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## The genus *Ornithogalum* L. (*Hyacinthaceae*) in Italy, XIV: towards a redefinition of infrageneric taxa, with new proposals

### Abstract

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In agreement with other authors, *Ornithogalum* L. is considered as a distinct genus in respect to *Honorius* S. F. Gray and *Loncomelos* Raf. Accordingly, the Italian taxa of *Ornithogalum* s. str. are here listed and briefly commented in a frame of their classical morphological and karyological characters. *O. umbellatum* L. is represented by different polyploid cytotypes ( $2n=27, 36, 45, 54, 90$  and  $108$ , with or without B chromosomes). Doubts about the possibility to discriminate *O. vulgare* Sailer in such a variable complex are expressed. *O. divergens* Boreau ( $2n=54+B$ ), *O. orthophyllum* Ten. ( $2n=18$ ), *O. exscapum* Ten. ( $2n=18$ ) and *O. ambiguum* Terracciano ( $2n=18$ ) are probably in relation with *O. corsicum* Jordan & Fourr. ( $2n=18$ ). *O. adalgisae* Groves ( $2n=45, 54$ ), *O. refractum* Kit. ( $2n=54$ ) and *O. brutium* Terracciano ( $2n=36, 45, 54+B, 72$ ) constitute a group of units whose affinity and distribution must be further evaluated. *O. kochii* Parl. ( $2n=18+B$ ), looks very similar to *O. monticulum* Jordan & Fourr. ( $2n=20$ ). *O. collinum* Guss. ( $2n=18$ ), according with our records, is present only in Sicily. *O. comosum* L. ( $2n=18$ ), belonging to sect. *Obtusangula* Zahar., is distributed from north-eastern Italy to Sicily. *O. montanum* Cyr. ( $2n=18+B$ ), the only representative of subgen. *Oreogalum* (Zahar.) Tornadore & Garbari, is present from southern Italy to Sicily. *O. gussonei* Ten. ( $2n=14+B$ ) of subgen. *Hypogaeum* Zahar. grows in Apulia and Sicily.

A new specific unit will be described for some populations of the Gargano area (Apulia) with peculiar ecological, karyological ( $2n=54, 63$  with or without B) and morphological characters. Lastly, the name *O. etruscum* Parl. is to be used for some central Italy polyploid populations ( $2n=72+B$ ), up to now wrongly assigned to *O. orthophyllum* Ten., an endemic diploid montane species of Abruzzi and Basilicata.

### Introduction

Over two decades ago, two of us (Tornadore & Garbari 1979) published a cytotaxonomical review of the genus *Ornithogalum* in Italy, with the geographical distribution of 7 specific units and one subspecies, based on herbarium findings and field investigations. Today, following further research – including a review of material from the herbaria in Italy and at Kew (K), at London's British Museum of Natural History (BM) and Edinburgh (E) – the picture outlined twenty years ago is no longer sustainable. In full or partial agree-

ment with other authors, we reviewed the specific features of some units which had been previously considered as synonyms and circumscribed in a clearer and more detailed way the systematic autonomy and the distribution – in Italy, Sardinia and Sicily – of some taxa. We believe that the genus *Ornithogalum* should be kept separate from the allied genera *Melomphis* Raf. (Syn. *Caruelia* Parl.), with only *Melomphis arabica* present in Italy, *Honorius* S. F. Gray (with two species in Italy, *H. nutans* and *H. boucheanus*) and *Loncomelos* Raf. (with *L. narbonensis*, *L. brevistylus*, *L. pyrenaicus* subsp. *pyrenaicus* and *L. p.* subsp. *sphaerocarpus*). These groups, due to objective morphological, organographic and biological conditions, look like natural units and deserve therefore a generic hierarchical level. Biochemical studies using glycosides named cardenolides by Ferth et al. (2001) seem to support such distinctions.

Here, we will not consider these taxa: our observations will only take into account *Ornithogalum* sensu stricto, which corresponds to *Heliocharmos* Baker.

As far as the division of *Ornithogalum* into subgenera and sections is concerned, for the time being we will refer to the picture outlined by C. Zahariadi in 1977 and partially proposed few years later (Zahariadi 1980) for *Flora Europaea*, even if some infrageneric groups do not seem to have been properly determined.

For each unit here considered, we will supply just the general informations we consider most significant, to keep this contribution flowing. Only sometimes shall we specify karyological, distributive, taxonomic or nomenclatural aspects. We would also like to specify that this contribution cannot be considered as conclusive, as the reader will see.

Let's start with *Ornithogalum* subgen. *Ornithogalum* (sect. *Ornithogalum*), which most floristic units in our country relate to.

Obviously, we have to express an opinion on the assumedly commonest species, i.e. *O. umbellatum*, with biotypes which in peninsular Italy have  $2n=27, 36, 45, 54, 90, 108$ , with or without accessory chromosomes.

It may sound unbelievable, but this species – referred to as *typus generis* – is still being discussed over by some specialists. “Was ist *Ornithogalum umbellatum* s. str.?” wondered Franz Speta in 2000a.

In our opinion, it must be clear from the start that the “nomenclatural type”, as defined according to the rules of the International Code of Botanical Nomenclature, must be distinguished from what the binomial *O. umbellatum* biologically represents. The question was answered, on objectively solid grounds, by William Stearn as early as 1983 (we make a short digression to recall that his death on May 9<sup>th</sup>, this year, deprived us all of the pleasure of having such useful discussions with him about so many issues...). The nomenclatural type indicated by Stearn (1983) refers to an engraving published by Reneaulme in 1611. The portrayed plant came from the Loire region, France, where, according to Raamsdonk (1984), hexaploid, and, according to Moret & al. (1991), triploid biotypes of the plant exist. In 1991, Stearn & Landström, based on Linnaeus's not having made a distinction between plants with dormant bulblets during the blooming period (these specimens could even be attributed to *O. angustifolium*) and plants with sprouting bulblets (those portrayed by Reneaulme, which could be attributed to *O. divergens*), decided that Linnaeus's binomial was to be rejected since it muddled things up. We will never know if the plant portrayed by Reneaulme was diploid, triploid or hexaploid. But the nomenclatural type is not based on biological features – which on the other hand could not even be

checked – but based on the Code's rules. In our opinion, a binomial of Linnaeus's (or of any other author) cannot be written off unless there are extremely sound reasons, as those currently set forth by the Code.

The proposed iconotype portrays the plant which all botanists have got used to referring to as *O. umbellatum*. Of course this name can circumscribe and embrace biotypes and populations with extremely different biological characteristics. Just look at the different ploidy levels! We basically agree, therefore, with Speta (2000a) on this issue: Linnaeus's name is not to be lost. In 1985, Greuter & al. stated they were glad the name *O. umbellatum* was used for the widespread species of fields and arable grounds in Europe and Mediterranean countries, but they included in *O. umbellatum* *O. divergens* as well, which now we tend to consider as distinguished from it. Speta (2000a), based in particular on structural observations of the bulb, thinks that – among the various forms of *O. umbellatum* existing in Lower Austria – polyploid biotypes attributable to *O. vulgare* Sailer (1841) can be distinguished (cf. Dobes & Vitek (2000) for the ploidy levels). Similar cytotypes also exist in Italy, but we are not sure they can be discriminated from others. Ferth & al. (2001) report they can also be identified based on their cardenolide pattern, which cannot be, however, correlated to the number of chromosomes. The content of these substances might be relevant, but we doubt it may be a useful diagnostic feature, especially on the field! Let's go on to another plant.

Unlike what was published by Tornadore & Garbari in 1979, today – as we mentioned – we believe that *O. divergens* Boreau has its own identity and cannot be considered as a synonym of *O. umbellatum*. Based on a further investigation of live – cultivated at the Botanical Gardens of Padua and Pisa – and dried materials from the main Italian herbaria, we believe this species – which has always been found to be hexaploid ( $2n=54$ ) with or without accessory chromosomes in Veneto, the Marches and Apulia – is quite common in Italy, where it is often taken for *O. umbellatum*.

*O. adalgisae* Groves is also polyploid (pentaploid or hexaploid, sometime with accessory chromosomes). This unit is morphologically similar to *O. exscapum*, from which it may be easily distinguished for its bulb, which bears numerous bulblets, but to which it seems to be phylogenetically related, according to a preliminary electrophoretic study on the leaf proteins. Two of us (Tornadore & Marcucci 1993) devoted a paper to this plant, and the considerations therein contained are to be considered as still applicable. So far, this species has been studied in Apulia only, but has also been noted in Pola, Istria. Observations are presently under way to see if these plants are linked with the so-called *O. refractum* Kit. ex Willd. (not *O. refractum* Guss., which belongs to the *O. umbellatum*'s cycle). A recent paper by Peruzzi & Passalacqua (2002) considers *O. adalgisae* as a synonym of *O. refractum*.

*Ornithogalum exscapum* Ten. is common from Tuscany to Sicily. It is always diploid and it is not too hard – in our opinion – to identify it properly (Fig. 1). A problem is instead still open on some Tuscan plants which were misinterpreted by Parlato (1857) as *O. nanum* Sibth. (now known as *O. sibthorpii* Greuter of the Balkan Peninsula), which grow alongside *O. exscapum*, from which they can be distinguished for some characteristics of the leaves, but above all for their having arcuate reflexed pedicels in fruits, always shorter than the bract, which is very large at the base, and other characteristics already evidenced by Tornadore (1986). Some colleagues have investigated these specimens, which are also diploid with 18 chromosomes (Peruzzi & Passalacqua 2002).

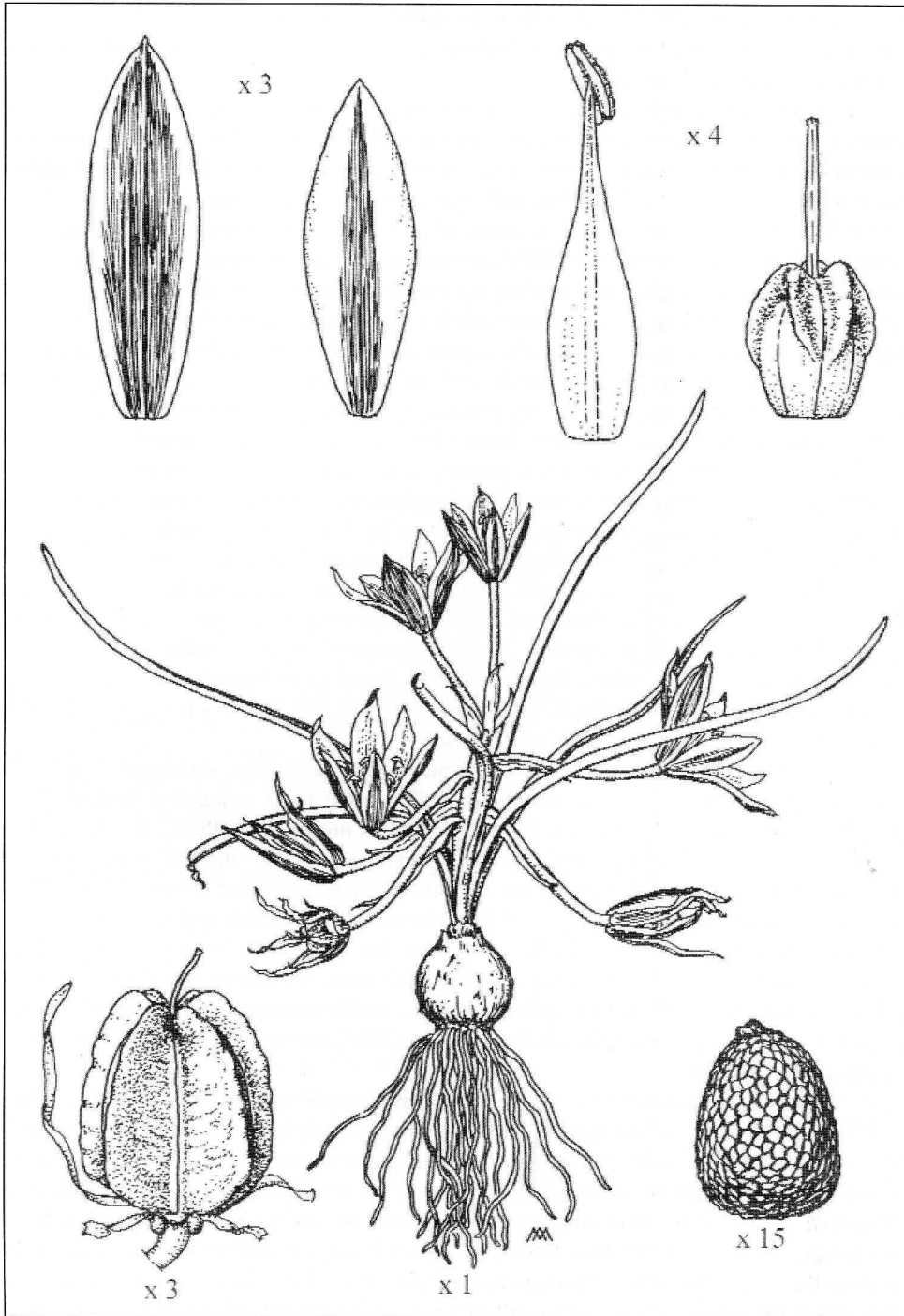


Fig. 1 *Ornithogalum exscapum* Ten. ( $2n=18$ ) from S. Rossore Estate, Pisa (Italy).

A taxon which is to be considered as an insular vicariant of *O. exscapum* is *O. corsicum* Jordan & Fourr., an endemic species of Sardinia and Corsica (Fig. 2). Also a diploid, it has well-defined features and it is somewhat surprising that some colleagues may have considered it as “un taxon de peu de valeur” (Moret *cit.* in Gamisans & Janmonod 1993) or a synonym of *O. exscapum* (Landström 1989: 28, sub *O. sandalioticum*). Some conclusions on this taxon have already been published by Garbari (1990) and we are going to confirm them here.

Similar to some dwarf forms of *O. divergens* and often taken for *O. exscapum* is a plant attributed to *O. refractum*. It is hexaploid, at least in the area of the Marches where it has so far been studied, and in any case polyploid ( $2n=54+B; 72$ ), according to the authors who investigated it (Raamsdonk 1984; Landström 1989; Markova & al. 1974). This year, one of our co-operators (L. Peruzzi, pers. com.) found some polyploid ( $2n=72$ ) samples on Mounts Nebrodi in Sicily, 1500 m a.s.l., which could relate to *O. refractum*, but which also look very similar to *O. adalgisae*. Further investigations are under way to confirm the assumptions which have been made on their similarities, or even on their possible synonymies. See also Peruzzi & Passalacqua (2002) on this subject.

We believe that the diploid *O. ambiguum* N. Terracc. ( $2n=18$ ; cf. also Speta 1990) may also be referred to this group. In its *locus classicus*, it is characterized by gregarious bulbs with free scales, usually binate flowering scapes, and generally larger flowers and leaves than *O. exscapum*. So far, this plant has been found in Calabria only. The lectotype may be selected among Terracciano's original specimens, which are preserved in FI.

*O. brutium* N. Terracc., which is still polyploid at varying degrees ( $2n=36, 45, 54+B, 72$ ), mostly pentaploid in its *locus classicus*, is also from Calabria (Castrovillari). Its most relevant features are the bulb with concrescent scales, bulbiferous within and outside the tunics, the flower pedicels close to the scape, the bract subequal to the peduncle. As with *O. adalgisae*, any relationship of *O. brutium* to *O. refractum* must also be investigated.

The latter five species we have been talking about should be attributable to the subgen. *Amphigalum* Zahar. though this taxon does not sound too convincing to us.

*Ornithogalum comosum* L. is related to sect. *Obtusangula* Zahar. The nomenclatural type was designated by Stearn based on a woodcut published by Rudbeck in 1701, which Linnaeus was aware of (Stearn 1983). This name generally refers to a synonym - *O. garganicum* Ten. - whose leaves are ciliolate or minutely denticulate at the margins. But this feature is not mentioned either by Rudbeck or Linnaeus, so there remains some doubt on the taxonomic identity of these two species. We can, however, add that in Crete (Greuter & al. 1985) the leaves may or may not be ciliolate, and this feature could therefore be unimportant. In Italy the plant, where it can be found from Friuli to the Marches, from Abruzzi to Basilicata and from Apulia to Sicily, has always been found to be diploid ( $2n=18$ ), sometimes with B (Tornadore & Marcucci 1988). As far as the nomenclatural type of *O. garganicum* is concerned, in Kew (n. 178/137/1) there is a sheet with two full specimens, with the wording “*Ornithogalum garganicum* Nob., origin. Gargano” and an addition written in someone else's hand “*collinum* Gussone *ined.*, Tenore *dedit* nov. 1827”. We think that one specimen can be designated as a lectotype.

During a field excursion of the Italian Botanical Society in the Gargano area, on May 24<sup>th</sup>, 2000, we observed many populations of an unknown *Ornithogalum* which is common

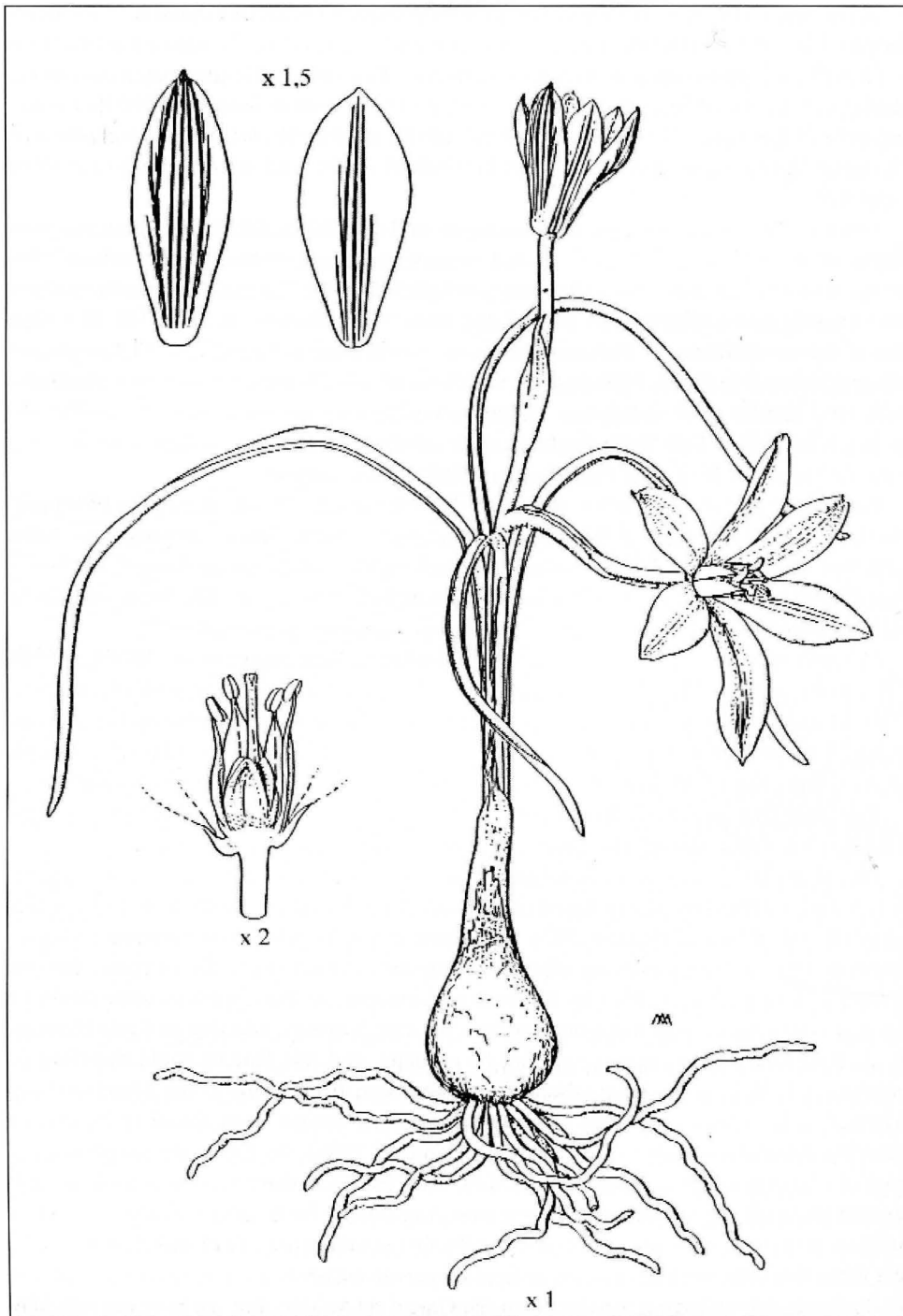


Fig. 2 *Ornithogalum corsicum* Jordan & Fourr. ( $2n=18$ ) from Bonifacio (Corse).

along the shadowy tracks of the Umbrian forest, along the edge of the wood which is composed of deciduous broadleaf trees (*Fagus*, *Acer*, etc.).

This *Ornithogalum* has a single large bulb with cloves but without bulblets, large glaucous-green leaves with a poorly-visible white stripe, a corymb-like inflorescence at the apex of a long scape. Karyologically, it has  $2n=54$  or  $63$  chromosomes, with or without B. Its specific ecology and morphological characteristics suggest it might be a new systematic specific unit (Tornadore & al. 2003).

Just a few words on *O. montanum* Cyr., a diploid species with or without accessory chromosomes ( $2n=18 + B$ ), which is commonly found in Basilicata, Calabria, Apulia and Sicily. It is similar to *O. lanceolatum* Labill. and sometimes considered as a synonym of the latter. *O. montanum* is sympatric and partially crossing with *O. lanceolatum* in Turkey, according to Cullen & Ratter (1967), Cullen in Davis (1984) and Øvstedal (1991). We wondered if the latter species might exist in southern Italy or Sicily, but we think it should not, as Barbujani & Pigliucci (1989) already suggested in a paper on the geographical patterns of the karyotype polymorphism of *O. montanum* in Italy.

And now, let's talk about *O. gussonei* Ten.

The plant was described as *O. tenuifolium* by Gussone in 1825, but this name had already been used and Tenore justly corrected the name of the species into *O. gussonii* (not "gussonei"). One of us (F. G.) have long discussed with W. T. Stearn on its correct "spelling" on July 8<sup>th</sup>, 1988. He favoured the double "i" at the end, while F. G. did not. But this is not a problem. The problem is, many authors still erroneously call the species *O. tenuifolium*, which is a South-African unit, now to be included in *Stellarioides* Medicus, according to Speta (2001b), a genus showing chromosome numbers, karyotypes and heterochromatin patterns quite different in respect to *Ornithogalum* (Vosa 1997, sub *Ornithogalum*).

Apart from this, Gussone in the first study refers to an iconographic table (t. 172 f. 2) which has never been made (P. Mazzola, pers. com.). No suitable iconography being available, the plant was and still is very often taken for some other species, in spite of its clear diagnostic features (Fig. 3): the lack of leaves in the blooming period, one single bulb, hairless and thread-like leaves, cross-run by a weak white line and a small red-orangey spot on the connective tissue of the anthers, which can still be seen in the dried specimen as well. The color is due to the presence of anthocyanins in the vacuoles of the stamen connective cells. Its chromosomes are  $2n=14$ , with or without B. This species and its distribution have been deeply investigated by Speta (1990), and we agree on his observation. He recently (Speta 2000b) and specifically described some populations from the Ionian Isles and the near-by Greek mainland as *O. immaculatum*, easily distinguishable from *O. gussonei* because of the lack of the brown point on the connective tissue of the anther. Specimens without the brownish spot have also been found by us in Apulia, mixed with those with the spot, but they clearly belong to the same species, *O. gussonei*. Incidentally, we would like to add that *O. trichophyllum* Boiss. & Heldr. has sometimes been considered as a variety of *O. gussonei*, despite its having very different features and not belonging to Mediterranean chorotypes (Borzatti von Loewenstern & Garbari 1996).

*O. gussonei* was and is very often taken for *O. collinum* Guss. or *O. kochii* Parl.

Of *O. collinum*, we can say it is a diploid species which is quite common in northern Sicily. Speta (1990) says it also exists in the Gargano (Apulia), but we have not seen any specimen from such area. Two of us were responsible for typifying and examining its diag-

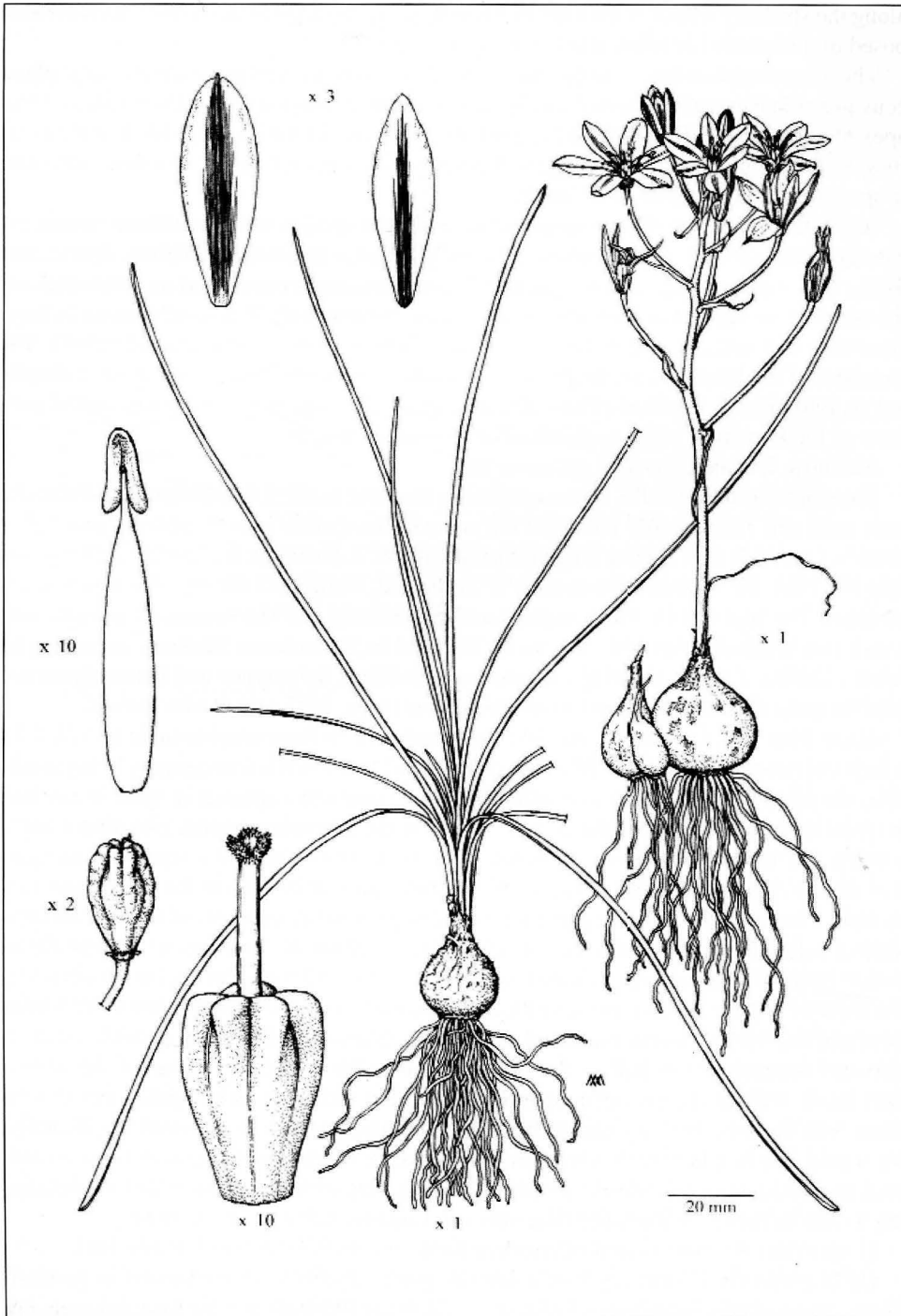


Fig.3 *Ornithogalum gussonei* Ten. ( $2n=14$ ) from Syracuse (Sicily).



nostic features (Garbari & Giordani 1984). We have already published that this species also exists in Greece and Crete, in keeping with Speta (1990), who described this unit in great detail.

Two of us investigated *O. kochii* some years ago (Giordani & Garbari 1990). Typified and described in its basic diagnostic features, it can be easily taken for *O. gussonei*, though in 1977 Zahariadi had already pointed out some profound differences: underground seed germination (hypogean cotyledon, as in *O. collinum*), red dots at the connection of the anther, non-coalescent bulb tunics, smelling flowers, common in the Mediterranean area for *O. gussonei*; epigeal seeds, no red spots on the anthers, coalescent tunics in a sort of pseudo-tuber bulb, odorless flowers, mainly common in Central Europe for *O. kochii*. They have a quite different karyology, *O. kochii* having a basic chromosome number  $n=9$ , *O. gussonei*  $n=7$ . Based on their karyotype morphology and morphological features, at present we can say *O. kochii* exists in Lombardy, Veneto and Friuli.

Very similar to *O. kochii* for its morphological features is *O. monticolum* Jordan & Fourr. which, according to our karyological investigation on French populations from Longis du Pin (1700 m a.s.l.), has  $2n=18$  with trisomic biotypes at  $2n=20$  (Tornadore & Marcucci 1988). According to Ferth & al. (2001), the plant seems to have some pentaploid cytotypes as well ( $2n=45$ ). Raamsdonk & Heringa (1987) studied this taxon in a number of areas in Piedmont, Liguria and Aosta Valley, where it has  $2n=18$  or 20 chromosomes. It is common in particular on the French and Italian Alps, with some population in southwestern Germany and perhaps in Austria, but this still has to be confirmed.

*O. orthophyllum* Ten., a poorly-known floristic unit, which is often considered a synonym of or taken for other units, especially *O. etruscum* Parl., *O. kochii* Parl. and even *O. umbellatum* L., deserves a few more words. Pastor (1987) thinks this taxon is related to *O. baeticum* (*O. orthophyllum* var. *baeticum* (Boiss.) Zahar.) and to *O. algeriense* (*O. orthophyllum* var. *algeriense* (Jord. & Fourr.) Maire & Weiller). Cullen in Davis (1984) states the Turkish material he investigated would seem to belong to *O. orthophyllum* subsp. *kochii*, using Zahariadi's 1980 analytical key. The latter considered *O. orthophyllum* as a subspecies of *O. umbellatum*.

This species was described by Tenore in 1830 in an area called Montegrande, near Pizzoli, in the province of L'Aquila, in the Abruzzi region (central Italy). We checked Naples' Herbarium for samples which could help us to typify this plant, but none of the examined vouchers can be eligible as a type, due to a number of reasons which would take too long to explain here. We went to the *locus classicus* and found many specimens which are consistent with the features contained in the protologue. Karyologically, the samples have always been found to be diploid,  $2n=18$ . When we started investigating this species, we thought it existed in Tuscany, Latium, Abruzzi and perhaps somewhere else. The opportunity to compare the live plant from the *locus classicus* to those of different origins made us change our minds completely.

First, we have to say that no karyological data which has been so far attributed by different authors to *O. orthophyllum* are reliable. A special paper will be published on the subject and our opinions will become clear. Today, we can briefly state that the karyological counts can be attributed to *O. kochii*, *O. algeriense*, *O. gussonei*, *O. baeticum*, *O. umbellatum*, but never to *O. orthophyllum* proper, which qualifies as an endemic diploid species of some mountains of the Abruzzi (and Basilicata, according to Parlatore, 1857).

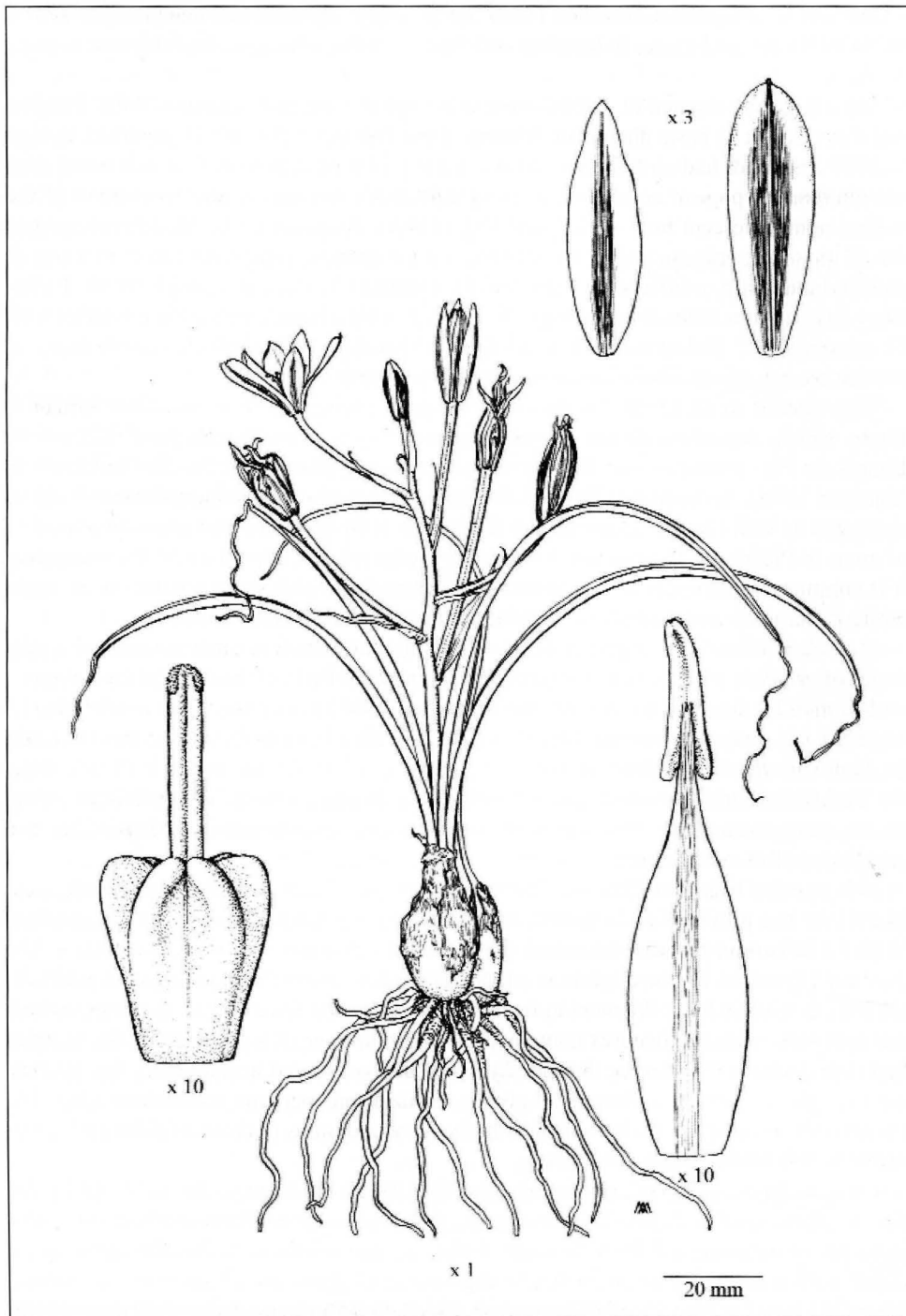


Fig.4 *Ornithogalum etruscum* Parl. ( $2n=72$ ) from Monte Pisano, Pisa (Italy).

But the investigation of this species, which is necessarily related to the investigation of other populations of central Italy, leads us to another interesting conclusion.

Parlatore (1857) described for Rocca d'Orcia, Tuscany, a new species which he called *O. etruscum*. Collected in the *locus classicus* and investigated also from a karyological point of view, it was found to be the same as some plants of the Monte Pisano, which at first we had temporarily named *O. orthophyllum*. The populations of the Monte Pisano, where this species is very common, are all polyploid (octoploid), such as those of Rocca d'Orcia, Isle of Elba, Mount Amiata and other areas of Tuscany ( $2n=72 + B$ ). In Latium, in addition to octoploid biotypes ( $2n=72 + 0-9 B$ ), a tetraploid specimen was found ( $2n=36 + B$ ) in a population of Montecassino (Frosinone); one triploid ( $2n=27$ ), one tetraploid ( $2n=36$ ), one hexaploid ( $2n=54$ ) and – obviously – octoploids ( $2n=72 + B$ ) as everywhere else were found in Molise. Parlatore (1857) attributed the plant from Monte Pisano to *O. tenuifolium*, but the author literally specified ( in Italian): “I describe herewith the plants I collected on the Monte Pisano and on the hills and knolls of the Tuscan Maremma, which are very different from that of Palermo for their leaves, which look less thread-like and are provided with a poorly-visible white line, and for the perigonium leaves which lengthen (elongate) during flowering: further investigation may perhaps distinguish such plants as different varieties or species. I would therefore name the Tuscan plant *O. neglectum*”.

Here comes the identity of a unit which is obviously very different from *O. tenuifolium* (i.e. *O. gussonei*), whose characteristics we have already mentioned, but also from *O. orthophyllum* for its morphology and karyology. We can identify these populations from central Italy using Parlatore's old name, i.e. *O. etruscum*, which the Pisan plants are also to be referred to (Fig. 4). The latter have slightly different features and karyotypical asymmetry, perhaps due to their geographical location at the edge of the distribution area, but not such as to suggest a subspecific or varietal characterization. Further statistical analyses are however in progress.

Now, it is time to conclude. The foregoing is a summary of our latest research, mainly based on classical morphological and karyological aspects. Our observations will continue, also by means of more sophisticated methods which other authors are already experimenting. But the knowledge of this group of plants, though remarkably widened, still poses problems and difficulties, so much so that *Ornithogalum* never stops – according to a well-chosen expression – being an “execrable” genus (Greuter 1988). Parlatore (1847) had already stated ( in Italian): “Owing to the muddle in the different specific units, the genus *Ornithogalum* would deserve a monographic research carried out by a talented botanist who should investigate the living specimens cultivated long enough to learn which characters are worth entering the identity diagnostic keys for each species”.

#### Acknowledgements

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