

## Notes on *Teucrium* sect. *Polium* (Lamiaceae) in Cyprus

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GEORGIOS HADJIKYRIAKOU &amp; RALF HAND

## Notes on *Teucrium* sect. *Polium* (*Lamiaceae*) in Cyprus

### Abstract

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Revision of an extensive herbarium material and detailed studies of plants in the field and in cultivation revealed that four species of *Teucrium* sect. *Polium* occur in Cyprus, all being endemic: *T. cypricum* is probably closely related to but not conspecific with the Libyan species *T. davaeanum*; *T. kyreniae*, originally treated as a subspecies of *T. cypricum*, is lifted to species rank; *T. karpasiticum*, a micro-endemic of the Karpasia peninsula, is described as new to science and is, probably, closely related to the fourth Cypriot species, *T. micropodioides*, the name of which is typified. Chromosome counts show that all four Cypriot species are tetraploid ( $2n = 26$ ). Their relationships are discussed; indumentum characters support their placement in *T.* subsect. *Rotundifolia*.

Additional key words: *Teucrium karpasiticum*, *Teucrium kyreniae*, taxonomy, endemism, chromosome numbers.

### Introduction

The taxa of *Teucrium* sect. *Polium* Schreb. occurring in Cyprus have been described in detail by Meikle (1985), who accepts two endemic species: *T. micropodioides* Rouy, a widespread taxon found in all of the eight phytogeographical divisions of Cyprus, and *T. cypricum* Boiss. The latter is represented by two subspecies, the nominal taxon, which is restricted to the igneous rocks of the Troodos range, and subsp. *kyreniae* P. H. Davis, which grows in a few places of the Pentadactylos range. Both subspecies are illustrated with excellent drawings by Meikle (1985: t. 78).

Extensive material collected in the last two decades as well as detailed studies of plants in the field and in cultivation revealed new results. There is no need for a complete revision of the section in Cyprus but some questions remained unanswered so far. The following notes intend to supplement Meikle's treatment. Our studies focussed on the following points: (1) How many taxa of *Teucrium* sect. *Polium* do occur in Cyprus? (2) What is the appropriate taxonomic rank for them? (3) Do Cypriot taxa occur outside Cyprus?

## Material and methods

Plants of the investigated Cypriot species have been studied in the field and cultivated under identical conditions for morphological comparisons in the Botanic Garden Berlin-Dahlem. They were raised from seeds collected in the wild. Specimens of adult plants will be preserved in the Garden Herbarium at B.

Besides, the investigation is based on herbarium specimens from B and the personal herbaria of the first author and R. Vogt, as well as on selected material from the herbaria FI, K, LY, MPU and P (herbarium abbreviations after Holmgren & Holmgren 1998-).

Chromosomes were counted in root-tip metaphases of plants cultivated in the Botanic Garden Berlin-Dahlem, following the technique described by Vogt & Aparicio (2000).

Measurements in the morphological descriptions including bracketed values follow the scheme “(minimum) c. 5 percentile – c.95 percentile (maximum)”.

Taxonomy and nomenclature of Cypriot taxa, if not stated otherwise, follow Meikle (1977, 1985) and the supplementary notes on the Cyprus flora edited by the second author (last instalment Hand 2006).

## Results

### 1. *Teucrium karpasiticum*, a new species from Cyprus

Studies by the first author in the Karpasia, the handle-shaped peninsula in the NE of Cyprus, revealed the existence of a taxon new to science. It could not be identified with any known species of *Teucrium* sect. *Polium*, to which it clearly belongs. In the relatively rich collection of E Mediterranean and Near East gatherings at B as well in the literature from these regions (e.g., Boulos 2002; Ekim 1982; Feinbrun-Dothan 1978; King 1988; Mouterde 1978; Siddiqi 1985) no similar taxa could be found. Other taxa occurring in these regions differ in several characters, especially leaf form and crenation, morphology of corolla and calyx, and qualitative indumentum composition.

#### *Teucrium karpasiticum* Hadjik. & Hand, **sp. nov.**

Holotype: “Cyprus, division 8 (sensu Meikle 1977, 1985), Kastros at Akrotiri Apostolou Andrea, flat place with scattered subshrubs and herbs about 100 m from the coastline, c. 10 m”, 17.7.2005, *Hadjikyriakou* 6767 (B; isotypes: B, CYP, FI, MPU, P, herb. *Hadjikyriakou*).

Differt a *Teucrio micropodioide* indumento caulium pilis plus minusve patentibus (non semper adpressis), inflorescentiis adultis elongatis (non globosis vel semiglobosis), nuculis 1.5 mm (non 1.8 mm) longis.

*Much-branched subshrub* forming low, intricate, diffuse or domed bushes 5-20 cm high; stems up to 25 cm long, greenish-brownish; old wood brownish to greyish, usually fissured. *Current year's shoots* of two kinds: (1) fertile shoots spreading or ascending, with a very dense indumentum of laxly adpressed or spreading, with age sometimes closely adpressed, crisped or non-crisped hairs, terete or subterete, at first simple, lengthening up to 15(-20) cm, each ending in a paniculate or corymbose inflorescence of capitula, occasionally capitula solitary and terminal; persisting, and becoming leafless, remaining white-hairy after the first year, with prominent leaf-scars; (2) sterile shoots born in the axils of the lower leaves of the fertile shoots, with the same indumentum, terete or subterete, lengthening usually up to 5(-10) cm, with closely arranged leaves and short internodes, remaining alive after the inflorescence of the fertile shoots becomes dry; short shoots bearing tufts of reduced leaves present in the leaf axiles of the fertile and sterile shoots. *Leaves* very shortly petiolate or sessile; lamina 6-11(-18) × 3-8.5(-10) mm, variously shaped when fully open; lamina of the first spring leaves on the young fertile shoots larger, obovate-rhombic to almost orbicular, flattish with slightly recurved margins; lamina of the leaves appearing at a later stage usually obovate or oblanceolate, with strongly recurved or revolute margins; margins crenate in the upper third to half of the lamina, with 1-4(-6) crenations on each side and an apical tooth, in the lower, cuneate part entire or somewhat sinuate-undulate; upper surface dark green

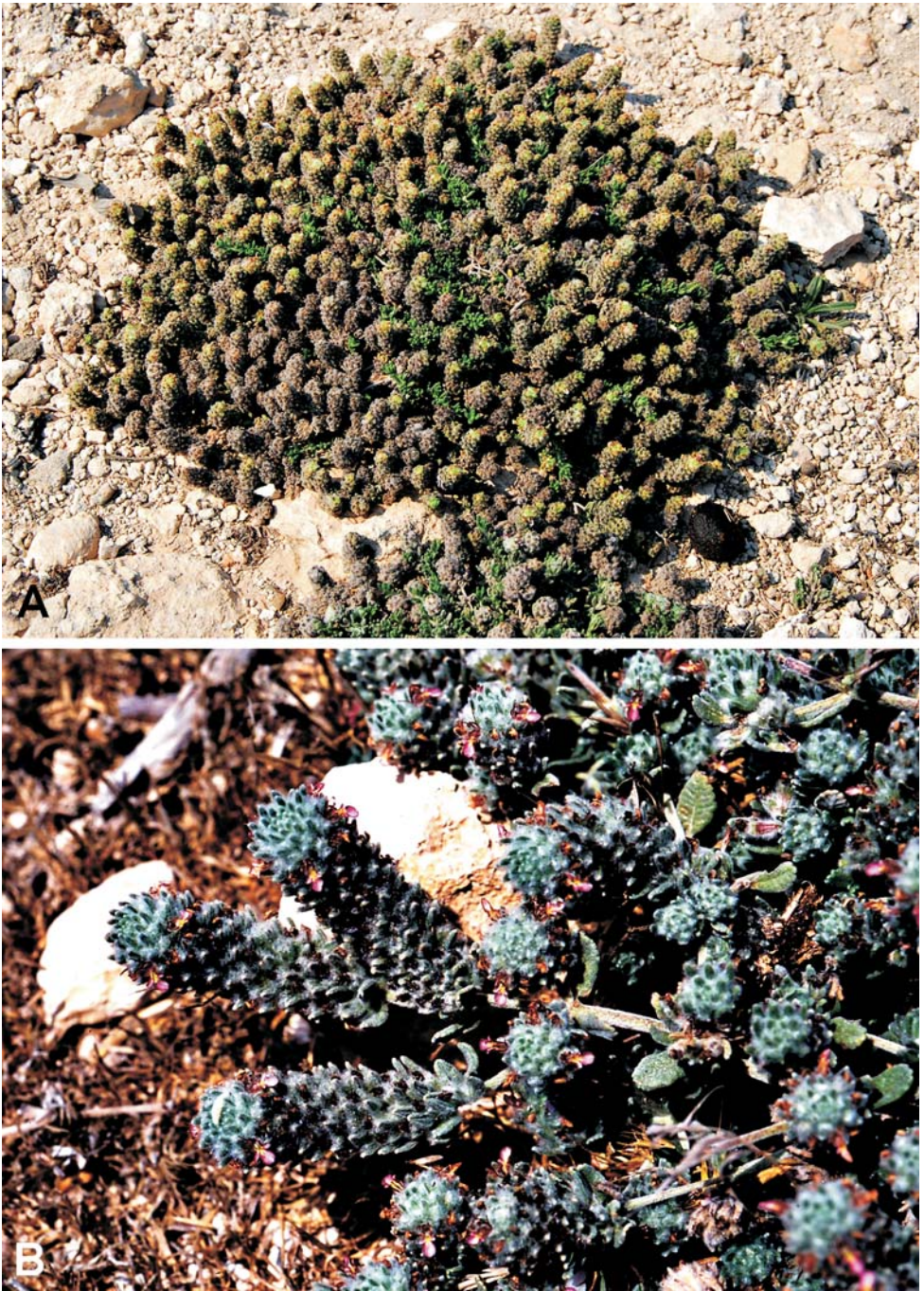


Fig. 1. *Teucrium karpasiticum* – A: habit of a plant in its typical coastal habitat at the type locality; B: elongated inflorescences and characteristic leaves of the fertile shoots, plant from type locality. – Photographs by G. Hadjikyriakou, A on 18.8.2007, B on 19.6.2004.

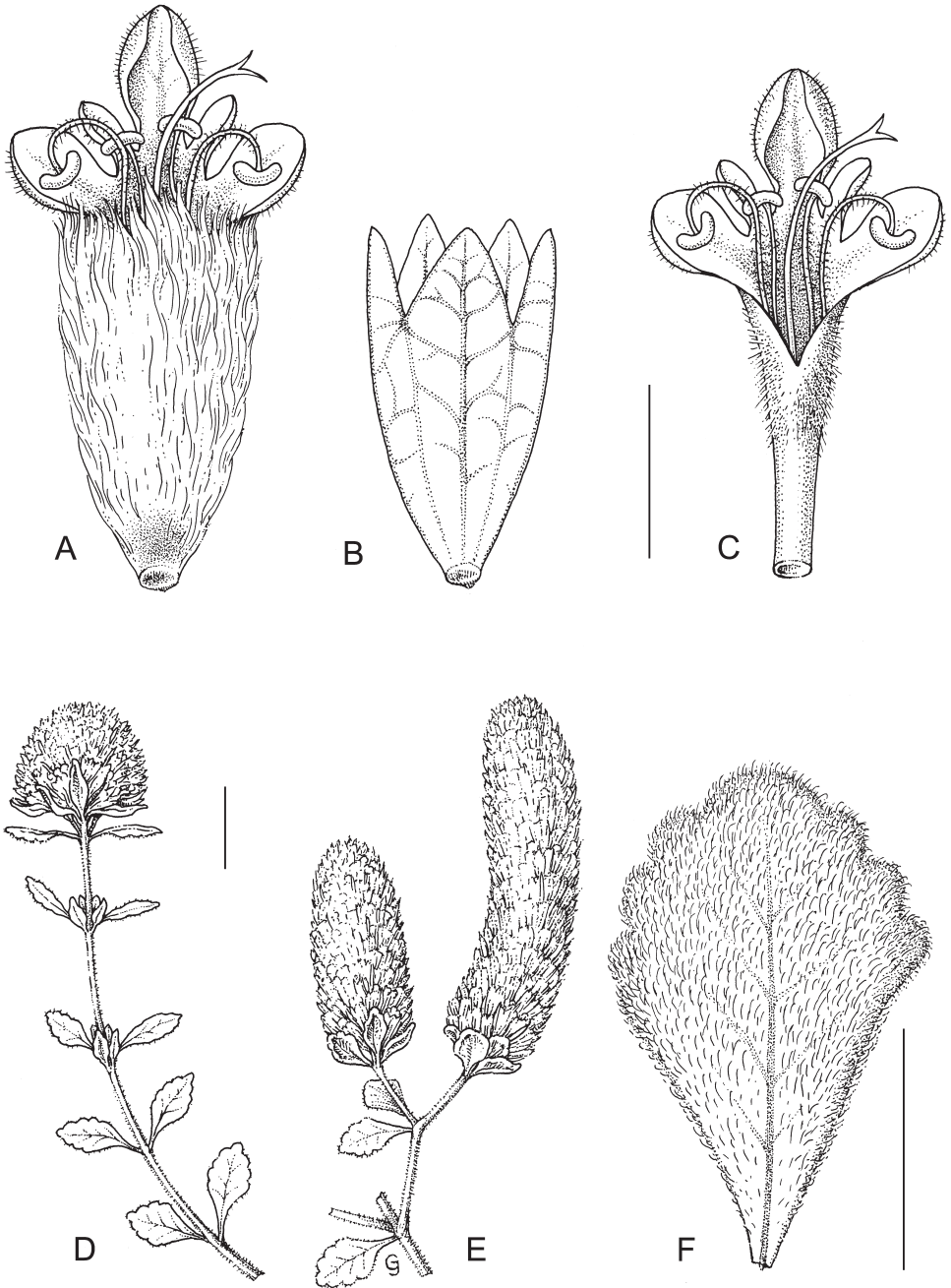


Fig. 2. *Teucrium karpatiticum* – A: flower; B: calyx, indumentum removed; C: corolla; D: young inflorescence; E: inflorescences by the end of the flowering season; F: typical spring stem leaf. – Scale bars: A-C = 2 mm, D-E = 1 cm, F = 5 mm; after material from the locus typi drawn by Gisela Jahrmärker.

with white, adpressed, crisped, short or long hairs, with shining glands and with the median nerve usually prominently impressed and the lateral nerves prominently to slightly impressed; lower surface more densely white-tomentose, with shining glands and prominent nervation. *Internodes* on fertile shoots usually longer than the leaves; internodes of the sterile shoots usually shorter than the leaves and, chiefly in autumn and winter, very short and the very closely arranged leaves appearing tetrastichous. *Flower heads* (capitula) initially globose, usually lengthening with age, becoming cylindric or subcylindric, less often conical or subconical,  $10\text{-}55 \times (8\text{-})10\text{-}13$  mm; very rarely flower heads with very few flowers; commonly arising singly on short or long lateral shoots from the axils of cauline leaves forming generally lax paniculate or corymbose inflorescences, sometimes solitary at the top of the flowering shoots; axillary capitula-bearing shoots with lax, reduced leaves and occasionally with smaller axillary flower heads below the terminal elongate head. *Flowers* sessile, subsessile or with pedicels about 0.5 mm long, the lower progressively drying out as soon as new flowers arise at the top of the lengthening flower head. *Bracts* foliaceous, smaller than the leaves, narrowly oblanceolate, obovate, spatulate or ovate, flat or with recurved margins,  $0.5\text{-}2 \times 3$  mm when fully open, about equalling or longer than the flowers; upper surface dark green, villose, with smaller glandular hairs and gland-dotted; lower surface more densely white-tomentose, with shorter glandular hairs and densely gland-dotted; margins sometimes with 1-2 pairs of small apical teeth, otherwise entire or subentire; apical tooth recurved. *Bracteoles* absent. *Calyx* tubular,  $(3.5\text{-})4.2\text{-}5.5\text{-}(5.8)$  mm, slightly lengthening in fruiting stage to  $5\text{-}5.6\text{-}(6.4)$  mm; *tube*  $3\text{-}3.5 \times 2\text{-}2.5$  mm, 5-nerved, curved, gland-dotted and villose-lanuginose, with shorter glandular hairs externally and sparse, short, subadpressed hairs internally; *teeth* somewhat unequal, hidden by hairs, gland-dotted and villose-lanuginose with shorter glandular hairs externally and up to some distance from the margins internally, except for the region of the veins with small glandular hairs only; abaxial teeth deltoid, somewhat acuminate,  $0.8\text{-}1.3 \times 0.7\text{-}1$  mm, adaxial teeth about  $0.8\text{-}1.2 \times 1\text{-}1.5$  mm. *Corolla* pink or purplish; external surface gland-dotted and thinly to densely pubescent above, glabrous at the lateral and basal lobes, subglabrous to glabrous towards the base; internal surface gland-dotted and thinly to densely pubescent at the throat, subglabrous to glabrous towards the base, glabrous at the median, lateral and basal lobes; *tube*  $2.5\text{-}3.5 \times 1.2\text{-}1.5$  mm, slightly curved; *limb* 4-6 mm long, basal lobes semicircular,  $0.8\text{-}1 \times 0.8\text{-}1$  mm, lateral lobes adpressed to the median lobe, oblong, c.  $(0.56\text{-})0.64\text{-}0.88\text{-}(1.04) \times 0.4\text{-}0.56$  mm, median lobe  $1.5\text{-}2.5 \times 1.5\text{-}1.7$  mm, somewhat cucullate. *Stamens* inserted at mouth of corolla tube, exerted; filaments purple, thinly pilose, the adaxial two c. 2.5 mm long, the abaxial two c. 3.5 mm long; *anthers* purple,  $(0.5\text{-})0.6\text{-}0.8$  mm long. *Ovary* glabrous, c. 0.7-1 mm long; style glabrous, c. 5-6 mm long; stigmatic lobes subulate, subequal, 0.3-0.5 mm long. *Nutlets* somewhat cochleariform to obovate, c. 1.5 mm long, rounded at apex, wedge-shaped at base, dark brown to blackish, granulose, distinctly reticulately veined and foveolate, attachment area flat, suborbicular, c. 0.8 mm in diameter, adjacent to the attachment area convex.

*Illustrations.* – Fig. 1-2 and electronic supplement; Hadjikyriakou (2007: 248).

*Etymology.* – The epithet *karpasiticum* is the Latinized form of the Greek karpasitikon (Καρπασίτικον), an epithet attributed to something that occurs at, or comes from Karpasia peninsula.

*Comparison with other species.* – Probably, the closest relative of the new species is *Teucrium micropodioides*, which differs in the structure of the inflorescence (capitate), leaf form (linear-oblong to oblong) and indumentum (white-tomentose, closely adpressed; see also detailed description by Meikle 1985). The conspicuously elongating, dense inflorescences of *T. karpasiticum* are not found in other Cypriot taxa. It is a constant character and not induced by ecological factors as in some other taxa of *T.* sect. *Polium*.

In particular regarding the inflorescence structure, some taxa of *Teucrium* sect. *Polium* of the E Mediterranean demand a closer look.

Occasionally, *Teucrium polium* (incl. *T. capitatum*, which is not accepted by many authors) produces unusually long racemes instead of more or less globose inflorescences. The Berlin herbarium (B) keeps such specimens, e.g., from France, Bulgaria and Turkey. Additionally, such elongation is mentioned by Puech (1976) for W Mediterranean and by King (1988) for Saudi Arabian plants (see also illustration by Collenette 1999). Sometimes, these plants were named, e.g., by Bornmüller (1888), who found populations with elongated inflorescences in Bulgaria (*T. polium* var. *racemiflorum*) but always together with typical plants and intermediates.

Other superficially similar taxa with dense, elongated racemes have been described from Libya: *Teucrium polium* f. *comosum* and f. *spicatum* (Pampanini 1914); syntype of the latter: [Libya] “Garian: Uadi Garian sul Ras Ometeba”, 29.4.1913, *R. Pampanini 4118* [FI photo !]; *T. zanonii* (Pampanini 1917) from Libya, which is accepted in recent floras (Brullo & Furnari 1979; Siddiqi 1985), is a white-flowered species characterized by the occurrence of branched hairs, consequently to be placed in *T.* subsect. *Polium* (holotype?: [Libya, Bengasi] “Cimitero Nuovo”, 26.4.1916, *V. Zanon 580* [FI photo!]; part of the specimen also depicted by Pampanini 1930).

However, none of these E Mediterranean taxa is conspecific with *Teucrium karpasiticum*. According to Navarro (1995) and Navarro & El Oualidi (2000b) presence or absence of branched hairs in the genus has an important infrageneric phylogenetic significance. No stellate, dendroid or dendritic trichomes could be found in *T. karpasiticum* (nor in the other three Cypriot species of *T.* sect. *Polium*). This speaks in favour of placing the new species in *T.* sect. *Polium* subsect. *Rotundifolia* (see 6., below).

It may prove that specimens “with abnormal inflorescences on secondary growths” already mentioned by Meikle (1985) represent *Teucrium karpasiticum*; otherwise they may be similar to the plants found at Orga (see 4., below).

*Distribution, habitat, ecology and conservation.* – *Teucrium karpasiticum* was first located at Kastros, at the extreme end of Karpasia peninsula, about 4 km NE of Apostolos Andreas monastery. Further investigations showed that it occurs in the area between Kastros and the eastern outskirts of Rizokarpaso in an area of about 90 km<sup>2</sup>. Scattered plants also occur at the western edge of Ronas bay sand dunes (3 km W of the village), sympatric with *T. micropodioides*. The geological substrate is variable, dominated by greywacke, marls, siltstones, sandstones and conglomerates of the Kythrea and Apalos-Athalassa-Kakkaristra formations as well as Terrace deposits (calcarenes, sands and gravels). Generally, the habitat types (according to Directive 92/43 EEC) are: 2250 coastal dune juniper thickets with *Juniperus phoenicea*; 2260 dune sclerophyllous scrubs; 5212 *Juniperus phoenicea* arborescent matoral; 5330 thermo-Mediterranean and pre-desert scrub; 5420 *Sarcopoterium spinosum* phrygana; 6220 pseudo-steppe with grasses and annuals (priority habitat type); and 9560 endemic Mediterranean forests with *Juniperus phoenicea* (priority habitat type). Apart from *Juniperus phoenicea*, which is the dominant species, *Pistacia lentiscus*, *Ceratonia siliqua*, *Coridothymus capitatus*, *Sarcopoterium spinosum*, *Urginea maritima*, *Asphodelus aestivus* and other bulbous plants are present.

Compared to the other taxa of *Teucrium* sect. *Polium* in Cyprus, *T. karpasiticum*, a more or less coastal taxon, has a very prolonged flowering season. Flowering starts in May and even in extremely hot summers, as the one of 2007, flowering plants can be found till late August. However, in mild summers flowering usually extends till October. The other taxa ascending up to the submontane and montane zone finish flowering by the end of July.

Potential threats for *Teucrium karpasiticum* are forest fires, tourism, grazing, military installations, road construction and forestry operations. At the moment, there is no need for conservational activities.

## 2. The taxa of *Teucrium cyprium* s.l. – subspecies or species?

As already pointed out by Meikle (1985), differences between *Teucrium cyprium* subsp. *cyprium* and subsp. *kyreniae* are “perhaps more obvious in the field than in the herbarium”. Subspecies

*cyprium* is widespread, but nowhere really common, on igneous, rocky ground of the Troodos range from about 500 m altitude up to the highest summit reaching nearly 2000 m. Plants are to be found in open, often rocky phrygana and in open pine forests (*Pinus brutia*, *P. nigra* subsp. *pallasiana*) but the species is no chasmophyte. The existence of two forms (woodland and exposed sunny habitats respectively; Jackson 1937) seems to be doubtful (see Davis in Burt & Davis 1949). Subspecies *kyreniae* is restricted to shaded or semi-shaded limestone crevices of the Pentadactylos range. It is a typical chasmophyte of the more or less vertical cliffs and never to be found on debris, screes or rocky ground at the base of the cliffs.

Meikle (1985) could not find useful differences in the size or shape of the calyx teeth or in the colour of flowers. According to Meikle (1985) both taxa differ merely in leaf size and in diameter of the capitula.

However, subspecies *kyreniae* has always milky white flowers tinged or streaked yellowish green, whereas subspecies *cyprium* has mostly pink or purplish, rarely pale yellow or white flowers. Another character well known to field botanists and more or less visible in herbarium specimens is the different colour of the leaves. Subsp. *cyprium* always has greyish green leaves obviously caused by the denser indumentum, whereas the leaves of subsp. *T. kyreniae* have a light green, somewhat yellowish appearance. The yellowish tinge is caused by the less dense indumentum making the glandular hairs better visible. In addition, the leaf surface often is more yellowish green than in subsp. *cyprium*. Single hairs have an identical colour in both taxa. These differences are demonstrated in colour photos published by Hadjikyriakou (2007: 246, 247) and in the electronic supplement to the present paper at [www.bgbm.org/willdenowia/willd38/hadjikyriakou+hand.htm](http://www.bgbm.org/willdenowia/willd38/hadjikyriakou+hand.htm).

The plants cultivated under identical conditions in the Botanic Garden Berlin-Dahlem clearly showed that differences in the colouration are genetically fixed. Even in very young plants the different colours are retained. At the same age plants also have leaves of different size, which coincides with the situation in the field. Even another leaf character is conserved in plants grown side by side: subsp. *kyreniae* has flattish leaves, whereas the leaves of subsp. *cyprium* are only initially flattish and then involute independently from water supply.

Endemism of taxon pairs in the two mountain ranges Troodos and Pentadactylos is a well-known phenomenon. Similar instances of parallel endemics are mentioned by Davis (in Burt & Davis 1949). Some examples are: *Onosma troodi* – *O. caespitosum*, *Phlomis cypria* subsp. *occidentalis* – subsp. *cypria*, *Scutellaria cypria* – *S. sibthorpii*.

As in island endemics and their mainland counterparts it is always difficult to decide how to rank these allopatric taxa. Generally, there is no possibility to check their behaviour in contact zones because their areas in the mountains of Cyprus are separated by the Mesaoria plain. However, the differences between subsp. *cyprium* and subsp. *kyreniae* (Table 1) compared to closely related taxa provide sufficient evidence to justify specific rank for both taxa.

***Teucrium kyreniae*** (P. H. Davis) Hadjik. & Hand, **comb. & stat. nov.**  
 ≡ *Teucrium cyprium* subsp. *kyreniae* P. H. Davis in Kew Bull. 4: 111. 1949

Table 1. Important differentiating characters of *Teucrium cyprium* and *T. kyreniae*.

	<i>T. cyprium</i>	<i>T. kyreniae</i>
colour of leaves (at least in living plants)	greyish green	light green often tinged yellowish
leaf length [mm]	(5.5-)6.5-9.5(-10)	(8.5-)10-15(-16.5)
calyx length, fruiting stage [mm]	(4.5-)4.6-5.9	(6-)6.3-7(-7.5)
adaxial calyx teeth, length [mm]	1.2-1.4(-1.6)	1.7-2
lateral lobes of corolla length × width [mm]	0.9-1.1 × 0.2-0.5	1.3-1.6 × 0.9-1



### 3. Typification of the name *Teucrium micropodioides*

The holotype of *Teucrium micropodioides* Rouy is the single specimen with two mounted plants, a determination slip in Rouy's hand and the handwritten diagnosis, preserved with Rouy's personal herbarium at LY. The label reads "Sintenis et Rigo Iter Cyprium 1880. 566. *Teucrium polium* L. var. *purpurascens* DC. In vineis pr. Galata 16/6". It perfectly fits the protologue by Rouy (1882). A specimen at B has a nearly identical label "in vineis prope monastir. Galata" collected in June 1880 and numbered identically; it represents an isotype. As already suspected by Meikle (1985) there is some confusion in the labelling of the Cypriot exsiccatum *Sintenis & Rigo 566*. All the material Meikle found is labelled "In montibus circa Kythraea", a village far away from Galata. Two such specimens are kept at K. We agree with Meikle (1985) that an occurrence of the species in the vicinity of Galata on igneous rocks of the Troodos range is rather improbable. Very probably, holotype and the isotype at B (other isotypes may well exist) are mislabelled as regards the locality. Since the specimens numbered "566" but labelled to come from "Kythraea" (as, e.g., preserved at K) do not agree with the label citation in the protologue, they may not be regarded as isotypes but may be the only gatherings labelled correctly.

### 4. Hybridisation and introgression among *Teucrium* sect. *Polium* in Cyprus?

Generally, Cypriot plants of *Teucrium* sect. *Polium* are easily diagnosable by discontinuous characters. Exceptionally, we have found plants in two regions of Cyprus that seem intermediate in several characters and may be of hybrid origin or results of introgression: (1) near Orga close to the N coast of Cyprus and (2) in the Akamas peninsula in the W of Cyprus as well as in the adjacent pre-Troodos hills.

#### (1) Orga population

This population restricted to a few m<sup>2</sup> shows a typical set of *Teucrium micropodioides* characters except for the structure of the inflorescences. Some, not all inflorescences of a plant are elongated (up to 28 mm), resulting in an appearance superficially similar to *T. karpatiticum*. Also the extent of the flowering period coincides with that of the latter species (see Specimens, below). Orga is situated more than 100 km WSW of the area of the latter taxon. It seems rather improbable that the plants are recent hybrids between these taxa. We do have two explanations. The plants may represent a very rare form of *T. micropodioides* with elongated inflorescences, or they are relicts of introgressive processes in the past, indicating that *T. karpatiticum* once was more widespread along the northern coast of Cyprus.

#### (2) Akamas populations

The plants in question are characterized by a set of characters qualifying them as hybrids between the two parent species *Teucrium cyprium* and *T. micropodioides*. They often have intermediately shaped leaves (broadly oblong, intermediate type of crenation) or tend to be similar to the presumed parental taxa in this respect. But all plants are characterized by a highly variable indumentum: more or less erect hairs on young stems changing to a closely adpressed indumentum in older stems (see Specimens, below, and see Electronic supplement).

The geology of Akamas and adjacent parts of Cyprus is highly varied, often presenting a mosaic of small serpentine outcrops surrounded by several types of limestones. Probably, this situation favours hybridisation. *Teucrium micropodioides* is not rare in this part of Cyprus but typical plants of *T. cyprium* could not be found, which supports the hypothesis that the former may be the more competitive representative of the genus.

Akamas is well known for isolated occurrences of otherwise strictly montane species preferring the igneous rocks of the Troodos range. Examples are *Arenaria rhodia* subsp. *cypria*, *Cynosurus echinatus* and *Orchis anatolica* s.l. Possibly, *Teucrium cyprium* once colonized this part of Cyprus and may subsequently have come under pressure by the more successful *T. micropodioides*. We refrain from naming this probable hybrid. Our remarks should help to focus further research especially with molecular methods; morphometrics and cytology do not provide useful tools in this case.

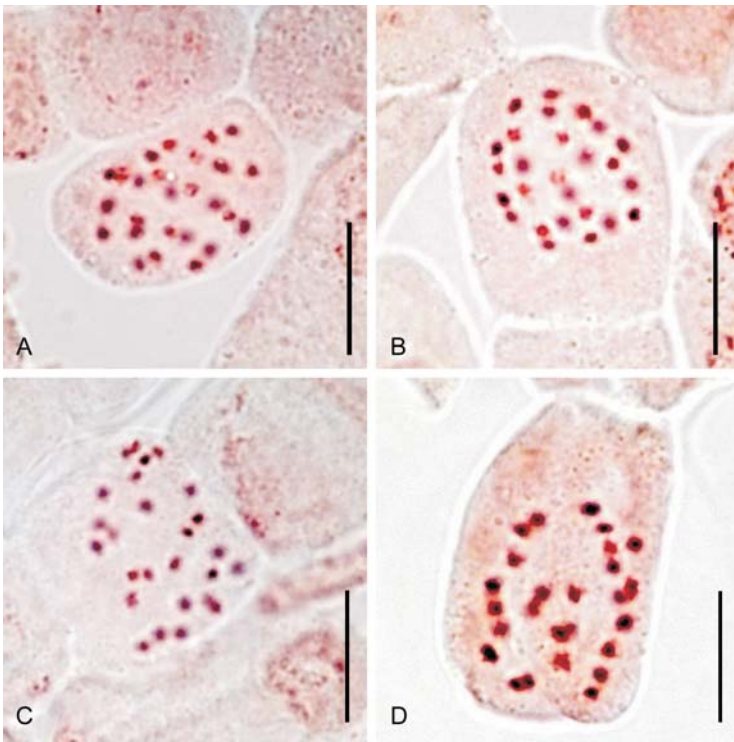


Fig. 3. A: *Teucrium micropodioides* – root-tip metaphases, showing  $2n = 26$  chromosomes; B: *T. cyprium* – root-tip metaphases, showing  $2n = 26$  chromosomes; C: *T. karpasiticum* – root-tip metaphases, showing  $2n = 26$  chromosomes; D: *T. kyreniae* – root-tip metaphases, showing  $2n = 26$  chromosomes. – Scale bars = 10  $\mu\text{m}$ .

Generally, presumed hybrids are rare though Cypriot taxa occur locally sympatrically but with differing ecological requirements. Also, there is a long line of potential contacts along the border of the Troodos igneous rocks and the surrounding limestones, however, without notable hybridisation.

## 5. Cytology

According to our chromosome counts, all four species of *Teucrium* sect. *Polium* in Cyprus are tetraploid with  $2n = 26$ :

*Teucrium cyprium* Boiss., s.str. –  $2n = 26$

Cyprus: Above Kryos Potamos bridge, flat stony place, roadside, 1550 m, 19.8.2006, G. Hadjikyriakou, BG Berlin-Dahlem acc. no. 016-07-07-10 (Fig. 3A); Armyrolivadon, rocky, small openings in *Pinus nigra* forest, 1620 m, 19.8.2006, G. Hadjikyriakou, BG Berlin-Dahlem acc. no. 016-08-07-10, 3 individuals counted.

This is the first chromosome number report for this taxon.

*Teucrium karpasiticum* Hadj. & Hand –  $2n = 26$

Cyprus: Kastros Akrotiri Apostolou Andrea, 10 m, 20.8.2005, G. Hadjikyriakou, 2 individuals counted (Fig. 3B).

This is the first chromosome number report for this taxon.

*Teucrium kyreniae* (P. H. Davis) Hadj. & Hand –  $2n = 26$

Cyprus: Above Antifonitis, 500 m, rock crevices, 5.8.2006, G. Hadjikyriakou, BG Berlin-Dahlem

acc. no. 016-02-07-10, 4 individuals counted; *ibid.*, 600 m, rock crevices, 5.8.2006, *G. Hadjikyriakou*, BG Berlin-Dahlem acc. no. 016-01-07-10, 2 individuals counted (Fig. 3C); cliff E of Lefkoniko pass, 250 m, rock crevices, 5.8.2006, *G. Hadjikyriakou*.

Providing the single previous count for a Cypriot taxon of *Teucrium* sect. *Polium*, Yıldız & Gücel (2006 under *T. cyprium* subsp. *kyreniae*) reported  $2n = 14$  (the accompanying photograph is suboptimal), which is very unusual for *T.* sect. *Polium* (see Navarro & El Oualidi 2000a) and *Teucrium* in general, and deviates considerably from our results for plants from the same region.

*Teucrium micropodioides* Rouy –  $2n = 26$

Cyprus: Stavri, old forest station between Ardana and Flamoudi, roadside, 500 m, 12.8.2006, *G. Hadjikyriakou*, BG Berlin-Dahlem acc. no. 016-04-07-10, 4 individuals counted; Kantou to Souni, among low shrubs, 20.6.2006, *G. Hadjikyriakou*, BG Berlin-Dahlem acc. no. 016-05-07-10; 2 km NW of Flamoudi, among low shrubs, 30 m, 12.8.2006, *G. Hadjikyriakou* (Fig. 3D).

This is the first chromosome number report for this taxon.

## 6. Relationships of the Cypriot species of *Teucrium* sect. *Polium*

Our studies in the extensive Mediterranean collections of *Teucrium* sect. *Polium* in B as well as literature studies revealed that all four Cypriot species clearly differ from other taxa occurring in the Mediterranean area, the Near East and Arabia, and are therefore endemics of the island.

As far as *Teucrium micropodioides*, the most widespread of the Cypriot species, is concerned, already Meikle (1985) stated that it “has yet to be discovered outside Cyprus”. Macro-morphologically, Meikle’s (1985) hypothesis that its nearest relatives could be found among segregates of the *T. polium* group is fully confirmed by us. Candidates could be *T. alpestre* Sm., *T. gracile* W. Barbey & Major and *T. cuneifolium* Sm. from Crete and the S Aegean islands. The few published data on the indumentum of the former two and their subsectional placement are somewhat contradictory (see Navarro & El Oualidi 2000a, 2000b; for data on the variability of Aegean taxa see Strid 1965).

The status of *Teucrium cyprium*, however, whether being endemic or conspecific with the Libyan endemic *T. davaeanum* Cosson (1889), has remained uncertain. Durand & Barratte (1910) compared both taxa by illustrating slight differences regarding leaf shape and flower structure. Jackson (1937), who published another set of detailed *T. cyprium* illustrations (but see Davis in Burtt & Davis 1949 on calyx illustration), discussed diagnostic characters critically but due to the lack of authenticated *T. davaeanum* specimens refrained from treating both taxa as conspecific. Davis (in Burtt & Davis 1949) who also did not have the opportunity to examine material of *T. davaeanum* was not convinced that both taxa are conspecific. Trichome type descriptions in more recent floras are somewhat contradictory and unclear. Brullo & Furnari (1979) found simple hairs only, at least on the calyx. On the other hand, Siddiqi (1985) mentions “soft spreading branched hairs” for younger branches and depicts the same type of hairs for the leaves. Obviously, the taxon investigated by him is not identical with *T. davaeanum* (holotype: [Libya] “In Cyrenaica ad Benieh et Labiar”, 7.1875, *Daveau* [P!]), because the type specimen does not have a single branched hair. The indumentum of *T. davaeanum* consists – as in *T. cyprium* and *T. kyreniae* – of clavate and sessile glandular and simple, unbranched trichomes. Because of the suboptimal conservational stage of the specimen only a limited number of measurements could be taken by the second author to avoid further damage: leaves 6.5-7.5 mm long, crenate mostly in the upper two thirds, sometimes only the upper half, apart from the apical lobe with 3-4 teeth per side; calyx 5.5-6.5 mm long, its teeth 1.6-2.1 mm long; lateral corolla lobe 0.8-1 mm long. There is a certain overlap in some characters with *T. cyprium* and *T. kyreniae*. But as already pointed out by some of the listed authors, leaf structure of *T. davaeanum* differs markedly by being strongly bullate, a character never been observed in any of the Cyprus taxa; leaf crenation also differs clearly. Therefore we conclude that *T. davaeanum* certainly is not conspecific with any of the Cypriot taxa.

*Teucrium cypricum* shows even more morphological similarities to *T. hijazicum* Hedge & R. A. King (in King 1988) from the mountains of western Saudi Arabia. According to these authors both taxa differ only by calyx shape and corolla characters (e.g., lateral lobes of the latter). The presumed relationship between the two taxa has been confirmed by Navarro & El Oualidi (2000b), studying in detail the trichome morphology. They revealed that both taxa share the same trichome types (clavate and sessile glandular and several subtypes of simple, unbranched trichomes) but differ slightly in the distribution of them (calyx, leaves, corolla lip and lobes). Morphologically, *T. cypricum* is closer to *T. hijazicum* than to *T. kyreniae* but it seems rather improbable that this reflects the phylogenetic relationship. In *T. hijazicum*, the leaf colour seems to be intermediate compared to the two Cypriot taxa (see photograph in Collenette 1999). The plant depicted also has reddish tinged calyces, a colour never been observed in the Cypriot taxa. Furthermore, the lip base is bright yellow, contrasting to the pale yellow remainder of the lip. In contrast, the lip of *T. cypricum* is mostly pink or purple, rarely pale yellow or white, whereas the lip of *T. kyreniae* is milky white and tinged or streaked with yellowish green at the base.

Previous studies of the trichomes (Navarro & El Oualidi 2000a-b) showed that at least *Teucrium cypricum* is a member of *T. sect. Polium* subsect. *Rotundifolia*, a taxon encompassing, apart from the widespread *T. montanum* L., mainly Iberian, N African and Arabian taxa (Navarro & El Oualidi 2000a-b). According to our studies, the other Cypriot taxa share the same types of trichomes and should consequently be treated as members of subsection *Rotundifolia* as well. We cannot confirm the contradicting placement of the Cypriot *T. micropodioides* and the Libyan *T. davaeanum* by Navarro & El Oualidi (2000a) in subsect. *Polium*, which is characterized by, e.g., branched hairs, which are absent in either species. Obviously, the E Mediterranean taxa of *T. sect. Polium* are in urgent need of a systematic revision.

Whatever the true relationships of the Cypriot taxa may be, the Cypriot species agree with *Teucrium* subsect. *Rotundifolia* in their habitat preferences. Members of this subsection occur primarily in microclimatically hot habitats, on cliffs, rocks, especially on serpentine, as well as in maritime environments, avoided by other taxa of the genus (see Navarro 1995). Obviously evolution of micro-endemics is stimulated in such habitats. *T. micropodioides* is exceptional in being not only widespread in the Cypriot lowlands and medium altitudes but also a very common element of the phrygana. It seems to replace *T. polium* s.l., a widespread Mediterranean element not known to occur in Cyprus, ecologically.

Whether the Cypriot taxa have a common ancestor cannot be answered by morphological studies alone. AFLP analyses indicate that all species from Cyprus are extremely closely related (E. Zippel, Berlin, pers. comm.); additional molecular studies are planned for the near future.

## 7. Key to the Cypriot species of *Teucrium* sect. *Polium*

1. Majority of leaves linear-oblong to oblong (when spread out), often with nearly parallel sides; shoots white-tomentose of closely adpressed hairs . . . . . *T. micropodioides*
- Majority of leaves obovate, ovate to almost orbicular (when spread out); shoots ± brownish or greenish, mostly with spreading or laxly adpressed hairs, rarely partly with closely adpressed hairs, then inflorescences lengthening with age . . . . . 2
2. Inflorescence elongated, much longer than broad, lengthening with age; nutlets c. 1.5 mm long . . . . . *T. karpasiticum*
- Inflorescence capitate, nearly as long as broad, not lengthening with age; nutlets c. 2 mm long . . . . . 3
3. Plant greyish green, calyx (fruiting) < 6 mm long, lateral corolla lobes < 1.2 mm long . . . . . *T. cypricum*
- Plant light green tinged yellowish, calyx (fruiting) > 6 mm long, lateral corolla lobes > 1.2 mm long . . . . . *T. kyreniae*

*Note.* – Possible hybrids combine characters of key alternatives (see 3.4.).

**Specimens of Cypriot species of *Teucrium* sect. *Polium* studied**

Divisions are sensu Meikle (1977, 1985), herb. GH = herb. G. Hadjikyriakou

*Teucrium cyprium*

Division 2: Kampos, Prasinoudi, Limnitis valley area, c. 2 km WNW of the village, mineral rich rocky banks of the track, c. 700 m, 5.5.2005, *Hand 4818 & Hadjikyriakou* (B); *ibid.*, Agia Anastasia SW above village, semi-open slope with scattered trees at the watertank, 780 m, 20.5.2005, *Hand 5053 & Hadjikyriakou* (B); Stavros tis Psokkas, Selladi tis Mosfilias, along track towards W, first 200 m from main road, c. 850 m, 29.4.2007, *Hand 5282* (B); Kannaviou, Argaki tis Agias valley above the road to Panagia, downstream of the second bridge, c. 450 m, 21.4.1998, *Hand 2240* (B); Madhari [sic], 5000 ft – summit, 17.7.1940, *Davis 1876* (B); Agios Theodoros, pass at the road to Zoopigi, along track going to SE, open pine forest, c. 1200 m, 7.5.2005, *Hand 4842* (B); Prodomos, dry rivulet crossing track c. 800 m NNE West Shoulder, rocky slope, scree, c. 1500 m, 17.5.2005, *Hand 5003* (B); Chionistra, 5500 ft., summit, 9.7.1940, *Davis 1811* (B), *ibid.*, rocky slope with *Pinus nigra* subsp. *pallasiana*, c. 1800 m, 9.7.1988, *Hadjikyriakou 48* (herb. GH); N of Chionistra, among open *Quercus alnifolia*, c. 1700 m, 6.7.2005, *Hadjikyriakou 6727* (herb. GH); In sylvis montis Troodos, 7.1880, *Sintenise & Rigo 724* (B); Troodos, 8.8.1898, *Post* (B); Armyrolivado, rocky slope with *Pinus nigra* subsp. *pallasiana* and *Quercus alnifolia*, c. 1600 m, 24.6.1988, *Hadjikyriakou 22* (herb. GH); *ibid.*, rocky slope, c. 1600 m, 7.7.2005, *Hadjikyriakou 6731* (B, herb. GH); Arkogadaroï Limnitis valley, pine forest, c. 700 m, 28.3.2005, *Hadjikyriakou 6196 & Hand* (B, herb. GH); Alona - Selladi tis Papoutsas, slope with *Quercus alnifolia*, c. 1380 m, 2.6.2005, *Hadjikyriakou 6498* (B, herb. GH). – Division 3: Dierona, c. 5.3 km towards Akrounta, rivulet above road, stony rivulet, c. 590 m, 28.4.1999, *Hand 2941* (B).

*Teucrium karpasiticum*

Division 8: Rizokarpaso, at the road near Kamenos forest SE Agios Filon at Agridia, grazed phrygana, c. 30 m, 29.4.2005, *Hand 4744 & Hadjikyriakou* (B); *ibid.*, Ormos tou Rona, S part, between coast and road, rocky phrygana, c. 20 m, 29.4.2005, *Hand 4738 & Hadjikyriakou* (B); Ronas valley sand dunes, along stream 100 m from the coast, c. 4 m, 17.7.2004, *Hadjikyriakou 6151* (B, herb. GH); *ibid.*, sand dunes, c. 3 m, 17.7.2004, *Hadjikyriakou 6152* (B, herb. GH); 3 km E of Rizokarpaso, road margins with shrubs, c. 5 m, 18.8.2007, *Hadjikyriakou 6980* (B, herb. GH); 500 m E of Rizokarpaso, among shrubs, c. 30 m, 18.8.2007, *Hadjikyriakou 6981* (B, herb. GH); W of Ronas bay and 3 km W of Rizokarpaso, among shrubs, c. 15 m, 18.8.2007, *Hadjikyriakou 6982* (B, herb. GH); *ibid.*, *Hadjikyriakou 6983* (B, herb. GH); Küstenfelsen nahe der Ruinen von Karpasia/Agios Filon, c. 3 m, 16.7.2004, *Vogt 16173* (herb. Vogt); Moni Apostolou Andrea, at the coast S of Kastros, S of the small bay, open rocky ground, c. 10 m, 29.4.2005, *Hand 4757 & Hadjikyriakou* (B); *ibid.*, c. 800 m W Kastros, at coastal track, rocky and sandy beach, c. 5 m, 24.5.2005, *Hand 5083 & Hadjikyriakou* (B); *ibid.*, at the coast S of Kastros, S of the small bay, open rocky ground, c. 10 m, 24.5.2005, *Hand 5079 & Hadjikyriakou* (B); Kastros Akrotiri Apostolou Andrea, rocky place near the sea, c. 5 m, 25.10.2003, *Hadjikyriakou 5809* (B, herb. GH); *ibid.*, rocky slope, c. 10 m, 28.10.2003, *Hadjikyriakou 5825* (B, herb. GH); 500 m SW of Kastros Akrotiri Apostolou Andrea, maritime rocks, c. 5 m, 28.10.2003, *Hadjikyriakou 5826* (B, herb. GH); Kastros Akrotiri Apostolou Andrea, rocky place, c. 10 m, 1.2.2004, *G. Hadjikyriakou 5897 & T. Hadjikyriakou* (B, herb. GH); *ibid.*, rocky place, c. 20 m, 19.6.2004, *Hadjikyriakou 6100* (B, herb. GH); *ibid.*, flat place with herbaceous vegetation, c. 15 m, 19.6.2004, *Hadjikyriakou 6101* (B, herb. GH); Kastros Akrotiri Apostolou Andrea, base of rock, c. 10 m, 17.7.2004, *Hadjikyriakou 6146* (B, herb. GH); *ibid.*, base of rock, c. 10 m, 17.7.2004, *Hadjikyriakou 6147* (B, herb. GH); *ibid.*, base of cliff, c. 10 m, 17.7.2004, *Hadjikyriakou 6148* (B, herb. GH); *ibid.*, flat place with herbaceous vegetation, c. 10 m, 17.7.2004, *Hadjikyriakou 6149* (B, herb. GH); 400 m NE of Apostolos Andreas monastery, c. 10 m, 17.7.2004, *Hadjikyriakou 6150* (B, herb. GH); Kastros Akrotiri Apostolou Andrea, opening among shrubs, c. 10 m, 10.10.2004, *Hadjikyriakou 6168* (B, herb. GH); *ibid.*, flat place, c. 10 m, 12.3.2005, *Hadjikyriakou 6180* (B, herb. GH); Kastros Akrotiri Apostolou Andrea, flat place with herbaceous vegetation, c. 10 m, 29.4.2005, *Hadjikyriakou 6310 & Hand* (herb. GH); *ibid.*, 24.5.2005,

*Hadjikyriakou 6433 & Hand* (herb. GH); 1 km W of Kastros Akrotiri Apostolou Andrea, sandy place, 24.5.2005, *Hadjikyriakou 6434 & Hand* (herb. GH); Cape Apostolos Andreas, Felsen und steinige Hänge, 5–50 m, 7.7.2005, *Vogt 16326* (herb. Vogt); Dipkarpaz/Rizokarpaso, Cape Apostolos Andreas, Strand und Dünen, c. 20 km östlich von Dipkarpaz/Rizokarpaso, Strand und Dünen “Golden Sands” zwischen Kiles Point und Galounopetra Point, c. 2–5 m, 17.7.2004, *Vogt 16182* (herb. Vogt).

#### *Teucrium kyreniae*

Division 7: Akanthou, ESE, cliffs above/W of waterworks c. 2 km SE Agios Merkourios, rocks and rocky slopes, c. 400 m, 14.5.2005, *Hand 4969 & Hadjikyriakou* (B); Halevga, cliffs at the road on W side of Gaiilas, c. 700 m, 9.5.2005, *Hand 4906 & Hadjikyriakou* (B); N of Gaiilas, crevices of limestone cliffs, c. 700 m, 6.5.2003, *Hadjikyriakou 5642 & Makris* (herb. GH); Agios Amvrosios, cliffs on the ridge track c. 2 km ENE Palaia Vrysi, partly shady cliffs, c. 550 m, 3.5.2007, *Hand 5335 & Hadjikyriakou* (B); above Antifonitis, crevices of limestone cliffs, c. 700 m, 19.5.2003, *Hadjikyriakou 5661* (herb. GH); *ibid.*, 17.7.2003, *Hadjikyriakou 5713* (herb. GH); N of Chalevga forest station, crevices of limestone cliffs, c. 700 m, 7.8.2004, *Hadjikyriakou 6160* (herb. GH); SW of Antifonitis, crevices of limestone rocks, c. 500 m, 4.6.2005, *Hadjikyriakou 6518* (herb. GH); *ibid.*, 20.6.2005, *Hadjikyriakou 6606* (B, herb. GH); Aşagi Dikmen/Kato Dikomo, steinige Hänge und Felswand oberhalb Yukan Dikmen/ Pano Dikomo, 13.7.2005, *Vogt 16364* (herb. Vogt).

#### *Teucrium micropodioides*

Division 3: Episkopi (near Pafos), c. 3 km SSE, small gorge below E 606 road, c. 300 m, 7.5.1998, *Hand 2414* (B); Timi, W edge of the village, from cemetery c. 500 along track, field margins and waste land, c. 50 m, 24.4.1999, *Hand 2878* (B); Pentakomo, 500–800 m WSW Akrotirio Dolos, above coastal track, rocky phrygana, c. 20 m, 1.5.2005, *Hand 4777* (B); Pentakomo, 1 km WSW Akrotirio Dolos, above coastal track, rocky phrygana, c. 20 m, 1.5.2005, *Hand 4783* (B); Akrotiri, S of track halfway from Akrotiri to Moni Agiou Nikolaou, c. 1 km E of turn-off, open ground on clearings in pine forest, c. 5 m, 4.5.2007, *Hand 5353* (B); Livadi Akrotiriou, elevated place in the marsh, 14.6.1995, *Hadjikyriakou 1671* (herb. GH); Ranti forest, sedimentary rocks, c. 30 m, 4.12.1996, *Hadjikyriakou 1960* (herb. GH); Stavrovouni, among shrubs, c. 600 m, 26.12.1996, *Hadjikyriakou 2060* (herb. GH); Akrotiri lighthouse, phrygana vegetation, c. 50 m, 15.5.2002, *Hadjikyriakou 5381* (B, herb. GH); Pissouri, low shrubs, c. 150 m, 30.5.2005, *Hadjikyriakou 6463* (herb. GH). – Division 4: Protaras, Akrotirio Gkreko, neck of the peninsula, S of the road near to its end, rocky coastal phrygana, c. 10 m, 11.5.2005, *Hand 4920* (B); Kavos Gkreko, rocky place, c. 30 m, 29.4.1989, *Hadjikyriakou 265* (herb. GH); Region Agia Napa, Protaras area, 10.1993, *Royle 536* (B). – Division 5: Milia Ammochostou, c. 50 m, 19.6.2004, *Hadjikyriakou 6111* (B, herb. GH). – Division 6: Agia Eirini, SW of the village, rocky plateau above coast, open sandstone phrygana, c. 30 m, 9.5.2005, *Hand 4879 & Hadjikyriakou* (B); *ibid.*, c. 2 km SSW at main track vertical to the coast, sandy clearings in pine afforestations, c. 30 m, 3.5.2007, *Hand 5332 & Hadjikyriakou* (B); Livera, Akrotirio Kormakitis, c. 500 m towards Livera, sand dunes at the track, c. 10 m, 9.5.2005, *Hand 4887 & Hadjikyriakou* (B); 300 m E of Livera, low shrubs, c. 30 m, 25.1.2004, *Hadjikyriakou 5893* (B, herb. GH); Akrotirio Kormakitis, rocky place with phrygana, c. 20 m, 3.7.2004, *Hadjikyriakou 6134* (B, herb. GH); *ibid.*, 3.7.2004, *Hadjikyriakou 6135* (B, herb. GH); *ibid.*, 3.7.2004, *Hadjikyriakou 6136* (B, herb. GH); *ibid.*, 3.7.2004, *Hadjikyriakou 6137* (B, herb. GH); *ibid.*, 3.7.2004, *Hadjikyriakou 6138* (B, herb. GH); N of Orga, among *Calycotome villosa*, c. 25 m, 3.7.2004, *Hadjikyriakou 6139* (B, herb. GH). – Division 7: Alakati E of Agios Amvrosios Keryneias, c. 2 m, 6.4.2005, *Hadjikyriakou 6207, Hand & Makris* (B, herb. GH); Kremmos tis Keryneias NW of Chalevga, pine forest, c. 700 m, 20.6.2005, *Hadjikyriakou 6602* (herb. GH); Beylerbeyi/Belapais, Kaynakköy/Sichari, Garrigue, steinige Hänge und Felsen an der Straße (nordseitig), Kalk, c. 450–500 m, 1.7.2005, *Vogt 16291* (herb. Vogt). – Division 8: Koma tou Gialou, at the road W/above the village, rocky phrygana, c. 50 m, 24.5.2005, *Hand 5085 & Hadjikyriakou* (B); N of Koma tou Gialou, kalfalla with phrygana, c. 100 m, 19.6.2004, *Hadjikyriakou 6109* (B, herb. GH); *ibid.*,

24.5.2005, *Hadjikyriakou* 6436 (herb. GH); W of Ronas bay and 3 km W of Rizokarpaso, among shrubs, c. 15 m, 18.8.2007, *Hadjikyriakou* 6984 (B, herb. GH).

*Teucrium* cf. *micropodioides* (Orga population)

Division 6: Orga, at the road N of the village, open phrygana, c. 50 m, 9.5.2005, *Hand* 4892 & *Hadjikyriakou* (B); *ibid.*, by the main road NNE of village center, E of the W ravine, open ground in grazed carob plantation, c. 50 m, 3.5.2007, *Hand* 5331 & *Hadjikyriakou* (B); N of Orga, abandoned land, c. 40 m, 20.12.2003, *Hadjikyriakou* 5858 (B, herb. GH); *ibid.*, 3.7.2004, *Hadjikyriakou* 6140 (B, herb. GH); *ibid.*, 21.8.2004, *Hadjikyriakou* 6161 (B, herb. GH); *ibid.*, 9.5.2005, *Hadjikyriakou* 6360 & *Hand* (herb. GH).

*Teucrium* cf. *cyprium* × *micropodioides*

Division 1: Loutra tis Afroditis, at the Arnaoutis lighthouse, on rocky ground, c. 180 m, 30.4.2007, *Hand* 5309 & *Christodoulou* (B); *ibid.*, c. 500 m SW of Akrotirio Arnaoutis, rocky coast, c. 5 m, 30.4.2007, *Hand* 5300 & *Christodoulou* (B); *ibid.*, c. 1 km SW of Akrotirio Arnaoutis, on marked “peninsula” with serpentine tip, on rocks, c. 10 m, 30.4.2007, *Hand* 5303 & *Christodoulou* (B); *ibid.*, same place and date, *Hand* 5304 & *Christodoulou* (B); Neo Chorio, main track SW Pissouromoutti, N side of the track, open *Pinus brutia* forest on serpentine, c. 340 m, 3.5.2005, *Hand* 4793 & *Morschek* (B); Koudounas at Akamas, on igneous rocks, c. 300 m, 4.12.1996, *Hadjikyriakou* 1932 (herb. GH); W of Akourdaleia, rocky slope with shrubs, c. 350 m, 28.4.2005, *Hadjikyriakou* 6297 (B, herb. GH); *ibid.* 30.5.2005, *Hadjikyriakou* 6462 (B, herb. GH); Pigadoullia at Akamas, rocky coast, sea level, 29.4.2004, *Christodoulou* in *Hadjikyriakou* 6843 (herb. GH). – Division 2: Kannaviou, at road S of turn-off to Anadiou, open phrygana, c. 380 m, 18.5.2005, *Hand* 5016, *Christodoulou* & *Kyriakou* (B).

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