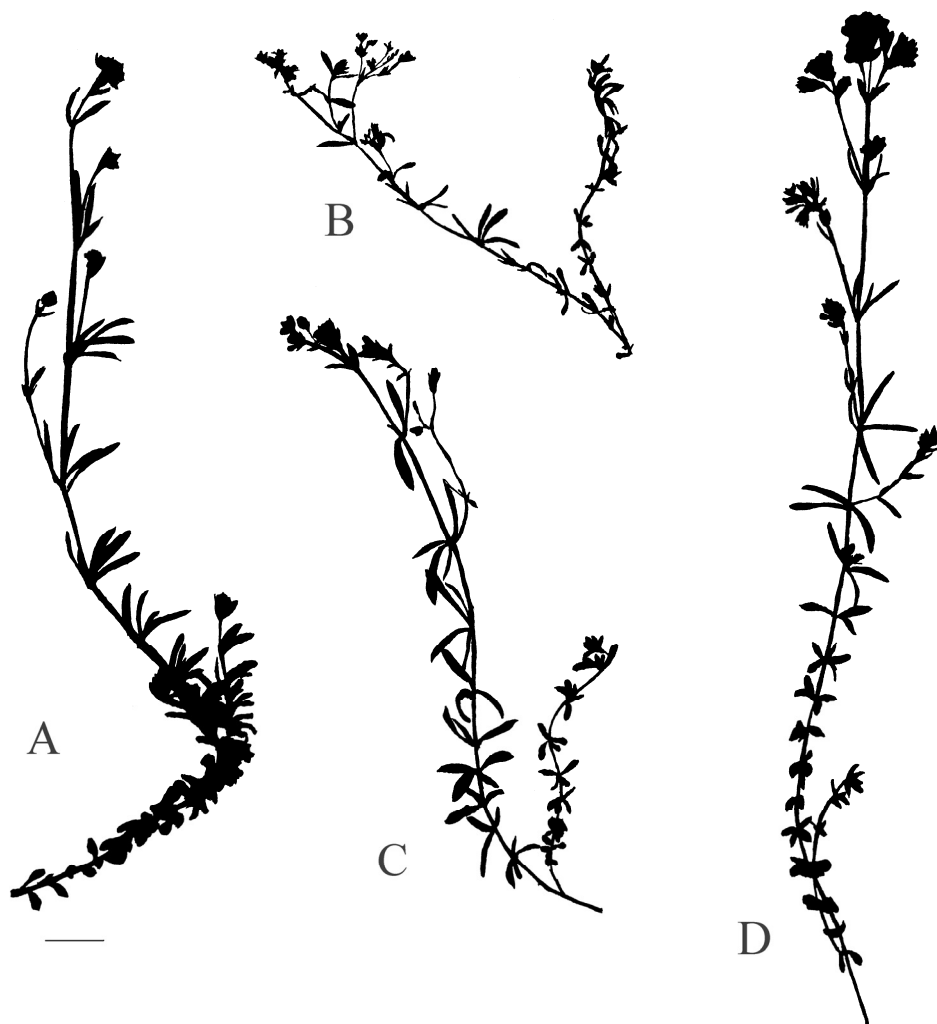


FIGURE 5. *Asperula cynanchica* subsp. *occidentalis* silhouettes. A, Liencres, Spain. B, C, Biarritz, France. D, El Tijo, Spain. Scale bar 1 cm.

Distribution: Southern Britain and Ireland (Figure 4), France, possibly elsewhere in Europe too. It is most frequent near the coast on sea cliffs and sand dunes, but may also occur inland. Some herbarium specimens contain a mixture of material suggesting that both varieties can grow together. Details of the specimens seen are given in Appendix 1.

Asperula cynanchica L. subsp. *occidentalis* (Rouy) Stace (Fig. 5).

Plant large, lax, stolons usually present, sometimes absent, bright orange or brown.

Lower stem leaves (2.3–)2.8–5.1(–7.8) mm × 0.9–1.9(–2.6), (1.5–)2–5.5(–6.5) times as long as wide. Middle stem leaves (5.8–)8–11(–13.5) mm × (0.7–)0.8–1.5(–1.8) mm, (3.9–)4.5–13(–17) times as long as wide. Middle internode 5–14(–17) mm, 0.6–1.4 times as long as adjacent leaf. Upper stem leaves (7.6–)9–15.3 mm × 0.7–1.1(–1.5), (7–)9–17(–21) times as long as wide. Inflorescence lax. Terminal pedicel 0–0.3(–0.4) mm, often very short. Corolla tube 0.9–1.2(–1.3) mm, 0.5–0.8 times as long as lobe. Corolla lobe (1.2–)1.4–2.1 mm × 0.4–1.1 mm, 1.5–3.6 times as long as wide. Lobe appendages always present.

Distribution: France (Basses-Pyrenees only; Ruderon (1995)) and northern Spain (Asturias, Cantabria, Guipúzcoa, Vizcaya) on calcareous grasslands and dunes. The specimens seen are cited in Appendix 2.

We have not seen voucher material of the records on the French flora website (www.tela-botanica.org) for Normandy but suspect they are likely to refer to var. *densiflora*, and the specimen from Le Poulignes, Loire-Inferior (**P**) is var. *densiflora*. We have no reason to doubt records cited in the Spanish flora website

(Poryecto Anthos: www.anthos.es) for northern Spain as they have been revised recently for *Flora Iberica*.

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We are grateful to the Keepers of **CGE**, **DBN**, **MA**, **P** and **RNG** for access to or loan of material, and to Gaëtan Guignard (**LY**) for images of the Rouy types, and Jerome Sawtschuk for help with translation. The map was plotted using DMAPW by Alan Morton.

KEY

1. Middle stem leaves (5–)7–19(–26) mm long, (5–)9–28(–45) times as long as wide and (0.5–)0.9–2.4(–4.4) times as long as adjacent leafsubsp. *cynanchica* var. *cynanchica*
1. Middle stem leaves (3–)4–11(–14) mm long, 4–13(–18) times as long as wide and (0.5–)0.6–2.3 times as long as adjacent leaf2
2. Terminal pedicel (0.2–)0.3–1.6(–1.7) mm; corolla lobe appendages distinct, weak or absentsubsp. *cynanchica* var. *densiflora*
2. Terminal pedicel 0–0.3(–0.4) mm, often very short; corolla lobe appendages distinctsubsp. *occidentalis*

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APPENDIX 1
BRITISH AND IRISH SPECIMENS OF *ASPERULA CYNANCHICA*
VAR. *DENSIFLORA* SEEN

ENGLAND

Worlebury Hill (V.c. 6), 14 Aug 1887, J. W. White (**CGE**, **NMW**). Worle Hill, Weston Super Mare (v.c. 6), June 1842, G. W. H. Thwaites (**CGE**). Marlborough (v.c. 7), 8 July 1885, E. S. Marshall, (**CGE**). Kingsdown [Kingston?] (v.c. 9), 15 June 1899, E. F. Linton (**NMW**). Portland (v.c. 9), 1837, A. Bloxham (**CGE**). Church Ope Cove, Portland (v.c. 9), 6 July 2000 and 11 August 2003, T Rich (**NMW**). Ventnor (v.c. 10), August 1834, F. Ballard (**NMW**). Golf links at sea level, Bembridge (v.c. 10), 12 July 1905, Miss C. Bickham (**CGE**). Bembridge (v.c. 10), July 1829, W. Annesley (**CGE**, left hand specimen). Short turf near cliff edge, Beachy Head (v.c. 14), July 1955, F. Rose (**NMW**).

WALES

Near Swansea (v.c. 41), 1835, T. A. Babington (**CGE**). Nottage (v.c. 41), 1891, A. H. J. (**NMW**). Near Rhossili (v.c. 41), 25 May 1953, B. A. Miles (**CGE**). Rhossili cliff (v.c. 41), 28 May, 1929 (**NMW**). On limestone on Gower (v.c. 41), June 1835, T. A. Babington (**CGE**). Langland Cliff, Gower (v.c. 41), 16 June 1928, V. M. Peel (**NMW**). Mumbles Hill (v.c. 41), 6 June 1993, G. Hutchinson (**NMW**). Mumbles Head (v.c. 41), 4 June 1997, T. Rich (**NMW**). Horton Dunes, Gower (v.c. 41), 28 June 1945, J. A. Webb (**NMW**), and undated, Anon (**NMW**). Limestone cliffs between Langland and Caswell Bay (v.c. 41), 30 May 1909, G. R. Willan (**NMW**). Whitford Burrows (v.c. 41), July 1993, P. Russell (**NMW**). Porthcawl (v.c. 41), 1905, A. H. J. (**NMW**), 7 June 1901, W. A. Shoolbred (**NMW**) and 17 June 1931, A. E. Wade (**NMW**). Kenfig, 3 July 1982, H. J. M. Bowen (**RNG**). Pennard Castle (v.c. 45), June 1920, E. N. Thomas (**NMW**), and 1971, R. A. Boniface (**NMW**). Pembrey Local Nature Reserve (v.c. 44), 5 July 2000, R. D. Pryce & K. A. Cottingham (**NMW**). Carreg Cennan (v.c. 44), 15 July 1945, J. A. Webb (**NMW**). Pembrey (v.c. 44), 8 July 1936, J. M. Lewis (**NMW**). Laugharne Burrows (v.c. 44), 1987, J. Rees (**NMW**). Dry dunes, Laugharne Burrows (v.c. 44), 4 July 1982, R. D. Pryce (**NMW**). Sand dunes, Burry Port (v.c. 44), 13 July 1967, J. R. Gates (**NMW**). Pendine Dunes (v.c. 44), 28 June 1952 (**NMW**). Whitesand Bay (v.c. 45), 5 April 1975, R. M. Burton (**NMW**). Cliff, Barafundle Bay (v.c. 45), 25 July 1960, A. C. Powell (**NMW**). Wall on the Burrows, Tenby (v.c. 45), 1881, J. Sidebotham (**CGE**). Tenby (v.c. 45), 19 August 1848, C. C. Babington (**CGE**). Tenby Burrows, 2 July 1931, E. C. Howells (**NMW**). Giltar Point, 12 July 1999, T. Rich (**NMW**). Lydstep, 12 July 1999, T. Rich (**NMW**). Saddle Point (v.c. 45), 23 July 1999, T. Rich (**NMW**). Angle (v.c. 45), 1871, illeg. (**CGE**). Sand dunes, Penally, 2 August 1975, J. E. Lousley (**RNG**).

IRELAND

Smerwick Cove (v.c. H2), 13 July 1841, C. C. Babington (**CGE**). Abundant on the sandhills, Castlegregory (v.c. H2), 24 June 1902, E. S. Marshall (**CGE**, **NMW**). Sandhills, Leinch (v.c. H9), 8 August 1893, H. C. Levinge (**DBN**) and July 1880, R. M. Barrington (**DBN**). Muckinish, Ballyvaughan (V.c. H9), 23 August 1895, N. Colgan (**DBN**, sand hill form). Near Kilmnovie, Aran Isles (v.c. H9), 5 September 1976, M. Scannell (**DBN**). Ballybunion (v.c. H16), August 1866, M. Barrington (**DBN**). Bunowen penisar (H16), 16 June 1974, M. Scannell (**DBN**). Sandy ground, Mannim (v.c. H16), September 1979, M. Scannell (**DBN**), and 23 August 1974, D. McClintock (**RNG**). Dogs Bay (v.c. H16), 1966, F. Rose (**NMW**). Roundstone (v.c. H16), undated, R. M. Barrington (**DBN**). Near the beaches near Roundstone (v.c. H16), 12 September 1873, C. C. Babington (**CGE**).

APPENDIX 2

SPECIMENS OF *ASPERULA CYNANCHICA* SUBSP. *OCCIDENTALIS* SEEN

FRANCE

Biarritz, côte des basques, entre parents, 18 September 1869, M. Ch. Contejean (**LY**, holotype of var. *galiiformis*); sables maritime, May 1878, Bordère, (**LY**, holotype of var. *cynanchiciformis*); coastal sand dunes, 9 August 1903, E. J. Neyraud (**LY**, **MA** nos. 117219 and 117218, **P**).

SPAIN

Cantabria, Meron, San Vicente de la Barquera, sand dunes, 30 August 1983, C. Aedo (**MA** no. 622313). El Tejo, Santander, 18 August 1968, M. R. de la Fuente (**MA** no. 682797) and dunes, 30 June 1969, M. R. de la Fuente (**MA** no. 682794). Liencres, Santander, dunes, 18 May 1969, M. R. de la Fuente (**MA** no. 682798) and 24 May 1969, M. R. de la Fuente (**MA** no. 682799). Cuchia, Santander, 2 July 1971, M. R. de la Fuente (**MA** no. 682796). Loredó, Ribamontan al Mar, dunes, 12 June 1993, M. R. de la Fuente (**MA** no. 682795), and 19 May 1990, C. Aedo (**MA** no. 622378). Loredó, Santander, Port-duna-arenosa, 7 October 1979, M. R. de la Fuente (**MA** no. 682825).