

TEPPNER Herwig 1991

4. *Onosma* L.

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CRETE: Several loc. (see HALÁCSY 1902: 349, RECHINGER 1943a: 455 & 1943b: 108); PELOPONNISOS: Taygetos!, Parnon!, Menalon!, Erimant-hos!, Panachaikon and near Tripolitza in Arcadia (HALÁCSY loc. cit.), Mt Barbou! (nom. Achaïas); STEREA ELLAS: Parnis (HALÁCSY loc. cit.), Pixaria!, Elikon!, Parnassos!, Kokkinari!, Giona!, Itil!, Vardousia!, Oxia!, Yiorla!, Chelidon!, Kalliakouda!, Timfristos!; S PINDHOS: Boumistos!, Kavki!, Voutsikaki!, Kazarma!, Mazur-Ailas!, Avgol!, Tringia!, Baros!, Boutai!, between Boustagani and Boutai!, Trapos!, Tomaros!, Mt Zalogon! (nom. Prevezis); N PINDHOS: Mitsikeli!, Kasidiaris!, Dhous-kon!, Timfi!, Skourtza!; NORTH CENTRAL: Olimbos!, near Farsala (HALÁCSY loc. cit.); IONIAN ISLANDS: Kefallinia (Enos!), Levkas!

A distinct taxon occurring in \pm natural habitats, usually at high altitudes, in much of the Mediterranean region and eastwards to Afghanistan.

Both blue- and white-flowered forms occur, particularly in Sterea Ellas and S Pindhos. The former tend to have more distinctly thickened fruiting pedicels, but this is not a clearcut difference, and all plants should probably be referred to ssp. *gasparrinii*. STRID & FRANZÉN (loc. cit.) reported $2n = 14$ in typical, blue-flowered ssp. *gasparrinii* from Olimbos and $2n = 28$ in white-flowered plants from the same mountain, probably also referable to ssp. *gasparrinii*. FRANZÉN (unpubl.) found $2n = 14$ in material from Giona (G 863), Yiorla (G 3381) and Timfristos (G 1584); PERSSON (unpubl.) counted the same number in P 669 from Menalon. LUQUE & VALDÉS (1984: 338-339) reported $2n = 42$ in several Spanish populations of ssp. *gasparrinii*.

Ssp. *sibthorpiana* (GRISEB.) FERNANDES has also been recorded from Greece. It is a lowland form, originally described from maritime sand in Kocaeli, at the Gulf of Izmit ("in sinum Nicodemicum") ESE of Istanbul. The variation in morphology and habitat and the occurrence of three cytotypes would make the *B. arvensis* complex an interesting object for experimental study.

4. *Onosma** L.

H. TEPPNER

Perennials, suffrutescent or herbaceous and then frequently short-lived, or biennials, often hispid. Leaves lanceolate to spatulate, usually narrow, often greyish from the dense indumentum; midrib distinct beneath, lateral veins usually obscure. Inflorescence terminal, consisting of (1-)2(-3) scorpioid, bracteate cymes. Flowers regular, nodding at anthesis, erect in fruit.

*Most *Onosma* species occur in dry, open, rocky habitats, and it is unusually difficult to distinguish between mountain and lowland taxa. For this reason, and because much new and original information has become available through the critical work of Prof. TEPPNER, all Greek species are included here. [Editor's note].

Calyx divided almost to base. Corolla clavate or subcylindrical, with very short, recurved lobes, usually yellow or cream, sometimes with a reddish tinge, without scales or invaginations. Stamens equal, inserted on corolla approximately half-way; anthers long, sagittate, with elongated sterile tips, bent and coherent at base, sometimes for entire length. Style gynobasic, slightly exserted; stigma small, shortly 2-lobed. Nutlets 4 in each fruiting calyx or often fewer by abortion, erect, trigonous-ovoid, glabrous, smooth or warty to wrinkled, with a flat, triangular base, ripening successively over a long period. – A taxonomically difficult genus with c. 150 species from Spain and Morocco to China, with centres of diversity in Anatolia, the Iranian Highlands and C Asia.

Literature: LACAITA (1924b), STROH (1939).

Descriptions of hairs refer to those on the upper surface of basal leaves or leaves of sterile shoots. *Stellate bristles* tuberculate at base occur in many species; they consist of a long central *seta* and several shorter *rays*. Length of nutlets refers to the length of the ventral edge.

1. Bristles simple, tuberculate at base, with a uniform indumentum of short hairs in between 2.
 - Bristles stellate, with a long central seta and a ring of shorter rays appearing from the basal tubercle 4.
2. Anthers laterally coherent along entire length. Corolla puberulent. 2 or 3 of the calyx lobes connate **3. *O. visianii***
 - Anthers coherent only at base. Corolla tube glabrous or nearly so. Calyx lobes free (occasionally connate in no. 2) 3.
3. Vegetative stems mostly procumbent; flowering stems ascending from a procumbent base. Anthers slightly exserted or almost so. Nutlets smooth **1. *O. frutescens***
 - Stems erect, arising from a basal leaf rosette. Anthers included. Nutlets warty to wrinkled **2. *O. graecum***
4. Uniform indumentum of short simple hairs present between the few-rayed stellate bristles 5.
 - Plant with stellate bristles only, or sometimes also with a few scattered simple hairs 6.
5. Stamens included in corolla. Stem usually branched. Plants fertile **4. *O. helveticum***
 - Stamens somewhat exserted. Stem unbranched, with 2 terminal cymes. Plants sterile Rare hybrids between *O. frutescens* and asterotrichous species, not treated here

6. Leaves usually 1 cm wide or more; lateral veins conspicuous on lower surface; hairs stout and strongly appressed on midrib, thin and patent on lamina **5. *O. spruneri***
- Leaves usually much narrower; lateral veins obscure and hairs \pm uniform on lower surface 7.
7. Anthers laterally coherent along entire length **7. *O. leptanthum***
- Anthers coherent only at base 8.
8. Flowers long-pedicellate, pedicels distinctly elongating in fruit. All or most leaves with flat margins 9.
- Flowers sessile or subsessile, lowermost ones sometimes on thick, rigid pedicels hardly elongating in fruit. Leaves usually with revolute margins 10.
9. Calyx lobes scabrid within **6. *O. pygmaeum***
- Calyx lobes with long hairs within **8. *O. sangiasense***
10. Corolla tinged mauve **17. *O. epiroticum***
- Corolla yellow to white 11.
11. Corolla white **11. *O. stridii***
- Corolla yellow to cream 12.
12. Bracts longer than or equalling calyx and pedicel. Corolla dark yellow at least when young; tube glabrous or sparsely pubescent **9. *O. erectum***
- Bracts, except sometimes those of lowermost 1-3 flowers, shorter than calyx and pedicel. Corolla light yellow, usually densely short-pubescent (if glabrous, then leaves only c. 2 mm wide) 13.
13. Plant densely caespitose with many sterile leaf rosettes present at anthesis. Stellate bristles \pm uniform 14.
- Plant laxly caespitose with several, few or no sterile leaf rosettes present at anthesis. Stellate bristles very variable in size, often with some short simple hairs in between 15.
14. Corolla tube glabrous or sparsely pubescent. Leaves very narrow (c. 2 mm), linear; stellate bristles appressed **12. *O. elegantissimum***
- Corolla pubescent. Leaves 2-8 mm wide, lanceolate to narrowly obovate. Stellate bristles patent **10. *O. kaheirei***
15. Several sterile leaf rosettes present at anthesis, forming lax cushions 16.

- Few or no sterile leaf rosettes present at anthesis 17.
- 16. Basal leaves 1-3 mm wide, usually distinctly narrower than cauline leaves. Cymes 2, subequal **16. *O. heterophyllum***
- Basal leaves 3-5 mm wide, equalling or wider than cauline leaves. Cyme(s) single or 2 unequal **13. *O. paradoxum***
- 17. Corolla 14-16 mm **14. *O. euboicum***
- Corolla usually at least 17 mm 18.
- 18. Lower cauline leaves much smaller than adjoining basal leaves of the same stem **15. *O. rigidum***
- Lower cauline leaves equalling or only slightly smaller than basal leaves, usually dry or lacking at anthesis **16. *O. heterophyllum***

1. *O. frutescens* LAM., *Tabl. Encycl. Méth., Bot.* 1: 407 (1792)

Described from the Orient.

Procumbent subshrub with elongated shoots. Leaves obovate to narrowly obovate or lanceolate to narrowly lanceolate, with long *simple bristles* and a uniform indumentum of short hairs in between. Flowering stems ascending, 5-20(-30) cm long. Pedicels 3-8(-10) mm at anthesis. Calyx much enlarged in fruit and becoming inflated at base. Corolla 17-20(-22) mm, usually \pm *tinged with orange or brownish-red* in anterior part during anthesis, fading bluish, glabrous except at tips of lobes. Anthers coherent only at base, *usually exerted* to 1/4-1/2 of their length. Nutlets 4-5 mm, rounded, ovoid with a short beak, smooth.

Rocks, screes, rocky slopes and walls, on different substrates, often in openings of phrygana and macchie, in Peloponnisos also on coastal limestone rocks (associations, see QUÉZEL 1964: 298-311, tabl. 4, 6, 8), 0-1500 m. Flowering March to May, fruiting May to July.

Common in Peloponnisos and the S part of the mainland. Specimens collected above 1000 m seen from Taygetos, Parnon, Farmakas, near Mega Spileon, Klokos, Pendeli, Parnassos and Giona.

S Greece (not in Crete), W and S Anatolia, W Syria. $2n = 14$ (GRAU 1964a: 268, TEPPNER 1971: 198, material from Arcadia and Attica, as well as recent counts from Fokis, Boeotia and Ilias).

2. *O. graecum* BOISS., *Diagn. ser.* 1, 11: 106 (1849)

Described from Greece (island of Syros and Imittos). Types presumably in G-Boiss.

Usually *biennial*, forming a *leaf rosette* in first year and an erect, usually branched flowering stem 15-40 cm in second year. Whole plant rather densely covered with long (5-8 mm) patent setae. Rosette leaves \pm lanceolate with long *simple bristles* and a uniform indumentum of short simple hairs in between. Flowers short-pedicellate. Calyx lobes free or sometimes

2-3 connate, much enlarged in fruit. Corolla 15-18 mm, dark yellow, *becoming orange or brownish in anterior part during anthesis*, fading red-dish-brown, purplish or dark violet, glabrous or with few scattered hairs. Nutlets 5.4-7 mm, triangular-ovoid, warty to wrinkled.

Rocks and rocky slopes, often in openings of phrygana or macchie, 0-850 m, usually on limestone. Flowering from end of March to May, fruiting from end of April to June.

Crete, S Peloponnisos, Imittos (not seen since first reported by BOISSIER), S and E Aegean Islands and, according to *Flora of Turkey*, also in NW Anatolia. $2n = 18$ (TEPPNER unpubl., material from Crete).

3. *O. visianii* CLEMENTI in *Atti 3. Riun. Scienz. Ital. Firenze*: 519 (1841)

Described from E Biokovo and from Muć near Sinj (Dalmatia). One specimen in FI! "Ex herb. Jos.D.ris Clementi": "Clementi leg. Mt. Biokovo, Dalmatia".

Syn.: *O. taygeteum* BOISS. & HELDR. in BOISS., *Diagn. ser. 1*, 11: 101 (1849), "Inter Varvara et Hagio Paraskevvy Taygeti", 18.7. 1844, HELDREICH, *Pl. Exsicc. Fl. Hellen.* 421 (isotype in WU-Hal!); *O. rhodopeum* VELEN. in *Sitzungsber. Königl. Böhm. Ges. Wiss. Prag. Math.-Naturwiss. Cl.* 1894(29): 22 (1894), "In m. Rhodope ad Causovo", STRÍBRNÝ 1893 (topotypes in W! and WU!).

Usually *biennial*, producing a *many-leaved rosette* in first year and an erect, much branched flowering stem 25-50 cm in second year. Branches elongated and patent. Whole plant with long (4-5 mm) patent setae. Rosette leaves linear-lanceolate with long *simple bristles* and a uniform indumentum of short simple hairs in between. Flowers short-pedicellate. 2-3 *calyx lobes connate*; calyx much enlarged in fruit. Corolla (15-)17-20(-25)mm, *whitish to very pale yellow*, puberulent. Anthers *laterally coherent for entire length*. Nutlets 4-5 mm, triangular-ovoid, wrinkled or minutely warty (partly or entirely).

Rocky slopes and meadows on shallow calcareous soils, often in open woodland, 1000-1650 m. Flowering June and July, fruiting July and August.

PELOPONNISOS: Taygetos! (HALÁCSY 1902: 336; apparently not rediscovered since HELDREICH's time); NORTH CENTRAL: Triklarion!, Vourinos!, Piperitsa!; NORTH EAST: Orvilos!

From Istria, SE Lower Austria and Slovakia to Greece. $2n = 18$ (TEPPNER 1971: 199-200 and unpublished counts in material from Austria, Yugoslavia, Hungary and Bulgaria; GRAU 1971: 182, 183, material from Bulgaria).

4. *O. helveticum* Boiss., *Diagn. ser. 1*, 11: 111 (1849)

Described from the Western Alps (Savoy and Wallis).

Note: If one assumes that BOISSIER did not intend to describe a new species but only to make a new combination (RAUSCHERT 1976) this name would be illegitimate because the taxon does not include the type of *O.*

echioides L. var. *helvetica* A. DC., a name which is cited immediately after the diagnosis. I believe the latter is to be regarded as an erroneously cited synonym, which cannot invalidate BOISSIER's species name because no name has priority outside of its own rank.

Syn.: *O. pseudoarenarium* SCHUR in *Verh. Mitth. Siebenbürg. Vereins Naturwiss. Hermannstadt* 10: 76 (1859), described from Turda or Thorenburg in Transsilvania; *O. halacsyi* HAYEK, *Prodr. Fl. Penins. Balcan.* 2: 88 (1928), described from Mt Stroungula in E Epirus, leg. HALÁCSY, 10.7. 1893 (holotype in WU-Hall!).

Short-lived perennial with lignified base and a few sterile leaf rosettes in addition to flowering stems. Rosette leaves narrowly obovate to narrowly lanceolate, with *stellate bristles and short simple hairs in between*; stellate bristles with (0-)5-10(-15) rays. Inflorescence usually branched, with additional cincinni in upper leaf axils. Flowers subsessile. Corolla (15-)17-20 mm, lemon yellow, puberulent. Anthers coherent only at base. Nutlets 2.2-4 mm, smooth.

Rocky slopes, screes and gravel, in *Abies cephalonica* woodland and above timberline, on limestone and marl, 900-1800 m. Flowering June and July, fruiting July and August.

S PINDHOS: Stroungula! (Tsoumerka area); N PINDHOS: Tsamanda (UPA!).

Scattered in the W and S Alps, N Appennini, S Italy, Lower Austria to Romania and Serbia as well as from Friulia to C Greece. $2n = 26$, sometimes with B chromosomes (material from Stroungula and elsewhere; TEPPNER 1971, 1972 and unpubl.). The species is allotetraploid, the 14 chromosomes of *echioides* type being clearly distinguishable from the 12 chromosomes of *setosum* type.

5. *O. spruneri* BOISS., *Diagn. ser.* 1, 11: 109 (1849)

Described from the foot of Mt Kitheron, first collected by SPRUNER in 1839. Holotype in G-Boiss!, topotypes in W! and WU!

Subshrub with strong, lignified base and flowering stems as well as sterile rosettes. Rosette leaves 10-26 × 0.5-2 cm, lanceolate, with flat margins; lateral veins prominent on lower surface; *stellate hairs strongly appressed above and on midrib beneath*, lower surface otherwise with finer, patent stellate hairs. Corolla 20-25 mm, yellow, puberulent. Nutlets 4-5.5 mm.

Dry, rocky slopes, also in rocky places between terraced fields, from near sea level to c. 600 m. Flowering April and May, fruiting in July.

Endemic; known only from a few localities in N Peloponnisos, Aetolia and on Mt Kitheron. $2n = 12$ (TEPPNER unpubl., material from N Peloponnisos, between Mykinae and Chiliomodion).

6. *O. pygmaeum* RIEDL in *Notes Roy. Bot. Gard. Edinburgh* 33: 302 (1974)

Orig. coll. from the Katara Pass, c. 1600 m. KLAUS, KUMMERT & MÜCK no. 162, 3.6. 1972 (holotype in W!).

Low perennial with lignified base and *cushion-like growth habit*. Rosette leaves $1-14 \times 0.2-1$ cm, green, with almost flat margins; *stellate bristles with 1-10 rays less than half as long as seta*; some long, simple bristles also present. Pedicels usually 4-7 mm at anthesis, *slender, elongating in fruit*. *Calyx scabrid within*, with some longer hairs at least at tips of lobes. Corolla 13-17(-20) mm, yellow, glabrous. Anthers 5-6 mm, coherent only at base, included in corolla. Nutlets 2.7-4 mm, smooth.

Rocky slopes with shallow soil, screes and rock crevices usually on serpentine, (900-)1100-2400 m. Flowering (May-)June and July, fruiting July and August.

N PINDHOS: Katara Pass!, Mavrovouni!, Milea!, Lingos!, Pirostia!, Aftia!, Tsouka Arosia!, Smolikas!, Gomara!, Levkasia!, Bouchetsi!, Gramos!

Endemic. Very closely related to *O. stellulatum* WALDST. & KIT. which occurs from NW Yugoslavia to N Albania (see TEPPNER 1981). $2n = 22$ (material from the surroundings of Kranea and from the Katara Pass; TEPPNER 1981: 300-302, and unpubl.).

7. *O. leptanthum* HELDR. in *Sched. Herb. Gr. Norm.* no. 1565 (1898)

Orig. coll.: "Laconia, in m. Taygeti regione superiori in rupestribus l.d. Megalo Stephani et Chalasmeno", 14.7. 1898, cura am H. ZAHN, HELDREICH *Herb. Gr. Norm.* 1565 (isotypes in W!, WU!, and WU-Hall!).

Perennial with lignified base and *cushion-like growth habit*. Rosette leaves $1-8 \times 0.15-0.7$ cm, greyish, with mostly flat margins; *stellate bristles with 10-30 rays at least half as long as seta*. Pedicels 3-8 mm, slender; pedicels and calyx densely covered with long, patent bristles. *Calyx with long simple hairs within*. Corolla 14-17 mm, yellow, glabrous except for minute pubescence on tips, back of lobes and along upper part of main veins; lobes 1.2-2 mm. Anthers 6.5-8 mm, *slightly exerted, coherent for entire length*. Nutlets 3.5-4.5 mm, smooth.

Rock crevices, rocky slopes and grassland in openings of coniferous forest and above timberline, 1450-2000 m (cf. QUÉZEL 1964: 327-328, tab. 15 and IATROU 1986: 163). Flowering June and July.

PELOPONNISOS: Taygetos (Mavrovouni!, Chalasmeno Vouno!, Profitis Ilias!, etc.).

Endemic. $2n = 22$, sometimes with 1-2 B chromosomes (TEPPNER 1981: 303-304, IATROU 1986: 164-165).

8. *O. sangiasense* TEPPNER & IATROU in *Phyton (Horn)* 27(2): 286 (1987)

Orig. coll.: "Peloponnisos, Prov. Lakonia, in declivibus meridionalibus montis Sangias, in saxosis calcareis", IATROU & TZANOUDAKIS, 9.5. 1979 (holotype in UPA - no. 5640!).

Perennial with lignified base and *procumbent growth habit with somewhat elongated sterile shoots*. Basal leaves $1-3.5 \times 0.2-0.9$ cm, narrowly obovate to obovate or spatulate, with flat to revolute margins;

stellate bristles with 5-30 rays usually less than half as long as seta, often mixed with small stellate and simple hairs. Pedicels 3-5 mm; pedicels and calyx densely covered with long patent hairs. *Calyx silky-sericeous within*. Corolla 18-20 mm, yellow, glabrous except for minute pubescence on tips, back of lobes and upper part of main veins; lobes 0.8-1 mm. Anthers c. 7 mm, included in corolla, coherent only at base. Nutlets unknown.

Dry, rocky slopes, 150-350 m, on limestone (see TEPPNER & IATROU 1987). Flowering from end of April to May.

PELOPONNISOS: Sangias!

Endemic. Known only from the type gathering.

9. *O. erectum* SIBTH. & SM., *Fl. Gr. Prodr.* 1: 121 (1806)

Described from mountains of Crete ("in montibus Cretae elatioribus"), apparently Levka Ori (cf. LACAITA 1924b: 400). Type: Plate no. 173 in SIBTH. & SM., *Fl. Gr.* 2 (1816).

Cushion-forming perennial with a lignified base. Basal leaves 1.8(-11) × (0.1-)0.2-0.6(-1.0) cm, narrowly lanceolate to narrowly obovate, with revolute margins; *stellate bristles very dense, appressed, with 10-20 rays*. Inflorescence very dense at beginning of anthesis, with buds covered by bracts. Flowers subsessile; *most bracts exceeding calyx*. Bristles on back of calyx lobes subpatent, inner surface of calyx with long and short hairs in upper 1/2-3/4. Corolla 22-26(-30) mm, *dark yellow*, rarely becoming lighter yellow during anthesis, glabrous or ± puberulent. Anthers 8-11 mm, coherent only at base. Nutlets 2.7-4 mm.

Endemic; belonging to the *O. tauricum* group which is represented by other taxa in neighbouring areas (Turkey-in-Europe, W Anatolia). Two subspecies can be recognized:

1. Corolla up to 28 mm, glabrous, or puberulent only at tips and back of lobes **a. ssp. erectum**
- Corolla up to 30 mm; tube puberulent at least in 5 longitudinal stripes, rarely glabrous **b. ssp. malickyi**

a. ssp. erectum

Syn.: *O. orphanidis* BOISS. in *Sched. Heldreich Herb. Gr. Norm.* no. 729 (1856), nom. nud., based on a GUICCIARDI collection from Kitheron (holotype in G!, isotype in WU-Hal!); *O. laconicum* BOISS. & ORPH. in *Sched. Fl. Gr. Exsicc.* no. 860 (1877), nom. nud., based on an ORPHANIDES collection from Parnon (isotypes in W!, WU! and WU-Hal!); *O. tauricum* sensu HALÁCSY, *Consp. Fl. Gr.* 2: 332 (1902) et HAYEK, *Prodr. Fl. Penins. Balcan.* 2: 84 (1928), non PALLAS.

Rocks, rocky slopes and screes of limestone and marl, often in open coniferous forest, 150-1700 m. Flowering April and May, fruiting June and July.

CRETE: Levka Ori (Omalos plateau!, near Xiloskala!, near Linoseli source!, Mavri, and other localities cited by RECHINGER 1943a: 456 and ZAFFRAN 1976: 136), Psiloritis! (Timios Stavros and Nida plateau, fide RECHINGER loc. cit.), Afendis Kavousi!, and lowland localities (cf. RECHINGER loc. cit.); PELOPONNISOS: Taygetos (Xerovouna!, near Artemisia!), Parnon (Kosmas!, Kolokros!, near Ag. Petros!, near Moni Malevi!, Pefkovouni!, near Ag. Ioannis!), near Killini (Lake Stimfalia!); STEREA ELLAS: Kitheron!, Dhifis!; AEGEAN ISLANDS: Samos!

$2n = 14 + 1B$, (STRID & FRANZÉN in *Taxon* 32: 139, 1983, material from Levka Ori); $2n = 14$ (TEPPNER 1988: 124-125, material from Levka Ori, Taygetos and Parnon).

b. ssp. malickyi TEPPNER in *Phyton (Horn)* 28(1): 126 (1988)

Orig. coll.: "Peloponnes, Oligyrtos-Gebiet, am Rand der Strasse Kandila-Skotini, c. 1100 m", H. MALICKY, 21.5. 1979 (holotype in GZU!).

Rocks and screes of limestone and conglomerate, rocky slopes in the *Abies cephalonica* zone and below, 700-1700 m. Flowering May and June, fruiting in July.

PELOPONNISOS: Taygetos!, Oligirtos!, Chelmos (valley of Styx!, Peristera!), Moni Mega Spileon!, Panachaikon!

Endemic. $2n = 26$ (TEPPNER 1988: 127, material from Kandila-Skotini and Mega Spileon).

10. O. kaheirei TEPPNER in *Phyton (Horn)* 28(1): 116 (1988)

Orig. coll.: "Attica: in saxosis regionis superioris m. Hymetti, ad cacumen usque, alt. 2500-3200 ped.", HELDREICH, *Herb. Gr. Norm.* no. 1358, 7. Jun. 1896 (holotype in WU-Hal!, isotypes in WU!).

Syn.: *O. erectum* SIBTH. & SM. var. *pubiflorum* HALÁCSY, *Consp. Fl. Gr.* 2: 333 (1902), p.p.

Cushion-forming perennial with lignified base and largely patent bristles. Basal leaves (1-)2-8(-10) \times 0.2-0.5(-0.6) cm, narrowly lanceolate to narrowly obovate, with revolute margins; stellate bristles very dense, patent or appressed, with 12-30 rays; *patent bristles 3-4(-5) mm long present in lower 1/2 or 2/3 of leaf, mainly at margins*. Lowermost bracts \pm equalling calyx, *successive ones shorter*. Outside of calyx with patent bristles; inside of calyx with a mixture of short and long hairs, although glabrous in basal 1-2(-5) mm. Corolla (17-)20-24 mm, *lemon yellow, puberulent*. Anthers 7-9 mm, coherent at base. Nutlets 3-4.5 mm, smooth.

Rocks and rocky slopes, openings in evergreen woodland, 500-1200 m. Flowering from mid-April to beginning of June, fruiting June and July.

PELOPONNISOS: Panachaikon!; STEREA ELLAS: Pateras!, Imittos!, Parnis!, Mal Madi (Euboea)!, Pixaria!

Endemic. TEPPNER (op. cit.) found $2n = 50$ in material from Imittos and $2n = 38$ in material from Mal Madi. The two populations differ somewhat morphologically (e.g., the calyces are larger in Imittos material); further studies are needed to determine whether they are taxonomically distinct.

11. *O. stridii* TEPPNER in *Phyton (Horn)* 28(2): 272 (1988)

Orig. coll.: "Nom. Fthiotidos, ep. Lokridos: Mt Kallidromon, along road between the villages of Modion and Kallidromon, 550 m. Serpentine gravel on road embankment." STRID & al. 26326, 13.4. 1987 (holotype in C!; isotypes in ATH!, C!, G!, GZU! and WU!).

Cushion-forming perennial with lignified base. *Basal leaves* 1-3.5 x 0.1-0.5 cm, narrowly obovate to narrowly lanceolate, with revolute margins; stellate bristles dense and appressed with (5-)10-30(-40) rays. Flowering stems 6-12 cm, with 1-2 cymes, slightly elongating in fruit; lowermost bracts \pm equalling calyx, *successive ones shorter*. Outside of calyx with \pm appressed bristles, inside with short hairs in upper 1/2-2/3 and longer hairs near tip. *Corolla* 24-27 mm, white or whitish; tube glabrous or with few scattered short hairs; lobes pubescent. Anthers 8-8.4 mm, coherent at base. Nutlets c. 3.5 x 2.4 mm, smooth.

Serpentine gravel, c. 500-600 m. Flowering in April, fruiting in June. STEREA ELLAS: Kallidhromon!

Endemic. Known only from the type gathering. Probably related to *O. elegantissimum*.

12. *O. elegantissimum* RECH. FIL. & GOULIMY in *Oesterr. Akad. Wiss., Math.-Naturwiss. Kl., Anz.* 94: 22 (1957)

Orig. coll.: "Macedonia occidentalis: Distr. Kozani, in monte Vourinon, in declivibus orientalibus, substr. serpentin., in saxosis, 1700 m". RECHINGER 17389, 5.-7.7. 1956 (holotype in W!).

Cushion-forming perennial with lignified base. *Basal leaves very narrow*, 2-15 x 0.15-0.4(-0.5) cm, with revolute margins; stellate bristles very dense and strongly appressed, with (5-)10-15(-20) rays. Lowermost bracts \pm equalling calyx, *successive ones shorter*. Calyx outside with \pm appressed bristles, inside with short hairs throughout and long hairs in upper 1/2-2/3. *Corolla* 15-22 mm, pale yellow, whitish in anterior part at anthesis; tube glabrous or with scattered short hairs. Anthers 7-8 mm, coherent at base. Nutlets 2.5-3.2 mm, smooth.

Stony and rocky slopes, 900-1800 m, in open evergreen scrub, on serpentine or occasionally limestone. Flowering May and June, fruiting June and July(-August).

NORTH CENTRAL: Vourinos (many places!); cf. AKEROYD & PRESTON (1981: 288) and BABALONAS (1984: 66).

Endemic. 2n = 14 (TEPPNER unpubl.).

13. *O. paradoxum* JANKA in *Oesterr. Bot. Z.* 22: 180 (1872)

Described from Mt Athos ("in m. Athos regionis mediae pineto infra Panajia", leg. JANKA, 25.7. 1871; BP, probably isotype!).

Syn.: *O. aucherianum* DC. ssp. *pallidum* (BOISS.) HAYEK var. *paradoxum* (JANKA) HAYEK, *Prodr. Fl. Penins. Balcan.* 2: 86 (1928).

Perennial with lignified base and *few to many short sterile shoots* (leaf rosettes) at anthesis, forming lax cushions. Leaves narrowly obovate, with revolute margins; stellate bristles dense, with 15-20 rays, \pm appressed, sometimes with some short simple hairs in between. Flowering stems 10-25 cm, usually with *a single cyme*, if two, the second one usually much shorter. Flowers subsessile; *bracts much shorter than calyx*, or lowermost subequal to calyx. Calyx 7-13 mm, outside with moderately patent stellate bristles and short simple hairs, inside with short hairs almost to base and long hairs in upper 2/3 or more. Corolla (17-)22-25 mm, pale yellow, puberulent. Anthers 6.2-7.3 mm, coherent at base, connective tips 1-2 mm from tip of corolla (in well pressed flowers). Nutlets 2.5-3.7 mm, smooth.

Rocky slopes, openings in woodland and scrub with *Pinus nigra*, *Berberis cretica*, *Sorbus graeca*, *Crataegus orientalis*, etc., on limestone, 500-1600 m. Flowering May and June, fruiting in July.

NORTH EAST: Athos (several places!).

A local endemic of uncertain taxonomic status, resembling *O. heterophyllum* and *O. rigidum*. Treated here as a species, because plants cultivated by STRID at C maintained essential characteristics.

14. *O. euboicum* RECH. FIL. in *Bot. Jahrb. Syst.* 80: 378 (1961)

Orig. coll.: "Euboea septentrionalis: Montes Kandili, in declivibus borealibus in ascensu ab Achmet Aga (Prokopion) versus Hag. Sotir, substr. serpentin., 300-800 m". RECHINGER 17028, 30.5. 1955 (holotype in W!).

Small subshrub with elongated branches. Some elongated, procumbent to ascending sterile shoots present at anthesis; leaves of these 1-4 \times 0.3-1 cm, obovate to spatulate, with flat or slightly revolute margins; *stellate bristles \pm dense, varying much in size*, larger ones with 10-25 very short, usually subappressed rays around the \pm patent seta. *Lowermost cauline leaves much smaller than basal ones*. Flowering stems 6-30 cm. Lowermost bracts equalling calyx, successive ones shorter. Outside of calyx with patent bristles, inside with short hairs throughout and longer hairs in upper 2/3. *Corolla 14-16 mm, lemon yellow, puberulent*. Anthers 5-6 mm, coherent at base. Nutlets 2.7-3.4 mm, smooth.

Rocks and rocky slopes, often in openings of *Pinus halepensis* woodland, 0-800 m, on serpentine and magnesite. Flowering from May to beginning of July, fruiting in July(-August).

STEREA ELLAS: Kandhilion!, near Mandudion!, Kymassi!, Pappades! (RECHINGER 1961: 378); S PINDHOS: between Kedron and Lutropigi! (nom. Karditsis).

Endemic to the serpentine areas of N Euboea and Karditsa. $2n = 14$ (TEPPNER unpubl., material from Kandhilion). Plants from Kedron-Lutropigi are somewhat different (e.g., rays of stellate bristles 0.2-0.4 mm long and more patent, in material from Euboea usually 0.1-0.2 mm and

appressed). Very closely related to *O. rigidum* (no. 15). Also *O. heterophyllum* (no. 16) occurs in N Euboea, and further research on the taxonomic position and delimitation of these taxa is required.

15. *O. rigidum* LEDEB., *Pander's Beitr. Naturk.* 1: 67 (1820), pl. 3(2): tab. 238 (1831)

Orig. coll.: Tauria, LEDEBOUR (isotype in W!).

Syn.: *O. aucherianum* DC., *Prodr.* 10: 60 (1846), described from the Bithynian Olympus (Ulu Dag); *O. pallidum* BOISS., *Diagn. ser. 1*, 11: 112 (1849), described from W Anatolia; *O. aucherianum* DC. ssp. *pallidum* (BOISS.) HAYEK, *Prodr. Fl. Penins. Balcan.* 2: 86 (1928), excl. var.; *O. montanum* SIBTH. & SM., *Fl. Gr. Prodr.* 1: 121 (1806) p.p. min., sensu LACAITA 1924a, 1924b, and BALL in *Fl. Eur.* 3: 93 (1972).

Note: *O. montanum* SIBTH. & SM. is regarded as a *nomen confusum* as two taxa were apparently mixed on the type sheet (Herb. Sibthorp 422); the indication of locality (Crete and Peloponnisos) is undoubtedly incorrect. According to *Fl. Turkey* 6: 375 (1978) and my own inquiries there is no extant specimen at OXF, but a drawing appears in LACAITA (1924a: tab. 3).

Procumbent subshrub with a few elongated sterile shoots at anthesis. Basal leaves 1-3.5(-4) × 0.15-0.7 cm, narrowly obovate to spatulate with flat or revolute margins; stellate bristles dense, very different in size, larger ones with (5-)8-12(-25) patent or appressed rays and a long, usually patent seta; short simple hairs often present in between the stellate bristles. Lowermost cauline leaves much smaller than basal ones. Flowering stems 10-20(-45) cm; lowermost bracts ± equalling calyx, successive ones shorter. Outside of calyx with patent bristles, inside with long and short hairs almost to base. Corolla (16-)17-20(-25) mm, pale yellow, puberulent. Anthers 6.5-7.5 mm, coherent at base. Nutlets c. 3 mm, smooth.

Rocky slopes, openings in macchie, 0-2500 m. Flowering in May.

NORTH EAST: near Didymotichon!; AEGEAN ISLANDS: Chios!

Crimea, W Anatolia, Turkey-in-Europe, E Bulgaria and E Greece. A large-flowered population occurs on Chios near Karies, and particularly densely hairy plants with up to 25-rayed stellate bristles have been collected from Ag. Minas on Chios (ORPHANIDES, *Fl. Gr. Exsicc.* 861). It is somewhat uncertain whether *O. rigidum* is always distinguishable from *O. heterophyllum*. $2n = 14$ (TEPPNER unpubl., material from Didymotichon, Chios, E Bulgaria and W Anatolia).

16. *O. heterophyllum* GRISEB., *Spicil. Fl. Rumel.* 2: 80 (1844)

Orig. coll.: [NE Greece, W of Alexandroupolis] "in litore arenoso p. Makri freq.", leg. GRISEBACH (holotype in GOET!).

Syn.: *O. tubiflorum* VELEN. in *Sitzungsber. Königl. Böhm. Ges. Wiss., Math.-Naturwiss. Cl.* 1890(1): 54 (1890), described from W and S Bulgaria; *O. psammophilum* RECH. FIL. & RIEDL in *Bot. Not.* 124: 79 (1971), described from littoral sand in NE Greece W of the river Strymos (RECH

39000; holotype in W!, isotype in G!); *O. echioides* sensu HALÁCSY, *Consp. Fl. Gr.* 2: 334 (1902), non L.; *O. echioides* L. var. *stojanoffii* TURRILL in *Kew Bull.* 1925: 35 (1925), described from Ali Botuš – Cengene Kalé, 1300 m, STOJANOFF (holotype in K!); *O. aucherianum* DC. ssp. *stojanoffii* (TURRILL) HAYEK, *Prodr. Fl. Penins. Balcan.* 2: 87 (1928).

Subshrub or woody-based perennial, usually *without or with only a few non-flowering rosettes at anthesis* (occasionally more rosettes in mountain forms). Basal leaves 1-8 × 0.1-0.7 cm, narrowly obovate to narrowly lanceolate, with flat or revolute margins; *stellate bristles ± dense, patent or appressed, much differing in size*, larger ones with 5-15(-25) rays; some simple hairs often present in between the stellate bristles. Flowering stems 15-50 cm, usually tall; *lowermost cauline leaves not or only slightly smaller than adjoining basal ones*, but leaves usually dry or lacking at anthesis in lower 1/4-1/2 of stem. Bracts usually much shorter than calyx. Outside of calyx with usually patent bristles, inside with short hairs almost to base and long hairs in upper 2/3. Corolla (17-)19-30 mm, pale yellow to lemon yellow, puberulent. Anthers 6-9 mm, coherent at base. Nutlets 2-4 mm, smooth.

Rocks, screes and rocky slopes, open meadows, openings in woodland, alpine grassland and occasionally on maritime sand, 0-2150 m, on a variety of substrates. Flowering from mid-May to July, fruiting July and August. The most widespread and common species throughout Greece, except for S Peloponnisos. The following are records from above c. 900-1000 m:

PELOPONNISOS: Taygetos (several coll.), Parnon!, S of Tripolis!, Parthenion!, W of Vytina!, Chelmos!; STEREA ELLAS: Parnassos!, between Giona and Iti!, Korax!, Arapokephatos!; S PINDHOS: Boumistos!; N PINDHOS: Metsovon!, Bouchetsi!; NORTH CENTRAL: Triklarion!, Velika Glavia near Pili!, S of Vernon!, Vourinos!, Livadhero near Kozani!, Olimbos (several coll.), Dobro Pole!, Tzena!; NORTH EAST: Athos!, Pangeon!, Menikion!, 30 km NE of Serre!, between Mavro Vouno and Boura!, Boura!, near Katafyton!, Orvilos!, Falakron!

From Albania, S Yugoslavia and Romania to S Greece. A very variable species with some particularly deviating forms, e.g.:

(1) A narrow-leaved form of N Greece ("*O. echioides* var. *stojanoffii*"): Distinct in the mountains (Menikion, Orvilos, Falakron) by usually a number of leaf rosettes at flowering time, narrow basal leaves with very dense, subappressed stellate bristles, and simple stems with persistent lower leaves. However, at lower altitudes it merges into the typical form. $2n = 14$ (STRID unpubl.; material from Menikion).

(2) Plants from the E and N foothills of Olimbos have several sterile rosettes, basal leaves narrower than cauline leaves, many-rayed, \pm appressed stellate bristles, and larger flowers (corolla 25-30 mm); they have $2n = 14$, and their relationships to (1) should be investigated.

(3) Tetraploid plants from C Peloponnisos often have several sterile rosettes, persistent lower cauline leaves, very dense indumentum of stellate bristles, somewhat longer bracts and darker corolla than in typical *O. heterophyllum*. Herbarium material may be difficult to distinguish from *O. erectum* ssp. *malickyi*. *O. erectum* and *O. heterophyllum* occasionally hybridize.

O. heterophyllum is a diploid with $2n = 14$ (GRAU 1968b: 288, material from Arachova, Greece) or tetraploid with $2n = 26$ (GRAU 1971: 181, 183, STRID 1971: 491, TEPPNER 1971: 216, MARKOVA & IVANOVA in *Taxon* 22: 298, 1973, and STRID & FRANZÉN in *Taxon* 32: 139, 1983; material from Albania, Yugoslavia, Bulgaria and N Greece). According to our present knowledge diploids occur from Alexandroupolis to Kavala, Menikion and Orvilos, N of Gevgelija (YU) and from Vermion, Pieria and Olimbos to Fokis, Boeotia and NE Peloponnisos. Tetraploids grow in the area of Thasos – Pangeon – Orvilos – S Katerini – Chalkidiki as well as from Mt Tzena, Vitsi and Vourinos to Epirus and through the Pindhos to Peloponnisos. In some populations, probably in areas where the two cytotypes meet, a range of higher chromosome numbers ($2n = 26$ to $2n = 38$) has been observed (TEPPNER unpubl.).

17. *O. epiroticum* TEPPNER in *Phyton* (Horn) 28(1): 52 (1988)

Orig. coll.: "Prov. Ioannina, distr. Konitsa: Valley of the river Aoos by Konitsa. On both sides of the river and E of the bridge. Alt. 460-500 m. Stony, rocky slopes with scattered shrubs. Flowers yellow-mauve". E. STAMATIADOU 17082, 22.5. 1973, Herb. Goulandrium 30507 (holotype in ATH!).

Perennial with lignified base. Basal leaves narrowly obovate, with revolute margins; *stellate bristles dense, appressed*, with 10-20 rays. Flowering stems 17-18 cm, with c. 20 leaves. Lowermost bracts \pm equalling calyx, successive ones much shorter. Corolla c. 22-24 mm, yellow, *mauve in anterior 1/3, bluish after anthesis*. Anthers c. 8.5 mm, coherent at base. Nutlets unknown.

Probably endemic in Epirus, so far known only from the type collection.

Doubtfully reported species

Reports of *O. mattirolii* BALD. from NW Greece (*Fl. Eur.* 3: 93, 1972) probably refer to *O. pygmaeum*.

5. *Alkanna* TAUSCH

A. STRID

Perennial herbs, sometimes woody at base, variously puberulent, pilose and setose, the indumentum ranging from slender glandular and eglandular hairs to rather robust setae bulbous at base. Root with a purple dye.