Mediterranean chromosome number reports — 12

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Abstract

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This is the twelfth of a series of reports of chromosomes numbers from Mediterranean area, peri-Alpine communities and the Atlantic Islands, in English or French language. It comprises contributions on 38 taxa: *Cyclamen, Crocus, Ajuga, Ornithogalum, Allium* and *Bellis* from Greece, by E. Kriemadi, P. Bareka & G. Kamari (Nos. 1278-1283); *Ononis* and *Astragalus* from Bulgaria and Turkey, by D. Pavlova & A. Tocheva (Nos. 1284-1287); *Geranium* from Bulgaria, by A. Petrova & P. Stanimirova (Nos. 1288-1294); *Scabiosa, Groenlandia, Hypericum, Crocus, Ajuga, Colchicum, Euphorbia, Centaurea, Aconitum* and *Leopoldia* from Italy, by L. Peruzzi & G. Cesca (Nos. 1295-1304); *Delphinium* from Tunisia, Morocco, France, Armenia, Balearic Islands and Canary Islands, by M. Bosch, J. Simon & C. Blanché (Nos. 1305-1311); *Anthyllis* and *Genista* from Spain and Sardinia, by T. Cusma Velari, L. Feoli Chiapella, V. Kosovel, G. Bacchetta & S. Patui (Nos. 1312-1314); *Genista* from Turkey, by T. Cusma Velari, L. Feoli Chiapella & Z. Aytaç (No. 1315); *Colchicum, Silene* and *Halocnemum* from Italy, by O. Cecchi & G. Fiorini (Nos. 1316-1318).

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Reports (1278-1283) by Eleni Kriemadi, Pepy Bareka & Georgia Kamari

1278. *Cyclamen hederifolium* Aiton — $2n = 68$ (Fig. 1).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, close to the village Maradochori, locality known as Amouso, 38°36'N, 20°38'E, 14 Oct 2000, *Kriemadi EK 72* (UPA).

Cyclamen hederifolium is widespread in Mediteranean area, from France to the Balkan Peninsula and Turkey.

The diploid chromosome number $2n = 2x = 34$ has been reported in Greek material from Peloponnisos (Bennett & Grimshaw 1991) and from Mt. Olympos (Strid & Franzen 1981), as well as from Bulgaria (Peev 1976). The tetraploid chromosome number $2n = 4x = 68$ has already been reported in Greek material (Bennett & Grimshaw l.c.) and it is in accordance with our counts from Levkas island. Moreover, the somatic number $2n = 28$ has been given by Peev (1977) in material from Bulgaria, while Bennett & Grimshaw (l.c.) reported the chromosome number $2n = 54$ in material from Italy.

The karyotype of this species is symmetrical, consisting mostly of metecentric (m) chromosomes, six of which bear small, spherical and not always visible satellites. Chromosome size varies from 1.1 to 2.6 µm.

1279. *Crocus boryi* Gay — $2n = 30$ (Fig. 2).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, close to the village Agios Nikolaos, 38°35'N, 20°33'E, 17 Nov 2000, *Kriemadi EK 70* (UPA).

Crocus boryi is a Greek endemic species distributed in W. and S. mainland, Ionian Islands, Kithira and southeast Kriti (Mathew 1982).

The chromosome number $2n = 30$ counted here confirms data reported by Brighton & al. (1973) in material from Peloponnisos and Kerkira island and by Phitos & Kamari (1983) from Kefallinia island.

A microphotograph of the karyotype is presented here from Levkas island. The karyotype is symmetrical, having mostly metacentric (m) chromosomes (Fig. 2). The karyotype formula consists of $2n = 24m + 2m\text{-SAT} + 4sm = 30$ chromosomes, ranging in size between 1.5 and 4.8 µm.

1280. *Ajuga iva* (L.) Schreb. — $2n = 10x = 80$ (Fig. 3).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, close to the village Agios Nikolaos, 38°35'N, 20°33'E, 17 Nov 2000, *Kriemadi EK 73* (UPA).

Ajuga iva is a Mediterranean element, distributed from Portugal eastwards to Jordan.

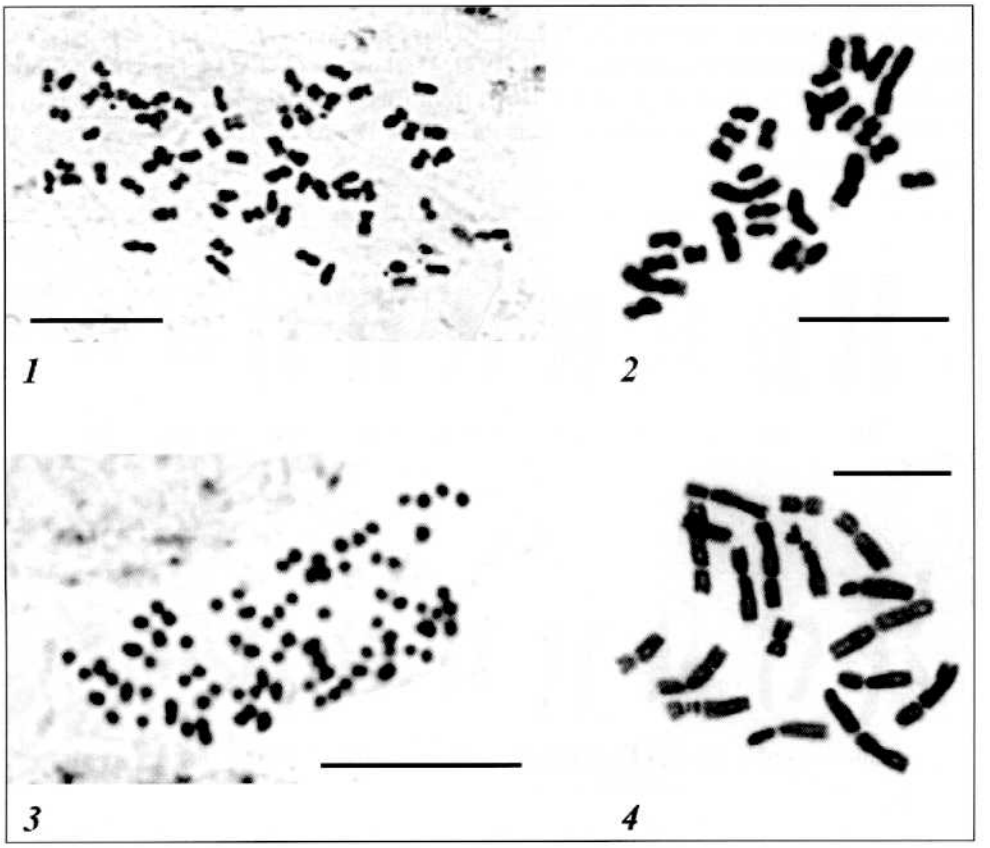
To our knowledge, no former records for this taxon have been reported from Greece. The somatic number $2n =$ c. 86 was counted in material from Balearic Islands, by Dahlgren & al. (1971).

The population examined here has proven to be decaploid, with $2n = 10x = 80$ small chromosomes, varying in size between 0.4 and 1.4 µm. The karyotype morphology cannot be detectable, due to the chromosome size, as well as, to unclear position of the centromeres.

1281. *Ornithogalum montanum* Cyr. [= *O. nyssarum* Petrovic] — $2n = 18$ (Figs. 4, 5a, 5b).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, S. of the village Evgiros, 38°37'N, 20°40'E , 14 Oct 2000, *Kriemadi EK 69* (UPA). - (Figs. 4, 5a).

— Ionian Islands, Nomos Zakinthou, Zakinthos island, S part of the island, locality known as Faros Keriou, phrygana, 37°40'N, 20°49'E, alt. c. 50-150 m, 5 Apr 1997, *Kamari & al. s.n., cult. no* K22 (UPA). - (Fig. 5b).



Figs. 1-4. Microphotographs of mitotic metaphase plates of : **1,** *Cyclamen hederifolium,* $2n = 68$; **2,** *Crocus boryi,* $2n = 30$; **3,** *Ajuga iva,* $2n = 10x = 80$; **4,** *Ornithogalum montanum,* $2n = 18$. — Scale bars = 10 µm.

Ornithogalum montanum is mainly distributed in the E. Mediterranean region extending westwards to Italy and Sicily.

Our count ($2n = 18$) is in accordance with previous records from Greece (Phitos 1980, Van Loon & Oudemans 1982, Cullen & Ratter 1967). The chromosome numbers $2n = 20$, 22, 24 (Phitos l.c.) and $2n = 16$ (Van Loon & Oudemans l.c.) have also been reported for Greek material.

The somatic number $2n = 18$ reported here, is also given from Italy (Garbari & Tornadore 1971, Tornadore & Garbari 1979), from Turkey (Cullen & Ratter 1967) and from Romania (Lungeanu 1972). Moreover, Tornadore & Garbari (l.c.) reported the chromosome complements $2n = 18$, 18+1B, 20, 20+1B, 22, 22+1B, 23, 24; 2n=30 is mentioned by Garbari & Tornadore (1972).

Several authors have reported a great variation in the chromosome number, as well as in B-chromosomes, of *O. montanum* from other countries. Barbujani & Pigliucci (1989) reported the chromosome number $2n = 18 + 2B$ in Italian populations, Kushnir & Galil (1977) found $2n = 16$, 20 in material from Israel, Cullen & Ratter (1967) counted $2n = 14$ in Turkish populations and $2n = 18$ in material from Sicily, Greece, Turkey and Lebanon. Also, the chromosome numbers 2n = 12, 14, 16 have been reported from in material from Bulgaria (Lungeanu 1972, Markova & al. 1972, Markova & al. 1974). The chromosome number $2n = 20$, is given by Agapova (1974) from Russia. Bolkhovskich & Alexandrova (1988) have reported the somatic numbers $2n = 2x = 18+2B$ and $2n = 2x = 36 + 4B$ in material from Armenia.

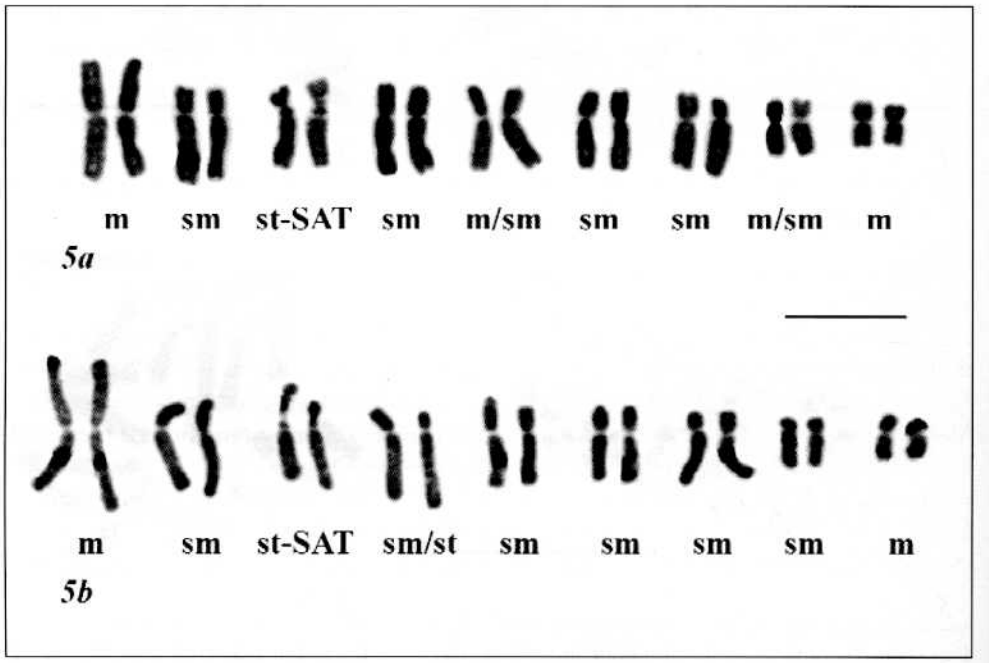


Fig. 5. Karyograms of *Ornithogalum montanum*, $2n = 18$, from the populations: **a,** Kriemadi EK 69; **b,** Kamari & al. *cult. no* K22. — Scale bar = 10 µm.

The karyotype is symmetrical, consisting mainly of metacentric and submetacentric chromosomes. The karyotype formula of the population from Levkas is $2n$ = 4m + 4m/sm + 8sm + 2st-SAT = 18 (Figs. 4, 5a). The population from Zakinthos consists of $2n$ = 4m + 10sm + 2sm/st + 2st-SAT = 18 chromosomes, varying in size between 2.7 and 10.5 µm. The fourth chromosome pair of this population is strongly heteromorphic in the length of its short arms (Fig. 5b).

1282. ***Allium ionicum*** Brullo & Tzanoud. — $2n$ = 16 (Fig. 6).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, S. of the village Evgiros, 38°37'N, 20°40'E , 14 Oct 2000, *Kriemadi EK 71* (UPA).

Allium ionicum is a Greek endemic species distributed in the Ionian Islands (Levkas, Kefalonia and Ithaki).

Brullo & Tzanoudakis (1994) have also reported the same chromosome number of $2n$ = 16 and a similar symmetrical karyotype in material from Levkas and Ithaki islands. They also refer variation in the number and the morphology of the SAT-chromosomes.

Microphotograph and a karyogram of a different population studied are presented here (Fig. 6). The karyotype is symmetrical, with mostly metacentric chromosomes, which vary in size between 7.0 to 12.8 µm. Satellites are observed on the long arms of the third in size chromosome pair and on the short arms of the submetacentric chromosome pair, which, however, are not always visible. Moreover, the shortest metacentric chromosome pair bears spherical and always visible satellites, in addition to an heterozygosity in the size of their short arms. The karyotype formula is given as: $2n$ = 10m + 4m-SAT + 2sm-SAT = 16 chromosomes.

1283. ***Bellis perennis*** L. — $2n$ = 18 (Fig. 7).

Gr: Ionian Islands, Nomos Levkadas, Levkas island, close to the village Agios Nikolaos, 38°35'N, 20°33'E, 17 Nov 2000, *Kriemadi EK 74* (UPA).

Bellis perennis is a Euro-Siberian element distributed throughout Europe, extending eastwards to Azerbaijan.

The somatic number $2n$ = 18 of this species is in accordance with previous reports by Baltisberger (1991) in material from Greece (Mt. Tsoumerka), Kuzmanov & Ko□uharov (1970) in material from Bulgaria and Morton (1977) in material from Great Britain. Material from Levkas island, of which a microphotograph and a karyogram are presented here (Fig. 7), has the same chromosóme number $2n$ = 18.

The karyotype of *B. perennis* is symmetrical, consisting of metacentric chromosomes, four of which bear small, spherical and always visible satellites. The karyotype formula is showed as $2n$ = 14m + 4m-SAT = 18 chromosomes, varying in size between 1.9 and 4.2 µm.

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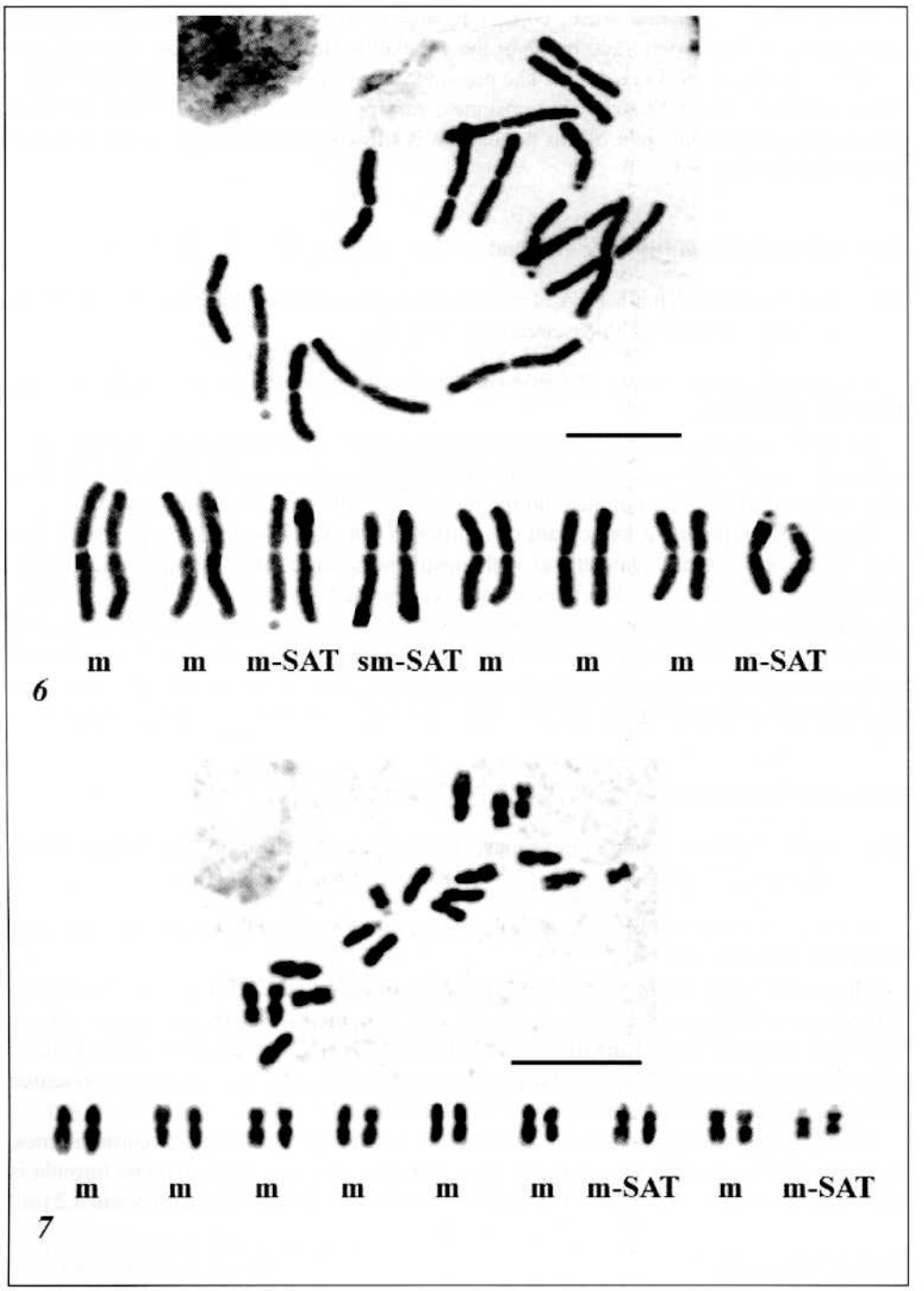

Figs. 6-7. Microphotographs of mitotic metaphase plates and karyograms of : **6,** *Allium ionicum,* 2*n* = 16; **7,** *Bellis perennis,* 2*n* = 18. — Scale bars = 10 µm.

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Reports (1284-1287) by Dolja Pavlova & Anita Tosheva

1284. *Ononis repens* L. — $2n = 32$ (Fig. 1).

Bu: Znepole region, Lobosh village, on the hills above the village, 4228'N, 2252'E, 15 Jul 2000, *A. Tosheva* (SO 100385).

The distribution range of this species covers Europe without its northern parts, the Mediterranean, the Caucasus Mts, Southwestern and Central Asia, Siberia and Northern Africa. This species is rarely distributed in Bulgaria up to 1500 m a.s.l. (Kuzmanov 1976, Kozuharov 1992) and is included in the Red Data Book of Bulgaria with category "rare" (Vassilev 1984).

The chromosome number $2n = 32$ is reported for the first time for a population from Bulgaria.

This chromosome number confirms previous counts of Reese (1952), Weimarck (1963), Palazueles & al. (1976) and Sanudo & al. (1979). The numbers $2n = 64$; $2n = 30$ and $2n = 60$ (see Fedorov 1969: 312, Goldblatt 1981: 251, Goldblatt & Johnson 1994: 100, 1996: 118 for references) were also reported for this species.

The centromere index, Ic = S/L+S (Grif & Agapova 1986) gives reasons to consider the chromosomes being of metacentric, submetacentric and intercentric types. The second pair of intercentric chromosomes bears small ball-shaped satellites. The karyotype is rather symmetrical. It consists of $2n = 2x = 18m + 8sm + 4I + 2I\text{-}SAT = 32$ chromosomes. The chromosome size varies between 1.6 m and 4.8 m. The ratio $X^{max} : X^{min}$ is 3 : 1.

1285. *Ononis pusilla* L. — $2n = 30$ (Figs. 2-6).

Bu: Znepole region, Golo Bardo Mts, on calcareous terrains near the touristic hut Orlite, 4230'N, 2301'E, 150 m a. s. l., 09 Jul 2000, *A. Tosheva*, (SO 101422). - (Fig. 2).

— Thracian plain, Plovdiv region, Popovitza village, on meadows southwards from the village, 4205'N, 2504'E, 26 Jun 2001, *M. Anchev*, (SO 101948). - (Fig. 3).

— Black Sea Coast, the city of Varna, St. Konstantin resort, 4312'N, 2753'E, 27 Jul 1999, *A. Tosheva*, (SO 101949). - (Fig. 4).

— Sofia region, Bezden village, on calcareous hills northwestwards from the village, 4245'N, 2304 E, 27 Jun 1999, *R. Tzonev*, (SO 101421). - (Fig. 5).

Tu: Western Turkey, in *Pinus nigra* forest near the village Tavsanli, 1300 m a.s.l., 3920'N, 2922'E, 25 Sep 1999, *D. Pavlova*, (SO 101950). - (Fig. 6).

The distribution range of this species covers Southern Europe, the Mediterranean, the Caucasus Mts and Southwestern Asia. This species is rarely distributed in Bulgaria up to 1000 m a.s.l.(Kuzmanov 1976, Kozuharov 1992).

The chromosome number $2n = 30$ for this population confirms previous data from Bulgaria (Kuzmanov & Markova 1973, Pavlova & Tosheva, 2000) and from other countries in Europe (for references see Fedorov 1969: 312, Goldblatt 1981: 251, 1984: 190, Goldblatt & Johnson 1994: 100, 1996: 118). The only report of $2n = 34$ is for populations from Slovakia (Majovsky 1970).

Karyotype analyses were done for four populations from Bulgaria (Znepole region, Thracian plain, Black Sea coast, Sofia region) and the one from Turkey. The centromere index shows chromosomes of metacentric and submetacentric types.

The karyotypes can be devided in two groups. The first group includes the karyotypes from Znepole region (Fig. 2) and Thracian plain (Fig. 3). The size of the chromosomes in these karyotypes varies between 2.4 - 5.2 m and 2.4 - 4.4 m respectively. The karyotypes consist of $2n = 2x = 16m + 10sm + 4sm\text{-}SAT = 30$ chromosomes. Both karyotypes have one submetacentric chromosome pair of different in size chromatides. The shortest chromosomes are of metacentric type, but the longest are of submetacentric type.

The second group includes the material from Black Sea coast (Fig. 4) and Sofia region (Fig. 5). The size of the chromosomes varies between 2.4 - 3.6 m and 2.0 - 4.0 m respectively. The karyotypes consist of $2n = 2x = 20m + 6sm + 4sm\text{-}SAT = 30$ chromosomes.

All investigated karyotypes are rather symmetrical. These results differ from previous data (Pavlova & Tosheva 2000) by the presence of two pairs of chromosomes with satellites.

The investigated population from Turkey (Fig. 6) stands close to those from the Black Sea coast (Fig. 4) and Sofia region (Fig. 5). The karyotype includes $2n = 2x = 20m + 2\ m\text{-}SAT + 6sm + 2\ sm\text{-}SAT = 30$ chromosomes. It differs from the bulgarian populations by the presence of a pair metacentric chromosomes with satellites.

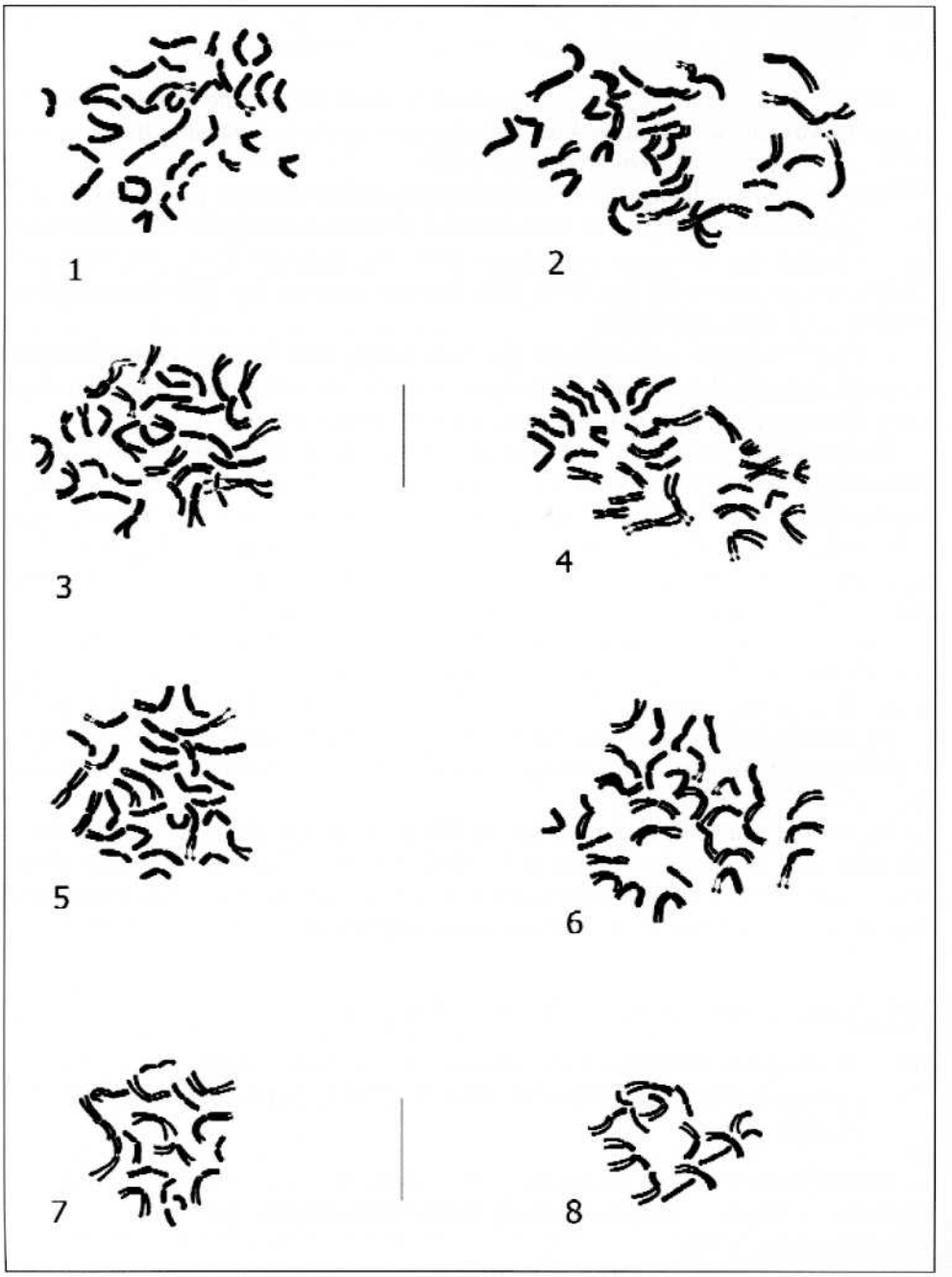
1286. *Astragalus pubiflorus* L. — $2n = 16 + 2B$ (Fig. 7).

Bu: Danube plain, calcareous hills eastwards from Debovo village, grassy places on southeast-facinf slopes, 150 m a.s.l., 4331'N, 2455'E, 26 Jun 2001, *D. Pavlova*, (SO 102144).

The distribution range of this species covers Southern Europe, Romania, Ukraine and the Balkan peninsula. This species is rarely distributed in Bulgaria up to 150 m a.s.l. (Valev 1976, Kozuharov 1992).

The chromosome number $2n = 16 + 2B$ is reported for the first time for a population from Bulgaria.

The karyotype consists of $2n = 2x = 12m + 4sm + 2B = 16 + 2B$ chromosomes and is symmetrical. The length of the metacentric and submetacentric chromosomes varies



Figs. 1-8. Karyotypes of: **1,** *Ononis repens*, $2n = 32$; **2,** *O. pussila* (Znepole region), $2n = 30$; **3,** *O. pussila* (Thracian plain), $2n = 30$; **4,** *O. pussila* (Black Sea Coast), $2n = 30$; **5,** *O. pussila* (Sofia region), $2n = 30$; **6,** *O. pussila* (Western Turkey), $2n = 30$; **7,** *Astragalus pubiflorus*, $2n = 16$; **8,** *A. depressus*, $2n = 16$; — Scale bar = 7m.

between 2.0 m and 4.0 m. The longest and the shortest chromosomes are of metacentric type.

1287. ***Astragalus depressus*** L. — $2n = 16$ (Fig. 8).

Bu: Western Rhodopes Mts, Beglika locality, on grassy places in the periphery of a *Pinus sylvestris* forest, 1300 m a.s.l., 4150'N, 2410'E, 30 Jul 2001, *D. Pavlova*, (SO 102042).

The distribution range of this species covers Northern Switzerland and Southern Europe - Spain, France, Italy, Romania, the Balkan Peninsula, Cyprus, and Asia Minor. This species is rarely distributed in Bulgaria up to 1300 m a.s.l. (Valev 1976, Kozuharov 1992).

The chromosome number $2n = 16$ confirms earlier reports (Favarger 1965, Cartier 1976, Andreev 1982, Franzen & Gustavsson 1983, Pavlova 1988). The karyotype consists of $2n = 2x = 8m + 8sm = 16$ chromosomes and is symmetrical. The size of the metacentric and submetacentric chromosomes varies between 1.6 m and 3.2 m. The longest and the shortest chromosomes are of metacentric type.

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Reports (1288-1294) by Ana Petrova & Pepa Stanimirova

1288. *Geranium caeruleatum* Schur — $2n = 2x = 28$ (Fig. 1) & $2n = 4x = 56$ (Fig. 2).

Bu: Vitosha Mt., grassy, shrubby places along the path between the locality Mechata polyana and Koupena summit, 1950 m, 42°35'N, 23°18'E, 06 Jul 2000, *Petrova 7200* (SOM).

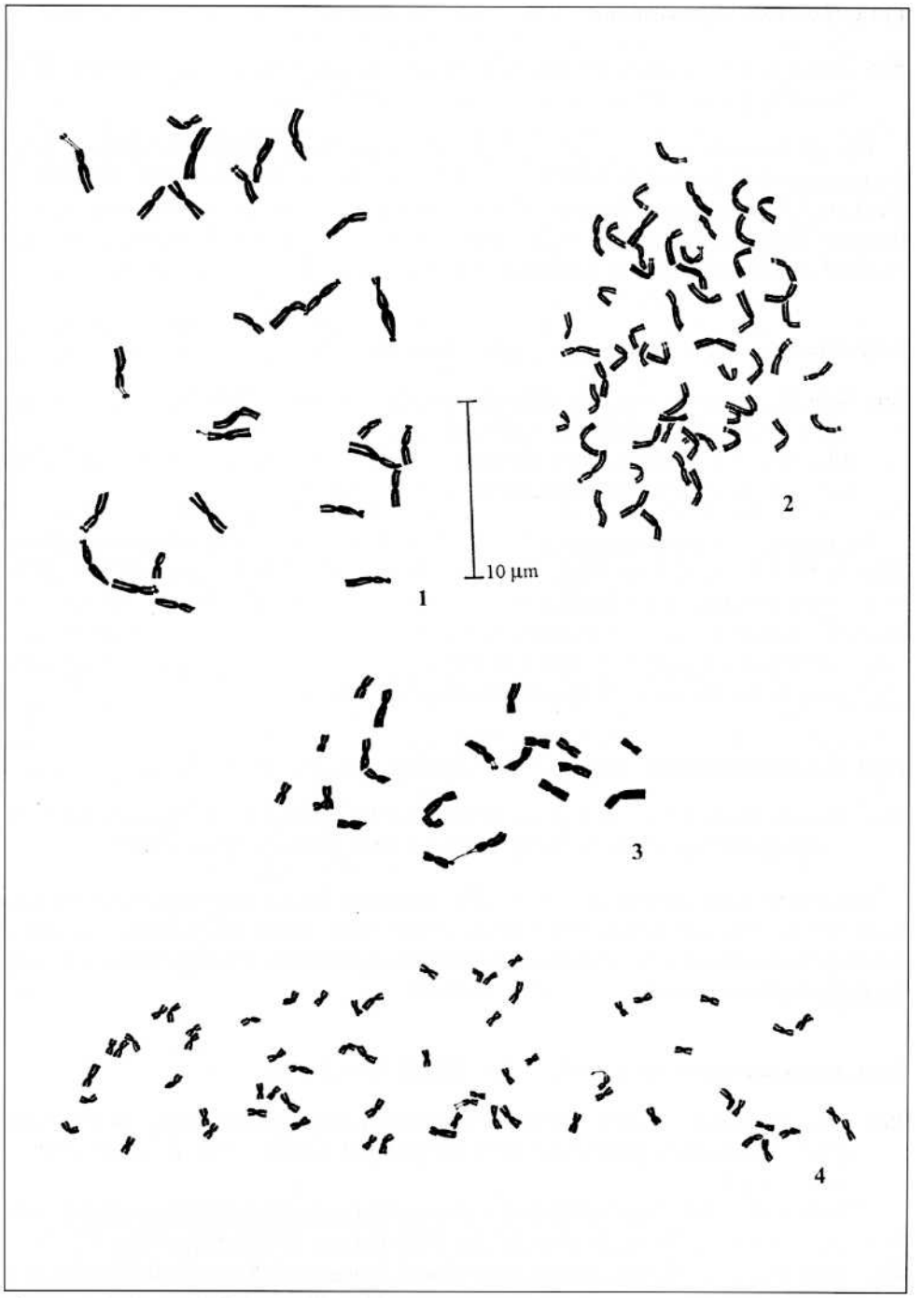
The chromosome number agrees with previous count of Andreev (1982) from Pirin Mt. It is the second report for the species. The karyotype studied consists of $2n = 10m + 12sm + 6sm\text{-}SAT = 28$ chromosomes, well differentiated in size. The tetraploid chromosome number $2n = 4x = 56$ (Fig. 2) together (i. e. in the same slide) with the diploid chromosome number (Fig. 1) is also observed. The phenomenon is known as endomitosis (Geitler 1939) conducting to endopolyploidy (Rieger & Michaelis 1958) and often occurs in different plants and different populations of Bulgarian *Geranium* species.

Doubled somatic chromosome numbers are reported also by other authors: Gauger, (1937) — $2n = 28$ and $2n = 56$ for *G. palustre* L.; Sokolovskaja & Strelkova (1948) — $2n = 28$ and $2\ n = 56$ for *G. gymnocaulon* DC.; van Loon (1984a) — $2\ n = 28$ and $2\ n = 56$ for *G. psilostemon* Ledeb.

1289. *Geranium dissectum* L. — $2n = 22$ (Fig. 3).

Bu: Black sea coast, grassy places near the town of Ahtopol, 42°06'N, 27°55'E, 21 Jun 1972, *Petrova 221825* (SOM).

The chromosome number confirms the data reported by Kirschner & al. (1982), van Loon (1984b), Diaz Lifante & al. (1992) and others (see Fedorov 1969, Goldblatt 1981). This is the first count for Bulgarian material. The karyotype studied includes $2n = 10m + 10sm + 2sm\text{-}SAT = 22$ chromosomes. Some differences in the size of the chromosomes are also observed.



Figs. 1-4. Karyotypes of: **1,** *Geranium caeruleatum*, $2n = 28$. **2,** *G. caeruleatum*, $2n = 56$. **3,** *G. dissectum*, $2n = 22$. **4,** *G. robertianum*, $2n = 64$.

1290. *Geranium roberti?num* L. — $2n = 64, 128$ (Figs. 4, 5).

Bu: Balkan range (middle), Beklemeto locality, grassy places near hotel Beklemeto, 1500 m, 42°47'N, 24°40'E, 25 Jul 1972, *Petrova 221426* (SOM).

The chromosome number found $2n = 64$ is in accordance with previous records by Strid & Franzen (1981), Laane & Lie (1985) and others (see Fedorov 1969; Goldblatt 1981, 1985). Van Loon (1984b) reported the same chromosome number in plants from different parts of Bulgaria. The karyotype consists of $2n = 56m + 2m\text{-SAT} + 6sm = 64$ chromosomes (Fig. 4). Doubled somatic chromosome number $2n = 128$ (Fig. 5) is also observed for this species.

1291. *Geranium divaricatum* Ehrh. — $2n = 28$ (Figs. 6, 7).

Bu: Rila Mt., grassy places around Rilski monastery, 1140 m, 42°09'N, 23°22'E, 05 Jul 1972, *Petrova 221364* (SOM). - (Fig. 6).

— Rila Mt., grassy places along the road to Vodnya chal summit, 1200 m, 42°12'N, 23°20'E, 12 Jul 1974, *Petrova 24199* (SOM). - (Fig. 7).

The counted chromosome number $2n = 28$ coincides with the results of previous authors (Dersch 1974, Löve & Löve 1982, Van Loon 1984b). Murín (1974) reported $2n = 26$ in plants from Slovakia. The chromosome number is reported here for the first time on Bulgarian material. The chromosome complements of the two populations examined are very similar consisting of $2n = 24m + 2m\text{-SAT} + 2sm = 28$ chromosomes. Considerable differences in the size between the chromosomes are observed.

1292. *Geranium brutium* Gasparr. — $2n = 26$ (Fig. 8) & $2n = 4x = 52$ (Fig. 9).

Bu: Western Balkan Foothill region, Vrachanska Mt., grassy, rocky places near cave Ledenika, 937 m, 43°13'N, 23°31'E, 27 Jun 1979, *Petrova 2991* (SOM).

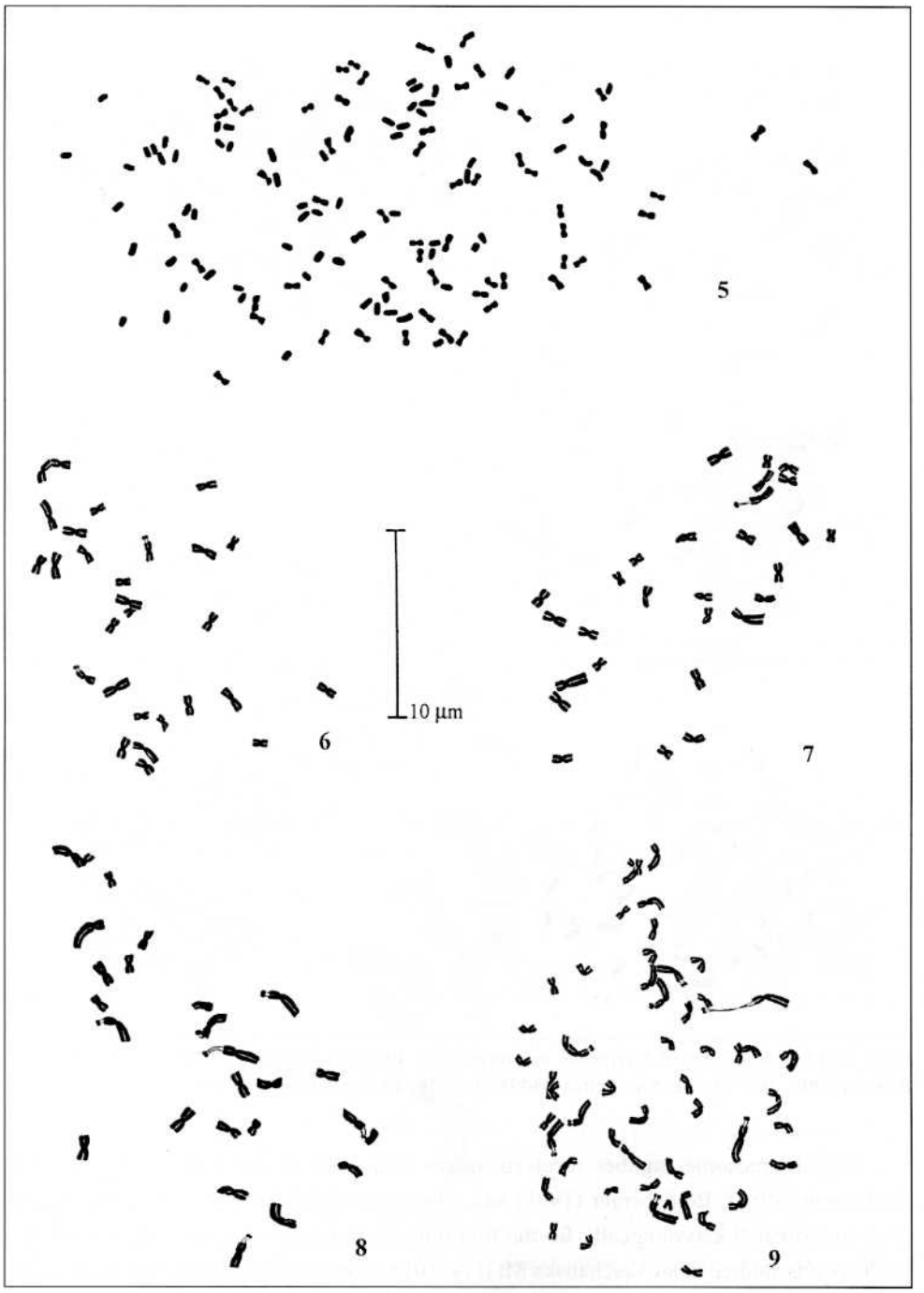
The chromosome number $2n = 26$ confirms the only known up to now result by Van Loon (1984b). The karyotype consists of $2n = 14m + 6sm + 6sm\text{-SAT} = 26$ chromosomes, differing in size (Fig. 8). The tetraploid chromosome number $2n = 52$ (Fig. 9) together with the diploid chromosome number is also observed.

1293. *Geranium macrorrhizum* L. — $2n = 46, 92$ (Figs. 10, 11, 12 & 13).

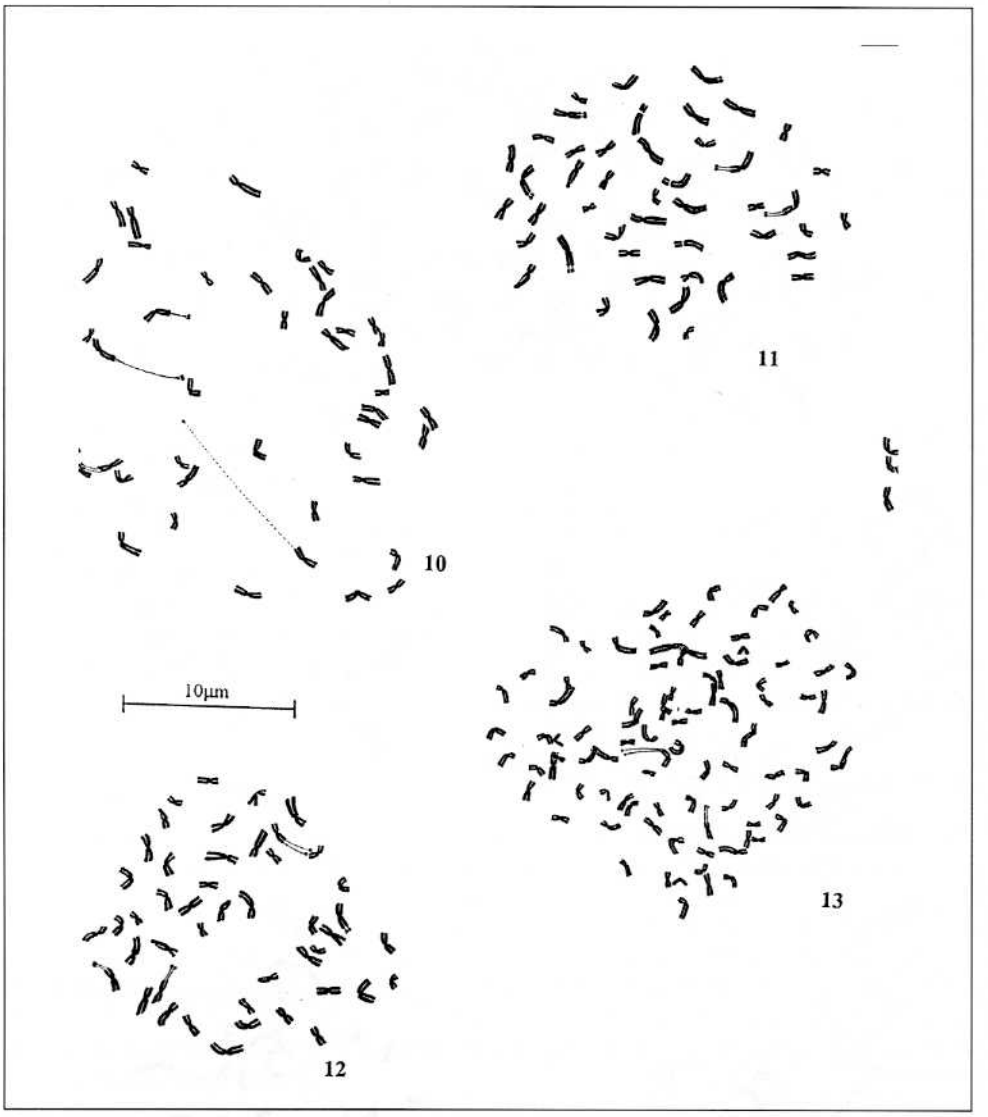
Bu: Western Balkan Foothill region, Vrachanska Mt., grassy, stony places near Okolchitsa summit, 1000 m, 43°11'N, 23°34'E, 04 Jul 1997, *Petrova 53297* (SOM). - Fig. 10, 13.

— West Rodope Mts, Moursalitsa hill, alpine pasture-grounds near Chaeva chouka summit, 1800 m, 41°38'N, 24°31'E, 15 Jul 1998, *Petrova 4498* (SOM). - Fig. 12.

— Balkan range (middle), grassy, stony places between Markova livada locality and rest-house Kozya Stena, 1600 m, 42°48'N, 24°34'E, 25 Jul 1998, *Petrova 5998* (SOM). - Fig. 11.

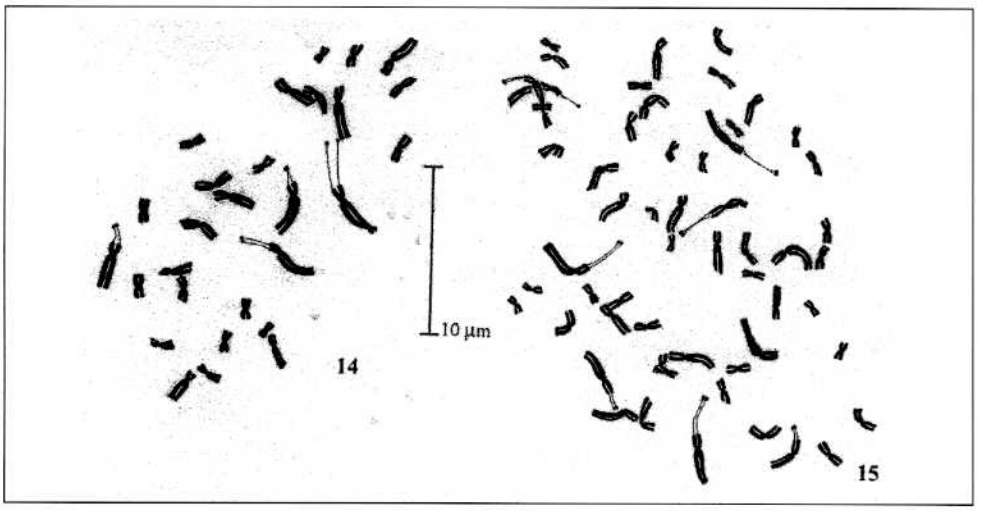


Figs. 5-9. Karyotypes of: **5,** *Geranium robertianum*, $2n = 128$; **6-7**, *G. divaricatum*, $2n = 28$ (**6,** pop. Petrova 221364; **7,** pop. Petrova 24199); **8,** *G. brutium*, $2n = 26$. **9,** *G. brutium*, $2n = 52$.



Figs. 10-13. Karyotypes of *Geranium macrorrhizum*: **10,** pop. Petrova 53297, $2n = 46$; **11,** pop. Petrova 5998, $2n = 46$; **12,** pop. Petrova 4498, $2n = 46$; **13,** pop. Petrova 53297, $2n = 92$.

The chromosome number received agrees with data in the literature by Strid & Andersson (1985), Baltisberger (1991) and others (see Goldblatt 1984). The species has been investigated karyologically for the first time on Bulgarian material. The karyotypes of the plants studied from Vrachanska Mt (Fig. 10) and West Rodope Mts (Fig. 12) include $2n = 28m + 4m\text{-SAT} + 14sm = 46$ chromosomes, while the karyotype studied from Balkan Range (Fig. 11) shows two more SAT chromosomes: $2n = 28m + 4m\text{-SAT} + 12sm + 2sm\text{-}$



Figs. 14-15. Karyotypes of *Geranium reflexum*: **14,** $2n = 28$; **15,** $2n = 56$.

SAT = 46 chromosomes. Some differences in the size between the chromosomes are observed in all cases. Doubled somatic chromosome number $2n = 92$ (Fig. 13) is also observed in the first population. Gauger (1937) and Van Loon (1984a) also reported high chromosome numbers $2n = 87$-93 for this species.

1294. *Geranium reflexum* L. — $2n = 28$ (Fig. 14) & $2n = 4x = 56$ (Fig. 15).

Bu: Western Balkan Foothill region, Vrachanska Mt, grassy, rocky places near cave Ledenika, 937 m, 43°13'N, 23°31'E, 10 Jun 1997, *Petrova 8197* (SOM).

The chromosome number corresponds to reports of Andreev (1982) based on plants from Pirin Mt and other authors (see Fedorov 1969). The karyotype studied consists of $2n = 14$m + 10sm + 4sm-SAT = 28 chromosomes with very clear differences in the size of the chromosomes. For this species, like many other representatives of the genus, together with the diploid chromosome number (Fig. 14), the tetraploid $2n = 56$ (Fig. 15) was also observed.

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Reports (1295-1304) by Lorenzo Peruzzi & Giuliano Cesca

1295. *Scabiosa holosericea* Bertol. — $2n = 16$ (Figs. 1, 2).

It: Calabria, Serra Dolcedorme, 39°55'N, 16°12'E, 29 Sep 2001, *Peruzzi & Gargano, cult.* Hort. Bot. Calabria University, accession number 272.

This species appears to be endemic of Italy (Greuter & al. 1986), where occurs in the Apennines and in Sardinia (Pignatti 1982). Calabrian populations of Pollino Massif represent the most southern part of the range of *S. holosericea*.

Our count confirms a previous report of $2n = 16$ chromosomes (Monti & al. 1978) in material from Apuan Alps (Tuscany). The karyotype formula, following Levan & al. (1964), is: $2n = 12m + 2sm + 1M\text{-}SAT + 1M = 16$. The third pair of chromosomes is strongly heteromorphic. Chromosome size ranges between 1.5 and 3.0 μm.

1296. *Groenlandia densa* (L.) Fourr. [= *Potamogeton densus* L.] — $2n = 12$ (Figs. 3, 4).

It: Basilicata, Pollino massif, Pozze di Serra Scorsillo, 39°57'N, 16°15'E, 6 Jun 2001, *Peruzzi & Passalacqua, cult.* Hort. Bot. Calabria University, accession number 69.

Groenlandia densa is an Eurasiatic element, which occurs in North Africa too (Mabberley 1997). This species is present in peninsular Italy and Sicily, growing in slow waters (Pignatti 1982).

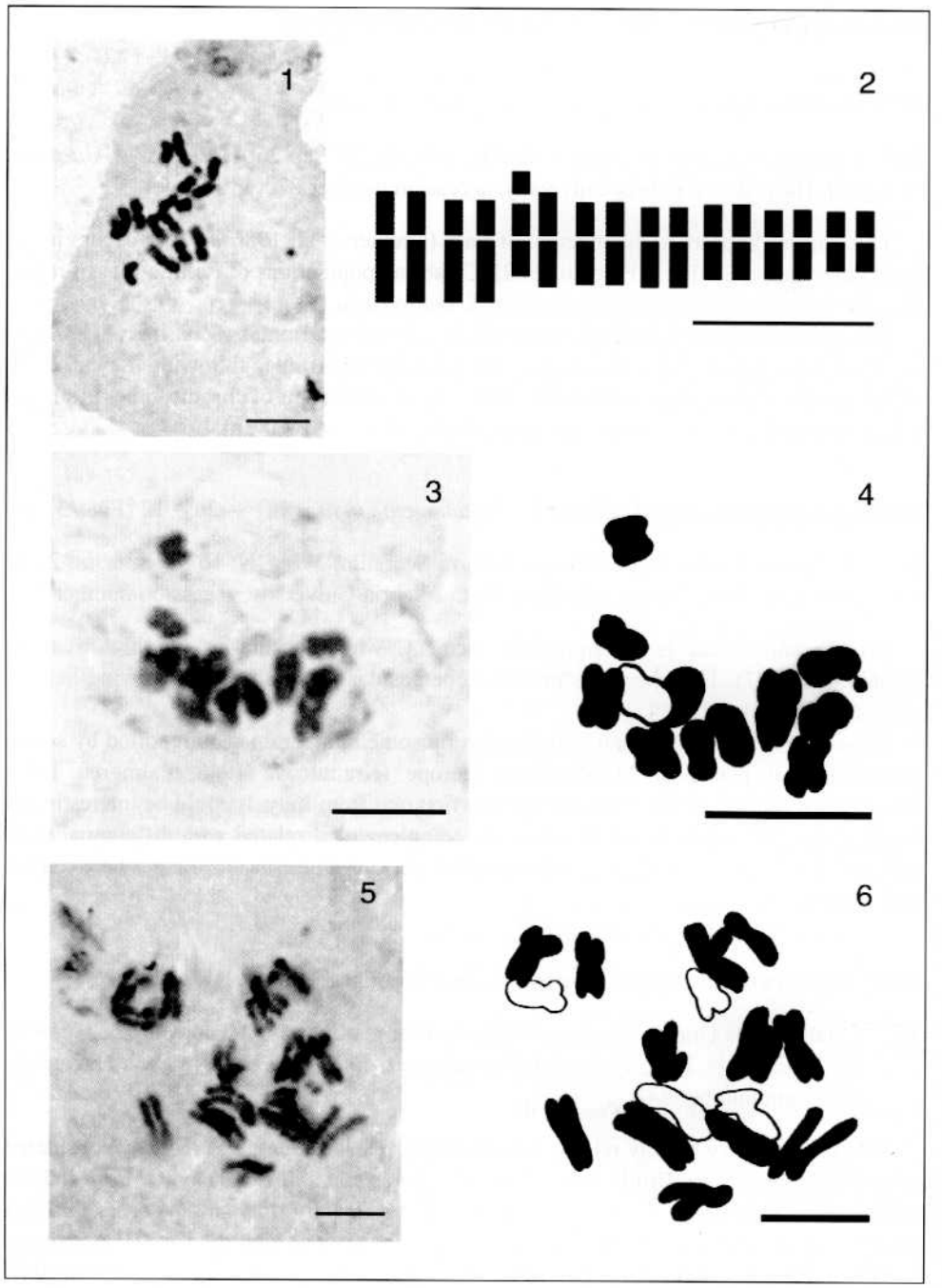
Our count is in disagreement with the chromosome number $2n = 30$ reported by several authors for plants of Mid-Northern Europe (Krahulcová 1988, Palmgren 1939, Hasitshka-Jenschke 1959). This report is the first one from Italy. It could be interesting to verify if this difference in the chromosome complement is related with differential morphological features, or with geographic distribution. Chromosome size ranges between 1.0 and 2.0 μm.

1297. *Hypericum calabricum* Sprengel — $2n = 16$ (Figs. 5, 6).

It: Calabria, Sila Grande, Macchia Sacra, near the crossroad to Mount Curcio, 39°18'N, 16°26'E, 5 Jun 2001, *Peruzzi & Passalacqua, cult.* Hort. Bot. Calabria University, accession number 542.

This taxon is very closely related with *H. barbatum* Jacq., and was recently considered as a distinct species by Brullo & al. (2001). *H. barbatum* s. l. is distributed from Italy to Balkan Peninsula (Greuter & al. 1986) and occurs in Italy only in Calabrian Sila and Pollino massifs (Pignatti 1982). The Italian populations can be identified as *H. calabricum*.

Our count agrees with data reported for *H. barbatum* by Contandriopoulos & Lanzalavi (1968) in Greek material. $2n = 14$ is reported by Franzen & Gustavsson (1983) in Greek plants too. This report is the first one for this unit. Chromosome size ranges between 2.5 and 4.0 μm.



Figs. 1-6. Microphotograph and karyogram of: **1-2,** *Scabiosa holosericea*, $2n = 16$; microphotographs and relative drawings of: **3-4,** *Groenlandia densa*, $2n = 12$; **5-6,** *Hypericum calabricum*, $2n = 16$. — Scale bars = 5μm.

1298. *Crocus biflorus* Miller — $2n = 8$ (Figs. 7, 8).

It: Calabria, Botanic Garden of Calabria University, where it grows spontaneously, 39°18'N, 16°11'E, 11 Jan 2002, *Peruzzi & Cesca* (CLU).

Crocus biflorus is widespread in Southern Europe, from Sicily eastwards (Mathew 1980).

Our report agrees with data published for Italy by many autohrs: Baldini (1992) in plants from Tuscany; Illuminati & al. (1995) in material from Latium, Campo & al. (1998) in Sicilian plants, Brighton & al. (1973) in Calabrian material too. The karyotype formula, following Levan & al. (1964), is: $2n = 2x = 4sm + 2st\text{-}SAT + 2st = 8$. For this species are even reported different chromosome numbers: $2n = 16$ (Brighton 1982) in plants from Bulgaria, $2n = 18$ (Sopova 1972) in plants from FYR of Macedonia, $2n = 30$ (Lovka 1995). Brandizzi & Grilli Caiola (1997) report 2n=24. Chromosome size ranges between 5.0 and 8.9 µm.

1299. *Ajuga tenorii* J. & C. Presl — $2n = 32$ (Figs. 9, 10).

It: Calabria, Piana di Lacina (Vibo Valentia), 38°36'N, 16°25'E, 28 Apr 2001, *Passalacqua & Ouzonov*, *cult.* Hort. Bot. Calabria University, accession number 543.

This rare species is endemic to Mid-Southern Italy (Pignatti, 1982).

Our result confirms data reported by Campo & Romano (1995) in plants from Sicily and Chichiriccò & Tammaro (1982) in material from Gran Sasso (Abruzzi). Chromosome size ranges between 1.0 and 2.0 µm.

1300. *Colchicum bivonae* Guss. — $2n = 32$ (Figs. 11, 12).

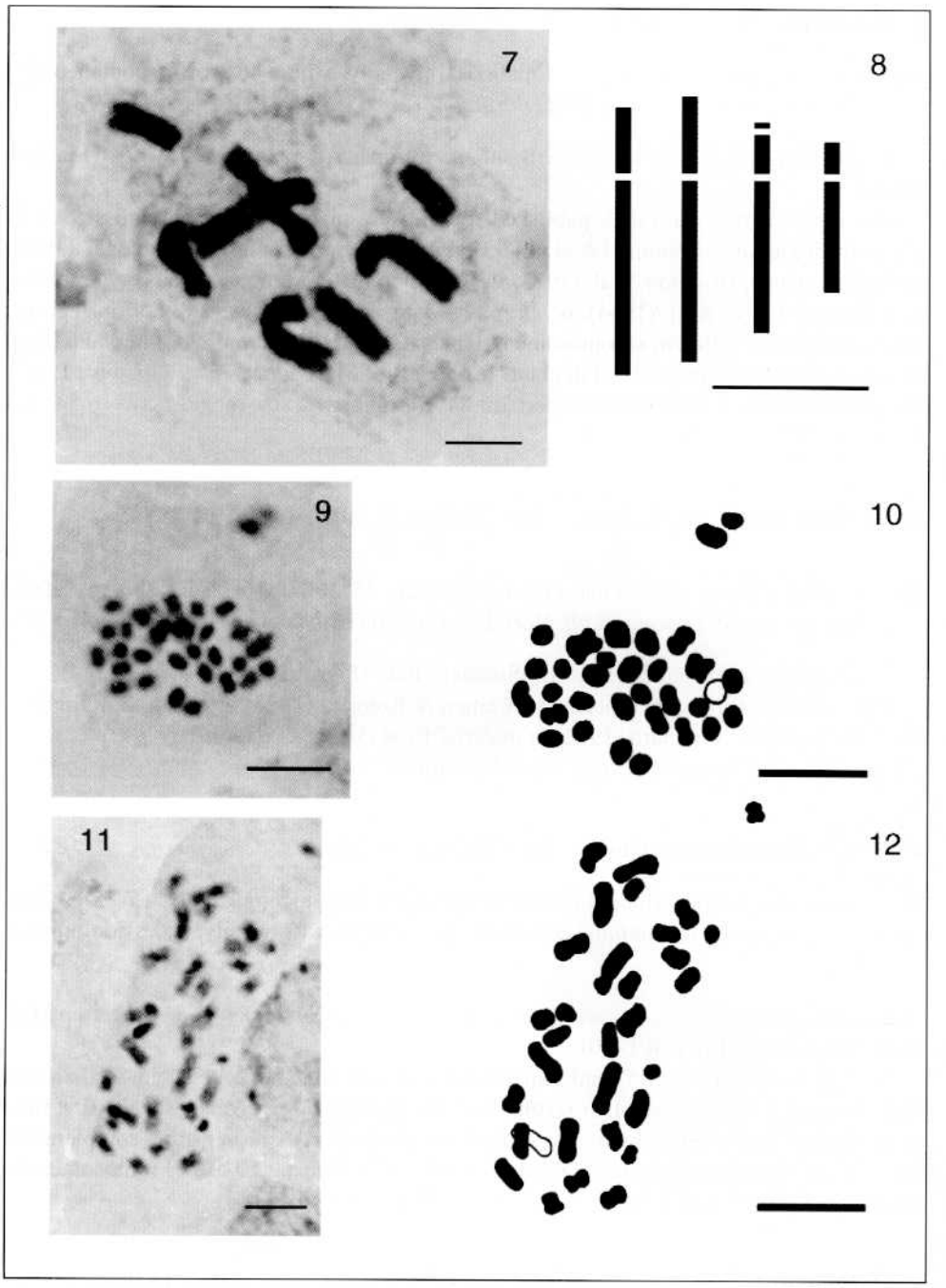
It: Basilicata, Lauria, Along the road Sinnica from Latronico, 40°05'N, 15°55'E, 7Oct 2001, *Gargano & Puntillo*, *cult.* Hort. Bot. Calabria University, accession number 24.

Colchicum bivonae is widespread in Central Mediterranean region and Southern part of Balkan Peninsula (Brickell 1980).

Campo & Romano (1995) and Papanicolaou (1984) counted $2n = 36$ in Sicilian and Greek material, respectively. Our result, $2n = 32$, appears to be recorded for the first time in this taxon, and is probably due to aneuploidy phenomena. Chromosome complements $2n = 52, 54, 90$ are reported too (D'Amato 1956, 1957; Brickell 1980). Chromosome size ranges between 0.5 and 2.7 µm.

1301. *Euphorbia gasparrinii* Boiss. subsp. ***samnitica*** (Fiori) Pign. — $2n = 16$ (Figs. 13, 14).

It: Marche: road from Fematre to Torricchio's reserve, 42°55'N, 13°01'E, 5 May 1999, *Cesca*, *cult.* temporarily in Hort. Bot. Calabria University.



Figs. 7-12. Microphotograph and indiogram of: **7-8,** *Crocus biflorus*, $2n = 8$; microphotographs and relative drawings of: **9-10,** *Ajuga tenorii*, $2n = 32$; **11-12,** *Colchicum bivonae*, $2n = 32$. — Scale bars = 5µm.

Euphorbia gasparrinii is endemic to Italy and belongs to the cycle of *E. epithymoides* L. (Greuter & al. 1986). The subspecies *gasparrinii* occurs in Sicily and probably in Calabria, while the subspecies here studied is restricted to Central Apennines (Pignatti 1982).

Our result agrees with the count of Tessitore & al. (1993) in plants from Mount Orsello (Abruzzi). Chromosome size ranges between 1.0 and 5.5 µm.

1302. *Centaurea tenorei* Guss. ex Lacaita — $2n = 18$ & $2n = 4x = 36$ (Figs. 15-18).

It: Campania: Penisola Sorrentina, near Positano, 40°38'N, 14°29'E, Aug 2001, *Avolio*, collected seeds.
— Campania: Penisola Sorrentina, Mount Avvocata di Maiori, 40°40'N, 14°40', Aug 1998, *Avolio*, collected seeds.
— Campania: Penisola Sorrentina, Mount S. Angelo a Tre Pizzi (*locus classicus*), 40°39'N, 14°30'E, Aug 1998, *Avolio*, collected seeds.
— Campania: Penisola Sorrentina, mounts near Scala and Ravello, 40°39'N, 14°36'E, Aug 1998, *Avolio*, collected seeds.

According to Pignatti (1982), this taxon is related with the *Centaurea parlatoris* Heldr. cycle, which is endemic to Italy. *C. tenorei* is restricted to Penisola Sorrentina (Campania), where occurs in four populations, which are weakly differentiated by a morphological point of view.

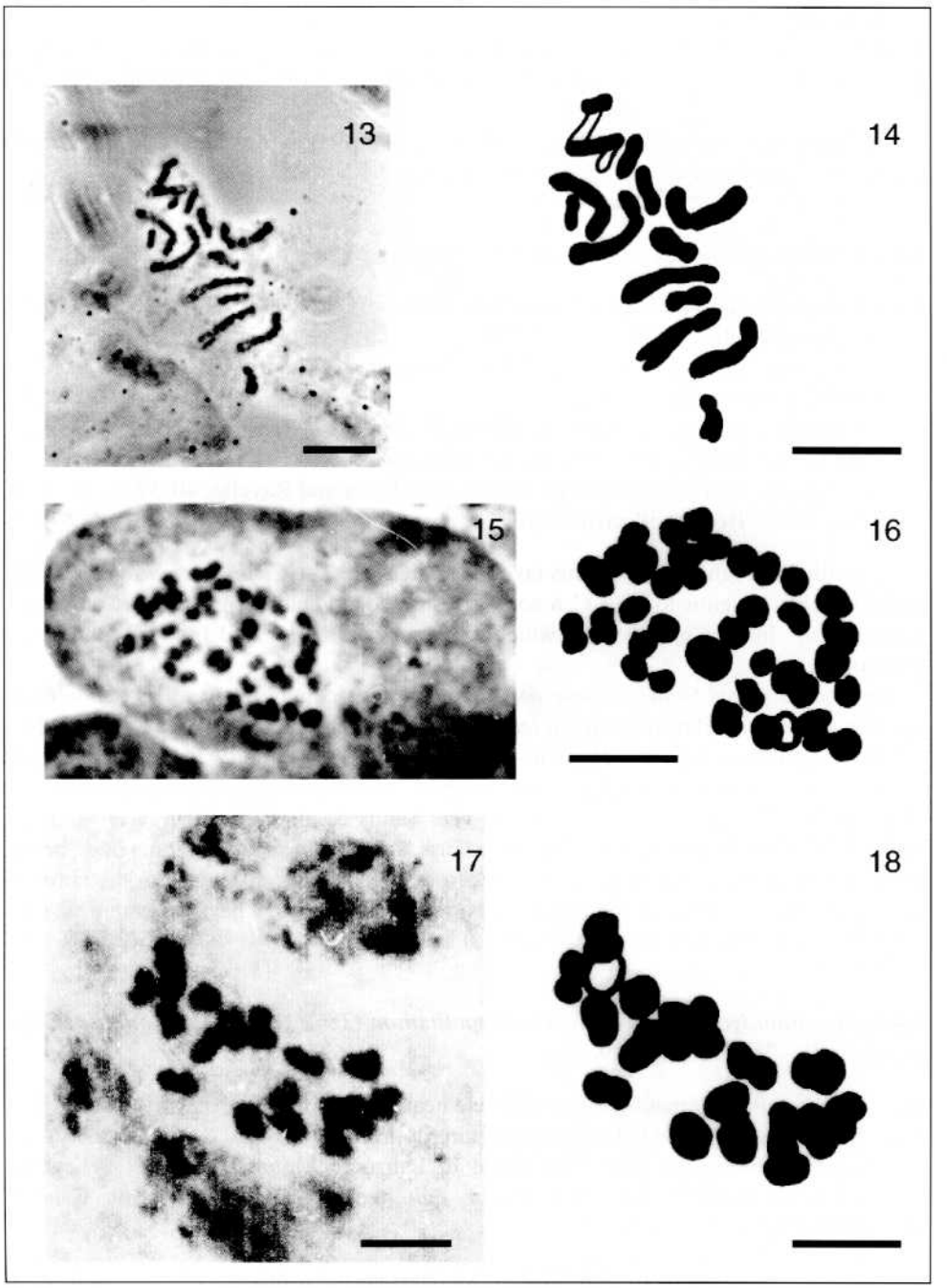
We studied plants from all these populations. Plants coming from a) (*C. tenorei* var. *maritima* Lacaita) and b) (*Centaurea tenorei* fo. *montaltensis* Lacaita) are tetraploid, $2n = 36$, while plants coming from c) (*locus classicus*) and d) are diploid, $2n = 18$. This report is the first one for this species. Up to now, in the *C. parlatoris* aggr. only were known taxa showing $2n = 18$, as *C. parlatoris* Heldr. (De Santis & al. 1976, Devesa & al. 1988, Colombo & Trapani 1990) and *C. ambigua* Guss. subsp. *nigra* (Fiori) Pign. (Baltisberger 1990). Further studies are required in order to establish if this difference in the chromosome complement between the populations of *C. tenorei* could have taxonomical relevance. Chromosome size ranges between 1.0 and 2.0 µm.

1303. *Aconitum lycoctonum* L. subsp. ***neapolitanum*** (Ten.) Nyman [= *Aconitum lamarckii* Rchb.] — $2n = 16$ (Figs. 19, 20).

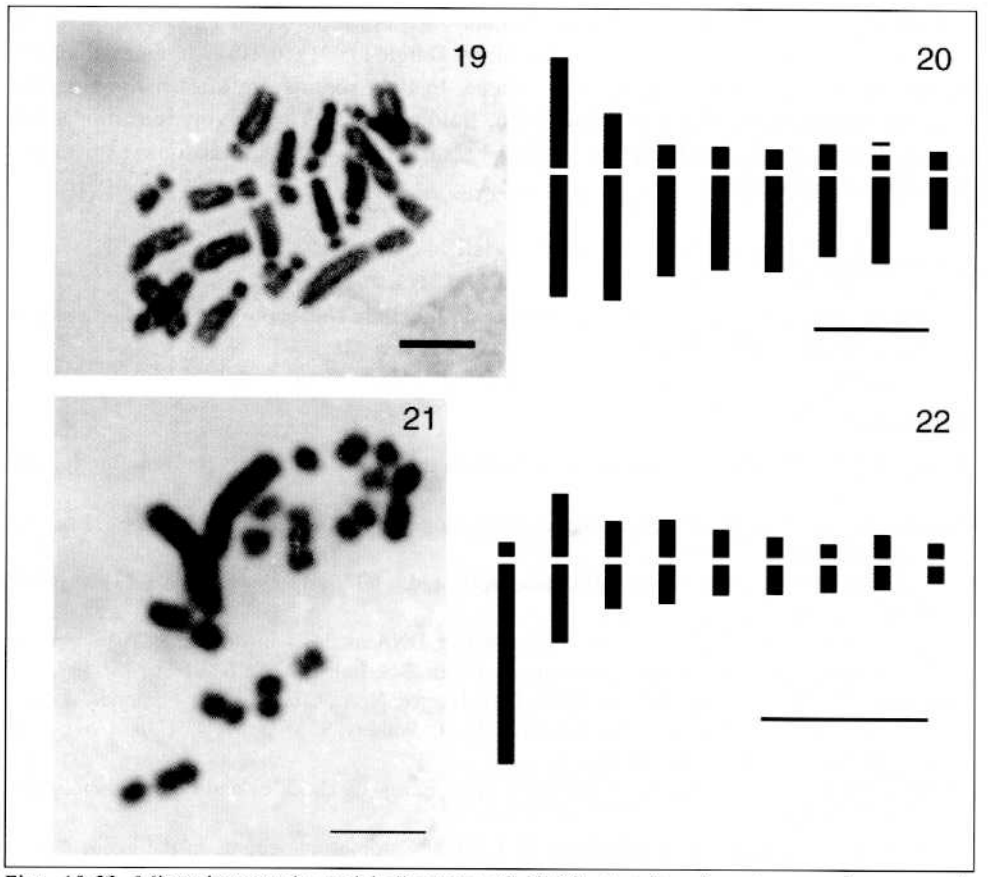
It: Calabria: Pollino massif, Serra del Prete near Piano di Ruggio, 39°55'N, 16°08'E, 1 Aug 1991, *Bernardo* (CLU; *cult.* temporarily in Hort. Bot. Calabria University).
— Calabria: along the path from Piano di Lanzo to Mount Cozzo del Pellegrino, 39°44'N, 16°02'E, jun 1991, *Cesca*, *cult.* temporarily in Hort. Bot. Calabria University.

This unit is widespread in Mid-Western Mediterranean basin from Morocco and Spain to Balkan peninsula (Greuter & al. 1989).

Our count agrees with reports by Sopova & Sekovski (1981) in plants from Greece and Galland (1988) in North African material, while Susnik (1967) counted $2n = 32$ in plants



Figs. 13-18. Microphotographs and relative drawings of: **13-14,** *Euphorbia gaspaeeinii* subsp. *samnitica*, $2n = 16$; **15-16,** *Centaurea tenorei*, $2n = 4x = 36$; **17-18,** *Centaurea tenorei*, $2n = 18$. — Scale bars = 5µm.



Figs. 19-22. Microphotographs and indiograms of: **19-20,** *Aconitum lycoctonum* subsp. *neapolitanum*, $2n = 16$; **21-22,** *Leopoldia comosa*, $2n = 18$. — Scale bars = 5µm.

from Balkans. See also Baltisberger & Utelli (2001) for $2n = 16$ of *A. lycoctonum*. Additional reports are available from Simon & al. at www.ub.es/botanica/greb/biodiver.htm. The karyotype formula, following Levan & al. (1964), is: $2n = 2m + 2sm + 10st + 2st\text{-}SAT = 16$. Chromosome size ranges between 1.6 and 8.0 µm.

1304. *Leopoldia comosa* (L.) Parl. [= *Muscari comosum* (L.) Miller] — $2n = 18$ (Figs. 21-22).

It: Sicily: Iblei mounts, along the road from Sortino to Buccheri, 37°09'N, 14°57'E, 19 Apr 2001, *Cesca, Peruzzi & Passalacqua, cult.* Hort. Bot. Calabria University, accession number 205.

This species is an European unit, distributed in the whole Mediterranean basin (Davis & Stuart 1980, Garbari 1973,1982).

Our result confirms data published by many authors reported in Fedorov (1969), by Corsi & al. (1996) in macaronesian material; by Dalgic (1991) in Turkish material and by Kapasa & al. (2001) in material from Greece. In Italy reports are known for Trentino, Tuscany, Sardinia and Sicily (Garbari 1966, Baldini 1992). The karyotype formula, following Levan & al. (1964), is: 2n = 14m + 2sm + 2t = 18. Chromosome size ranges between 1.0 and 6.5 μm.

Acknowledgements

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Reports (1305-1311) by M. Bosch, J. Simon & C. Blanché

1305. *Delphinium emarginatum* C. Presl. subsp. ***emarginatum*** — $2n = 16$ (Figs. 1A, 2A).

Tn: Capbon, Aïn Oktor, Djebel Korbous, 36°30'N, 10°35'E, 100 m, maquis clearing, 29 May 1992, *J. Molero & J. Vicens* (*BCF* 40110).

Dephinium emarginatum, a species endemic to the W. Mediterranean area, has two recognized subspecies: subsp. *emarginatum*, from Sicily and N. Africa, and subsp. *nevadense*, endemic to eastern Andalucia (Spain) (Blanché & al. 1996). The African plants were named var. *africanum* Maire (Maire 1964). This count agrees with the only previous report from Ottonello & al. (1985), who did not specify the subspecies, and has the same number than the other studied subspecies (Blanché 1991; Simon & al. 1995). The chromosomic formula is $2n = 2m + 6sm + 8st = 16$ (Fig. 2A), and the chromosome size ranges from 4.0 and 12.5 µm.

1306. *Delphinium favargeri* C. Blanché, Molero & Simon P. — $2n = 16$ (Figs. 1B, 2B).

Ma: Essaouira to Ounara (Km 13), 31°28'N, 9°40'W, 300 m, road margins and ditches, 16 Jun 1994, *C. Blanché, M. Bosch, J. Molero, A. Rovira & J. Simon* (*BCF* 39580).
— Cape Beddouza, 24 Km from Safi, 32°6'N, 9°22'W, 140 m, topmost plateau over cliffs, near the lighthouse, field margins, 16 Jun 1994, *C. Blanché, M. Bosch, J. Molero, A. Rovira & J. Simon* (*BCF* 39587).

The chromosomic report of this relatively recent described species (Blanché & al. 1997), distributed only in N Africa, coincides with a previous report of two other Moroccan populations of the same taxon but published under the name of *D. nanum* subsp. *albolilaceum* (Blanché & al. 1990) and also with all the studied annual species of subgenus *Delphinium*. As usual in this subgenus, the karyotype has only a long chromosome pair (its chromosomic formula is $2n = 2sm + 14st = 16$, Fig. 2B). The chromosomic size ranges from 3.4 to 8.8 µm following the general trend of chromosome shortening compatible with the reported smaller DNA content in this subgenus than in the perennial species (Al-Kelidar & Richards 1981).

1307. *Delphinium obcordatum* DC. — $2n = 16$ (Figs. 1C, 2C).

Ma: Tetuan, Asilah, Mohamed V bridge, 35°26'N, 6°4'W, 5m, dunes, 15 Jun 1994, *C. Blanché, M. Bosch, J. Molero, A. Rovira & J. Simon* (*BCF* 39575).

This annual species belongs also to the subgenus *Delphinium*. The obtained number

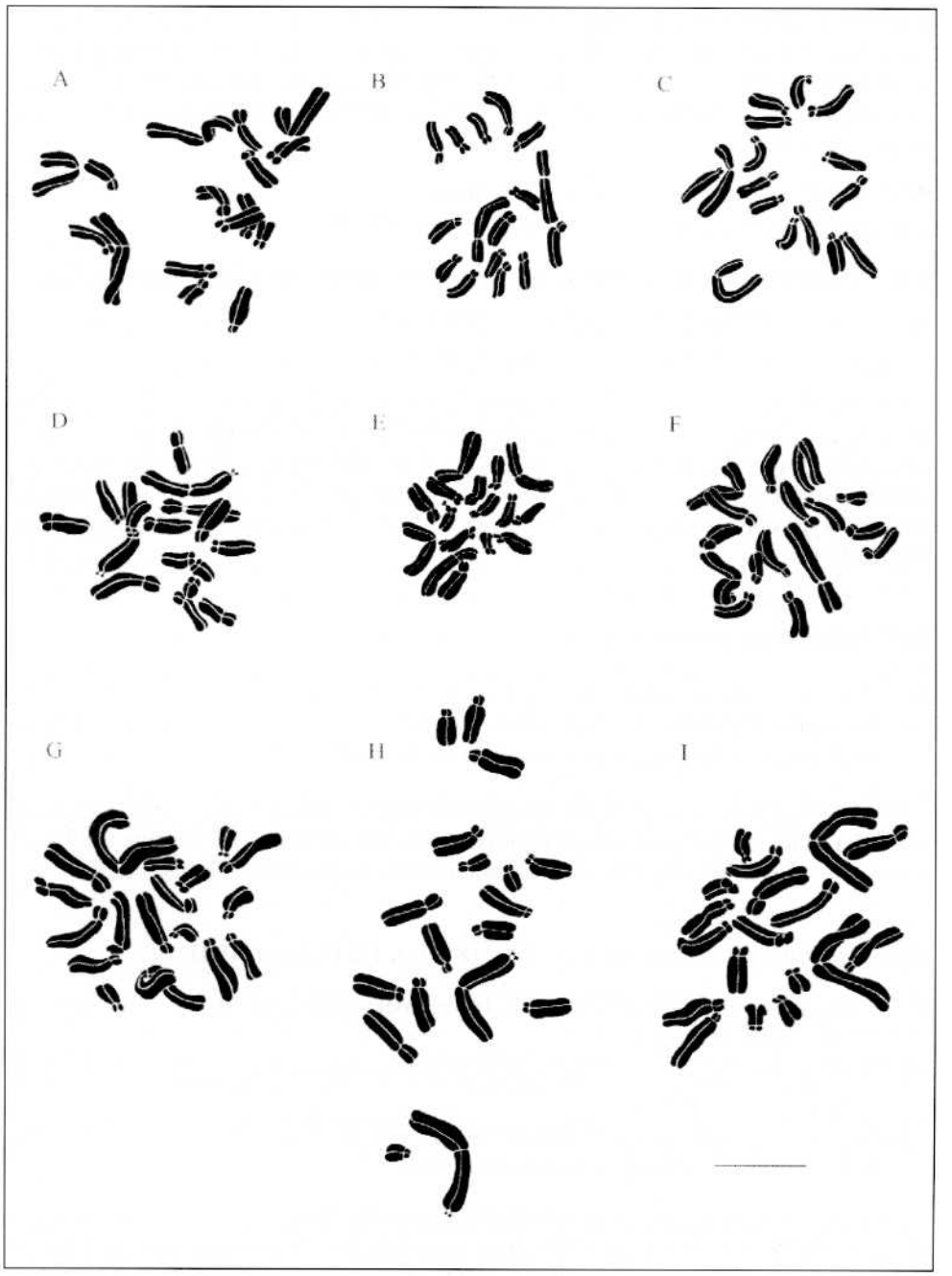

Fig. 1. Mitotic metaphase plates of *Delphinium*: **A,** *D. emarginatum* subsp. *emarginatum,* $2n = 16$; **B,** *D. favargeri* (Essaouira population), $2n = 16$; **C,** *D. obcordatum*, $2n = 16$; **D,** *D. requieni*, $2n = 16$; **E,** *D. speciosum*, $2n = 16$; **F,** *D. sylvaticum*, $2n = 16$; **G – I,** *D. staphisagria,* $2n = 18$; **G,** Eivissa population; **H,** Talambote population; **I,** La Gomera population. — Scale bar = 10 μm.

confirms the previous counts of 5 Moroccan populations reported under the name *D. nanum subsp. elongatum* (Blanché & al. 1990), which is a synonymous. The chromosomic formula, which is $2n$ = 2sm + 14st = 16 (Fig. 2C), and the chromosome size, which varies from 4.0 to 10.0 µm, both are similar to those of *D. favargeri* (see above) in the same trend of the subgenus.

1308. *Delphinium requieni* DC. — 2n = 16 (Figs. 1D, 2D).

Ga: Iéras (Hyères Islands), Porquerolles, 43°00'N, 6°12'E. Cultivated in the Botanical Garden Marimurtra (Blanes, Girona, Spain).

This species is a narrow endemic from the Ierás (Hyères Islands) that belongs to subgenus *Staphisagria*, a small and very original group within the tribe *Delphinieae*. The count of $2n$ = 16 agrees with the previous ones (Kurita 1957; Al-Kelidar & Richards 1981; Contandriopoulos & Cardona 1984; Verlaque & al. 1991) and is the same than those reported from the closely related *D. pictum* (Simon & al. 1995, and references therein). The karyotype consists of $2n$ = 2m + 2sm + 8st + 4t = 16 (Fig. 2D) and sizes ranges from 3.0 to 12.6 µm.

1309. *Delphinium speciosum* Bieb. — $2n$ = 16 (Figs. 1E, 2E).

Ar: Ashtarak, Aragats mountain on the road to the lake Karilich, 40°30'N, 44°36'E, 2900 m, alpine meadows, 12 Aug 1995, *Fajvush, Gabrielyan, Garcia-Jacas, Guara, Hovannisyan, Susanna, Tamanyan & Vallès* (S 1499B).

Our finding of $2n$ = 16 confirms the previous reports (Langlet 1927; Sokolovskaya & Strelkova 1948, 1962; Tumajanov & Beridze 1968). The chromosomic formula is $2n$ = 2m + 6sm + 8st = 16 (Fig. 2E). The size of chromosomes ranges from 2.9 to 9.8 µm.

1310. *Delphinium staphisagria* L. — $2n$ = 18 (Figs. 1G, H, I and 2G, H, I).

Bl: Eivissa, Benarràs, 39°30'N, 1°26'W, 160 m, rocky prairie, 28 May 1995, *J. Simon & M. Bosch* (*BCF* 40443).

Ma: Western Rif, Talambote, 35°12'N, 5°20'W, 100 m, nitrophilous grassland, 6 Jul 1994, *A. Romo* (*BCF* 40457).

Ca: La Gomera, Agulo to Las Rosas, 28°14'N, 17°13'W, road margins over salty rocks, 6 Jun 1997, *J. Molero & A. Rovira* (*BCF* s.n.).

Delphinium staphisagria has a wide distribution in the Mediterranean area from Canary Islands to Turkey (Greuter & al. 1989). Here we report $2n$ = 18 chromosomes for 3 distant populations, one from Eivissa, another from Morocco and the third one from La Gomera (Canary Islands). This number coincides with four previous reports, one from an Iberian population (Simon & al. 1995) and three from three Greek populations (Constantinidis & Kamari 1995; Bareka & al. 2000). However this species was traditionally reported as $2n$ =

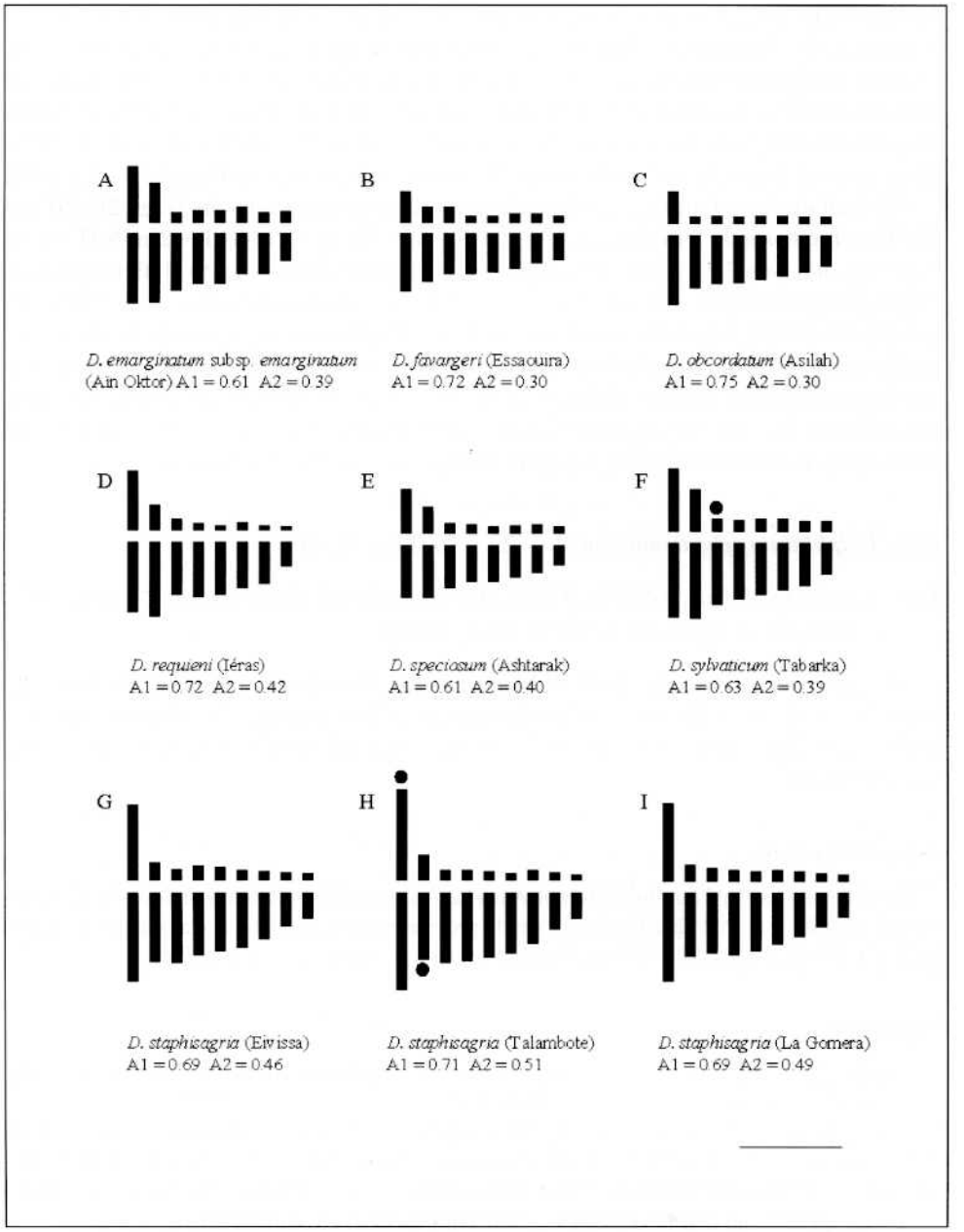

Fig. 2. Haploid idiograms of *Delphinium* obtained by measuring at least 5 good mitotic metaphases, 2 hours after pretreatment with 0.02 M 8-hydroxyquinoleine (asymmetry indices A1 and A2 are calculated following Romero 1986): **A,** *D. emarginatum* subsp. *emarginatum*, $2n = 16$; **B,** *D. favargeri*, $2n = 16$; **C,** *D. obcordatum*, $2n = 16$; **D,** *D. requieni*, $2n = 16$; **E,** *D. speciosum*, $2n = 16$; **F,** *D. sylvaticum*, $2n = 16$; **G – I,** *D. staphisagria*, $2n = 18$; **G,** Eivissa population; **H,** Talambote population; **I,** La Gomera population. — Scale bar = 10 µm.

16 (Hocquette 1922, Lewitsky 1931, Gregory 1941, Maire 1964, Blanché 1991) or $2n = 32$ (Langlet 1927, Gregory l.c., Maire l.c.). These mostly old reports might be errors or the result of manipulated plants due to the ornamental and medicinal use of *D. staphisagria* (see also comments by Constantinidis & Kamari l.c.). $2n = 18$ is a very unusual number within the genus. In fact, until present it is only found in the species *D. bolosii* (Simon & al. 1995). Other cases of disploidy within the tribe *Delphinieae* are reviewed in Blanché & al. (1997).

All 3 mitotic karyotypes are similar and have a pronounced asymmetry (Figs. 2G, 2H and 2I). The chromosomic formulas are $2n = 2m + 16st = 18$, $2n = 2m\text{-SAT} + 2sm\text{-SAT} + 12st + 2t = 18$, and $2n = 2m + 16st = 18$, respectively. They are also similar to all three previous karyotype reports of $2n = 18$ and even to the *D. bolosii* karyotype (Simon & al. 1995). All consist of one very long metacentric pair (16.0 to 18.5 µm) and eight size decreasing acrocentric pairs (3-9 µm). This fact implies significant differences in the second chromosome pair between euploid diploids (Blanché & al. 1997) and this species. An acceptable explanation is that $2n = 18$ karyotypes could be directly derived from $2n = 16$ by fission of the second pair at centromeric level, each pair giving rise to a new chromosome.

1311. *Delphinium sylvaticum* Pomel — $2n = 16$ (Figs. 1F, 2F).

Tn: Tabarka to Neftza, 36°45'N, 9°15'E, 400 m, cork-oak forest margin, 28 May 1992, *C. Blanché, J. Molero & J. Vicens* (*BCF* 40101).

This species is an endemic from W Mediterranean, found only in Tunisia. As far as we know this is the first chromosome number report of this species. The chromosomic formula is $2n = 2m + 4sm + 8st + 2st\text{-SAT} = 16$ (Fig. 2F) and chromosome size ranges from 4.3 to 13.6 µm.

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Reports 1312-1314 by Tiziana Cusma Velari, Laura Feoli Chiapella, Vera Kosovel, Gianluigi Bacchetta & Sonia Patui

1312. ***Anthyllis cytisoides*** L. — $2n = 14 + 0$-B (Fig. 1a).

Hs: Murcia, Lorca, Rambla de Lorca, marls, 37°43'N, 1°48'W, 330 m, 26 Mar 1998, *G. Bacchetta s.n.* (CAG).

Anthyllis cytisoides occurs in the western Mediterranean region: Spain, Balearic Isles,

southern France, northern Morocco and northern Algeria (Jahandiez & Maire 1932, Quezel & Santa 1962, Greuter & al. 1989, Benedí 2000).

The chromosome number $2n = 14$, rarely with an accessory chromosome, confirms the references reported by various authors concerning material from Spain [various populations of southern and southeastern Spain (provinces of Granada, Almería and Jaén), Fernández Piqueras 1976, 1979; Fernández Piqueras & Sañudo 1980; Tarragona, La Musara-Villaplana, Luque & al. 1983; Cádiz, Barbate, Vioque & Pastor 1991] Balearic Isles (Mallorca, Paguera, Guinochet & Lefranc 1972) and France (Perpignan, Couderc 1974). Chromosome size ranges from 1.21 to 2.53 µm and 0.77 µm for B chromosomes. This chromosome number can be traced back to the basic number x = 7 (Fernández Piqueras 1979; Fernández Piqueras & Sañudo 1980; Benedí 2000).

The species grows mainly on calcareous substrates, at altitudes between 0 m and 1300 m; the bioclimate is Mediterranean from xeric to pluviseasonal-oceanic (from lower thermomediterranean-upper semiarid to upper mesomediterranean-lower subhumid), after Rivas-Martínez & al. 1999. It can be found in termophilous "maquis" and rocky habitats, in coenoses of alliance *Rosmarinion officinalis* Br.-Bl. ex Molinier 1934.

Anthyllis cytisoides belongs to sect. Terniflorae (V.N. Tikhom. & Sokoloff) Benedì, which includes also *A. terniflora* (Lag.) Pau, distributed in southeastern Spain and northern Morocco (Rif); this species presents the number 2n = 14 as well (Fernández Piqueras 1976, 1979, Fernández Piqueras & Sañudo 1980, on populations from Almería and Albacete).

1313. *Anthyllis hermanniae* L. — $2n = 14$ (Fig. 1b).

Sa: Nuoro, Urzulei, Serra Ortenie, uppercarboniferous granodiorites, 40°09'N, 9°32'E, 880 m, 10 Aug 2002, *G. Bacchetta s.n.* (CAG).

Sa: Nuoro, Dorgali, Monte Tului, cretaceous dolomitic limestones, 40°15'N, 9°35'E, 890 m, 10 Aug 2002, *G. Bacchetta s.n.* (CAG).

Anthyllis hermanniae L. is a Mediterranean species distributed from Corse to Anatolia (Greuter & al. 1989, Benedí 2000).

The chromosome number $2n = 14$ confirms the references reported by various authors [Larsen 1956, from cultivated material; Cardona & Contandriopoulos 1983, from a population from Greece (Patras); Cardona & al. 1986, from several populations from Corse]. Chromosome size ranges between 0.88 and 1.65 µm.

Anthyllis hermanniae belongs to sect. Aspalathoides DC. The basic number x = 7 is present also in the taxa of this section. The species results diploid, as *A. lagascana* Benedì, distributed in southeastern Spain and northern Algeria (Benedí 2000), for which the number $2n = 14$ was reported in a population from Albacete (Fernández Piqueras 1976, 1979, Fernández Piqueras & Sañudo 1980, sub *A. henoniana* Coss.). *A. hystrix* (Willk. ex Barceló) Cardona, Contandriopoulos & Sierra, endemic to Minorca (Benedí 2000), on the contrary results dodecaploid with $n = 42$ and/or $2n = 84$ (Cardona & Contandriopoulos 1983; Cardona & al. 1986).

The species grows indifferently on various soils, at altitudes between 0 m and 1600 m; the bioclimate is Mediterranean pluviseasonal-oceanic (from lower mesomediterranean-

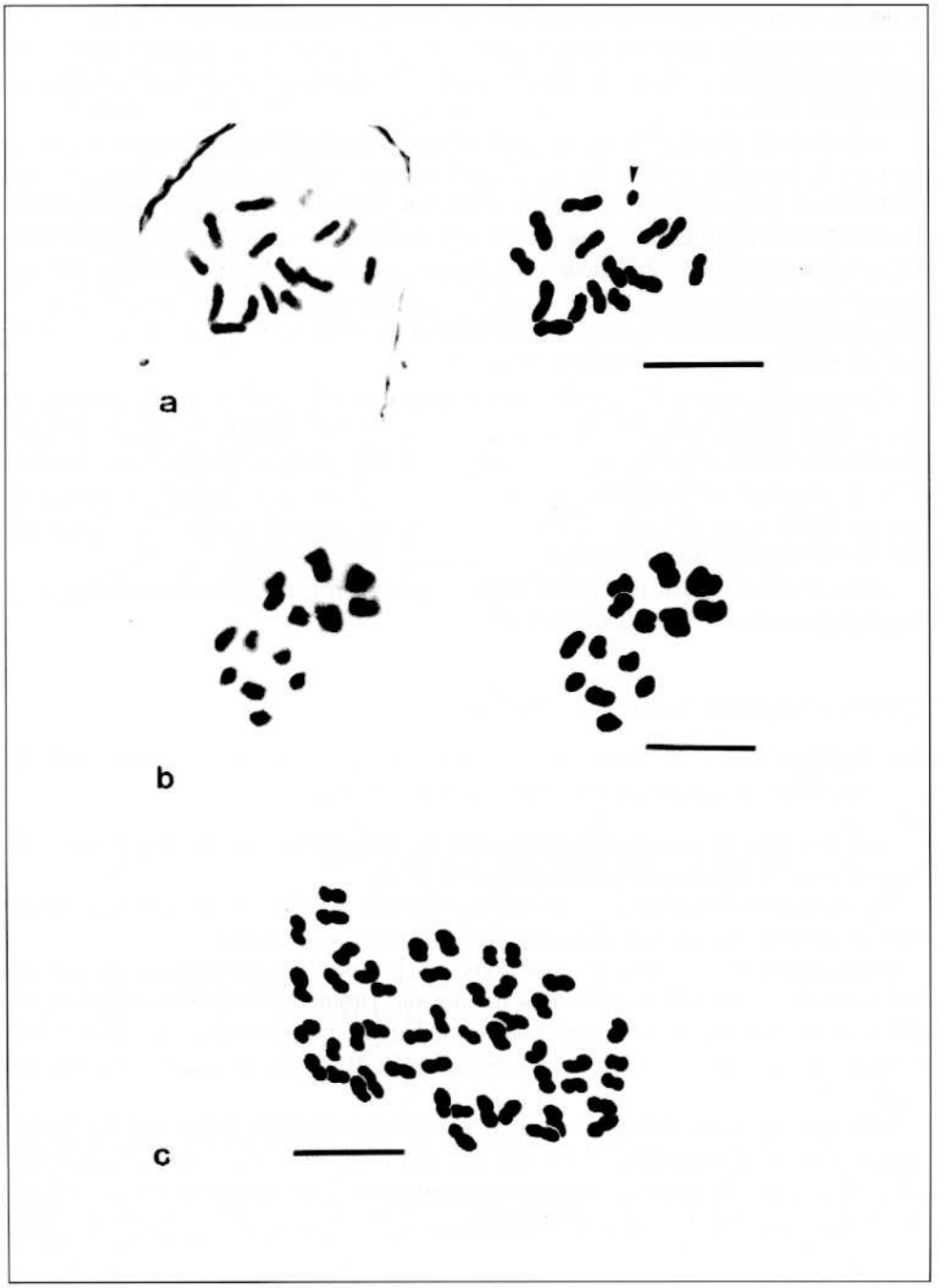

Fig. 1. Photomicrographs and drawings of somatic metaphase plates of: **a,** *Anthyllis cytisoides*, 2n = 14 + 0-1B; **b**, *Anthyllis hermanniae*, 2n = 14; **c**, *Genista morisii,* 2n = 48. — Scale bars = 5 μm; Arrows indicate B-chromosomes.

upper dry to upper supramediterranean-lower humid). It is characteristic of garrigue and coenoses with spiny hummock-shaped shrubs (hummocks) growing on rocky habitats. In Sardinia and Corse it can be found in coenoses of alliance *Teucrion mari* Gamisans et Muracciole 1984.

Anthyllis sect. Oreanthyllis Griseb. as well is characterized by the same basic number base x = 7. *Anthyllis ramburei* Boiss., *A. onobrychioides* Cav., both endemic to the Iberic Peninsula, *A. polycephala* Desf. and *A. tejedensis* Boiss., of southern Spain and northwestern Africa, all present $n = 7$ and/or $2n = 14$ (Küpfer 1974; Fernández Piqueras 1976, 1979; Fernández Piqueras & Sañudo 1980; Vioque & Pastor 1991). The same chromosome number has been found in *A. barba-jovis* L., a Mediterranean species (mainly western), which grows from eastern Spain to Dalmatia (Pogliani 1970-71; Fernández Piqueras 1976, 1979; Fernández Piqueras & Sañudo 1980).

A. montana L., a morphologically heterogeneous species, of which various infraspecific taxa have been described in the mountains of southern Europe from Spain to Greece, presents two levels of ploidy: $n = 7$ and/or $2n = 14$ (Favarger & Küpfer 1968; Pogliani 1971; Lovka & al. 1971; Küpfer 1974; Fernández Piqueras 1979; Fernández Piqueras & Sañudo 1980) and $n = 14$ / $2n = 28$ (Küpfer 1974; Fernández Piqueras 1979; Fernández Piqueras & Sañudo 1980), which seem to coexist in the same taxon.

Anthyllis aurea Welden, distributed in the Balkan Peninsula, has the same number $2n = 14$ (Kozuharov & al. 1972; Krusheva 1975).

1314. *Genista morisii* Colla — $2n = 48$ (Fig. 1c).

Sa: Cagliari, Narcao, Is Medas, oligo-miocenic ignimbrites 39°08'N, 8°41'E, 95 m, 15 May 2001, *G. Bacchetta & C. Pontecorvo s.n.* (CAG).

Genista morisii is endemic to Southwestern Sardinia, growing in Sulcis-Iglesiente and Campidano of Cagliari and Oristano (Valsecchi 1976).

The chromosome number $2n = 48$ confirms the only existing reference; Villa & Sanna (1983) report the same number for a population from Uras (Cagliari).

The species grows indifferently on various soils between 0 m and 400 m of altitude; the bioclimate is Mediterranean pluviseasonal-oceanic (from upper thermomediterranean-lower dry to lower mesomediterranean-lower subhumid). It can be found in "maquis" and garrigue, in coenoses of class *Cisto-Lavanduletea* Br.-Bl. in Br.-Bl., Molinier et Wagner 1940.

Other species of sect. Scorpioides Spach, to which *Genista morisii* belongs, present the same chromosome number $2n = 48$: *G. corsica* (Loisel.) DC. (Contandriopoulos 1962; Villa 1978; Cusma Velari & al. 2000), *G. cadasonensis* Valsecchi (Villa 1988), *G. ifniensis* A. Caballero (Cusma Velari & al. 1999) and *G. ferox* Poiret (Tschechow 1931; Villa 1980).

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Report 1315 by Tiziana Cusma Velari, Laura Feoli Chiapella & Zeki Aytaç

1315. *Genista involucrata* Spach — $2n = 18 + 0\text{-}2B$ (Fig. 1a).

Tu: Western Anatolia, Niğde, 37°58'N, 34°41'E, 1230-1250 m, 18 Jul 1997, *Zeki Aytaç s.n.* (TSB).

Genista involucrata is endemic to Anatolia (Gibbs 1966, 1970). No previous karyological data are known for this species.

The chromosome number $2n = 18 + (0\text{-}2B)$ has been found. Chromosome size ranges from 2.03 to 5.12 µm and 0.54 µm for B chromosomes.

The chromosome number $2n = 18$ may be traced back to the secondary basic number $x = 9$ (Sañudo 1979). *Genista involucrata* belongs to sect. Spartioides Spach; various taxa of this section, occurring mostly in the eastern Mediterranean region, present numbers deriving from $x = 9$. *G. subcapitata* Pancic, a species of central part of the Balkan Peninsula, *G. halacsyi* Heldr., endemic to southern Greece (Peloponnisos), and *G. pulchella* Vis., a species with a disjunct distribution in southern France and the eastern Adriatic coast, have $n = 9$ and/or $2n = 18$ (Forissier 1975; Verlaque 1988; Cusma Velari & al. 1996). *G. sakellariadis* Boiss. & Orph., *G. millii* Boiss., endemic to northern and central Greece respectively, and *G. pulchella* have $2n = 36$ (Verlaque 1988; Cusma Velari & al. 1996).

The basic number $x = 9$ in *Genista* is present in many species of sect. Erinacoides Spach, distributed both in the Iberian Peninsula and in the Sardinian-Corsican district (Sañudo 1971, 1973; Cusma Velari & al. 1998, 2001; Villa 1988) and sporadically in sect. Voglera (Gaertn., Mey. & Schreb.) Spach (Sañudo 1972).

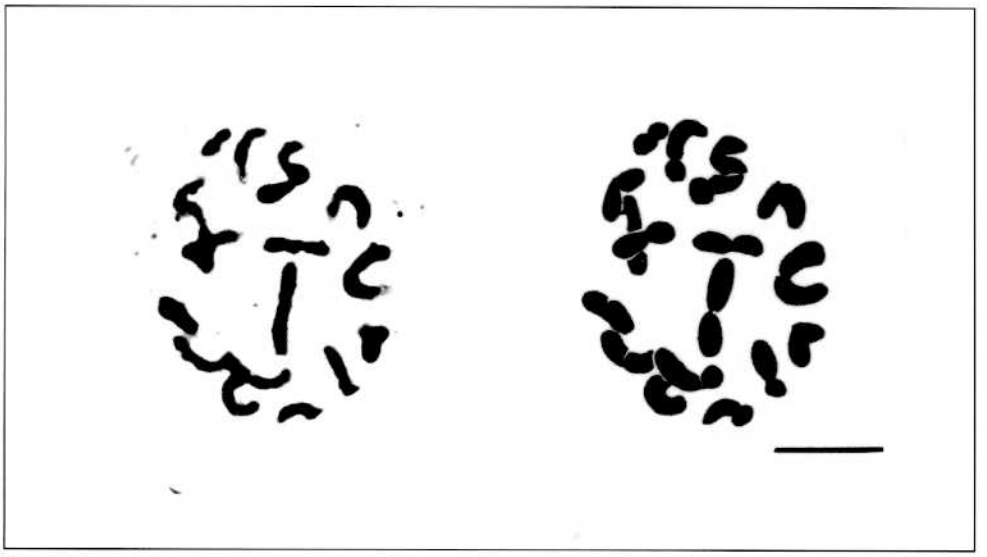

Fig. 1. Photomicrograph and drawing of a somatic metaphase plate of: *Genista involucrata*, 2n = 18 + 0-2B. — Scale bar = 5 μm.

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Reports (1316-1317) by Olympia Cecchi & Graziana Fiorini

1316. *Colchicum alpinum* DC. — $2n = 54$ (Figs. 1A, 1B, 1a).

It: Appennino Tosco-Emiliano, Passo del Lagastrello (Massa Carrara), dry meadows near the Abbey of Linari, 1000 m, 44°22'N, 10°7'E, 12 Aug 1997, *E. Ferrarini* (cultivated in "Orto Botanico Forestale dell'Abetone").

— Alpi Apuane, Capanne di Careggine (Lucca), 802 m, 44°4'N, 10°8'E, 14 Aug 1997, *E. Ferrarini* (cultivated in "Orto Botanico Forestale dell'Abetone").

— Alpi Apuane, Puntato (Lucca), 980 m, 44°3'N, 10°18'E, 2 Aug 2002, *O. Cecchi* (cultivated in Botanical Garden of Florence "Giardino dei semplici": N° 4280, N° 4374).

Colchicum alpinum, a rare species in Italy (Pignatti 1982), has been karyologically investigated by D'Amato (1956, 1957), who found $2n = 54$ in several Italian localities including Tuscany [Macchia Antonini (Pistoia)]. This work confirms 2n = 54 in three new populations from Tuscany.

The karyotype formula (Levan 1964) is $2n = 6x = 10M + 14m + 22sm + 8st = 54$ (Fig. 1a); the asymmetry indexes (Arano & Saito 1980, Romero Zarco 1986) are AsK = 0.65 and A1 = 0.4 A2 = 0.3.

This species seems to have a medium-heigth asymmetric karyotype. The karyotype seem to be made up of a large number of small chromosomes (ca. 36), overall length from 2,4 µm to 1 µm, and a small number of larger chromosomes (ca.18), overall length from 4 ?m to 2,4 µm. These two groups of chromosomes point out the probable allopolyploid origin of the hexaploid series.

As observed by Feinbrun (1957) tetraploid species within the genus *Colchicum* sect. Autumnales generally have small chromosomes (*C. bivonae* Guss., *C. autunmale* L., *C.*

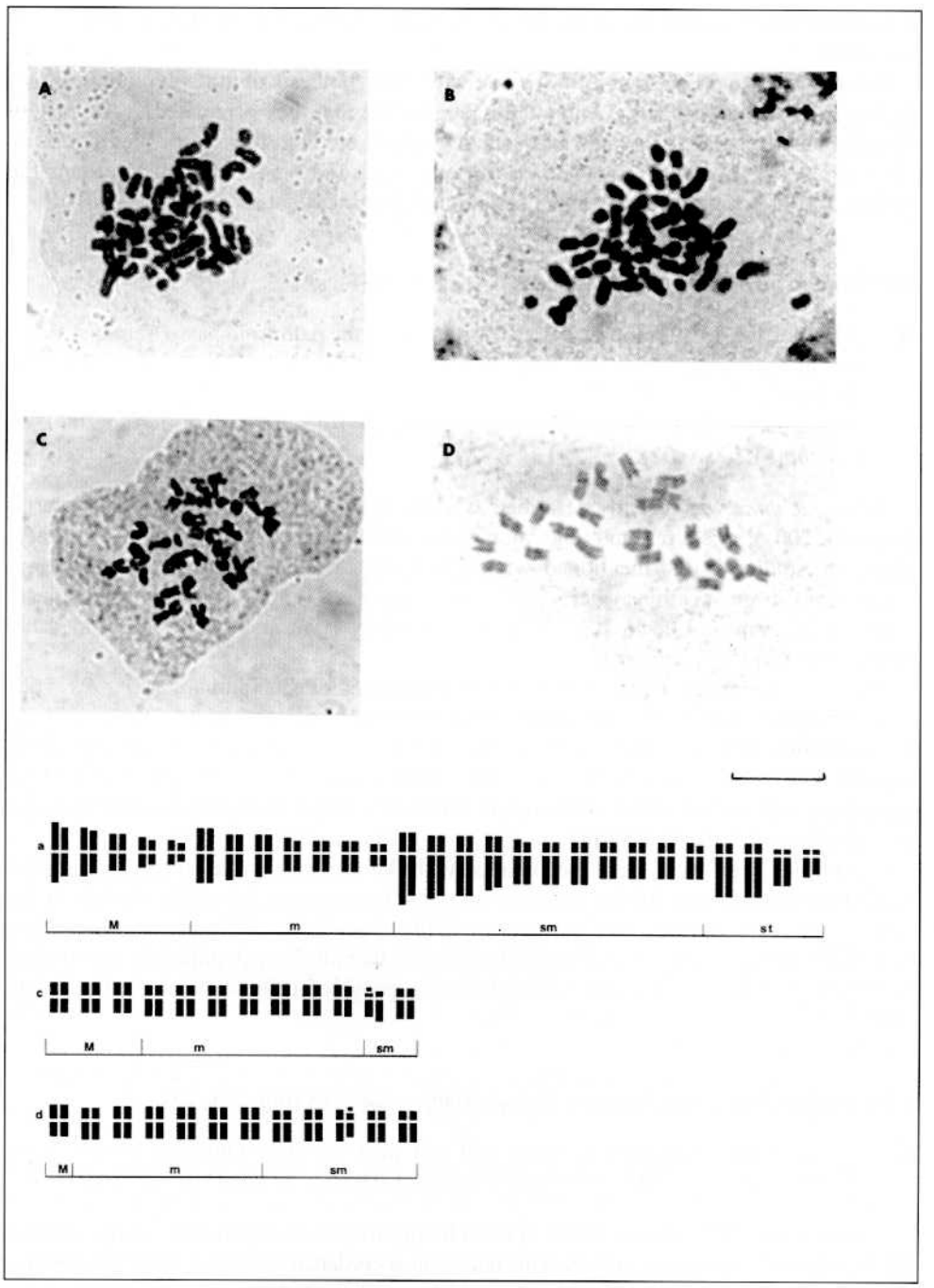

Fig. 1. Mitotic metaphase plates and idiograms of: **A-B,** *Colchicum alpinum*, $2n = 54$: **A, a,** Passo del Lagastrello population; **B**, Capanne di Careggine population; **C-D,** *Silene pichiana*, $2n = 24$: **C, c,** Mt. Tambura population; **D, d**, Passo Fiocca population. — Scale bar = 10 µm.

speciosum Stev.), instead the only diploid (*C. hierosolymitanum* Feinbr.) has large chromosomes.

Levan (1940) and Feinbrun (1957) agree with the hypothesis of allopolyploid origin of the hexaploid species of Sect. Autumnales, suggesting that they originated in the eastern Mediterranean area ($2n = 18$) and subsequently spread out both to western Mediterranean ($2n = 54$, $2n = 140$) and to temperate Eurosiberian areas ($2n = 54$), in which are found the Alpine, North-Apenninic and Apuan populations here investigated.

1317. *Silene pichiana* Ferrarini & Cecchi — $2n = 24$ (Figs. 1C, 1D, 1c, 1d).

It: Alpi Apuane, Mt. Tambura (Massa Carrara), near the path from passo Tambura to the top of the mountain ca. 1800 m, 44°6'N, 10°14'E, 24 Aug 2000, *O. Cecchi* (FI, 28/10/02).

— Alpi Apuane, Passo Fiocca (Lucca), 1100 m, 44°16'N, 10°16'E, 31 Aug 2000, *O. Cecchi* (FI, 28/10/02).

Silene pichiana was recently described as a new species for the Italian Flora (Ferrarini & Cecchi 2001); it is a rare unit and known only from a very few localities. It was karyologically studied in the mentioned work, but under different names and for different places from those mentioned here. The number $2n = 24$ agrees with those previously reported (Ferrarini & Cecchi 2001, Küpfer 1974 sub *S. vallesia* L., Giordani & al. 1980 sub *S. vallesia* L. ssp. *vallesia*).

The karyotype formula (Levan 1964) of the population of Mt. Tambura is $2n = 2x = 6M + 14m + 3sm + 1sm\text{-}SAT = 24$ (Fig. 1c); the asymmetry indexes (Arano & Saito 1980, Romero Zarco 1986) are AsK = 0.58 and A1 = 0.3 A2 = 0.2. The karyotype formula of the population of Passo Fiocca is $2n = 2x = 2M + 12m + 9sm + 1sm\text{-}SAT = 24$ (Fig. 1d); the asymmetry indexes are AsK = 0.58 and A1 = 0.3 A2 = 0.2. Chromosomes show an overall length from 2,5 µm to 1,5 µm.

Our chromosome data are in accordance with the previous work on the number, the asymmetry indexes and for the presence of a sat-chromosome, but differ slightly in the form of the chromosomes, this however probably depends on different pressure in the manual squashing of the root tips, and also the fact that all these populations are isolated on the top of different mountains, which, however, geographically all belong to the Apuan Alps.

1318. *Halocnemum strobilaceum* (Pallas) Bieb. — $2n = 18$ (Fig. 2 A, 2a).

It: Tenuta della Trappola (Grosseto), salt soil near the river Ombrone mouth, 1 m, 42°40'N, 11°01'E, 12 Sep 1999, *G. Fiorini, A. Donati, B. Foggi* (FI, 28/10/02).

Halocnemum strobilaceum, a rare species living in salt soil, up to now has never been karyologically investigated in Italy. This data is in accordance with $2n = 18$ in populations of Turkey (Zeybek & al. 1977) and of Iran (Hekmat-Shoar & Manafi 1982).

This species seems to have a rather symmetric karyotype. The karyotype formula (Levan 1964) is $2n = 18 = 9x = 4M + 14m$ (Fig. 2a); the asymmetry indexes (Arano &

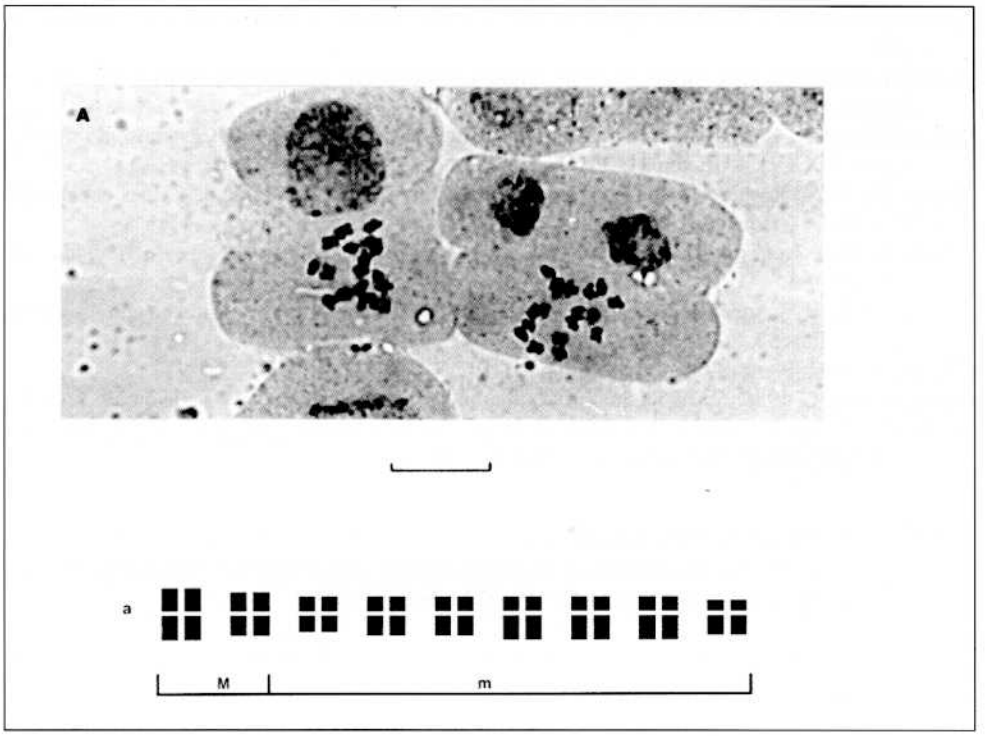

Fig. 2. Mitotic metaphase plate **(A)** and idiogram **(a)** of *Halocnemum strobilaceum*, $2n = 18$. — Scale bar = 10 µm.

Saito 1980, Romero Zarco 1986) are AsK = 0.56 and A1 = 0.21, A2 = 0.12. Chromosomes are small, overall length from 2.0 µm to 1.25 µm.

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