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***Galium procurrens*, a New Diploid Relic Species  
of the *G. sylvaticum*-Group from the Balkan Peninsula**

By

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**Key Words:** *Rubiaceae*, *Galium*, *G. procurrens* EHREND., spec. nova.—  
Polyploid complex, chorology.—Balkan relic element of European decidu-  
ous forest group.

**Abstract:** *Galium procurrens* is described as a new diploid relic species  
from Montenegro/N. Albania and SW. Bulgaria. It is related to the tetra-  
ploid *G. laevigatum* and other diploid and polyploid taxa of the *G. sylvaticum*-  
group inhabiting European deciduous forests.

The *Galium sylvaticum*-group (= sect. *Leiogalium* DC. ex LEDEB.  
ser. *Nemoralia* M. POP.) includes perennial herbs with whorls of 5–12  
leaves and leaflike stipules of elliptical to linear-lanceolate shape,  
beneath somewhat more light (and often  $\pm$  bluish) green than above,  
and with broadly ovoid to pyramidal, lax inflorescences,  $\pm$  capillary  
pedicels, white, cup-shaped to rotate corollas, acute to apiculate corolla  
lobes and smooth mericarps. Members of the *G. sylvaticum*-group are  
characteristic elements of European deciduous forest biota, ranging  
from the Balkans to NE. Anatolia, the upper Volga, N. Germany,  
S. Italy and the Pyrenees. Apart from more recent interest in poly-  
ploidy ( $x = 11$ ;  $2x$ ,  $4x$  and  $6x$  taxa: BUTTLER & BRESINSKY 1966)  
and eco-geographical relationships within the group (HADAČ 1969),  
long continued biosystematic studies have resulted in a critical treat-  
ment for Flora Europaea, vol. 4 (EHRENDORFER & KRENDL 1973)  
and a short outline of affinities and possible evolution (EHRENDORFER  
1975, with distribution map). These studies necessitate the recognition  
of a new taxon, worthy of specific status:

***Galium procurrens* EHREND., spec. nova (Fig. 1a)**

Descr.: Habitu *Galio laevigato* L. simile, perenne. Rhizoma stolones  
radicantes deinde floriferos emittens. Folia lineari-(ob)lanceolata,  
(25) 30–40 (50)  $\times$  (2.5) 3.5–5.5 (7) mm attingentia, subtus pruinosa. Pe-

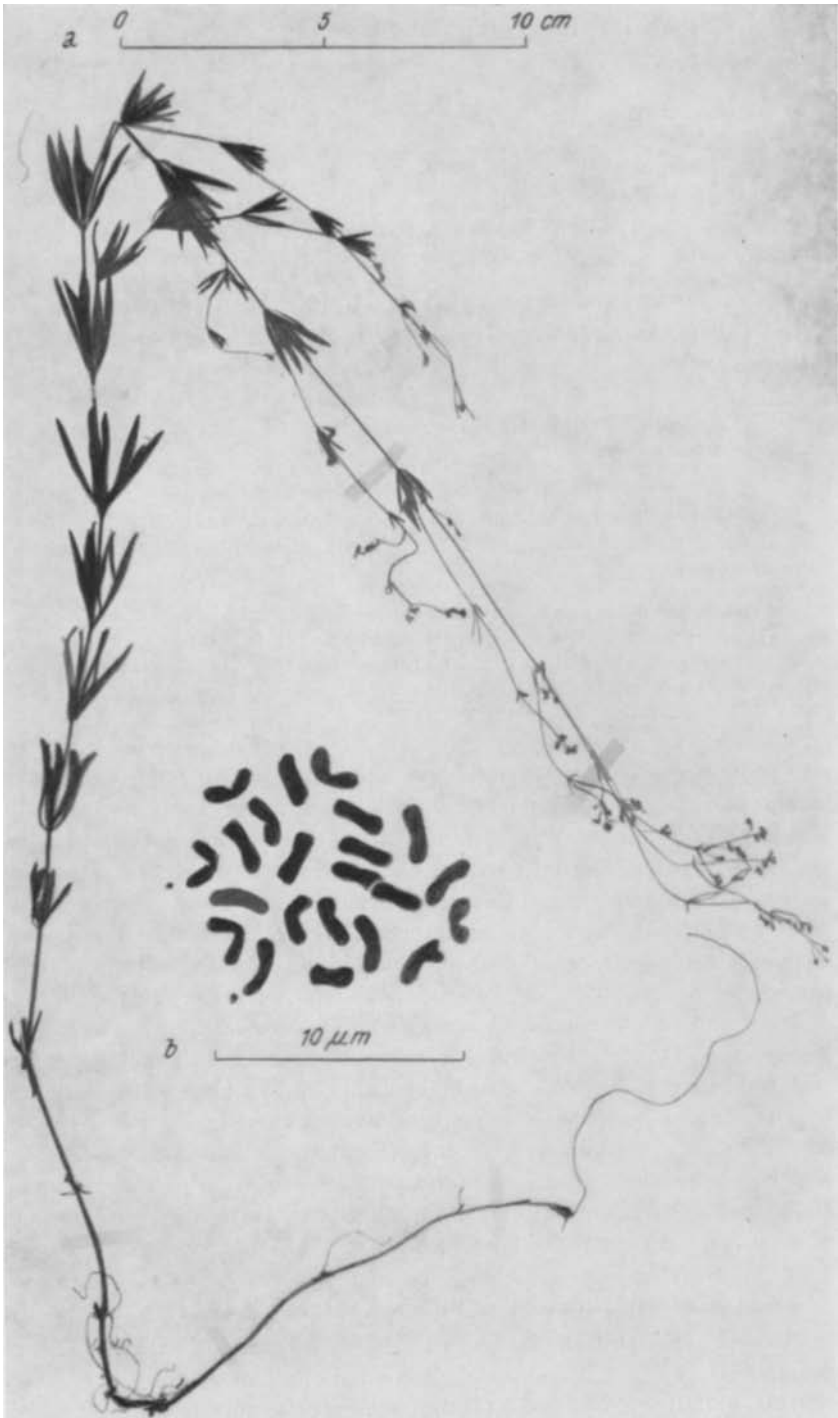


Fig. 1. *Galium procurrens*. a Habit of type specimen, b mitotic metaphase chromosomes from root tip

dicelli plerumque diametro corollae breviores. Corolla subcampanulata, (2) 2.2–2.6 (3) mm diam., lobis acutis vel subapiculatis. Ovarium et mericarpi pruinosa. Numerus chromosomatum  $2n = 22$ .

In habit and other characters similar to *G. laevigatum* L. Stock with subterranean runners. Young shoots pruinose. Stems 40–80 cm, rather slender, the base with adventitious roots,  $\pm$  rounded at lower part, upwards with 4 weak ridges, glabrous (very rarely with scattered short hairs). Leaves up to (25) 30–40 (50)  $\times$  (2.5) 3.5–5.5 (7) mm, length: breadth (6) 8–10 (11), linear-(ob)lanceolate, widest about or above the middle, gradually narrowed towards the base, somewhat more abruptly narrowed towards the acute apex; glaucous-pruinose below, dark green above, remaining greenish when dried; margins somewhat rough with 1–2 rows of small and shortish papillose teeth; venation apart from main nerve inconspicuous. Inflorescence ovoid-pyramidate, rather loose, pedicels usually shorter than the diameter of the corolla. Corolla (2) 2.2–2.6 (3) mm in diam., cup-shaped, lobes acute to shortly apiculate. Ovaries and mericarps  $\pm$  pruinose. Chromosome number diploid,  $2n = 22$ .

Typus: [Yugoslavia, Montenegro] Cattaro [= Kotor], Vermač; 2-VII-1905, J. SCHNEIDER (holotype W).

Hab.: In  $\pm$  open, deciduous mountain forests with *Fagus sylvatica* etc.

Distrib.: Montenegro, N. Albania, and SW. Bulgaria.—Specimens seen: [Yugoslavia] Montenegro, Driebece; SZYSZYLOWICZ 1886 (W). [N.] Albania [Krasniqi], ad Radeča Velja prope Kat. Kostića, distr. Kuči, in rupestribus; 7. VII. 1898, BALDACCI 212 (W, WU).—, Klementi [= Këlmendi], Kurec (Gruda) ad Broja [= Brojë]; 11.–14. VII. 1900, BALDACCI 124 (W).—, Umgebung von Shkodra [= Shkodër], nord-westliche Vorberge des großen Bardanjolt; 12. VI. 1916, JANCHEN (W). Bulgaria, Slavijanka Mt., distr. Goce Delčev, "Dola" above village Paril; 28. IX. 1973, ANČEV A 3194, and 26. VII. 1971, ANČEV 71678 a (SOM).

The new species is diploid, with  $2n = 22$  (fig. 1b), as has been established for the Slavijanka population by the junior author.

Metaphase plates have been studied in root tips obtained from seedlings germinated in Petry dishes at room temperature after seeds having been kept 14 days at 0 °C. The root tips were fixed after 40 minutes of 8-hydroxyquinoline pretreatment in 45% acetic acid, passed through cold hydrolysis, stained with haematoxyline after GOMORI and finally squashed. Slides have been made permanent in euparal.

The karyotype is characterized by the following 11 chromosome pairs: 1 long metacentric with satellites; 1 long, 2 shorter, 3 middle sized and 1 very short metacentric; 3 middle sized submetacentric.

Few details about the habitat of *G. procurrens* are available. On Slavijanka Mt. it occurs on West slopes of "Dola" between 1200 and 1400 m in outskirts of the *Fagus sylvatica*-forest, together with *Corylus avellana* L., *Euonymus latifolia* SCOP., *Rhamnus rupestris* Scop., *Cynanchum nivale* BOISS. et HELDR., *Circaea lutetiana* L., *Valeriana officinalis* L., *Thalictrum aquilegifolium* L., *Paris quadrifolia* L., *Fragaria vesca* L., *Veronica austriaca* agg., *Geranium macrorrhizum* L., *Astrantia major* L. etc. The other localities of our new species are probably also montane beech forests.

The distribution area of *G. procurrens* appears to be disjunct between Montenegro + N. Albania and SW. Bulgaria; but further attention is likely to result in the discovery of more stations.

The relic nature of *G. procurrens* is underlined by the richness of its disjunct areas in endemic species. For Slavijanka Mt. this has already been emphasized by STOJANOV (1921, 1924) and DRENOVSKY (1935). The rocky limestone slopes and ridge of "Dola", partly covered with forests of *Pinus heldreichii* CHRIST, harbour many endemic Balkan species like *Malcolmia angustifolia* BOISS. et ORPH., *Saxifraga stribrnyi* (VEL.) PODP., *Potentilla apennina* TEN. subsp. *stojanovii* URUM. et JAV., *Anthyllis aurea* WELDEN, *Rhamnus fallax* BOISS., *Frangula rupestris* (SCOP.) SCHUR, *Cynanchum nivale* BOISS. et HELDR., *Convulvulus suendermannii* BORNM., *Sideritis scardica* GRISEB., *Micromeria cristata* (HOPPE) GRISEB., *Galium aegeum* (STOJ. et KITAN.) ANČEV ined., *Asyneuma limoniiifolium* (L.) JANCH., *Diosphaera rumeliana* (HAMPE) BORNM., *Petcovia orphanidea* (BOISS.) STEF., *Centaurea parilica* STOJ. et STEF., etc.

The morphological differentiation of *G. procurrens* from related taxa is mainly based on: runners and adventitious rooting of stem bases, (mostly) glabrous stems, linear-(ob)lanceolate leaves with only somewhat scabrous margins, pedicel length shorter than corolla diam., small and cup-shaped flowers with acute to subapiculate lobes and glaucous pruinosity (mainly on young shoots, lower leaf surface and ovaries: vanishing with age, but leaving behind scattered crystalline effigurations). In contrast, the sympatric central Balkan 2 x-*G. pseudoaristatum* SCHUR [incl. *G. matteji* (BALD.) HAYEK] has no runners, often hairy stems, linear-(lanceolate) leaves, more crowded partial inflorescences and no pruinosity. The related 2 x-*G. aristatum* L., ranging from the S. to the W. Alpes (and the E. Pyrenees?!) has rotate corollas and apiculate corolla lobes. *G. laconicum* BOISS. et HELDR. from Greece, also 2 x, is similar to *G. procurrens* in its runners, but lacks pruinosity and often has hairy stems. Other 2 x-taxa with pruinosity and cup-shaped flowers have longer pedicels and only acute corolla lobes; they are the Euxinian *G. longifolium* (SIBTH. et SM.) GRISEB. with no (or

short) runners and strongly scabrous leaf margins (2–4 rows of larger papillose teeth), and the Central European *G. sylvaticum* L. with no runners at all and broader (3–10 mm) leaves. The SE. Bulgarian *G. bulgaricum* VEL. is very close to *G. longifolium* but non-pruinose.

Among 4 x-members of the *G. sylvaticum*-group certainly *G. laevigatum* L. is the most similar to our new species; it connects it morphologically and chorologically with *G. aristatum*, having  $\pm$  short runners, (ob)lanceolate leaves, slightly cup-shaped and larger corollas (mostly 2.5–3.5 mm diam.) with  $\pm$  apiculate lobes, and only some pruinosity (on lower leaf surface, rarely on ovaries); its distribution ranges from N. Croatia through the southern Alps into the Apennines and SW. Italia (Campania, f.i. the Sorrento Peninsula: from there recent 4 x-chromosome counts; EHRENDORFER, unpubl.). *G. schultesii* VEST., extensively distributed in E-Europe, seems to border the area of *G. procurrens* in the N and E with 4 x- and 6 x-cytotypes; also similar because of runners and pruinosity, it differs by a strong tendency for turning black when dry, broader oblanceolate to elliptical leaves, longer pedicels and larger (mostly 3.5–4.5 mm diam.) rotate flowers with apiculate corolla lobes.

From our present understanding of the *G. sylvaticum*-group it appears that the geographically disjunct Balkan populations of *G. procurrens* belong to its ancient (Late Tertiary?!) 2 x racial "basis". Morphological affinities and distribution suggest that it participated in the origin of 4 x-taxa with more continuous and northern areas: *G. laevigatum* and *G. schultesii*-4 x.

### Zusammenfassung

Die neue Art ist diploid ( $2n = 22$ ) und vor allem durch Ausläufer, schmal (ob)lanceolate Blätter, blaugrüne Bereifung und kleine becherförmige Blüten mit bespitzten Kronzipfeln ausgezeichnet. Die disjunkten Vorkommen liegen in montanen Buchenwäldern der endemitenreichen Gebirge der Balkanhalbinsel (Montenegro/N. Albanien und SW. Bulgarien). *G. procurrens* war offensichtlich an der Entstehung von polyploiden Sippen der in europäischen sommergrünen Laubwäldern beheimateten *G. sylvaticum*-Gruppe beteiligt.

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