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THE GENERA *PAEDEROTA* AND
PSEUDOLYSIMACHION
(SCROPHULARIACEAE) IN CROATIA

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Three species mentioned so far in the literature very probably do not really occur in this country or have not been reliably recorded up to now and, therefore, should be cancelled from the Croatian Flora (marked by ** in the text): *Paederota lutea* (= *Veronica lutea*), *P. bonarota* = *V. bonarota*, *Pseudolysimachion spicatum* (= *Veronica spicata*) (s. str.). Thus, the genus *Paederota* is very probably not represented in this country. Two species, whose occurrence in Croatia has been unknown or has been neglected by modern standard Floras, are confirmed or recorded for the first time (●): *Pseudolysimachion pallens* (= *Veronica pallens*), *P. spurium* (= *V. spuria*); two species have been or still are problematical in some respects (□): *Pseudolysimachion barrelieri* (= *Veronica barrelieri*), *P. orchidea* (= *V. orchidea*). Unsolved taxonomical and ecogeographical problems concerning *Pseudolysimachion spicatum* group are discussed, and differential characters between *P. longifolium* and *P. spurium* are given. The ecogeographical (including coenological) characteristics of all the species present in Croatia are briefly surveyed.

Introduction

A revision of the genera *Paederota*, *Pseudolysimachion* (= *Veronica* sect. *Pseudolysimachia*), mainly in the herbaria ZA, ZAHO (both Zagreb) and W, WU (both Vienna) has offered some additional data to the old and recent literature and has raised doubts concerning the occurrence in Croatia of the genus *Paederota* and of *Pseudolysimachion spicatum* (s. str.); on the other hand, we give evidence for the presence of certain species hitherto neglected, mistaken or taxonomically not distinguished for Croatia. We try to summarize the present-day knowledge on the distribution in Croatia including ecological data for each species. For a parallel revision of the genus *Veronica* see Fischer et al. (1989).

Two asterisks (**) designate species that should be cancelled from the Flora of Croatia as there are no reliable records so far; the empty square (□) marks species whose occurrence in Croatia is problematic in some way, e. g., because they are underrecorded or many records are erroneous, having been mistaken or confused with other species; the black dot (●) designates species that were doubtful but have been confirmed by us, and species new for the Flora of this country. — We use the term »continental« here in the climatological sense only, and not in the sense of many Croatian authors who refer to the

inland part of the country in contrast to the (mediterranean) coastal parts and the islands. Most of inland (»continental«) Croatia, actually, has a rather oceanic climate (*Fagion illyricum* zone and *Carpinion betuli illyricum* zone sensu Horvat & al. 1974, see also Jovanović & al. 1986) except for areas in the extreme northeast, which have subcontinental climate, flora and vegetation.

Results

** PAEDEROTA

** *P. lutea* Scop. (= *Veronica lutea* (Scop.) Wettst.) does not occur in Croatia, we found neither literature records nor herbarium specimens; the letter »H« (for Croatia) in Domac (1984:310), therefore, is very probably erroneous. The distribution range of this mainly SE Alpic species is a remarkable example of the »Croatian Gap«: its main (almost) continuous range covers the area from the Alps of Vicenza (Region of Veneto, Italy) in the west, to mt Dobratsch (near Villach, Carinthia, Austria) in the north, to Radeče (Štajersko, Slovenia) in the east, and to mt Krim (S. of Ljubljana, Slovenia) in the south; a chorologically very remarkable, disjunct, small occurrence in the Čabulja mts in Hercegovina (Hayek 1929, Slavnić 1967), is separated by 360 km to the SE (a fact which, by mistake, is neither mentioned by Merxmüller (1952), nor by Hartl (1966:144); besides, the reputed disjunct occurrence in one locality in the NE Alps (Merxmüller 1952, Hartl 1966) has never been confirmed since and is probably also based on a mistake).

** *P. bonarota* (L.) L. (= *Veronica bonarota* L.) is very probably lacking in Croatia as well (so, the whole genus must be cancelled). Very old records for mt Velebit long turned out to have been based on misidentified *Bartsia alpina* (see discussion by Degen 1938: 16, who states that this species should be cancelled from the Croatian Flora). Very strangely, however, in herb. ZA there are two specimens of *P. bonarota* in herb. SCHLOSSER labelled »Badanj, Debelo Brdo (Velebit)«, i. e. the same locality which is considered to be without this species by several authors (including Schlosser & Vukotinović 1869!) up to Horvat (1931b) and Degen (1938)! Are these herbarium labels wrong, or a forgery, or does or did (by artificial introduction?) *P. bonarota* really grow in mt Velebit?

PSEUDOLYSIMACHION

P. longifolia (L.) Opiz (= *Veronica longifolia* L., *V. maritima* L.) is mainly distributed in the lowlands of the big rivers Sava (Posavina) and Drava (Podravina). — So far, nothing is known about the subspecies/karyodemes (a diploid and a tetraploid in N. and C. Europe, not adequately studied, Hartl 1966) in Croatia. — *Ecology*: inundated riparian forests, marshy meadows; probably character species of the *Molinietalia* (e. g. in E. Slavonia, see Ilijanić 1968, Horvatić & al. 1970, and Durbavec & al. 1984; *Deschampsion* (Posavina: Horvatić 1931); also in *Genisto-Quercetum roboris* (*Alno-Quercion roboris*, Horvat 1938).

Unfortunately, it still remains unclear to us what »*V. croatica* Borbas« is (see Degen 1938:17). It is not mentioned by Domac (1984), either as a species or as a synonym.

● *P. spurium* (L.) Rauschert (= *Veronica spuria* L., *V. foliosa* W. & K., *V. paniculata* L.) has not been recorded for Croatia by modern au-

thors. Though already mentioned by Neilreich (1866) for the »Murinsel« (= Međimurje) which has been part of Croatia since 1854, and by Schulzer v. M. & al. (1866) who recorded our species also for Slavonia (Duzluk in the Papuk mts), repeated by Neilreich (1870) and (except Međimurje) by Schlosser & Vukotinović (1869), it has escaped the attention of modern Croatian botanists (Domac 1984). We found two sheets in herb. SCHLOSSER, one labelled as originating from Križevci (= »Kreuz«), determined as »*V. foliosa*«, collected by SCHLOSSER himself in 1857 (?) (not mentioned in Schlosser & V. 1869), the other sheet exhibits a mixture of *P. spurium* and *P. barrelieri* and is said to originate from mt. Tuhobić near (N of) Zlobin (c. 15 km E. of Rijeka), on mountain meadows (»na gorskih livadah«), collected by VUKOTINOVIĆ, 17. 7. 1877, determined as »*V. spicata*«. The occurrence of *P. spurium* in Međimurje, in the Papuk mts and in Križevci is not improbable as this species is of panonian general distribution (see below); the sheet from mt Tuhobić, however, seems doubtful to us because this locality is far off the Pannonian Floristic Province and panonian climate, and the occurrence of *P. spurium* therefore highly improbable. Rauš & Šegulja 1983, mention this species for Slavonia, although, unfortunately, without giving any locality. — *P. spurium* is perhaps a good example of a species exhibiting a subcontinental tendency similar to that of *P. orchideum* and *Veronica prostrata* but less pronounced than *P. pallens*. Outside Croatia, *P. spurium* is distributed in Vojvodina, Bulgaria, Roumania, Hungary, E. Austria (one station only!), Slovakia, GDR (extinct nowadays), Poland, Ukraine, Russia (M. A. FISCHER unpubl.). — *Ecology* (general characteristics of this species; no data so far from Croatia): margins of dry thermophile oak forests and shrubs, dry but rich grassland; in *Geranium sanguinei*?

P. spurium resembles *P. longifolium* in habit; the most important diagnostic characters — improved by us as to our current knowledge — between these two species are as follows:

P. longifolium

P. spurium

Stem on top (below the inflorescence) densely covered with 0.2—0.5 mm long thin \pm crisp, eglandular hairs, \pm pointing downwards, sometimes almost greyish-tomentose, glands always absent; lamina of leaves narrowly lanceolate, (5—)6—11 (—13) cm long, 1—2 (—3) cm wide, usually sharply serrate; 1 terminal inflorescence or 1—3 (—6) additional shorter lateral inflorescences just below the terminal one in the axils of the uppermost leaves (which are equal or only slightly shorter than the lower ones); pedicels usually 1—2 mm long in flower, 1—3 mm long in fruit, 0.3—0.5 (—1) \times as long as the bract, densely pubescent with 0.1—0.2 mm long eglandular hairs patent or curved downwards or appressed downwards; bracts 3—6 mm long, narrowly linear, eglandular-ciliate; style (4—)5—8 mm long.

Stem on top (below the inflorescence) usually less densely covered with very short (0.1—0.2 mm) downward curved eglandular hairs, sometimes additionally with longer (0.2—0.6 mm) patent glandular hairs; lamina of leaves broadly lanceolate to ovate, 4—9 cm long, 1—3 cm wide, usually less sharply serrate; below the terminal inflorescence several ((2—)5—10 (—12)) additional inflorescences (often in whorls of 3—4) of approximately the same size in the axils of bracts (strongly reduced leaves), thus resulting in a double-raceme synflorescence; pedicels 1.5—3 mm long in flower, 2.5—4 mm long in fruit, 1.5—2.5 \times as long as the bract, sparsely to rather densely covered with extremely short (0.05—0.1 mm) glandular hairs (\pm curved downwards), or sessile glands; bracts 1—3 mm long, lanceolate, glandular-ciliate; style usually 3—5 (—6) mm long.

P. spicatum and the subsequent species *P. barrelieri*, *P. orchideum*, *P. pallens* (and other species not present in this country), have often in the past been considered to be elements of one common species called »*Veronica spicata*« (sz. s. l.). All the Croatian records under this name are to be understood in this broad sense and refer to either *P. barrelieri*, or *P. orchideum*, or *P. pallens*. According to Fischer (1974, 1982), these taxa are clearly distinct in morphology and ecology, they do not hybridize and consequently merit specific rank.

** *P. spicatum* (L.) Opiz s. str. (= *Veronica spicata* L. s. str.), though widespread in temperate Eurasia, from Japan to the British Isles, is apparently lacking in Croatia; we did not find any specimens. It is not impossible, however, that it occurs in the extreme NE of Croatia and that »*Veronica spicata* var. *vulgaris*« (Schulzer v. M. & al. 1866: »Auf trockenen Triften und Waldrändern häufig«) refers to this species. *P. spicatum* is characterized mainly by sepals with long (0.3—0.5 mm), thin, eglandular cilia and a different, much shorter and usually glandular indument on the sepal surface (Fischer 1974, there also further details).

□ *P. barrelieri* (Schott ex R. & S.) Holub (= *Veronica barrelieri* Schott ex R. & S.; *V. spicata* var. *setulosa* Koch) is the commonest of the species of the *P. spicatum* group in Croatia. *P. barrelieri* is characterized mainly by the sepals with stiff eglandular cilia and a completely glabrous sepal surface. Stem and leaves are either glabrous to subglabrous (= subsp. *nitens* (Host) M. A. Fischer) or ± densely hirsute (= subsp. *barrelieri*). Subsp. *nitens* is rare in Croatia, grows mainly in Istria (but is common in Slovenia); subsp. *barrelieri* is rather common in the mediterranean and montane-submediterranean parts of coastal Croatia and the islands (see also Fischer 1974 and the map there). (»*V. spicata*« and »var. *setulosa*« in Rossi 1930, very probably, refer both to *P. barrelieri* as well as »*V. spicata* f. *squamosa*« by KELLER in Trinajstić 1985). It is endemic to the (western?) Balkan Peninsula. — *Ecology*: dry, sunny, rocky, calcareous grassland: class character species of *Festuco-Brometea* (mts Velika and Mala Kapela: Trinajstić & al. 1981), order character species of *Scorzonero-Chrysopogonetalia* (Horvat 1962); *Chrysopogoni-Saturejon* (*Carici-Centaureetum*: Horvat 1931a, Horvat in Horvat & al. 1974; 483; Gaži-Baskova & Šegulja 1978); alliance character species of *Scorzonerion villosae* (Horvatić 1963), association character species of *Bromo-Plantaginietum* (*Bromion erecti*: Horvat in Horvat & al. 1974; 480; Gaži-Baskova & Šegulja 1978), *Ostryo-Carpinion orientalis* (Horvat 1959); companion of *Orno-Quercetum ilicis continetosum* (in W. Istria: Trinajstić & Šugar 1976); *Festucion pungentis* (*Seslerietalia juncifoliae*; Velebit: Horvat 1930).

□ *P. orchideum* (Crantz) T. Wraber (= *V. orchidea* Crantz, *V. spicata* subsp. *orchidea* (Cr.) Hayek, *V. spicata* var. *orchidea* auct.) has often been confused with other species. The main and best diagnostic characters of this good species (Fischer 1974) are the indument of the calyx and of the stem: sepals glandular-pubescent with 0.2—0.5 mm long glandular hairs which are all equal, those on the margin are like those on the surface; upper part of the stem covered with 0.1—0.4 mm long upward curved eglandular hairs. The distincti-

vely twisted long linear corolla lobes, so conspicuous in this taxon, are of dangerous diagnostic value and have been the cause of many misidentifications (and, consequently, wrong evaluation of the taxonomic rank) because similar corollas occur in other species of the group. The colour of the corolla, mentioned in some Floras (e. g. Domac 1984: 310), is not diagnostic either. The flowers of *P. orchideum* exhibit, however, a peculiar smell (like burned hairs at lady's hairdressers in old times) which is diagnostic indeed. The lower leaves are often \pm subglabrous, it is true, but emphasis on this character is responsible for misidentification and confusion with other species, particularly with *P. barrelieri* subsp. *nitens* which has glabrous, shiny and leathery, thickish leaves (\gg I. dosta debeli \ll). \gg *V. orchidea* \ll reported by Rossi (1930) evidently refers to *P. barrelieri*.

There exists some old herbarium material of true *P. orchideum* in herb. ZA and W (herb. SCHLOSSER) from Zagreb (mostly determined as \gg *V. crassifolia* \ll which is the name of a different species in the SE) and from near Zagreb (mt Sljeme) and from localities NE (Čučerje) and E of Zagreb (Križevci) where the present occurrence should be checked. It might be distributed over all the eastern parts of Croatia, the more so since this species, like *P. spurium*, is an element of the Croatian flora well recorded in the old literature (as var. of *V. spicata*: Schulzer v. M. & al. 1866, repeated by Schlosser & Vukotinović 1869 and Neilreich 1870) from E. Slavonia (Čepin and Vukovar). The general distribution range is clearly Pannonic-Pontic, covering the Pannonian Basin and floristically related areas: Vojvodina, N. Bulgaria, Roumania, Ukraine, Hungary, Slovakia, E. Moravia and E. Austria. — *Ecology*: Continental oak forests, periodically moist meadows; but not in dry steppe-like grassland like *P. barrelieri*, *P. pallens* and *P. spicatum*! (Schulzer v. M. & al. 1866, significantly, record *P. orchideum* from forests and vineyards, i. e. habitats not used by the other species of the group!).

● *P. pallens* (Host) M. A. Fischer (= *V. spicata* f. *lanigera* Vandas, *V. incana* sensu auct., non L., *V. spicata* var. *incana* sensu auct.) is a distinct species characterized by its almost tomentose indument of the calyx: particularly the margins of the sepals are densely covered by cob-webby thin, branched, eglandular hairs; glandular hairs are present only on the capsule and in the lower parts of the stem (Fischer 1974). This taxon, like *P. orchideum*, was distinguished already in the beginnings of Croatian floristics but has been confused or united with the much more eastern *P. incanum*. The oldest record of *P. pallens* is for \gg grassy hills \ll near Vukovar (E. Slavonia). There are 3 sheets in herb. ZA, all also from Slavonia, two of them, collected by HIRC, with exact origin localities: Turnašica (NE. slope of mts Bilogora, c. 13 km NW of Virovitica; on sandy soil. 30. 9. 1901) and Lončarski Vis near Kutjevo (Papuk mts) (24. 7. 1894). — *Ecogeography*: Habitats: dry, sunny steppe-like grassland, on sandy soils (?). The 3 localities mentioned above are situated in the climatically most continental parts of Croatia. Turnašica is at the isohyetal line of 900 mm annual precipitation (Bertović 1968, map 1). Virovitica is at the border-line between the (\gg central European \ll) suboceanic *Carpinion betuli illyricum* zone and the subcontinental (\gg steppe forest \ll) *Quercion petraeae* zone (Bertović 1968: map 4) or transitional zone to *Aceri tatarici-Quercion* (Glavač 1968); Vukovar is lying at the border between the *Quercion petraeae* zone and the still more strongly continental *Aceri-Quercion* zone (Bertović 1968,

Glavač 1968). The main distribution area of *P. pallens* covers regions adjacent to the east: Bosnia and parts of Serbia, Vojvodina, W. Bulgaria, where it replaces *P. barrelieri* (Fischer 1974: 37, map). *P. pallens* is a pronouncedly continental species in contrast to the oceanic *P. barrelieri* distributed only in W. Croatia. Further studies in the exact distribution ranges of *P. barrelieri*, *P. orchideum*, and *P. pallens* might result in a convincing illustration of the conspicuous climatological (and vegetational and chorological) gradient ranging from the western over the northern towards the eastern parts of Croatia (climatologically documented e. g. by Bertović 1968: map 4). Other *Veroniceae* species with a \pm pronounced subcontinental chorology are *V. prostrata*, *V. vindobonensis*, *V. dillenii*.

*

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SAŽETAK

RODOVI *PAEDEROTA* I *PSEUDOLYSIMACHION* (*SCROPHULARIACEAE*)
U FLORI HRVATSKE

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Na osnovi revizije herbarskog materijala iz herbarskih zbirki ZA i ZAHO (Zagreb), te W i WU (Beč) donosimo neke ispravke i dopune o prisutnosti i rasprostranjenosti pojedinih vrsta rodova *Paederota* i *Pseudolysimachion* u flori Hrvatske.

Tri vrste koje su se dosad u literaturi navodile vrlo vjerojatno ne dolaze u Hrvatskoj, ili nisu bile dosad sa sigurnošću utvrđene, stoga bi ih trebalo brisati iz flore Hrvatske (označene u tekstu sa **): *Paederota lutea* (= *Veronica lutea*), *P. bonarota* (= *V. bonarota*), *Pseudolysimachion spicatum* (= *V. spicata*) (s. str.). Prema tome rod *Paederota* vrlo vjerojatno ne dolazi na području Hrvatske. Dvije vrste, koje su dosad bile nepoznate, ili su bile zanemarene u modernim standardnim florama, potvrđene su ili zabilježene prvi put (☉): *Pseudolysimachion pallens* (= *Veronica pallens*), *P. spurium* (= *V. spuria*); dvije vrste su još uvijek u izvjesnom smislu problematične (□): *Pseudolysimachion barrelieri* (= *Veronica barrelieri*), *P. orchideum* (= *V. orchidea*). Neriješeni taksonomski i ekogeografski problemi skupne vrste *Pseudolysimachion spicatum* raspravljani su, a navedene su i razlike između *P. longifolium* i *P. spurium*. Ukratko su prikazane ekogeografske (uključujući fitoceno-loške) osobine vrsta koje dolaze na području Hrvatske.

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