Mediterranean chromosome number reports — 5

edited by G. Kamari, F. Felber & F. Garbari

Abstract

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This is the fifth instalment of a series of reports of chromosome numbers from Mediterranean area, peri-Alpine communities and the Atlantic Islands, in French or English language. It comprises contributions on 196 taxa: *Festuca* from Spain, by E. Ortúñez Rubio & V. de la Fuente García (Nos. 394-400); *Anchusa, Barlia, Centaurea, Delphinium, Helichrysum, Isatis, Orchis, Pancratium, Serapias, Silene* and *Solenanthus* from Greece, by Th. Constantinidis & G. Kamari (Nos. 401-414); *Agrostemma, Dianthus, Minuartia, Petrorhagia, Sagina, Saponaria, Silene, Spergularia* and *Stellaria* from Bulgaria, by A. Petrova (Nos. 415-434); *Alkanna, Anchusa, Cerinthe, Cynoglossum, Cynoglottis, Echium, Heliotropium, Lappula, Symphytum, Ajuga, Ballota, Galeopsis, Lamium, Origanum, Satureja, Scutellaria* and *Teucrium* from Bulgaria, by M. Markova & V. Goranova (Nos. 435-473); *Astragalus* from Bulgaria, by D. Pavlova (Nos. 474-478); *Achillea* from Bulgaria by A. M. Nedelcheva (Nos. 479-480); *Ambrosinia* from Tunisia, *Delphinium* from Spain, France, Anatolia and Balearic Islands, *Consolida* from Bulgaria and Spain, by J. Simon, M. Bosch, C. Blanché & J. Molero (Nos. 481-490); *Acanthus, Achillea, Atriplex, Bubonium, Cardopatium, Carex, Carthamus, Cirsium, Crepis, Crupina, Cynosurus, Echinops, Gynandriris, Jurinea, Lavatera, Milium, Onopordon, Phalaris, Plantago, Poa, Pulicaria, Reseda, Sinapis, Scrophularia, Smyrnium* and *Trachynia* by S. Snogerup (Nos. 491-517); *Androcymbium* from Spain, Morocco, Canary Islands, Israel, Crete, Algeria and Tunisia, by M. Margelí, J. M. Montserrat, J. Pedrola-Monfort & J. Vallès (Nos. 518-523); *Allium* from Yugoslavia, by J. Puizina, M. E. Solič & D. Papeš (Nos. 524-527); *Anisantha, Arrhenatherum, Avena, Boissiera, Briza, Bromus, Catabrosa, Dactylis, Echinochloa, Festuca, Melica, Poa, Taeniatherum* from Caucasus, by E. Nazarova & A. Goukasian (Nos. 528-542); *Fibigia* from Yugoslavia, by V. Kostović-Vranješ & D. Papeš (No. 543); *Narcissus* from Italy, by R. M. Baldini (No. 544); *Allium, Asparagus, Arenaria, Galium, Globularia, Leuzea, Verbascum* from France, by R. Verlaque, C. Reynaud & C. Vignal (Nos. 545-551); *Artemisia* from Spain, France, Balearic Islands, Tunisia, Morocco, by J. Vallès & M. Torrell (Nos. 552-558); *Cephalanthera, Coeloglossum, Corallorhiza, Dactylorhiza, Epipactis, Gennaria, Goodyera, Gymnadenia, Himantoglossum, Listera, Neottia, Nigritella, Ophrys, Orchis, Platanthera, Pseudorchis* from Spain, by L. Ruiz (Nos. 559-589).

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Reports (394-400) by E. Ortúñez Rubio & V. de la Fuente García

394. ***Festuca ampla*** Hackel — $2n = 4x = 28$ (Fig. 1a).

Hs: Rascafría, arroyo de Artiñuelo, 40°49'N, 03°56'W, 1300 m, 10 Jul 1982, *F. Fernández Gonzáles* 82710 (MAF).

The chromosome number $2n = 4x = 28$ is the same as that given by A. Fernandes & Queiros (1969) and Queiros (1974), in localities from Portugal. Also Devesa & Luque (1988) found that this taxon was tetraploid ($2n = 4x = 28$). The karyotype is symmetrical, and metacentric and submetacentric chromosomes are present. We have not found any B chromosomes. However, A. Fernandes & Queiros (1969) found 4B chromosomes. Endemic to Iberian Peninsula and North Africa. Distributed on acid lands in the C, W and SW of Iberian Peninsula.

395. ***Festuca summilusitana*** Franco & Rocha Afonso, *Bol. Soc. Brot.* 54: 94 (1980). — $2n = 6x = 42$ (Fig. 1b).

Hs: Avila, Pto. de Tremedal (Sª de Candelario), 40°23'N, 05°37'W, grazing ground, 1685 m, 6 Aug 1989, *E. Ortúñez* 89E13 (Herb. Fuente & Ortúñez).

— Avila, Pto. de Menga (Sª de la Paramera), 40°28'N, 05°07'W, grazing ground, 1560 m, Aug 1990, *V. de la Fuente & E. Ortúñez* 92E21 (Herb. Fuente & Ortúñez).

— Avila, Cerro Gorría (Sª de Avila), 30°39'N, 05°00'W, grazing ground, 1700 m, 29 Aug 1989, *V. de la Fuente & E. Ortúñez* 89E16 (Herb. Fuente & Ortúñez).

— Avila, Pto. de los Serranillos (Sª del Cabezo), 40°19'N, 04°56'W, 1600 m, Aug 1990, *E. Ortúñez* 90E50 (Herb. Fuente & Ortúñez).

— Avila, Solana de Avila, Central del Chorro (Sª de Tormantos), 40°20'N, 05°40'W, 1500 m, 11 Jul 1991, *S. Sardinero* 3 (MAF).

Our count is the first to be published for this species. The karyotype is symmetrical, with metacentric and submetacentric chromosomes present and, at least, one pair of telocentric chromosomes. Endemic to Iberian Peninsula. Distributed in the northwestern Iberian quadrant.

396. ***Festuca indigesta*** Boiss. subsp. ***aragonensis*** (Willk.) Kerguélen. — $2n = 4x = 28$ (Fig. 1c).

Hs: Soria, Collado del Muerto (Sª del Moncayo), 41°43'N, 01°55'W, *Hieracium-Plantaginion,* 4 Jul 1987, *G. Navarro* s.n. (MAF).

All the specimens counted are tetraploid ($2n = 4x = 28$). The karyotype is symmetrical, and numerous metacentric chromosomes are present. Endemic to "Moncayo" and "Urbión" mountains (Spain).

397. ***Festuca curvifolia*** Lag. ex Lange (*F. curvifolia* δ *hystrix* Willk. in Willk. & Lange; *F. ovina* subsp. *eu-ovina* var. *indigesta* subvar. *aragonensis* sensu St.-Yves) — $2n = 6x = 42$ (Fig. 1d).

Hs: Madrid, Cabeza Lijar (Sª de Malagón), 40°39'N, 04°10'W, 1600 m, 12 Jul 1982, *P. Cantó* 8 (MAF).

— Madrid, Peñalara (Sª de Guadarama), 40°49'N, 04°03'W, psicroxerophic grazing ground, 2000 m, 12 Sep 1989, *E. Ortúñez* 89E4 (Herb. Fuente & Ortúñez).

— Madrid, Siete Picos, Pto. de Navacerrada (Sª de Guadarama), 40°44'N, 04°03'W, psicroxerophic grazing ground, 1930 m, *E. Ortúñez* s.n. (Herb. Fuente & Ortúñez).

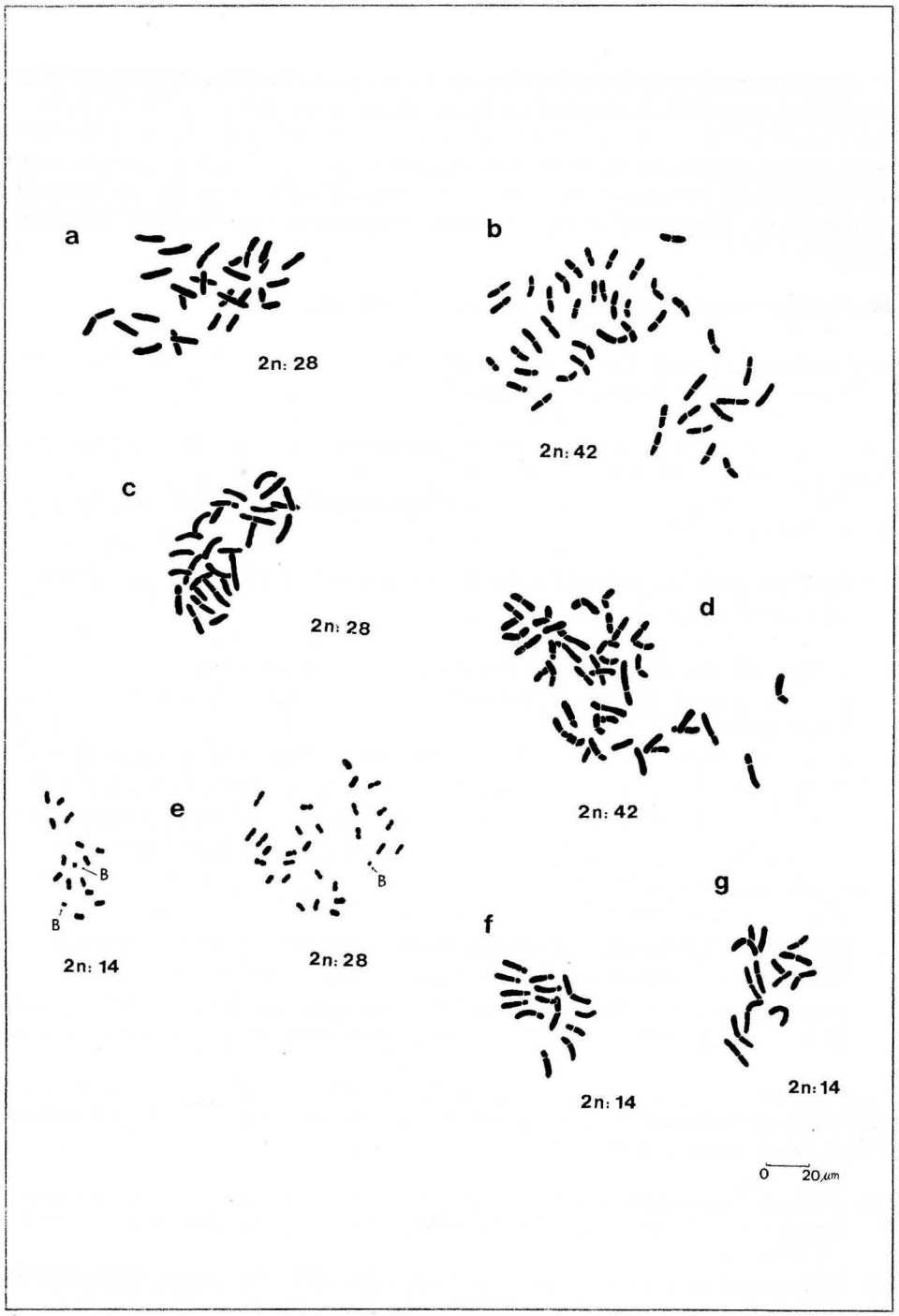

Fig. 1. Karyotypes of: **a**, *Festuca ampla;* **b**, *F. summilusitana*; **c**, *F. indigesta* subsp. *aragonensis*; **d**, *F. curvifolia*; **e**, *F. hystrix*; **f**, *F. rivas-martinezii*; **g**, *F. marginata* subsp. *andrés-molinae*. - Scale bar = 20 µm.

— Segovia, estación de la Pinilla, Pico del Lobo (Sª de Ayllón), 41°06'N, 03°28'W, 1750 m, Aug 1990, *E. Ortúñez* s.n. (Herb. Fuente & Ortúñez).

Our count is the first for localities from Central System Spain. All specimens counted were found to be hexaploid ($2n$ = 6x = 42). The karyotype is similar to that of *F. summilusitana*. Distributed in the "Ayllón", "Guadarama" and "Urbion" mountains (Spain).

398. *Festuca hystrix* Boiss. — $2n$ = 14, 28 + 0-2B (Fig. 1e).

Hs: Guadalajara, entre Cifuentes y Cañarredonda, 40°44'N, 02°38'W, Jun 1992, *V. de la Fuente* s.n. (Herb. Fuente & Ortúñez).

We found two chromosome numbers $2n$ = 2x = 14 and $2n$ = 4x = 28. The karyotype is symmetrical and 1 or 2B chromosomes were observed.

Endemic to Iberian Peninsula and North Africa. Distributed on basic land in the N, E and SE of Iberian Peninsula.

399. *Festuca rivas-martinezii* Fuente & Ortúñez, *Bot. J. Linn. Soc.* 114 (1994) — $2n$ = 2x = 14 (Fig. 1f).

Hs: Avila, entre Pto. de Villatoro y Villanueva del Campillo (Sª de Gredos), 40°34'N, 05°10'W, piornal, 1550 m, 12 Jul 1990, *V. de la Fuente & Ortúñez* 90E39 (Herb. Fuente & Ortúñez).

— Avila, entre Pto. de Villatoro (Sª de Gredos), 40°33'N, 05°10'W, *Quercus pyrenaica*, 1450 m, 11 Jul 1990, *V. de la Fuente & Ortúñez* 90E36 (Herb. Fuente & Ortúñez).

— Avila, Pto. de Peña Negra (Sª de Gredos), 40°17'N, 05°17'W, rocky grazing ground, 1900 m, Jul 1990, *V. de la Fuente & Ortúñez* 90E91 (Herb. Fuente & Ortúñez).

— Guadalajara, Pto. de la Quesera (Sª de Ayllón), 41°13'N, 03°24'W, 1720 m, 20 Jul 1990, *V. de la Fuente & Ortúñez* 90E68 (Herb. Fuente & Ortúñez).

— Madrid, Pto. de Navafría (Sª de Guadarrama), 40°58'N, 03°48'W, 1580 m, 15 Jun 1989, *V. de la Fuente & Ortúñez* 89E5 (Herb. Fuente & Ortúñez).

— Segovia, Estación de la Pinilla, Pico del Lobo (Sª de Ayllón), 41°11'N, 03°48'W, 1550 m, 20 Jul 1990, *V. de la Fuente & Ortúñez* 90E62 (Herb. Fuente & Ortúñez).

All specimens counted were found to be diploid. The karyotype is symmetrical with metacentric and submetacentric chromosomes and B chromosomes are lacking. Distributed in the Central System (Spain).

400. *Festuca marginata* Fuente & Ortúñez subsp. ***andres-molinae*** Fuente & Ortúñez, *Bot. Complut.* 18: 105-112 (1993) — $2n$ = 2x = 14 (Fig. 1g).

Hs: Burgos, de Oña a Picos de Bireba, 42°42'N, 03°26'W, sandy land, 570 m, 12 Sep 1991, *I. García Mijangos* 3868 (BIO).

— Burgos, Salas-Covarrubias, junto al Arlanza, 42°03'N, 03°26'W, 10 Jul 1973, *E. Fuertes& A. Molina* 136502 (MAF).

Our count is the same as that given for *F. marginata* subsp. *marginata* by Bidault (1966, 1968, 1970, 1972), Parreaux (1971) and Kerguélen (1975). The karyotype is symmetrical and B chromosomes are lacking. Distributed on basic land in the N and NE of Spain.

Acknowledgements

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Reports (401-414) by Theophanis Constantinidis & Georgia Kamari

401. *Anchusa aegyptiaca* (L.) DC. — $2n = 16$ (Figs. 1a, b, c).

Gr: Saronic gulf islands, Nomos Attikis, Dokos island, supra portum ad borealem insulae, c. 150 m, 37°19'N, 23°19'E, 23 Apr 1994, *Phitos & al. 23712* (UPA).

Anchusa aegyptiaca is an east Mediterranean member of subgen. *Lycopsis*. It is easily distinguished from other members of the subgenus in this area by its pale yellow flowers.

A previous count ($2n = 16$) and a karyotype of this taxon have been given by Díaz Lifante & al. (1992) from material collected in Israel.

The same chromosome number $2n = 16$, the karyotype (Figs. 1a, c), as well as the karyogram (Fig. 1b) are presented here for the first time for Greece. Out of the 16 chromosomes, 14 appear to be submetacentric or ± submetacentric, 6 of them bearing small satellites, and 2 metacentric: $2n = 2x = 2m + 8sm + 6sm\text{-}SAT = 16$ chromosomes.

Luque (1983, 1995) considers that the basic number $x = 8$ is the predominant and more primitive one in the genus *Anchusa*, where polyploids ($4x$, $6x$) are also known to occur. In *A. aegyptiaca* the apparent chromosome size varies between c. 5 to 10 μm.

402. *Barlia robertiana* (Loisel.) Greuter — $2n = 36$ (Figs. 2a, b).

Gr: Peloponnisos, Nomos Ilias, inter pagos Koumouthekras et Smerna, in apertis silvae *Pinus halepensis*, solo calcareo, c. 500 m, 37°32'N, 21°41'E, 26 Mar 1994, *Phitos & al. 23516* (UPA).

The chromosome number of this Mediterranean taxon has previously been reported from France (Raynaud 1971, Natarajan 1978, Cauwet-Marc & Balayer 1986) and Italy (Scrugli & al. 1976, Mazzola & al. 1981, D'Emerico & al. 1992, 1993), all as $2n = 36$. A different number, $2n = 60$ has also been published (see Del Prete 1978, Cauwet-Marc & Balayer 1986, for references).

The chromosome number $2n = 36$ and the karyotype are given here for the first time for Greece (Fig. 2a, b). The chromosomes vary from c. 1.8 to 4.5 μm in size, and are mostly metacentric (m) and submetacentric (sm).

Two of them bear conspicuous satellites, while several others have single or double satellites, possibly of telomeric heterochromatin, that stain faintly in Feulgen (Figs. 2a, b).

403. *Centaurea deusta* Ten. s.l. — $2n = 18$ (Fig. 3).

Gr: Sterea Ellas, Nomos Fthiotidos, Mt Othris, slopes of the Koufoskilorema shallow ravine, c. 2-3 km E of Neochorion, *Quercus* forest on non-calcareous substrate, c. 680-780 m, 39°02'N, 22°32'E, 23 Aug 1992, *Constantinidis 2768* (UPA).

Centaurea deusta s.l. is an annual or biennial species of sect. *Phalolepis* with a distribution in the Balkan Peninsula and Italy. The chromosome number $2n = 2x = 18 \pm 1$ B has been found in material that came from former Yugoslavia (Matthäs 1976, 1981, Siljak 1977, Lovric 1982), Bulgaria (Kuzmanov & Georgieva 1990), Italy (Brullo & al. 1991, Tessitore & al. 1993), and Greece (one population from the island of Kerkira, Matthäs l.c).

The karyotype of *C. deusta* (Fig. 3) shows considerable symmetry and consists mostly of medium-sized submetacentric (sm) and small metacentric (m) chromosomes, varying in size from 1.5 to 2.5 μm.

The two longer submetacentric chromosomes bear conspicuous satellites, while on two medium-sized metacentric chromosomes the satellites are not always visible.

The plants of the population on Mt Othris examined here, bear white to creamy-yellow florets, in contrast to the more usual pink-purplish ones; in other respects, specimens collected are almost identical morphologically to those from Italy and former Yugoslavia.

404. *Centaurea parilica* Stoj. & Stefanov — $2n = 22$ (Figs. 4a, b).

Gr: Makedonia, Nomos Dramas, Mt Falakro, the summit area, grassy and rocky slopes, limestone, c. 2100-2230 m, 41°18'N, 24°06'E, 21 Aug 1994, *Strid & Constantinidis 36666* (C, UPA).

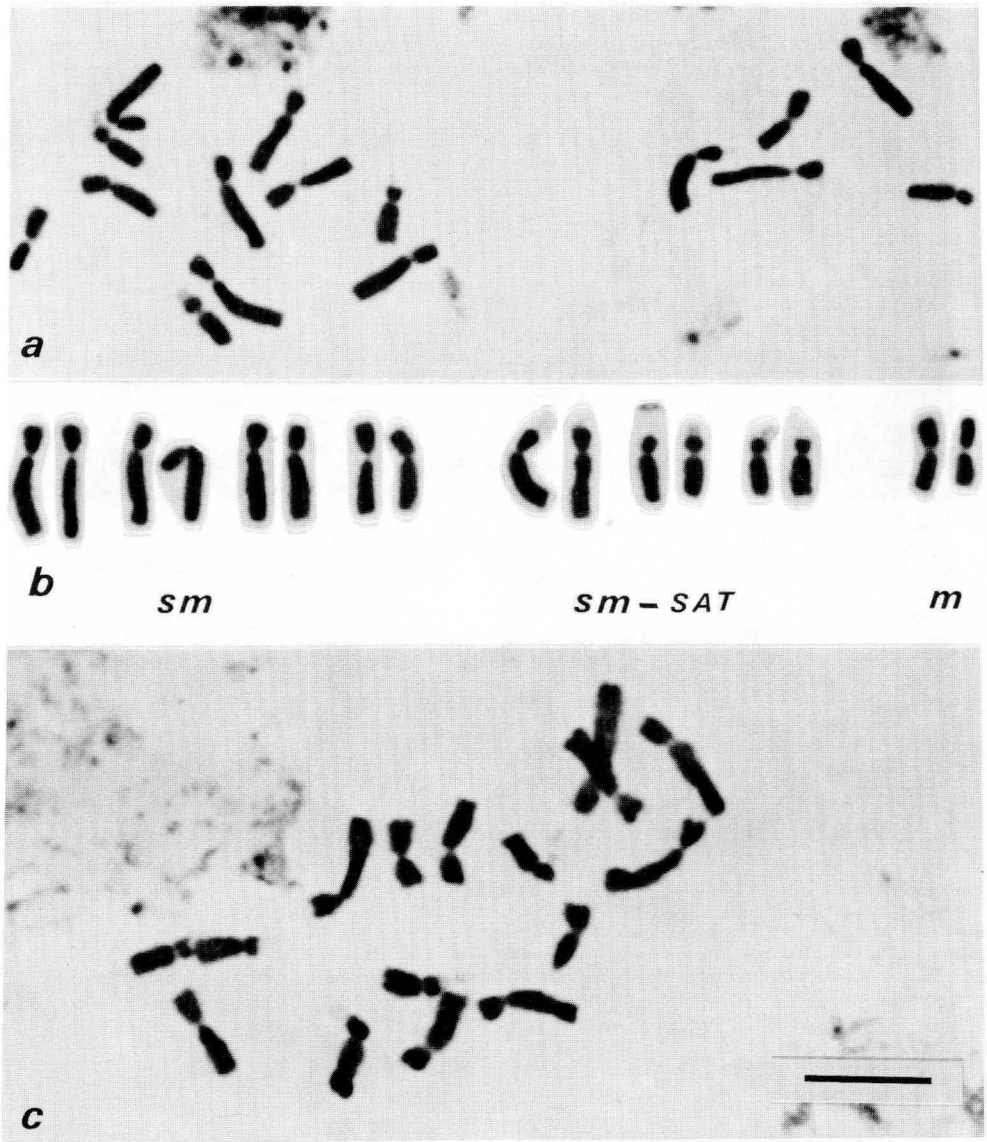
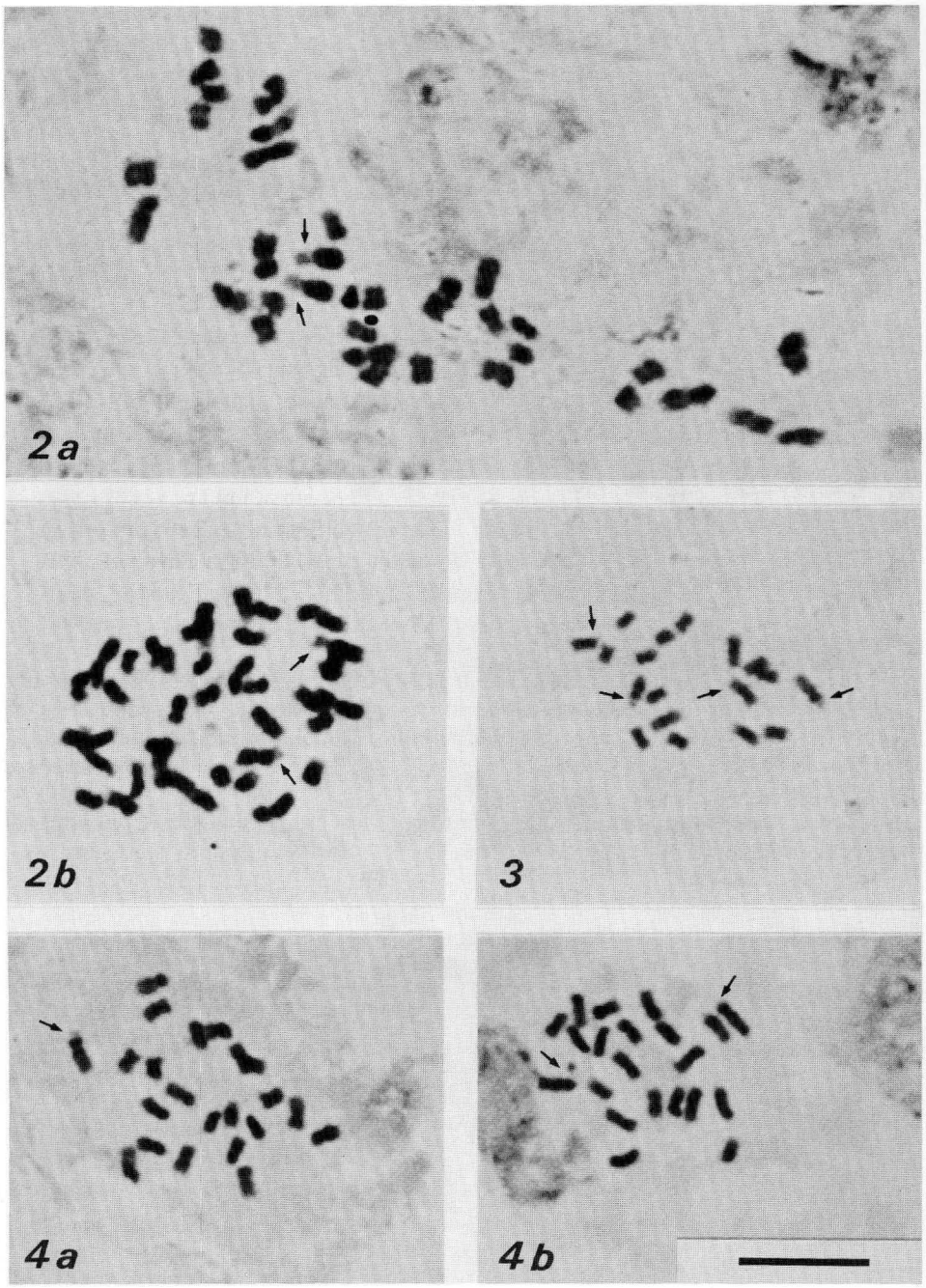


Fig. 1. *Anchusa aegyptiaca*: a, c, mitotic metaphase plates, $2n = 16$; b, karyogram. - Scale bar = 10 µm.



Figs. 2-4. Mitotic metaphase plates of: 2a, b, *Barlia robertiana*, $2n = 36$; 3, *Centaurea deusta*, $2n = 18$; 4a, b, *Centaurea parilica*, $2n = 22$. Arrows indicate SAT-chromosomes. - Scale bar = 10 µm.

This taxon is a Balkan endemic, distributed in Northern Greece and Bulgaria. It has previously been examined karyologically by Kuzmanov and Georgieva (1987, 1990) in material from Bulgaria. Its chromosome number $2n = 22$ and its karyotype, presented here for the first time for Greece, are in agreement with those found in Bulgarian material. The karyotype of *C. parilica* is symmetrical, and consists of metacentric (m) and submetacentric (sm) chromosomes (Figs. 4a, b), varying in size from 1.5 to 3.0 μm. The longer chromosome pair is submetacentric, always seen to bear small, clear satellites. In some karyotypes 1-2B chromosomes (Fig. 4b) were also observed.

405. *Delphinium staphisagria* L. — $2n = 18$ (Figs. 5a, b).

Gr: Makedonia, Mt Athos (Agion Oros), between the skiti (=monastery) of Agia Anna and the skiti of Mikra Agia Anna, rocky slopes, limestone, c. 200-350 m, 40°09'N, 24°18'E, 11 May 1994, *Constantinidis 5893* (UPA).

— Sterea Ellas, Nomos Etolias-Akarnanias, coastal road between the villages of Astakos and Mitikas, c. 50-150 m, 38°36'N, 21°02'E, 29 May 1995, *Phitos & Kamari* 24599 (UPA).

Delphinium staphisagria has a predominantly Mediterranean distribution, and is also found in the Canary Islands. Its chromosome numbers $2n = 2x = 16$ and $2n = 4x = 32$ given earlier (see Fedorov 1969 for references) are not in agreement with our count $2n = 2x = 2m + 2sm + 10st + 4t\text{-}SAT = 18$, found in two distant Greek populations. To our knowledge, this number is very rare in the tribe *Delphineae*, and has previously been reported only for the Spanish *D. bolosii* (Blanché & Molero 1983) and *Aconitella scleroclada* var. *rigida* (see Trifonova 1990)*. In the karyotype and karyogram (Fig. 5a, b) of the species given here for the first time for Greek material, a pronounced asymmetry is observed: there is one very long (c. 18-20 μm) metacentric (m) chromosome pair, bearing secondary constrictions on both arms, one submetacentric pair (sm) of c. 8-9.5 μm, while the rest of the chromosome complement is acrocentric (st) or subtelocentric (t), varying in size from c. 3.3 to 10 μm. Several of the acrocentric and subtelocentric chromosomes show secondary constrictions in their long arms, and in addition two of them possess small satellites. Moreover, three to four of them bear small satellites on their short arms (Figs. 5a, b). Notable here is also an apparent structural heterozygosity in the position of the secondary constrictions on the two longest metacentric chromosomes. Such long chromosomes, found also in other *Delphinium* species, may be the result of a telomeric fusion of shorter chromosomes. The chromosome number $2n = 20$ is very rare in the genus, although it has been reported in *D. denudatum* from India (Sarkar & al. 1982). Alternatively, fission in an $x = 8$ karyotype may have given rise to complements with 18 chromosomes. Further study on the observed dysploidy by using alternative chromosome staining techniques could elucidate the structure and possible origin of this karyotype.

406. *Helichrysum sibthorpii* Rouy — $2n = 28 \pm 1B$ (Figs. 6a, b, c).

Gr: Makedonia, Mt Athos (Agion Oros), the summit area, limestone rocks and rocky slopes, c. 1900-2030 m, 40°10'N, 24°20'E, 18 Aug 1994, *Strid & Constantinidis 36610* (C, UPA).

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* but see also report no. 487 by Simon et al. in this column. [Ed.]

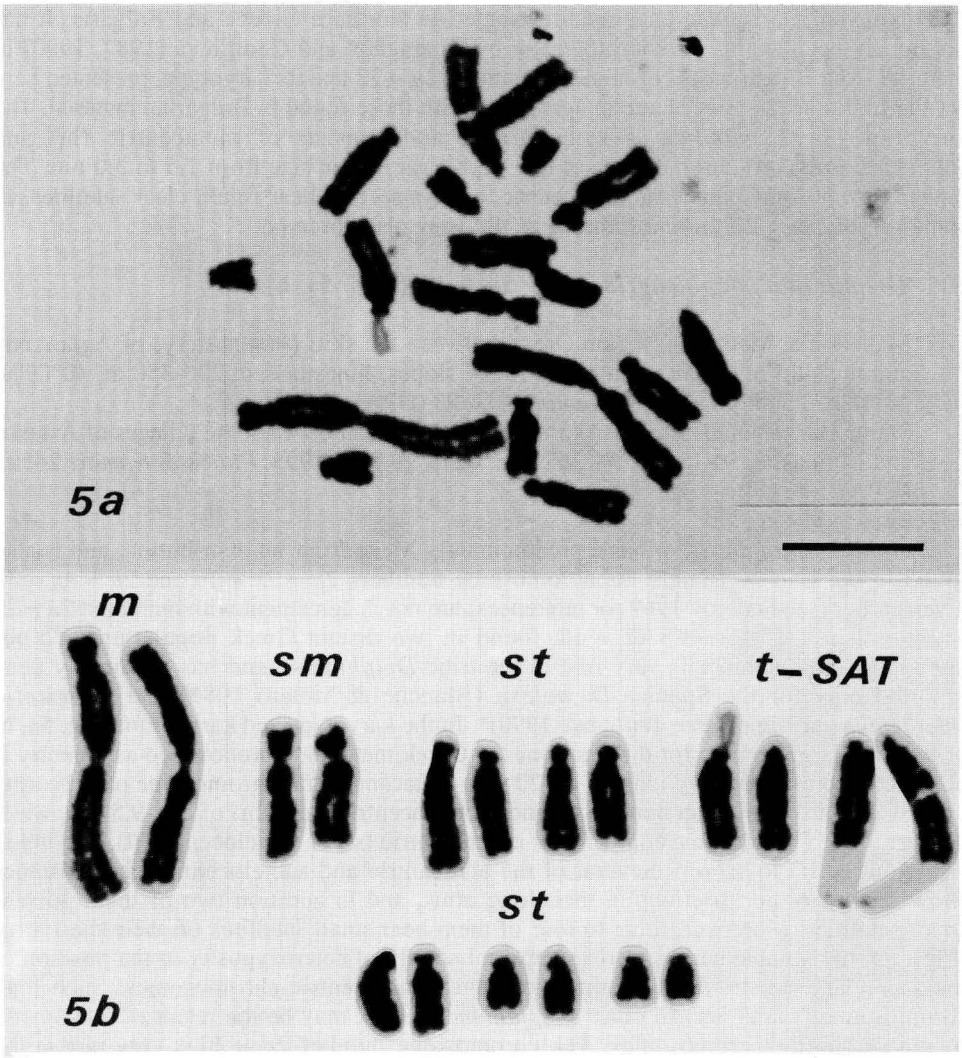
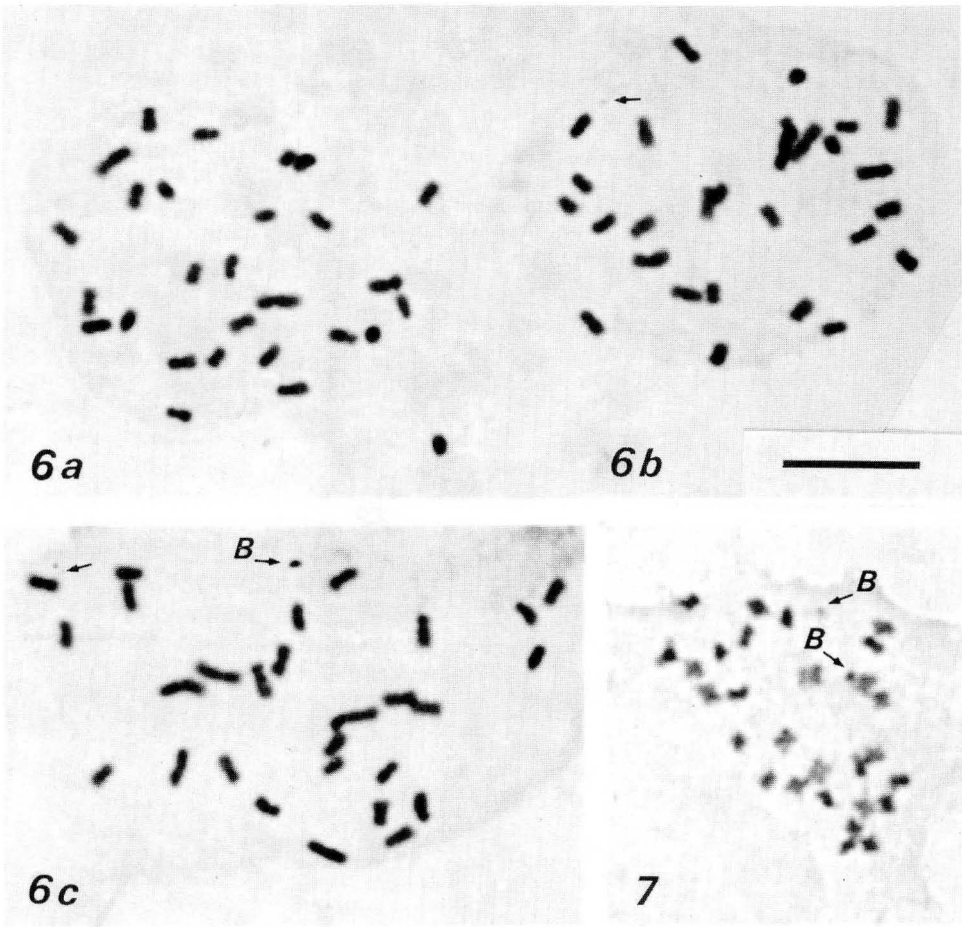


Fig. 5. *Delphinium staphisagria*: a, mitotic metaphase plate, $2n = 18$; b, karyogram. - Scale bar = 10 μm.

A local endemic of Mt Athos growing between 1750-2000 m altitude. Its chromosome number $2n = 28$ was previously reported by Georgiadou (1991).

Its karyotype is given here for the first time. It is symmetrical with mostly metacentric (m) chromosomes varying in size from c. 1.7 to 3.9 μm. Two of the small submetacentric chromosomes have satellites, one of which is not always visible (Fig. 6a, b). In some cases 1-2 small B-chromosomes have also been observed (Fig. 6c).

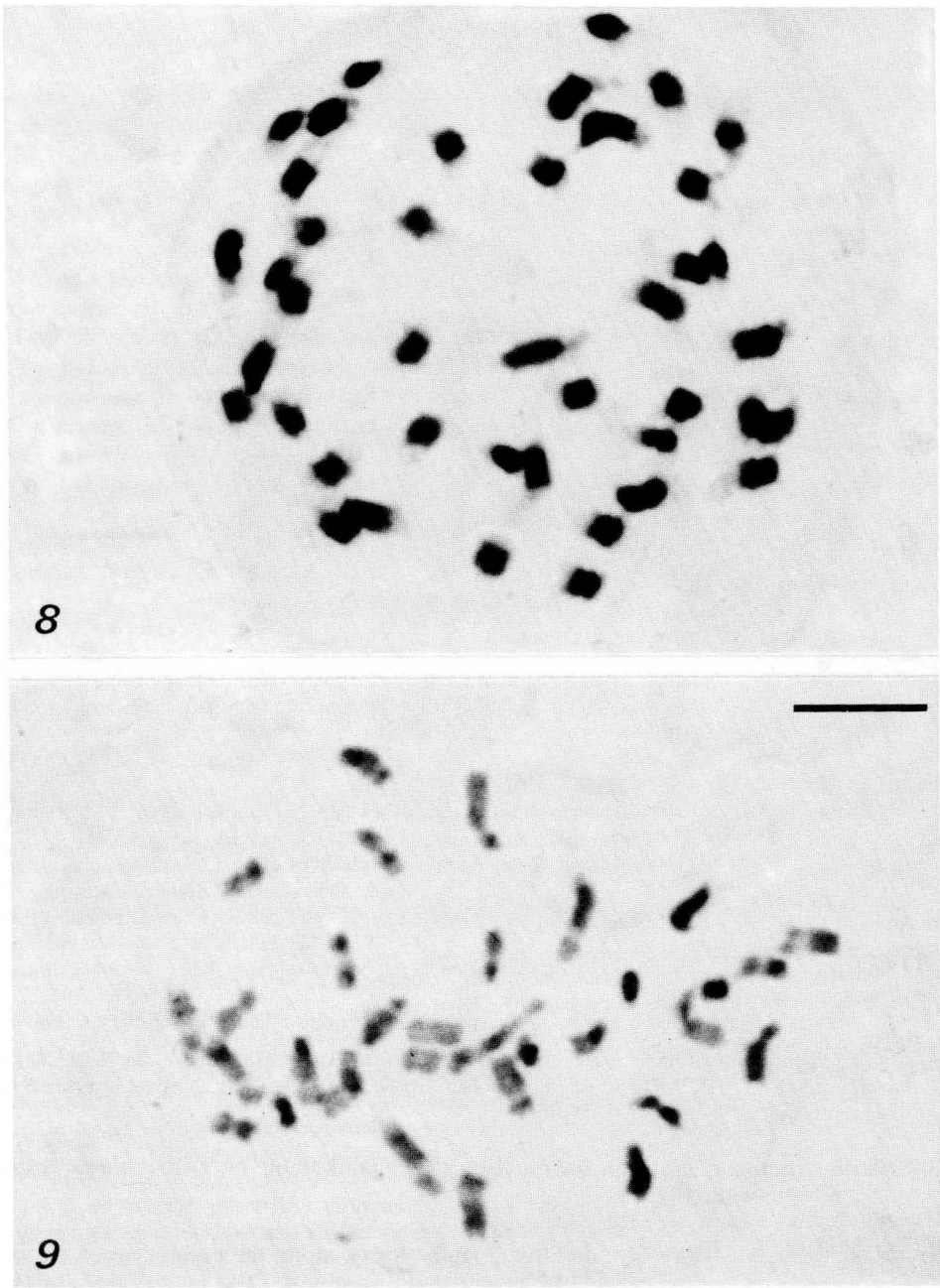


Figs. 6-7. Mitotic metaphase plates of: 6a, b, *Helichrysum sibthorpii*, $2n = 28$; 6c, *H. sibthorpii* $2n = 28 + 1B$; 7, *Isatis tinctoria* subsp. *athoa*, $2n = 28 + 2B$. Arrows indicate SAT- and B-chromosomes. - Scale bar = 10 µm.

407. *Isatis tinctoria* L. subsp. ***athoa*** (Boiss.) Papanikolaou (= *Isatis athoa* Boiss.) — $2n = 28 + 2B$ (Fig. 7).

Gr: Makedonia, Mt Athos (Agion Oros), south slopes, along the path between the skiti of Agia Anna and the chapel of Panagia, dense shrubs, c. 1100 m, 40°09'N, 24°19'E, 11 May 1994, *Strid & Constantinidis* 36504 (C, UPA).

Isatis tinctoria subsp. *athoa* is an endemic perennial taxon known only from the Athos Peninsula. Its chromosome number $2n = 28$ has previously been reported by Papanicolaou (1986). Its karyotype morphology, presented here for the first time, is symmetrical and consists of very small (c. 1-2 µm) metacentric (m) chromosomes. Two small, differing in size, B-chromosomes are usually observed (Fig. 7).



Figs. 8-9. Mitotic metaphase plates of: 8, *Orchis lactea*, $2n = 42$; 9, *Orchis papilionacea*, $2n = 32$. - Scale bar = 10 µm.

408. *Orchis lactea* Poiret — $2n = 42$ (Fig. 8).

Gr: Sterea Ellas, Nomos Attikis, the gulf of Egosthena, limestone slopes facing the sea, sparse *Pinus* and *Juniperus* forest, c. 5-35 m, 38°08'N, 23°13'E, 26 Dec 1993,

Constantinidis 4298 (UPA).

Orchis lactea has a Mediterranean distribution and is allied to *O. tridentata* Tod. All previous records for this species (Fedorov 1969, Scrugli 1977, Mazzola & al. 1981, D' Emerico & al. 1992) report the same chromosome number, $2n = 42$. Our count and karyotype (Fig. 8), reported from Greece for the first time, are in agreement with the previous authors. The chromosomes are mostly metacentric (m) with the rest submetacentric (sm), ranging in size from c. 2.2 to 4.7 μm. Satellites occur on several of them, appearing as pale dots at the telomeric region.

409. *Orchis papilionacea* L. s.l. — $2n = 32$ (Fig. 9).

Gr: Sterea Ellas, Nomos Viotias, c. 5 km NNE of Ritsona, phrygana, c. 240-270 m, 38°26'N, 23°31'E, 20 Mar 1994, *Constantinidis* (tubers collected, cult. no. *F 636*, UPA).

Orchis papilionacea is a variable species distributed in the Mediterranean area. Several karyological references exist for the species (Fedorov 1969, Löve & Kjellqvist 1973, Scrugli & al. 1976, Del Prete 1978, Bianco & al. 1987, Capineri & Rossi 1987, D' Emerico & al. 1990). The chromosome number $2n = 32$, reported for the first time for Greece, is in agreement with all previous counts. The karyotype (Fig. 9) consists of 16 metacentric (m), 12 submetacentric (sm) and 4 acrocentric (st) chromosomes, several of which bear simple or double satellites, usually on the longer arm. These are faintly stained with Feulgen and are possibly of constitutive telomeric heterochromatin. Structural heterozygosity with respect to the size of the satellites is apparent in a submetacentric chromosome pair (Fig. 9).

410. *Pancratium maritimum* L. — $2n = 22$ (Fig. 10).

Gr: Sterea Ellas, Nomos Etolias-Akarnanias, Aktion, sandy seashore close to the road, c. 1-3 m, 38°56'N, 20°45'E, 12 Nov 1993, *Constantinidis & al.* (seeds collected, cult. no *F 569*, UPA).

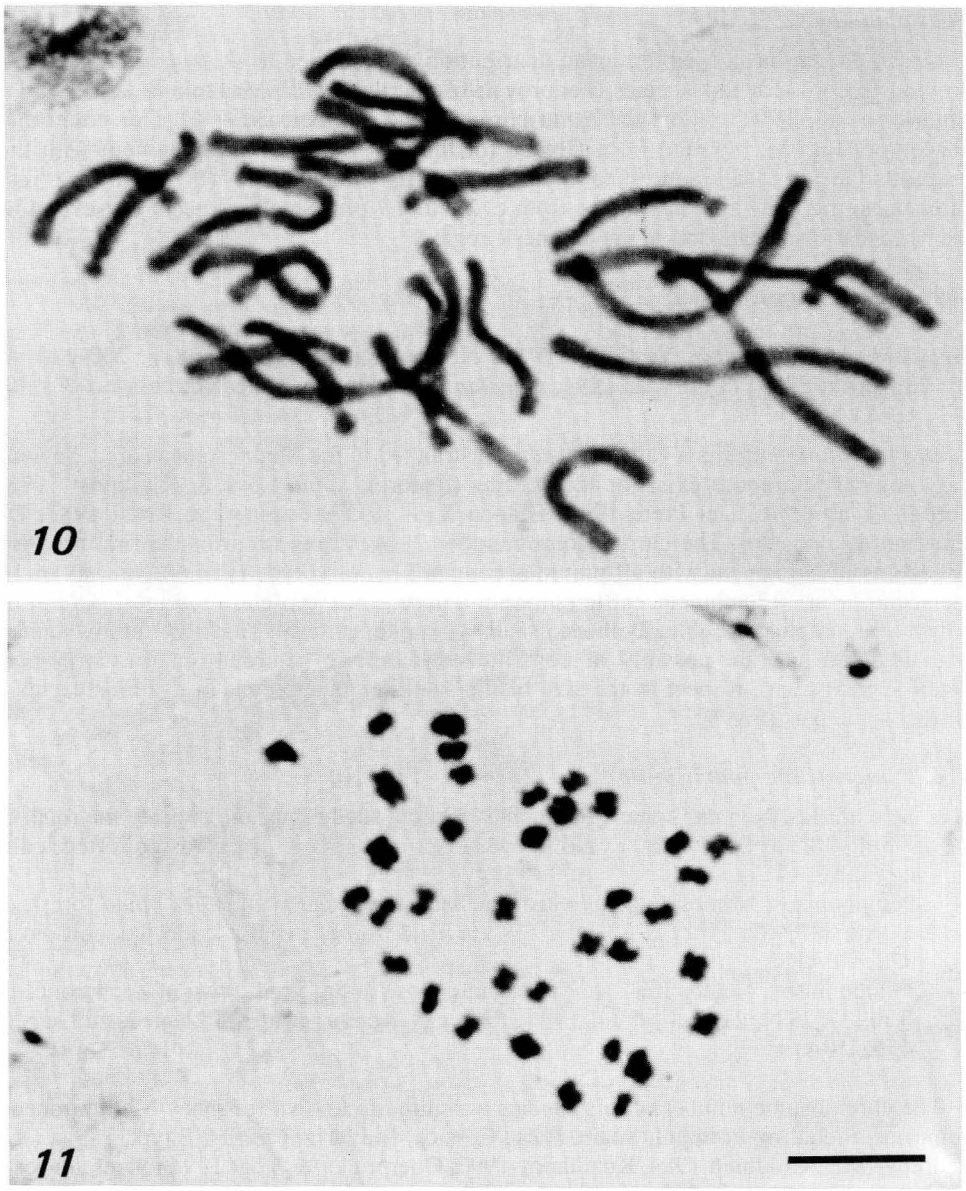
— Peloponnisos, Nomos Achaias, Strofilia, sandy seashore with *Pinus pinea* forest, c. 1-3 m, 38°09'N, 21°21'E, 13 Jul 1993, *Phitos & Kamari* (bulbs collected, cult. no *F 373*, UPA).

— Peloponnisos, Nomos Ilias, sandy seashore close to the small town of Zacharo, c. 1-3 m, 37°28'N, 21°37'E, 3 Jul 1994, *Phitos & Kamari* (bulbs collected, cult. no *F 650*, UPA).

The chromosome number of this species was hitherto known for many Mediterranean countries, including Portugal, Spain, Italy, Corsica, Bulgaria, Cyprus, Egypt, Libya (see Fedorov 1969, Goldblatt 1984, Kuzmanov 1993, Oberprieler & Vogt 1994 for references), but not for Greece. The chromosome number $2n = 22$ and the karyotype given here agree with all previous reports. The chromosomes are long, ranging from 12 to 30 μm. The karyotype formula is $2n = 8m + 4sm + 2st + 8t = 22$ (Fig. 10).

411. *Serapias orientalis* (Greuter) H. Baumann & Künkele subsp. ***carica*** H. Baumann & Künkele — $2n = 36$ (Fig. 11).

Gr: Makedonia, Mt Athos (Agion Oros), between Karies and the Monastery of Iviron, roadsides in dense shrub and forest, schist, c. 200 m, 40°15'N, 24°16'E, 08 May 1994, *Strid & Constantinidis 36391* (C, UPA).



Figs. 10-11. Mitotic metaphase plates of: 10, *Pancratium maritimum*, $2n = 22$; 11, *Serapias orientalis* subsp. *carica*, $2n = 36$. - Scale bar = 10 µm.

The group of *Serapias orientalis*, *S. vomeracea* (N. L. Burm.) Briq. and *S. cordigera* L., together with their subspecies, is critical and has been treated differently by various authors. Our specimen has been determined according to Baumann & Künkele (1989) and Bartolo & Pulvirenti (1993) and seems to extend the known geographical distribution of

subsp. *carica* given by the former authors.

No previous chromosome reports for this subspecies were found, and thus to our knowledge, the chromosome number $2n = 36$, as well as its karyotype (Fig. 11) are given here for the first time. The number $2n = 36$ is by far the most common diploid number in this genus (see Cauwet-Marc & Balayer 1986) and the same number has been reported by D'Emerico & al. (1992, 1993) for subsp. *apulica* from Italy. The karyotype of subsp. *carica* examined here is symmetrical, and consists of small (c. 1.7-3.3 μm), mostly metacentric (m) chromosomes, three or four of which bear small satellites (Fig. 11). This taxon differs karyotypically from subsp. *apulica*, in the complete absence of acrocentric (st) chromosomes (cf. D' Emerico & al. l.c.).

412. *Silene auriculata* Sm. — $2n = 24$ (Fig. 12).

Gr: Sterea Ellas, Nomos Viotias, Mt Parnassos, the south and west slopes of the Vourlia summit, rocky slopes and dolines, c. 1700-1800 m, 38°30'N, 22°39'E, 19 Jul 1994, *Constantinidis & Vassiliades* 5021 (UPA).

The chromosome number $2n = 24$ and the karyotype of *Silene auriculata* are reported here for the first time. A previous reference for the same taxon by Damboldt & Phitos (1968) from Italy should be attributed to *S. lanuginosa* Bertol., a taxon closely related to *S. auriculata* (Bechi et al. 1991). Most of the 24 chromosomes are metacentric (m) while the rest are submetacentric (sm). All of them are small, ranging in size between 2.5 to 3.5 μm (Fig. 12). Two m and two sm chromosomes bear small satellites.

413. *Silene paradoxa* L. — $2n = 24$ (Fig. 13).

Gr: Sterea Ellas, Nomos Fthiotidos, Mt Othris, slopes of the Koufoskilorema shallow ravine, c. 2-3 km E of Neochorio, *Quercus* forest on non-calcareous substrate, c. 680-780 m, 39°02'N, 22°32'E, 23 Aug 1992, *Constantinidis 2773* (UPA).

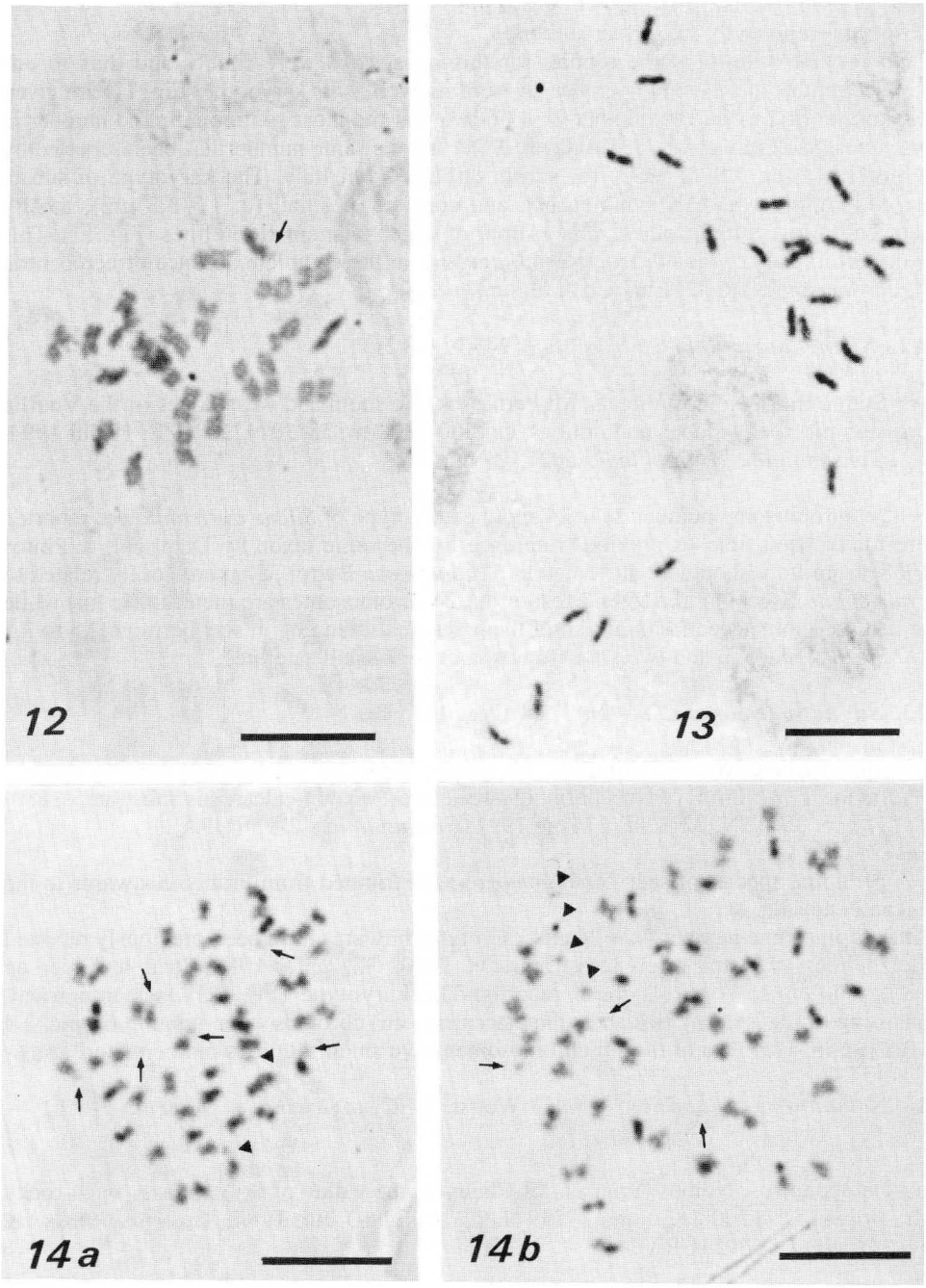
A perennial species of sect. *Siphonomorpha*, distributed from France eastwards to the Balkan Peninsula.

Its chromosome number $2n = 24$ and karyotype drawings have been previously reported (Melzheimer 1974 and references, Degraeve 1980, Ghazanfar 1983, Strid & Anderson 1985); our count confirms these records. The karyotype (Fig. 13) is symmetrical, consisting of metacentric (m) and submetacentric (sm) chromosomes, ranging from c. 2.4 to 3.2 μm in size. Two of the sm chromosomes have small satellites on their short arms.

414. *Solenanthus stamineus* (Desf.) Wettst. (= *Cynoglossum stamineum* Desf.) — $2n = 48 \pm 2$-4B (Fig. 14a, b).

Gr: Peloponnisos, Nomos Achaias, Mt Chelmos, the valley of Styx, mostly open rocky slopes, c. 1700-1850 m, 37°59'N, 22°12'E, 10 Jul 1994, *Constantinidis & Vassiliades 5892* (UPA).

A rare taxon in Greece, known from Mts Chelmos, Killini and Giona (Strid 1991, Dimopoulos 1993). These are the only localities in Europe, where the species is found disjunct; the main distribution area lies much further east, in the south and eastern part of Anatolia extending to central Asia and the west Himalayas.



Figs. 12-14. Mitotic metaphase plates of: 12, *Silene auriculata*, $2n = 24$; 13, *Silene paradoxa*, $2n = 24$; 14a, *Solenanthus stamineus*, $2n = 48 + 2B$; 14b, *S. stamineus*, $2n = 48 + 4B$. Arrows indicate SAT-chromosomes and arrowheads B-chromosomes. - Scale bar = 10 µm.

To our knowledge, the chromosome number of *Solenanthus stamineus* is given only by Ghaffari (1986), as $n = 12$ counted on Iranian material. Our count of $2n = 4x = 48$ chromosomes as well as the karyotype morphology are presented here for the first time (Figs. 14a, b). In relation to the Iranian material, the Greek population is tetraploid, consisting of small m and sm chromosomes of up to c. 2.3 µm. Six of them bear satellites, while two to four B- chromosomes are usually visible (Figs. 14a, b). It is possible that the Greek populations of *Solenanthus stamineus* originate from Asiatic ones through an ancient migration route to the west. Further karyological data to examine ploidy levels in both Asiatic and Greek populations would be desirable.

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Reports (415-434) by Ana Petrova

415. ***Agrostemma githago*** L. — $2n = 48$ (Fig. 1).

Bu: River Strouma region, on the "Kozhouha" hill, 41°27'N, 23°15'E, grassy places, 150 m, 25 Jul 1974, *Petrova 24295* (SOM).

Both the diploid ($2n = 2x = 24$) and the tetraploid ($2n = 4x = 48$) chromosome numbers have been reported by several authors (see Fedorov 1969, van Loon & Jong 1978, for references, Skalinska & al. 1978, Strid & Franzen 1981, Reynaud & al. 1993). The tetraploid karyotype consisting of $2n = 4x = 40m + 2m$ - SAT + 6sm = 48 chromosomes, is reported here for the first time for a Bulgarian population.

416. ***Dianthus armeria*** L. — $2n = 30$ (Fig. 2).

Bu: Sofia region, near the Kremokovtsi factory, 42°47'N, 23°29'E, forest places, 650 m, 24 Sep 1972, *Petrova 221682* (SOM).

The chromosome number $2n = 30$ agrees with the results of previous authors (see Fedorov 1969, van Loon & Jong 1978, for references, Kovanda 1984). Petrova (1975) and later van Loon & van Setten (1982) also recorded the same chromosome number for Bulgarian material. The karyotype studied here consists of $2n = 2x = 20m + 2m$ - SAT + 8sm = 30 chromosomes.

417. ***Dianthus cruentus*** Griseb. — $2n = 30$ (Fig. 3).

Bu: Balkan foothill region, on the "Venetsa" hill, around the town of Belogradchik, 43°35'N, 22°42'E, stony places, 800m, 19 Jul 1973, *Petrova 23419* (SOM) (Fig. 3).
— Znepole region, near Dragoman, 42°57'N, 22°58'E, shruby places, 1100 m, 22 Jul 1973, *Petrova 23485* (SOM).

The chromosome number $2n = 30$ obtained here confirms that found by other authors (see Fedorov 1969, for references). The same chromosome number has been reported for Bulgaria by Carolin (1957) on material of unknown origin, and by Andreev (1981) for Mt Pirin, "Baijuvi dupki-Dzindziritsa"reserve. The karyotype studied here consists of $2n = 2x = 14m + 14sm + 2sm$ - SAT = 30 chromosomes.

418. ***Dianthus giganteus*** Dum.-Urville s.l. — $2n = 30$ (Fig. 4).

Bu: Black sea coast, north of the village of Varvara, Bourgas district, 42°08'N, 27°53'E, shruby places, 6 Aug 1973, *Petrova 23651* (SOM) (Fig. 4).
— Western Rhodopes, forest "Beglika", 41°52'N, 24°07'E, grassy places, 1520 m, 25 Oct 1972, *Petrova 221743* (SOM).

The chromosome number $2n = 30$ confirms the one recorded by other authors (see Fedorov 1969, for references). Günak-Sünter (1978) and Carolin (1957) have also recorded the same diploid chromosome number from Bulgarian material of unknown provenance. This karyotype consists of $2n = 2x = 12m + 2m$ - SAT + 14sm + 2sm - SAT = 30 chromosomes.

Figs. 1 - 4. Karyotypes of : 1, *Agrostemma githago*, $2n = 48$; 2, *Dianthus armeria*, $2n = 30$; 3, *D. cruentus*, $2n = 30$; 4, *D. giganteus*, $2n = 30$.

419. *Dianthus gracilis* Sm. s.l. — $2n = 60$ (Fig. 5).

Bu: Mt Pirin, near the village of Vlachi, 41°45'N, 23°14'E, grassy places, 600 m, 1 Aug 1972, *Petrova 221504* (SOM).

The tetraploid chromosome number $2n = 60$ agrees with the result of Carolin (1957) and Papanicolaou (1984). Van Loon & van Setten (1982) obtained the same chromosome number for Bulgaria, Mt Rila. The karyotype examined here consists of metacentric and submetacentric chromosomes. The diploid chromosome number has also been reported for this species (see Fedorov 1969, for references).

420. *Minuartia glomerata* (Bieb.) Degen — $2n = 28$ (Fig. 6).

Bu: Mt Stranza, north-east of Malko Turnovo, 41°58'N, 27°31'E, grassy places, 320 m, 7 Aug 1973, *Petrova 23753* (SOM).

The chromosome number $2n = 28$ agrees with the report of Celebioglu & Favarger (1982). It is the first report for a Bulgarian population. The karyotype studied here consists mainly of metacentric and submetacentric chromosomes, and includes two pairs of satellited chromosomes.

421. *Minuartia hamata* (Hausskn. & Bornm.) Mattf. — 2n = 30 (Fig. 12).

Bu: On the southern part of Mt Pirin, around the village of Delchevo, Gotse Delchev district, 41°03'N, 23°04'E, grassy stony places, 1100 m, *Petrova 23280* (SOM).

This chromosome number confirms the author's previous report (Petrova 1975) for Bulgarian populations. The karyotype consists of $2n = 2x = 10m + 18sm + 2sm - SAT = 30$ chromosomes.

422. *Petrorhagia illyrica* (Ard.) P.W.Ball & Heywood — $2n = 26$ (Fig. 7).

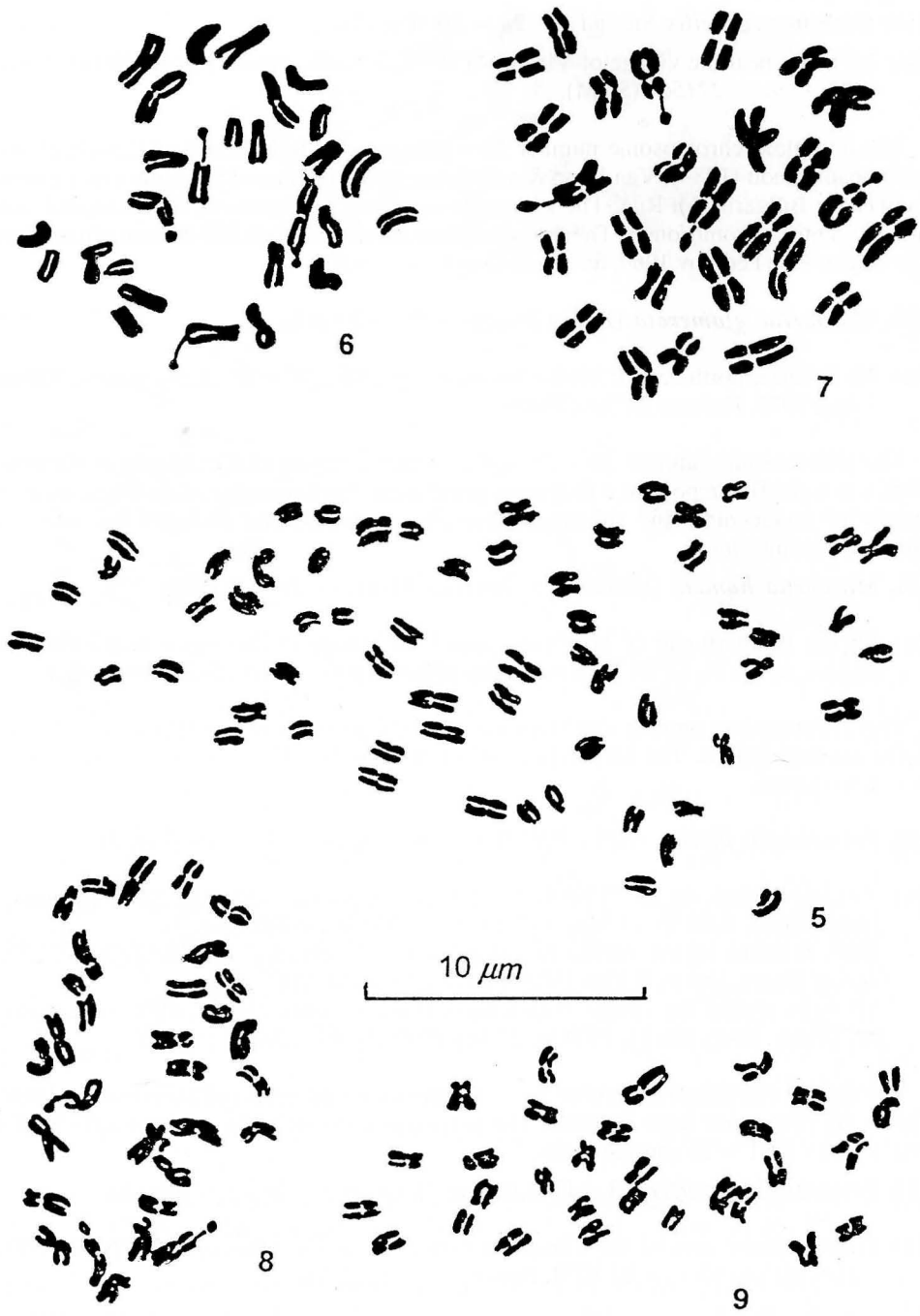
Bu: Znepole region, on the "Chepan" hill, near Dragoman, 42°59'N, 22°59'E, grassy, stony places, 1000 m, 23 May 1973, *Petrova 23506* (SOM) (Fig. 7).
— River Strouma region, on the east slope of the "Kozhouha" hill, 41°27'N, 23°27'E, grassy places, 150 m, 9 May 1973, *Petrova 2391* (SOM).
— Mt Pirin, around the village of Delchevo, Gotse Delchev district, 41°03'N, 23°04'E, dry grassy, stony places, 1000 m, 27 Sep 1973, *Petrova 23798* (SOM).

The diploid chromosome number $2n = 26$ agrees with the report of Montmollin (1986). This is the first report from Bulgaria. The karyotype consists of $2n = 14m + 2m - SAT + 8sm + 2sm - SAT = 26$ chromosomes.

423. *Petrorhagia prolifera* (L.) P.W.Ball & Heywood — $2n = 30$ (Fig. 8).

Bu: Danube plain, around the village of Ostrov, near Oryachovo, 43°41'N, 24°09'E, grassy places, 50 m, 8 Jul 1976, *Petrova 26173* (SOM).

The diploid chromosome number $2n = 30$ confirms that reported by several authors (Kliphuis 1977, Strid 1980, Fernandez Casas & Ortiz 1978, Strid & Franzén 1981, Kovanda 1983).



Figs. 5 - 9. Karyotypes of : 5, *Dianthus gracilis*, 2*n* = 60.; 6, *Minuartia glomerata*, 2*n* = 28; 7, *Petrorhagia illyrica*, 2*n* = 26; 8. *P. prolifera*, 2*n* = 30; 9, *P. saxifraga*, 2*n* = 30.

The karyotype consists of $2n = 2x = 14m + 4m$ - SAT + 12sm = 30 chromosomes, this is the first report for this species for Bulgaria.

424. ***Petrorhagia saxifraga*** (L.) Link — $2n = 30$ (Fig. 9).

Bu: Balkan foothill region, on the "Venetsa" hill, around Belogradchik, 43°38'N, 22°42'E, stony places, 800 m, 19 Jul 1973, *Petrova 23418* (SOM) (Fig. 9).
— Znepole region, on the "Chepan" hill, near Dragoman, 42°59'N, 22°59'E, grassy, stony places, 1200 m, 23 Jul 1973, *Petrova 23511* (SOM).

The diploid chromosome number $2n = 30$ agrees with the reports of Gadella & Kliphuis (1972), van Loon & Snelder (1979), Celebioglu & Favarger (1993), while Van Loon & van Setten (1982) reported the same number for a Bulgarian population. Our karyotype consists of metacentric and submetacentric chromosomes.

The tetraploid chromosome number $2n = 4x = 60$ has also been reported (see Majovsky & Murin 1987, Strid 1980, Strid & Franzén 1981).

425. ***Petrorhagia thessala*** (Boiss.) P. W. Ball & Heywood — $2n = 30$ (Fig. 10).

Bu: On the southern part of Mt Pirin, near the village of Nova Lovcha, Gotse Delchev district, 41°25'N, 23°43'E, calcareous stony places, 720 m, 26 Jun 1975, *Petrova 25488* (SOM).

The species is a Balkan endemic, the above cited locality being the only one known in Bulgaria. The chromosome number agrees with that reported by Iatrou (1985). The karyotype consists of $2n = 2x = 18m + 10sm + 2sm$ - SAT = 30 chromosomes.

426. ***Petrorhagia velutina*** (Guss.) P. W. Ball & Heywood — $2n = 30$ (Fig. 11).

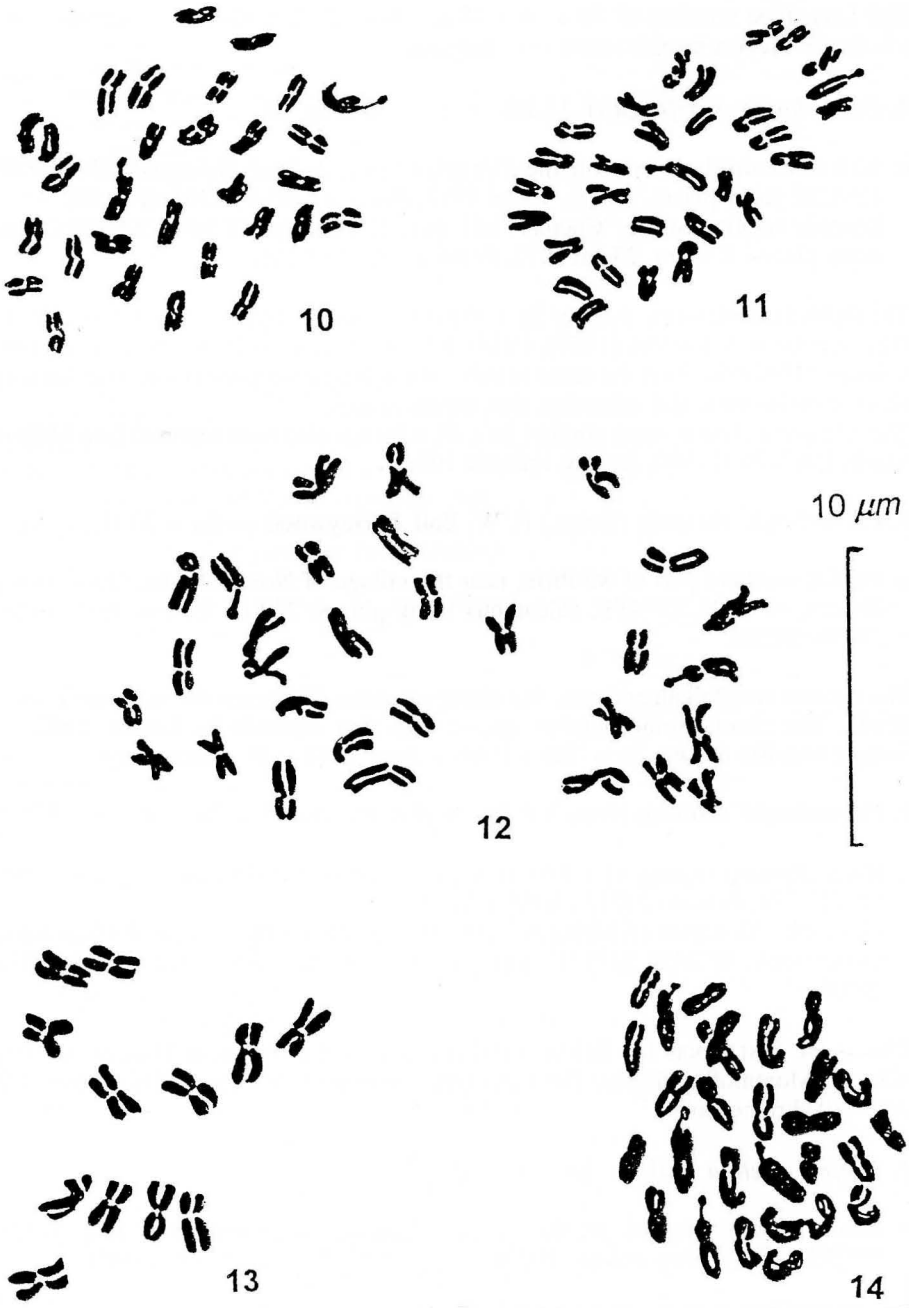
Bu: River Strouma region, near Kocherinovo, 42°04'N, 23°03'E, grassy places, 350 m, 12 Jul 1974, *Petrova 24212* (SOM) (Fig. 11).
— Slavyanka Mountain (Alibotush), along the road from the village of Goleshovo to Gotsev vruh, 41°24'N, 23°37'E, grassy places, 1000 m, 4 Aug 1972, *Petrova 221567* (SOM).

This is the first report for Bulgaria and it confirms the counts of Thomas & Murray (1983) and Montmollin (1986). The karyotype consists of $2n = 2x = 12m + 16sm + 2sm$ - SAT = 30 chromosomes.

427. ***Sagina apetala*** Ard. — $2n = 12$ (Fig. 13).

Bu: River Strouma region, on the eastern slope of the "Kozhouha" hill, 41°27'N, 23°27'E, grassy stony places, 150 m, 9 May 1973, *Petrova 23100* (SOM).

Examination of Bulgarian material confirms the reports of several authors (see Fedorov 1969, for references). The karyotype consists of $2n = 2x = 6m + 6sm = 12$ chromosomes.



Figs. 10 - 14. Karyotypes of: 10, *Petrorhagia thessala*, 2*n* = 30; 11, *P. velutina*, 2*n* = 30; 2*n* = 30; 12, *Minuartia hamata*, 2n = 30; 13, *Sagina apetala*, 2*n* = 12; 14, *Saponaria officinalis*, 2*n* = 28.

428. *Saponaria officinalis* L. — $2n = 28$ (Fig. 14).

Bu: Eastern Rhodopi, near the village of Mandritsa, Kurdzhali district, 41°49'N, 25°30'E, grassy places, 80 m, 24 Jul 1975, *Petrova 25653* (SOM).

The tetraploid chromosome number found here confirms reports from Bulgaria (Van Loon & van Setten 1982, Cheshmedziev 1994) and elsewhere (see Fedorov 1969, Löve & Löve 1982, Goldblatt & Johnson 1991, for references). This karyotype consists of $2n=4x=12m + 2m - SAT + 12sm + 2sm - SAT = 28$ chromosomes.

429. *Silene conica* L. — $2n = 20$ (Fig. 15).

Bu: Thracian lowlands, at the locality "Uludere", near Harmanli, 41°55'N, 25°55'E, dry grassy places, 80 m, 24 May 1972, *Petrova 22378* (SOM).

The diploid chromosome number $2n = 20$ agrees with the reports of Vachova & Ferakova (1978), van Loon & Snelders (1979), Dvorak & Dadakova (1984), Baltisberger & al. (1993). Van Loon & van Setten (1982) gave $2n = 20$ as well as $2n = 24$ for this taxon for Bulgaria. The karyotype consists of $2n = 2x = 4m + 4m - SAT + 12sm = 20$ chromosomes.

430. *Silene subconica* Friv. — $2n = 20$ (Fig. 16).

Bu: Black Sea coast, near Sozopol, 42°25'N, 27°41'E, sandy places, 20.5.1972, *Petrova 221831* (SOM).

The diploid chromosome number $2n = 20$ agrees with the reports, given as *S. conica* subsp. *conica,* by Strid & Franzén (1981), van Loon & van Setten (1982), the latter being a count from a Bulgarian population. This karyotype consists of $2n = 2x = 10m + 8sm + 2sm - SAT = 20$ chromosomes.

431. *Spergularia maritima* (All.) Chiov. subsp. ***maritima*** — $2n = 18$ (Fig. 18).

Bu: Black Sea coast, at the locality "Salistar", between the villages of Sinemorets and Rezovo, 42°04'N, 27°58'E, damp sand, 6 Aug 1973, *Petrova 23674* (SOM).

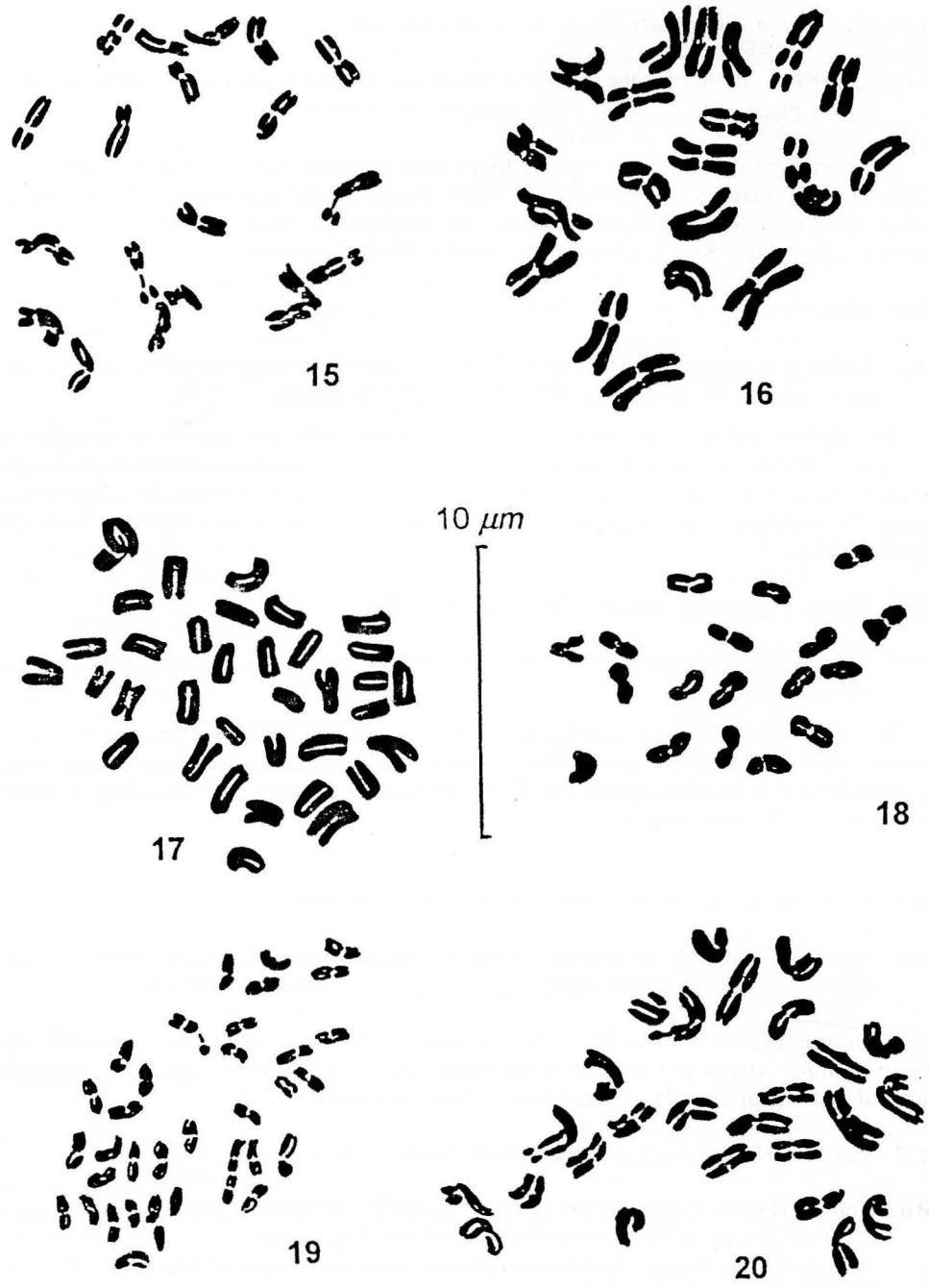
The chromosome number $2n = 18$ confirms previous reports by Ratter (1973), van Loon & Jong (1978) and Dvorak & Dadakova (1978) from elsewhere. The karyotype studied consists of $2n = 2x = 10m + 8sm = 18$ chromosomes.

432. *Spergularia rubra* (L.) J. Presl & C. Presl — $2n = 36$ (Fig. 19).

Bu: Central Balkan Range, at the locality "Kartala", 42°47'N, 24°42'E, grassy places, 2000 m, 26 Aug 1972, *Petrova 221484* (SOM) (Fig. 19).

— Eastern Balkan Range, Karnobatska planina, near the village of Planinitsa, 42°54'N, 27°09'E, 300 m, 5 Aug 1965 (leg. *Kuzmanov*), *Petrova 15179* (SOM).

The tetraploid chromosome number $2n = 4x = 36$ agrees with the reports of Dvorak & al. (1979) and Strid & Franzén (1981, 1983). It is the first report for a Bulgarian population.



Figs. 15 - 20. Karyotypes of: 15, *Silene conica*, 2*n* = 20; 16, *S. subconica*, 2*n* = 20; 17, *Spergularia salina*, 2*n* = 36; 18, *S. maritima* subsp. *maritima*, 2*n* = 18; 19, *S. rubra*, 2*n* = 36; 20, *Stellaria nemorum*, 2*n* = 36.

The karyotype consists of metacentric and submetacentric chromosomes and a pair of m - SAT. The diploid chromosome number has also been reported for this species (see Löve & Löve 1974, for references).

433. ***Spergularia salina*** J. Presl & C. Presl — $2n = 36$ (Fig. 17).

Bu: River Strouma region, near the village of Marikostinski bani, 41°26'N, 23°21'E, damp sand, 100 m, 10 May 1973, *Petrova 23104* (SOM).

The chromosome number $2n = 4x = 36$ agrees with the reports by Ratter (1973), Dvorak & Dadakova (1984) and Semerenko (1985) on material from other regions. The karyotype consists of metacentric and submetacentric chromosomes.

434. ***Stellaria nemorum*** L. — $2n = 26$ (Fig. 20).

Bu: Mt Pirin, near the rest house "Javorov", 41°50'N, 23°24'E, grassy places, 1750 m, 15 Aug 1974, *Petrova 24275* (SOM).

The chromosome number $2n = 2x = 26$ agrees with reports by several authors (see Fedorov 1969, for references, Vachova & Schwarzova (1977), Lara Ruiz (1993). Ancev (1993) reported it from Bulgaria (Central Stara Planina). Our karyotype consists of $2n = 2x = 10m + 14sm + 2sm$ - SAT = 26 chromosomes.

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Reports (435-473) by Margarita Markova & Valentina Goranova

435. ***Alkanna tinctoria*** Tausch — $2n = 30$ (Fig. 1A).

Bu: Struma valley, near the village Marikostino, 41°25'N, 23°17'E, stony places, 1972, *Markova L163* (SOM).
— Pirin Mt, above the town of Sandanski, 41°32'N, 23°17'E, grassy places, 1986, *Markova L1581* (SOM).

This is the first chromosome number report for this species from material of Bulgarian origin. The chromosome number agrees with that indicated by several authors (Grau 1968, Kamari & Papatsou 1973, Majovsky & al. 1978, Baltisberger & al. 1993), but not with that in Fedorov (1969) $2n = 14$. Population from two different floristic regions were studied. The karyotypes of populations L163 and L1581 had $2n = 2x = 22$ sm + 6st + 2st - SAT = 30 chromosomes.

436. ***Anchusa italica*** Retz. — $2n = 32$ (Fig. 1B).

Bu: Thracian plain, by the town Sadovo, 42°06'N, 24°58'E, ruderal places along the roads, 1977, *Markova L787* (SOM).

The chromosome number $2n = 32$ confirms a previous report for a Bulgarian population (Markova & Ivanova 1971) and previous for other regions (Levitsky 1940, Fernándes & Leitão 1972, Löve & Kjelquist 1974, Valsecchi 1976, Luque 1983, D'Amato & Trojani 1985, and see also Fedorov 1969, Goldblatt 1981, 1984, Van Loon 1987 for references). The karyotype of population L787 includes $2n = 2x = 4$m + 18 sm + 8st + 2st - SAT = 32 chromosomes. As far as the authors are aware, four karyotypes formulas of *A. italica* have been published (Levitsky l.c., Markova & Ivanova l.c., Valsecchi l.c., Luque l.c., D'Amato & Trojani l.c.).

The main difference with respect to two bulgarian karyotype formulas is the different number of the m, sm and st chromosomes.

437. ***Anchusa hybrida*** Ten. — $2n = 16$ (Fig. 2A).

Bu: Thracian plain, by the town of Sadovo, 42°06'N, 24°58'E, ruderal places along roads, 1977, *Markova L786* (SOM).

This is probably the first karyological study for this species based on Bulgarian plants. The chromosome number, $2n = 16$, agrees with those by Fedorov (1969), Valsecchi (1976), Devesa & al. (1984) and Luque (1983). The karyotype of population L786 consists of $2n = 2x = 12$sm + 2st + 2st - SAT = 16 chromosomes.

The karyotype formula of the Bulgarian plants is identical with that published by Valsecchi (l.c., based on a drawing) for a population from Sardinia, but differs from the karyotype formula of the Coimbra population (Fernándes & Leitão 1972, sub *A. undulata* subsp. *hybrida*, also based on a drawing).

438. ***Anchusa leptophylla*** Roemer & Schultes — $2n = 32$ (Fig. 2B, C, D), 2n = 33 (Fig. 2E).

Bu: Northern Black Sea coast, by the locality Sveti Konstantin & Elena near the town of Varna, 43°13'N, 27°56'E, sandy places, 1976, *Markova L698* (SOM).
— Tundza hilly region, between the town of Straldža and the village of Atolovo, 42°33'N, 26°42'E, grassy places, 1984, *Markova & Goranova L1455* (SOM).

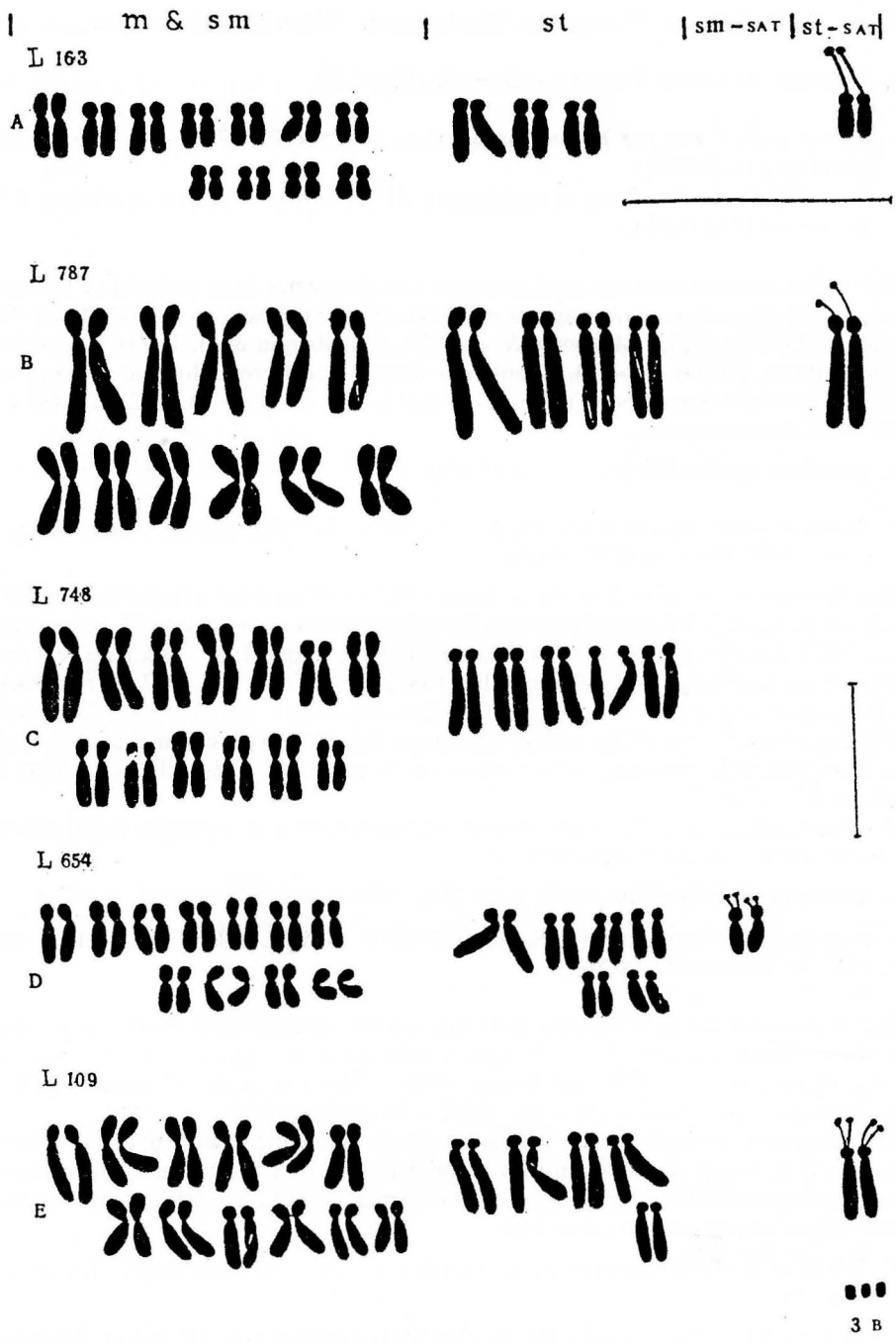

Fig. 1. Karyograms of: A, *Alkanna tinctoria*, 2*n* = 30; B, *Anchusa italica*, 2*n* = 32; C-E, *Cynoglottis:* C-D, *C. barrelieri*, 2*n* = 36; E, *C. barrelieri* 2*n* = 36+2B. - Scale bar = 10 µm.

Fig. 2. Karyograms of *Anchusa*: A, *A. hybrida*, 2*n* = 16; B-D, *A. leptophylla*, 2*n* = 32; E, *A. leptophylla*, 2*n* = 33. - Scale bar = 10 μm.

— Mt Strandža, around the village of Fakija, 42°09'N, 27°03'E, grassy places, 1975, *Markova L477* (SOM).
— Eastern Rodopi, above the village Mezek, 41°48'N, 25°05'E, grassy places, 1980, *Markova L1069* (SOM).

Markova (1983a, 1989) published two chromosome numbers for *A. leptophylla*, $2n$ = 16 and $2n$ = 32; however, the former number is erroneous as it refers to *A. procera*.

The karyotype of population L698 has $2n = 4x$ = 28sm + 2st + 2st-SAT = 32 (Fig. 2B), L1455 $2n = 4x$ = 28sm + 4st - SAT = 32 (Fig. 2C), L477 $2n = 4x$ = 26sm + 4st + 2st - SAT = 32 (Fig. 2D), and L1069 $2n = 4x + 1$ = 1m + 26sm + 2st + 4st - SAT = 33 (Fig. 2E).

439. *Anchusa ochroleuca* M.B. — $2n$ = 16 (Fig. 3A).

Bu: Danube plain, around the town of Svištov, 43°34'N, 25°20'E, dry grassy places, 1977, *Markova L720* (SOM).

Distributed in the NE Balkan and S Russia. The diploid chromosome number $2n$ = 16 is reported for the first time in this study on samples from population L720 (Markova 1983a). The chromosome number $2n$ = 16 is not in agreement with the number $2n$ = 24 found in Fedorov (1969). The karyotype consists of $2n = 2x$ = 12sm + 2st + 2st - SAT = 16 chromosomes.

440. *Anchusa officinalis* L. var. ***macedonica*** (Velen.) Gus. — $2n$ = 16 (Fig. 3B).

Bu: Southern Black Sea coast, in the Arkutino reserve, 42°23'N, 27°39'E, dry grassy places, 1980, *Markova L1034* (SOM).

The chromosome number, $2n$ = 16, is reported here for the first time for this taxon. The karyotype consists of $2n = 2x$ = 10sm + 4st + 2st - SAT = 16 chromosomes.

440a. *Anchusa officinalis* L. var. ***moesiaca*** (Velen.) Gus. — $2n$ = 4x = 32 (Fig. 3C, D).

Bu: Mt Rila, locality Stenicite above the village of Belica, 41°57'N, 23°35'E, stony places, 1978, *Markova L974* (SOM).
— Eastern Rodopi, above the village of Ardino, 41°32'N, 25°08'E, dry grassy places along the roads, 1980, *Markova L1040* (SOM).
— Eastern Rodopi, around village of Kobilino, 41°31'N, 26°07'E, ruderal places along the roads, 1977, *Markova L1065* (SOM).
— Thracian plain, locality Džendemtepe in the town of Plovdiv, 42°07'N, 24°46'E, stony places, 1982, *Markova L1246* (SOM).

The chromosome number, $2n = 4x$ = 32, is reported here for the first time for this taxon. Populations from three different floristic regions were studied and two cytotypes found. The karyotype of population L974 has $2n = 4x$ = 28sm + 4st = 32 (Fig. 3C and L1065, L1040 and L 1246 $2n = 4x$ = 26sm + 4st + 2st - SAT = 32 chromosomes (Fig. 3D).

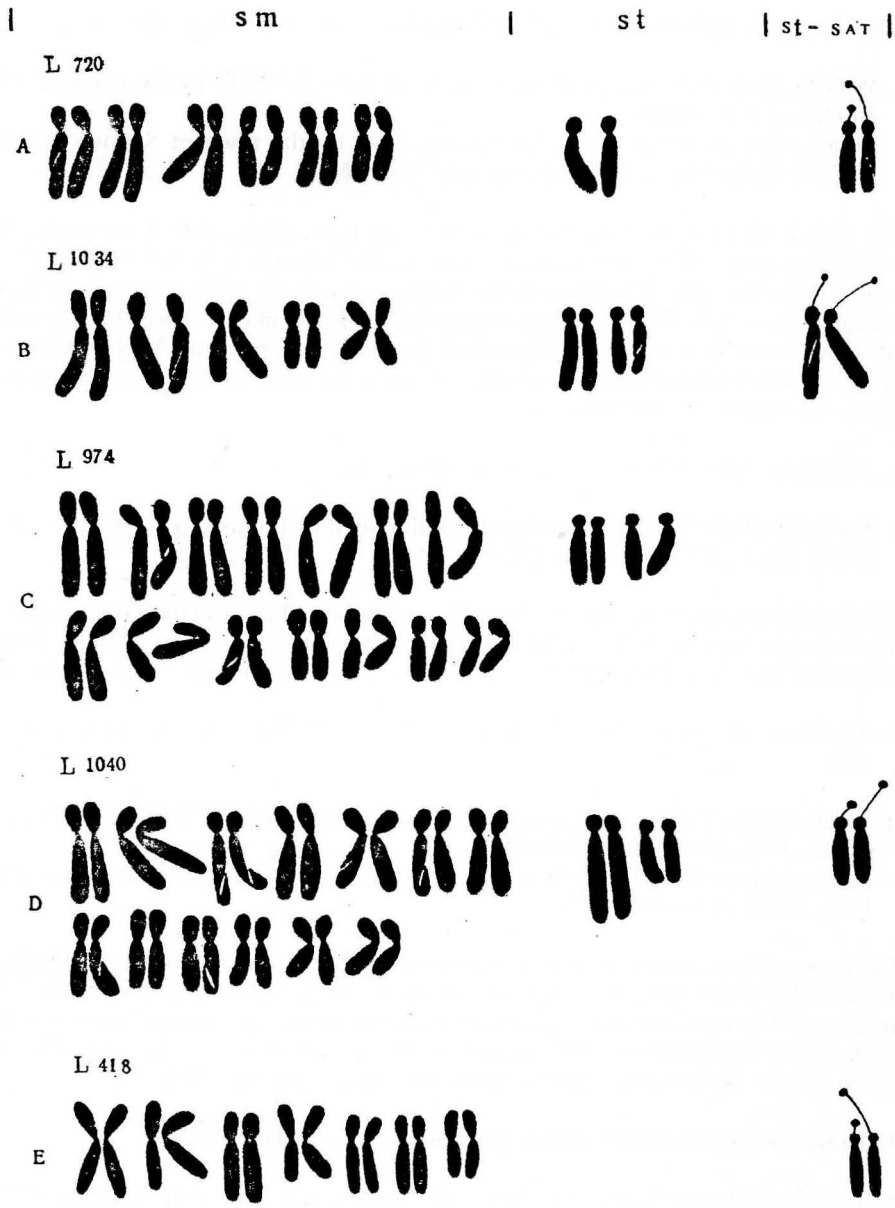

Fig. 3. Karyograms of *Anchusa*: A, *A. ochroleuca*, $2n = 16$; B, *A. officinalis* var. *macedonica*, $2n = 16$; C-D, *A. officinalis* var. *moesiaca*, $2n = 32$; E, *A. officinalis* var. *officinalis*, $2n = 16$. - Scale bar = 10 μm.

440b. ***Anchusa officinalis*** L. var. ***officinalis*** — $2n = 16$ (Fig. 3E).

Bu: Mt Rila, around the village of Govedarzi, 42°14'N, 23°31'E, by the roadside, 1974, *Markova L418* (SOM).
— Thracian plain, alongside of the railway line, by the town of Sadovo, 42°06'N, 24°58'E, stony places, 1977, *Markova L771* (SOM).

The diploid chromosome number $2n = 16$ found here, agrees with that reported from two Bulgarian populations (Markova & Ivanova 1973, Loon & Setten 1982) and from elsewhere (see Fedorov 1969, Moore 1973, Majovsky & al. 1976, D'Amato & Trojani 1985, van Loon 1987). The karyotype of populations L418 and L771 has $2n = 2x = 14$sm + 2st - SAT = 16 chromosomes. D'Amato & Trojani (l.c.) reported a karyotype formula with 6m chromosomes, which is closest to the karyotype described by Markova & Ivanova (l.c.) with 2m chromosomes.

441. ***Anchusa stylosa*** M.B. — $2n = 16$ (Fig. 4A).

Bu: Northern Black Sea coast, on the hill in the town of Balcik, 43°22'N, 28°12'E, dry grassy places, 1976, *Markova L501* (SOM).

The diploid chromosome number, $2n = 16$, reported by Markova (1983a) for population L501, is in agreement with the result of Luque (1983), but its karyotype differs from the one reported here. This karyotype consists of $2n = 2x = 12$sm + 2sm - SAT + 2st = 16.

442. ***Anchusa thessala*** Boiss. & Spruner — $2n = 12$ (Fig. 4B), 2n = 6x = 36 (Fig. 4C).

Bu: Southern Black Sea coast, around the town of Ahtopol, 42°04'N, 27°55'E, stony places, 1972, *Markova L286* (SOM).
— Tundza hilly region, around the town of Elhovo, 42°08'N, 26°33'E, dry grassy places, 1975, *Markova L546* (SOM).

The known basic chromosome numbers in the genus *Anchusa* according to Darlington & Wylie (1955) and Löve & Löve (1974) are $x = 6$, 8 and 9? and $x = (4)$, 6, 7, 8, 9, respectively. The numbers most frequently found in Bulgarian material are $x = 6$ and 8. The karyotype of population L286 consists of $2n = 2x = 8$sm + 4st = 12 (Fig. 4B), and of L546 $2n = 6x = 26$sm + 2sm - SAT + 6st + 2st - SAT = 36 (Fig. 4C).

443. ***Cerinthe glabra*** Miller subsp. ***glabra*** — $2n = 18$ (Fig. 4D).

Bu: Mt Rila, between the locality Partisanska poljana and the hut Ribni esera, 42°06'N, 23°32'E, rocky places, 1974, *Markova L342* (SOM).

This first account for this taxon based on Bulgarian plants confirms previous findings (see Fedorov 1969 for references, Murin & Majovsky 1979). The karyotype has $2n = 2x = 14$sm + 4sm - SAT = 18 chromosomes.

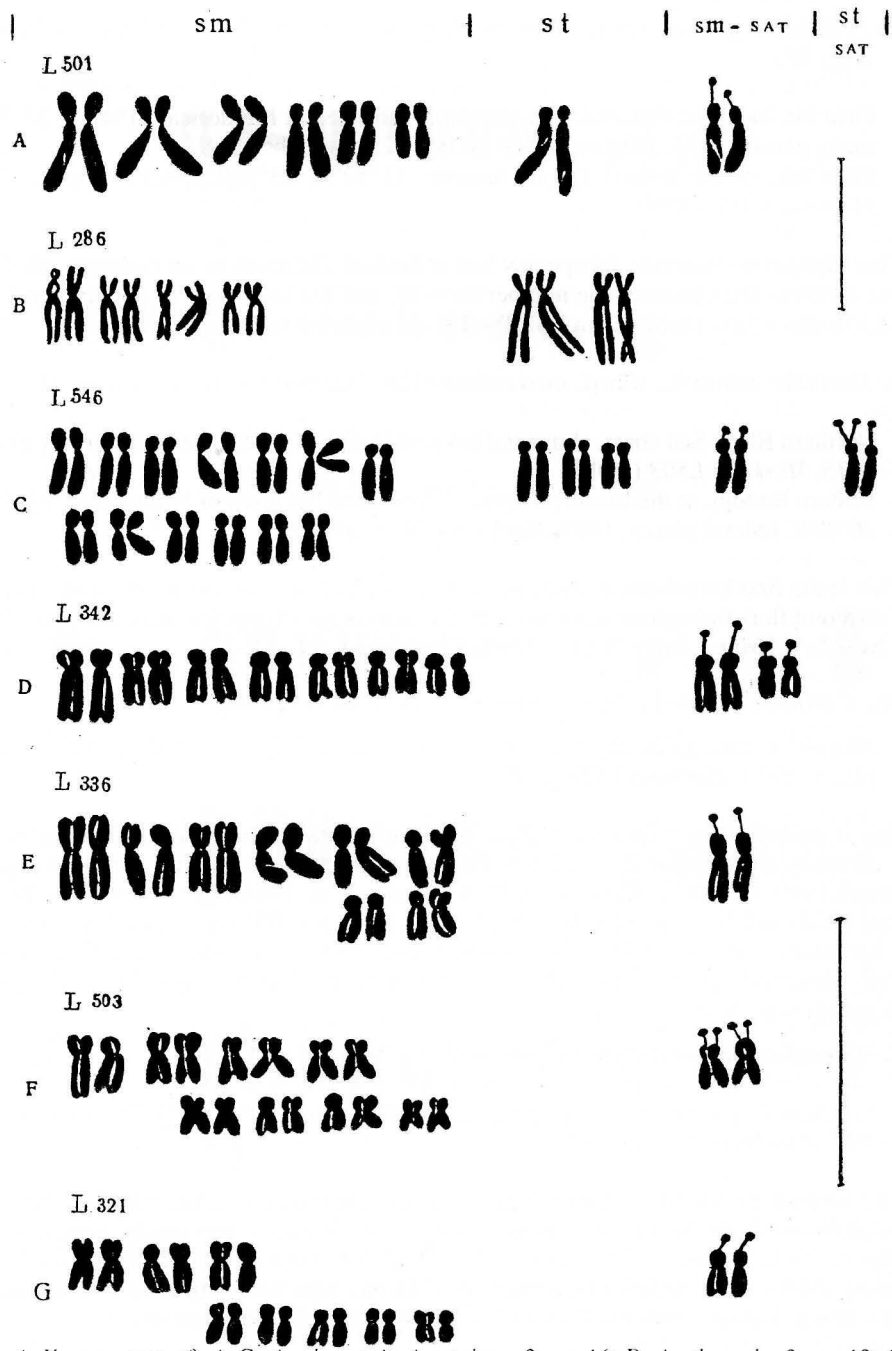

Fig. 4. Karyograms of: A-C, *Anchusa*: A, *A. stylosa*, 2*n* = 16; B, *A. thessala*, 2*n* = 12; C, *A. thessala*, 2*n* = 36; D-G,. *Cerinthe*: D,. *C. glabra* subsp. *glabra*, 2*n* = 18; E,. *C. glabra* subsp. *pirinica*, 2*n* = 18; F, *C. minor* subsp. *auriculata*, 2*n* = 18; G, *C. minor* subsp. *minor*, 2*n* = 18. - Scale bar = 10 μm.

443a. ***Cerinthe glabra*** subsp. ***pirinica*** (Stoj. et Acht.) N. Andr. et Peev — $2n = 18$ (Fig. 4E).

Bu: Pirin Mt, locality "Pametnica na alpinista" near the hut Banderica, 41°47'N, 23°28'E, rocky places, 1974, *Markova L349* (SOM).
— Pirin Mt, in the Bajuvi Dupki reserve, 41°52'N, 23°28'E, rocky slopes, 1974, *Markova L336* (SOM).

This Bulgarian endemic subspecies has a limited distribution on northern Mt Pirin above 1850 m. The chromosome number $2n = 18$, and the karyotype of populations L349 and L336 ($2n = 2x = 16sm + 2sm - SAT = 18$) are reported here for the first time.

444. ***Cerinthe minor*** L. subsp. ***auriculata*** (Ten.) Domac — $2n = 18$ (Fig. 4F).

Bu: Northern Black Sea coast, above the town of Balčik, 43°22'N, 28°12'E, grassy places, 1975, *Markova L503* (SOM).
— Eastern Rodopi, at the locality Popova česma, near the town of Ivailovgrad, 41°28'N, 26°08'E, ruderal places, 1987, *Markova L1692* (SOM).

This is the first karyological study on Bulgarian plants for this taxon. Populations from two different floristic regions were studied. The karyotype of populations L503 and L1692 has $2n = 2x = 16sm + 2sm - SAT = 18$ chromosomes.

444a. ***Cerinthe minor*** L. subsp. ***minor*** — $2n = 18$ (Fig. 4G).

Bu: Znepole region, along the river Erma near the town Trăn, 42°51'N, 22°45'E, ruderal places, 1974, *Markova L321* (SOM).

This is probably the first karyological study of this taxon based on Bulgarian plants. The chromosome number $2n = 18$ confirms previous counts for plants for other regions (Fedorov 1969, Gadella & Kliphuis 1972, Majovsky & al. 1974). The counts $2n = 24$ (see Moore 1974) and $2n = 36$ (Skalinska & al. 1971, Malecka 1981) have also been reported. The karyotype consists of $2n = 2x = 16sm + 2sm - SAT = 18$ chromosomes. Araratjan (1954) observed some cells with the chromosome numbers $2n = 18$ and $2n = 36$ (endopolyploidy) in one root tip.

445. ***Cynoglossum creticum*** Miller — $2n = 24$ (Fig. 5A).

Bu: Southern Black Sea coast, at the locality Silistar, 42°02'N, 27°57'E, stony places, 1975, *Markova L465* (SOM).

The diploid chromosome number $2n = 24$ was established by the study of the same population L465 by Markova (1983a). The result confirms previously reported data (Fedorov 1969, Moore 1972, 1974, 1977, Goldblatt 1981, 1985, 1988, Goldblatt & Johnson 1990). The tetraploid number $2n = 48$ has also been reported (see Goldblatt 1981). The karyotype consists of $2n = 2x = 18sm + 6st = 24$ chromosomes.

446. ***Cynoglossum hungaricum*** Simonkai — $2n = 24$ (Fig. 5B, C, D, E, F).

Bu: Eastern Rodopi, around the town of Ivailovgrad, 41°29'N, 26°08'E, 1981, *Markova L1136* (SOM).

Fig. 5. Karyograms of *Cynoglossum*: A, *C. creticum*, $2n = 24$; B-F, *C. hungaricum*, $2n = 24$. - Scale bar = 10 μm.

— Mt Belasica, between the villages of Kameno and Samuilovo, 41°22'N, 23°07'E, stony places, 1983, *Markova & Ančev L1435* (SOM).
— Southern Black Sea coast, around the village of Sinemorec, 42°04'N, 27°56'E, dry grassy places, 1977, *Markova L849* (SOM).
— Mt Strandža, around the village of Balgări, 42°04'N, 27°42'E, grassy places, 1977, *Markova L844* (SOM).
— Mt Strandža, the locality Šupotlo, near the village Brodilovo, 42°03'N, 27°48'E, dry stony places, 1977, *Markova L820* (SOM).

The number $2n = 24$ agrees with previous reports (Fedorov 1969, Moore 1977, Goldblatt 1984, van Loon 1987). Five populations were examined and all had the diploid number $2n = 24$, but different karyotype formulas. The karyotype of population L1136 has $2n = 4x = 6m + 16sm + 2st = 24$ (Fig. 5B), L1435 $2n = 4x = 4m + 16sm + 2sm$ - SAT + $2st = 24$ (Fig. 5C), L849 $2n = 4x = 2m + 18sm + 2sm$ - SAT + $2st = 24$ (Fig. 5D), L820 $2n = 4x = 18sm + 6st = 24$ (Fig. 5E), 5 L844 $2n = 4x = 16$ sm + 2sm - SAT + $6st = 24$ (Fig. 5F).

447. ***Cynoglottis barrelieri*** (All.) Vural & Kit Tan — $2n = 36$ (Fig. 1C, D), $2n = 4x = 36 + 3B$

Bu: Znepole region, around the Kolonica summit, Golo Bărdo, 42°33'N, 23°04'E, rocky places, 1977, *Markova L748* (SOM).
— Ljulin Planina, above the village of Klisura, 42°42'N, 23°11'E, dry stony places, 1976, *Markova L654* (SOM).
— Znepole region, around the town Dragoman, 42°55'N, 23°00'E, stony places, 1971, *Markova L109* (SOM).

The chromosome number $2n = 4x = 36$, established from two populations, agrees with the result previously published by Markova (1983a) for population L654. A high degree of karyological variation has been observed in this taxon: $2n = 16$ (Strey 1931), $2n = 18$ (Levitsky 1940, D'Amato & Trojani 1985), $2n = 24$ (Loon & De Jong 1978) and $2n = 36$ (Markova l.c.). Levitsky (l.c.) and D'Amato & Trojani (l.c.) have reported karyotype formulas with different numbers of m chromosomes (2 and 8), a chromosome type not found here. Three cytotypes have been observed: $2n = 4x = 26$ sm + $10st = 36$ (Fig. 1C) for L748, $2n = 4x = 22sm + 12st + 2st$ - SAT = 36 (Fig. 1D) for L654, and $2n = 4x = 24sm + 10st + 2st$ - SAT + 3B (Fig. 1E) for L109.

448. ***Echium plantagineum*** L. — $2n = 16$ (Fig. 6A).

Bu: Southern Black Sea coast, near the town of Carevo, 42°08'N, 27°49'E, roadside, 1977, *Markova L810* (SOM).
— Eastern Rodopi, above the village of Želesino, 41°25'N, 25°58'E, ruderal places, 1986, *Markova L1609* (SOM).

The diploid chromosome number $2n = 16$ is the first karyological study for Bulgarian plants for this species. This number confirms the counts of Fedorov (1969), Moore (1982), Borgen (1970), Fernándes & Leitão (1972), Humphries & al. (1978), Luque (1984) and van Loon (1987). The karyotype of populations L810 and L1609 has $2n = 2x = 14sm + 2sm$ - SAT = 16 chromosomes. Borgen (l.c.) reported a similar karyotype for a Macaronesian population, with all, except 2 small m chromosomes, being sm.

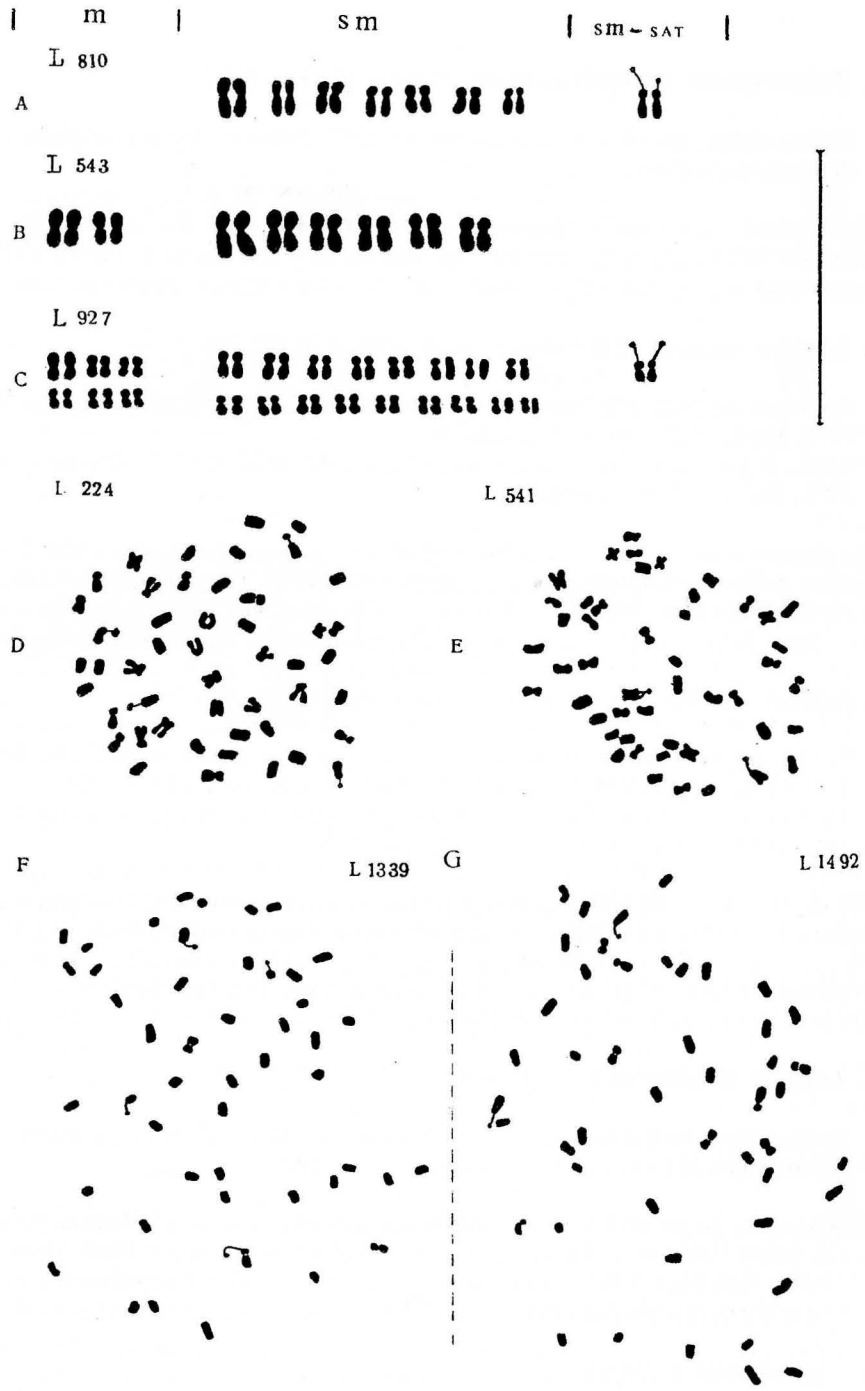

Fig. 6. Karyograms and karyotypes of: A, *Echium plantagineum*, 2*n* = 16; B, *Heliotropium suaveolens*, 2*n* = 16; C-G, *Lappula*: C-D, *L. barbata*, 2*n* = 48; E-F, *L. patula*, 2*n* = 48; G, *L. squarrosa*, 2*n* = 48. - Scale bar = 10 µm.

449. *Heliotropium suaveolens* M.B. — $2n = 16$ (Fig. 6B).

Bu: Struma valley, near the village Kulata, 41°23'N, 23°22'E, dry grassy places, 1975, *Petrova L543* (SOM).

The diploid chromosome number $2n = 16$ was found in the study of the same population L543 by Markova (1983b). The number $2n = 48$ (Murin & Sheikh 1971) has also been reported. The karyotype includes $2n = 2x = 4m + 12sm = 16$ chromosomes.

450. *Lappula barbata* (M.B.) Gürke — $2n = 48$ (Fig. 6C, D).

Bu: North-eastern Bulgaria, around the town of Kardam, 43°18'N, 26°17'E, grassy places, 1978, *Markova & Černeva L927* (SOM).
— Vitoša region, above the village of Pančarevo, 42°36'N, 23°28'E, dry stony places, 1972, *Markova L224* (SOM).

The chromosome number $2n = 48$ established for two populations agrees with the result previously published for population L224 (Markova 1983a). The number $2n = 24$ has also been reported (Fedorov 1969). The karyotype of population L927 has $2n = 8x = 12m + 34sm + 2sm$ - SAT = 48 (Fig. 6C), while L224 has 4sm-SAT chromosomes (fig. 6d).

451. *Lappula patula* (Lehm.) Gürke — $2n = 48$ (Fig. 6E, F).

Bu: North-eastern Bulgaria, at the locality Saslagjol near the town of Bjala, 43°25'N, 25°45'E, dry stony ruderal places, 1975, *Markova & Ivanova L541* (SOM).
— Thracian plain, around the town Dimitrovgrad, grassy ruderal places along the river Marica, 1983, *Markova & Goranova L1339* (SOM).

The number $2n = 48$, found in two populations, agrees with the results published for population L541 (Markova 1983a) as well as with the data of Podlech & Bader (1974). In the karyotype of the two investigated populations the metacentric chromosomes predominate. In L541 there are 2sm - SAT chromosomes (Fig. 6E), while in L1339 there are 4 - SAT chromosomes (2sm + 2, Fig. 6F).

452. *Lappula squarrosa* (Retz.) Dumort. — $2n = 48$ (Fig. 6G).

Bu: North-eastern Bulgaria, around the town Pliska, 43°18'N, 27°08'E, dry grassy ruderal places, 1984, *Markova L1492* (SOM).

The chromosome number $2n = 48$ confirms a previous count for a Bulgarian population (Loon & Setten 1982) as well as counts for other regions (see Fedorov 1969, Moore 1970, 1972, 1973, Goldblatt 1981, 1984, 1988). In the karyotype of population L1492 the metacentric chromosomes predominate, and SAT - chromosomes are submetacentric.

453. *Symphytum orientale* L. — $2n = 32$ (Fig. 7A).

Bu: Southern Black Sea coast, along the river Ropotamo, 42°17'N, 27°53'E, damp scrub, 1975, *Markova L487* (SOM).

The chromosome number $2n = 32$ was established by the study of the same population L487 (Markova 1983b) and agrees with the results of Gadella & Kliphuis (1978) and Grau (1971) from material of garden origin, but not with the counts $2n = 62$ and $2n = 63$ (see Fedorov 1969). The karyotype consists of $2n = 4x = 14m + 16sm + 2sm$ - SAT = 32.

454. ***Symphytum ottomanum*** Friv. — $2n = 18, 20$ (Fig. 7B, C, D), 22.

Bu: Pirin Mt, above the town of Sandanski, 41°32'N, 23°17'E, damp ruderal places, 1986, *Markova L1580* (SOM).
— Western Rodopi, at the locality Slivov dol, near the town of Bačkovo, 41°56'N, 24°52'E, woody damp places, 1982, *Markova L1241* (SOM).
— Eastern Rodopi, around the village of Momčilgrad, 41°28'N, 25°24'E, scrubby places, 1980, *Markova L1057* (SOM).
— Stara Planina Mt, in the Steneto forest reserve, 42°42'N, 24°42'E, 1982, *Markova L1316* (SOM)
— North-eastern Bulgaria, at the locality Pop Čair near the town of Šumen, 43°14'N, 26°57'E, scrub, 1978, *Markova L959* (SOM).
— North-eastern Bulgaria, the hill above the village of Čestemensko, 43°44'N, 27°21'E, scrub, 1975, *Markova L509* (SOM).

The number $2n = 20$ for this taxon was reported for the first time by Markova & Ivanova (1970). The same chromosome number, as well as $2n = 40$, has also been reported from elsewhere (Loon & Oudemans 1982, Strid & Franzén 1983, Strid & Andersson 1985, van Loon 1987). The latter number was found in different individuals from the same populations (Strid & Andersson 1987). The data here do not agree with the number $2n = 48$, found in material from the Botanical Gardens of Sofia and Palermo (Gadella & Kliphuis 1978).

The chromosome number $2n = 18$ (probably a descending aneuploid) agrees with the data from a Romanian population (Tarnavschi 1948 after Strid & Andersson l.c.). The chromosome number $2n = 22$ is here reported for the first time, and seems to be an ascending aneuploid. The karyotype of population L1580 consists of $2n = 2x = 6m + 10sm + 2$ sm - SAT + 2st = 20 chromosomes (Fig. 7B), L1316 and 1241, $2n = 2x = 4m + 14$ sm + 2st = 20 (Fig. 7C), and L1057, $2n = 2x = 4m + 12sm + 2sm$ - SAT +2st = 20 (Fig. 7D).

455. ***Ajuga salicifolia*** (L.) Schreber subsp. ***bassarabica*** (Šavul. & Zahar.) P.W. Ball — $2n = 24$ (Fig. 8A).

Bu: North-eastern Bulgaria, at the locality Saslăgjol near the town of Bjala, 45°25'N, 25°45'E, dry grassy places, 1979, *Markova L1025*(SOM).
— Eastern Rodopi, at the locality Likana, near the town of Ivailovgrad, 41°24'N, 26°07'E, scrubby places, 1981, *Markova L1141* (SOM).
— Thracian plain, near the village Aprilovo, 42°08'N, 25°50'E, dry grassy places, 1981, *Markova L1181* (SOM).

Distributed in Bulgaria, European Turkey and the neighbouring NW Asiatic mainland. The chromosome number $2n = 24$ was counted for the first time by Markova (1982), and as far as we know, this is the only known chromosome number published for this subspecies. Three populations were studied and all have the following karyotype: $2n = 16sm + 2sm$ - SAT + 4st + 2st - SAT = 24 chromosomes.

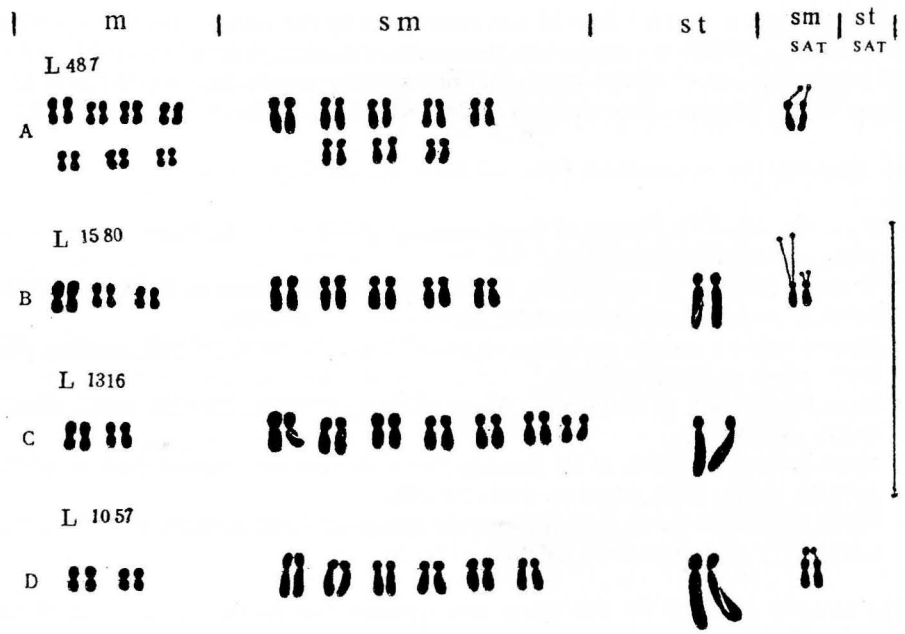

Fig. 7. Karyograms of *Symphytum*: A, *S. orientale* $2n = 20$; B-D, *S. ottomanum*, $2n=20$. - Scale bar = 10 µm.

456. *Ballota nigra* L. subsp. ***nigra*** — $2n = 20$ (Fig. 8B, C, D).

Bu: Danube plain, the village of Dolen Dăbnic, 43°23'N, 24°29'E, ruderal places, 1974, *Markova & Ivanova L437* (SOM).
— Thracian plain, 5 km west of the town Čirpan, 42°12'N, 25°18'E, in ditches, 1976, *Markova L673* (SOM).
— Tundža hilly region, the village of Rasdel, 42°02'N, 26°38'E, by roadside, 1984, *Markova & Goranova L1470* (SOM).
— Black Sea coast, near the town of Carevo, grassy places, 1977, *Markova L809* (SOM).

The chromosome number $2n = 20$ is reported here for the first time for Bugaria and agrees with previously published data from elsewhere (see Majovsky & al. 1974, Loon 1987, Goldblatt 1988 for references, and Pogan & al. 1982). However, it does not agree with the count $2n = 22$ by Gill (1983) for Canadian plants from Canada. Four different populations were studied here karyologically. Two of them (L437 and L673) are similar: $2n = 4m + 14sm + 2sm\text{-}SAT = 20$ (Fig. 8B). The karyotype of population L1470 has $2n = 4m + 12sm + 2sm\text{-}SAT + 2st = 20$ (Fig. 8C), and L809 $2n = 4m + 12sm + 4st = 20$ chromosomes (Fig. 8D).

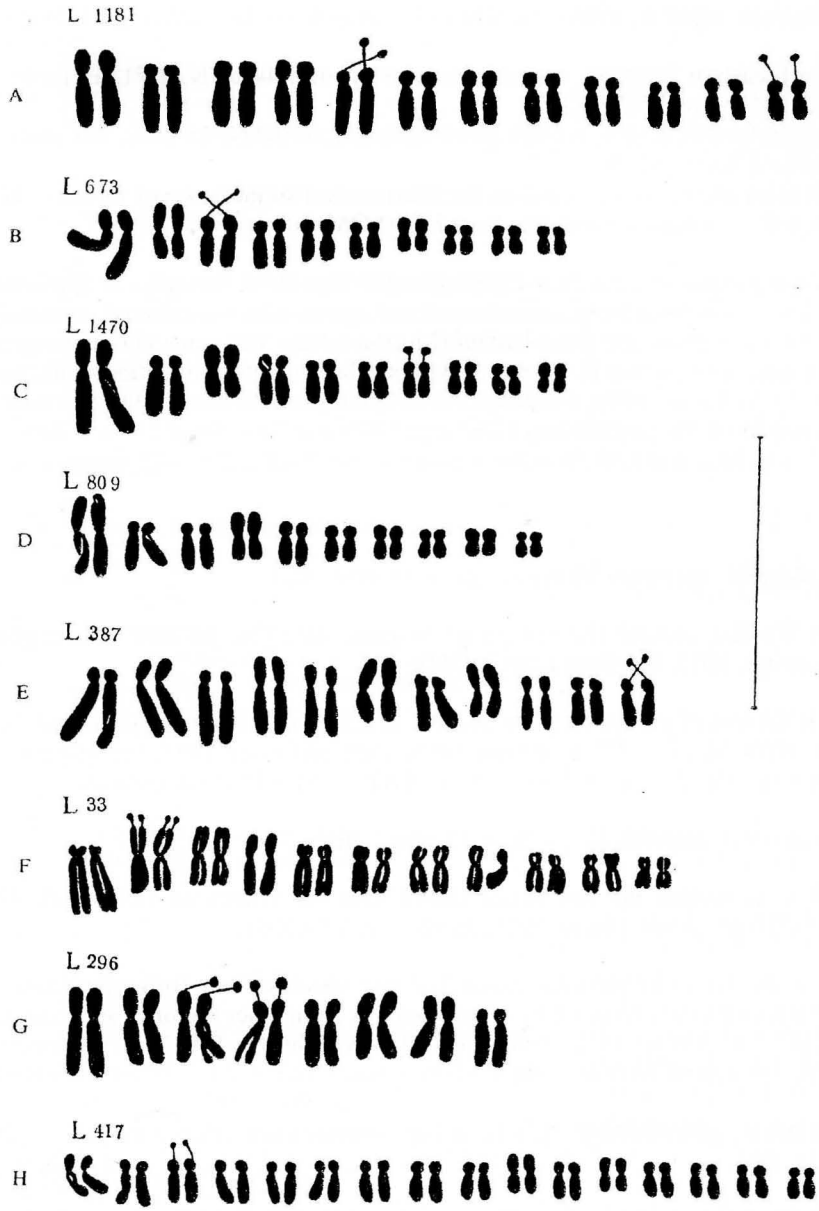

Fig. 8. Karyograms of: A, *Ajuga salicifolia* subsp. *bassarabica*, 2*n* = 24; B-F, *Ballota*: B-D, *B. nigra* subsp. *nigra*, 2*n* = 20; E-F, *B. nigra* subsp. *foetida*, 2*n* = 22; G-H, *Galeopsis*: G, *G. speciosa*, 2*n* = 16; H, *G. tetrahit*, 2*n* = 32. - Scale bar = 10 µm.

456a. *Ballota nigra* L. subsp. ***foetida*** (Vis.) Hayek — $2n = 22$ (Fig. 8E,F)

Bu: North-eastern Bulgaria, near the town of Silistra, 44°05'N, 27°15'E, rocky places, 1971, *Markova L387* (SOM).
— Balkan foothill region, the village of Arbanasi, 43°03'N, 25°22'E, wet places, 1976, *Markova L618* (SOM).
— Thracian plain, on the island on the Marica river in the town of Plovdiv, 42°07' N, 24°46'E, wet places, 1969, *Markova L33* (SOM).

The chromosome number $2n = 22$ (Markova & Thu 1974, Jasiewicz & Mizianty 1975) is established here from Bulgarian material and agrees with those found previously from France (Labadie 1976) and from Britain (Morton 1973). The same chromosome number has also been reported for *B. nigra* s.l. without determination of intraspecific taxa (see Fedorov 1969, Moore 1969, Goldblatt 1985, Goldblatt & Johnson 1991 for references). The karyotype of the populations L387 and L618 has $2n = 4m + 12sm + 2sm - SAT + 4st = 22$ (Fig. 8E), and L33 $2n = 2m + 16sm + 2sm\text{-}SAT + 2st = 22$ chromosomes (Fig. 8F).

457. *Galeopsis speciosa* Miller — $2n = 16$ (Fig. 8G).

Bu: Mt Vitoša., around the village of Bojana, 42°37'N, 23°20'E, damp places on clearings, 1973, *Markova L296* (SOM).

This is the first report for Bulgaria and it is in accordance with data from elsewhere (see Fedorov 1969, Moore 1977, Goldblatt 1985, 1988 and Loon 1987, for references). The karyotype includes $2n = 2x = 10sm + 4sm - SAT + 2st = 16$ chromosomes.

458. *Galeopsis tetrahit* L. — $2n = 32$ (Fig. 8H).

Bu: Mt Rila, around the rest house Baeva near the village of Govedarci, 42°13'N, 23°32'E, dry grassy places, 1975, *Markova L417* (SOM).

This is the first chromosome count for this species from Bulgarian material and corresponds to the data reported by several authors from other regions (see Fedorov 1969, Moore 1977, Goldblatt 1985, 1988, Goldblatt & Johnson 1991, for references). The karyotype consists of $2n = 4x = 4m + 24sm + 2sm - SAT + 2st = 32$ chromosomes.

459. *Lamium galeobdolon* (L.) L. subsp. ***montanum*** (Pers.) Hayek — $2n = 36$ (Fig. 9A).

Bu: Mt Strandža, at the locality Kirjasov dol, 42°02'N, 27°45'E, damp shady places, 1969, *Markova L1 6*(SOM).

The tetraploid chromosome number $2n = 4x = 32$ found for subsp. *montanum* is the first count for Bulgarian plants, and it is in accordance with all the previous ones (Dersch 1964, Polatschek 1966, Fedorov 1969, Skalinska & al. 1971, Wegmüller 1971, 1973, Majovsky & al. 1974, Strid & Franzén 1981 and others, sub *Galeobdolon*, *Lamium*, *Lamiastrum*) from different European localities of Europe. The karyotype of population

L16 has $2n = 4x = 2m + 24sm + 2sm - SAT + 6st + 2st - SAT = 36$ chromosomes.

460. *Lamium garganicum* L. subsp. ***laevigatum*** Arcangeli — $2n = 18$ (Fig. 9B, C, D)

Bu: Mt Vitoša, above Dragalevci, 42°37'N, 23°22'E, in sparse forest, 1969, *Markova L40* (SOM).
— Western Rodopi, at the locality Slivov dol, near the town of Bačkovo, 41°56'N, 24°52'E, in the forest, 1969, *Markova L5* (SOM).
— Strandža Mt, at the locality Kirjasov dol, 42°02'N, 27°45'E, in rocky grassy places, 1969, *Markova L3* (SOM).

The chromosome number $2n = 18$ is reported here for the first time for Bulgarian material of this subspecies, and is in agreement with previously reported numbers for this species and the typical subspecies (see Fedorov 1969, Loon 1987, for references and Borsos 1971). The karyotype of population L40 consists of $2n = 16sm + 2sm - SAT = 18$ (Fig. 9B), L5 of $2n = 10sm + 2sm - SAT + 6st = 18$ (Fig. 9C),; and L3 of $2n = 10sm + 6st + 2st - SAT = 18$ chromosomes (Fig. 9D).

460a. *Lamium garganicum* L. subsp. ***pictum*** (Boiss. et Heldr.) P.W. Ball — $2n = 18$ (Fig. 9E).

Bu: Mt Pirin, between the hut Vihren and the locality Kabata, 41°43'N, 23°27'E, grassy rocky places, 1986, *Markova L1668* (SOM).

According to Ball (1972) and Baden (1991a), this taxon is an endemic of Greece, but Jordanov had found it on Mt Pirin as early as 1928. As far as the authors are aware, this is the first karyological study of this subspecies. The karyotype consists of $2n = 4m + 10sm + 4sm - SAT = 18$ chromosomes.

461. *Lamium maculatum* L. var. ***cupreum*** (Schim., Nym. et Kotschy) Briq. — $2n=18$ (Fig. 9F).

Bu: North-Eastern Bulgaria, in the locality Pop-Čair near the town Šumen, 43°14'N, 26°57'E, light scrub, 1978, *Markova L963* (SOM).

This is the first report for this taxon based on Bulgarian material and it agrees with that given by Uhrikova (in Majovsky & al. 1978). The karyotype consists of $2n = 4m + 10sm + 2st + 2st - SAT = 18$ chromosomes.

461a. *Lamium maculatum* L. var. ***nemorale*** Reichenb. — $2n = 18$ (Fig. 9G,H).

Bu: Sofia region, around the village of Klissura, Mt Julin, 42°42'N, 23°22'E, sparse scrub, 1982, *Markova & Goranova L1259* (SOM).
— Mt Strandža, at the locality Kirjasov dol, 42°02'N, 27°45'E, dry scrub, 1869, *Markova L4* (SOM).

This is the first karyological study for this taxon for Bulgaria, and it agrees with those of several authors for *L. maculatum* s.l. for elsewhere (see Fedorov 1969, Moore 1974, 1977, Goldblatt 1984, 1985, 1988, Goldblatt & Johnson 1991 for references). The karyotype of population L1259 consists of $2n = 14sm + 2sm - SAT + 2st = 18$ (Fig. 9G), and L4 of $2n = 10sm + 2sm - SAT + 6st = 18$ chromosomes (Fig. 9H).

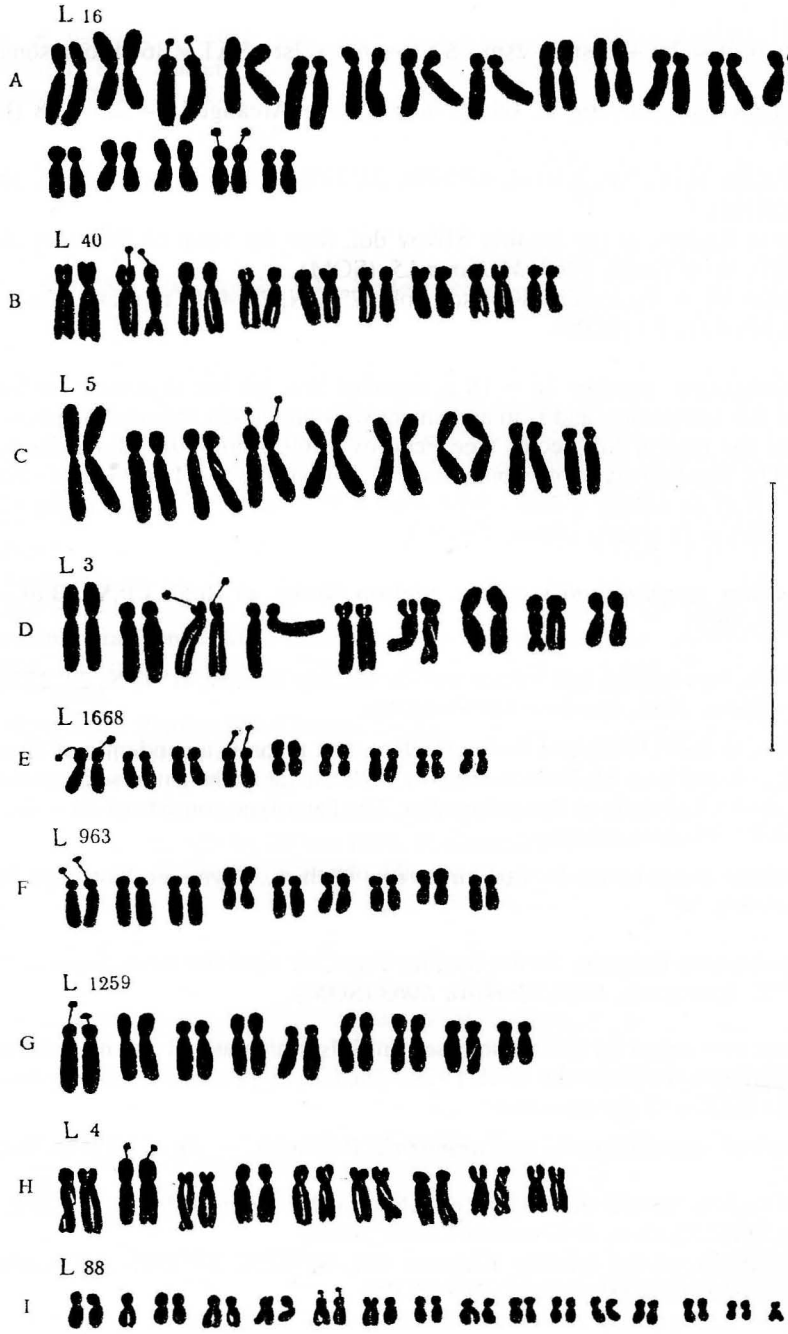

Fig. 9. Karyograms of: A-H, *Lamium:* A, L. *galeobdolon* subsp. *montanum*, $2n = 36$; B-D, *L. garganicum* subsp. *laevigatum*, $2n = 18$; E, *L. garganicum* subsp. *pictum*, $2n = 18$; F, *L. maculatum* var. *cupreum*, $2n = 18$; G-H, *L. maculatum* var. *nemorale*, $2n = 18$; I, *Satureja cristata*, $2n = 30$. - Scale bar = 10 µm.

462. ***Origanum vulgare*** L. subsp. ***hirtum*** (Link) Ietswaart — $2n = 30$ (Fig. 10C).

Bu: Eastern Rodopi, above the river Vǎrbica, near the town of Momčilgrad, 41°27'N, 25°25'E, rocky places, 1986, *Markova & Vasileva L1620* (SOM).
— Eastern Rodopi; around the village of Gorna Kula, rocky places, 1986, *Markova & Vasileva L1618* (SOM).

The chromosome number found, $2n = 30$, agrees with that referred in Loon (1987, sub *O. heracleoticum*). The karyotype of the two populations from the Rodopi mountain range includes $2n = 12sm + 16sm + 2sm$ - SAT = 30 chromosomes.

462a. ***Origanum vulgare*** L. subsp. ***viridulum*** (Martin-Donos) Nyman — $2n = 30$ (Fig. 10D).

Bu: Mt Pirin, around the village of Breznica, 41°32'N, 23°43'E, rocky places, 1982, *Černeva L1326* (SOM).
— Central Rodopi, the locality Červena Stena near the monastery of Backovo, 41°55'N, 24°53'E, rocky places, 1983, *Markova L1335* (SOM).

This is probably the first karyological study based on Bulgarian material, and it agrees with the report by Strid & Franzén (1981) from Mt Olimbos. The karyotype of populations L1326 and L1335 consists of $2n = 6m + 20sm + 2sm$ - SAT + $2st = 30$ chromosomes.

463. ***Satureja bulgarica*** (Velen.) K. Maly — $2n = 22$ (Fig. 10A).

Bu: Easthern Rodopi, along the river Arda by Momčilgrad, 41°28'N, 25°24'E, dry sunny places, 1986, *Markova & Vasileva L1614* (SOM).

Endemic to S Bulgaria & NE Greece. The chromosome number $2n = 22$ was established from the study of the same population, L1614 (Markova 1989). This number probably represents an aneuploid. The karyotype consists of $2n = 2m + 18$ sm + 2sm - SAT = 22 chromosomes.

464. ***Satureja coerulea*** Janka — $2n = 30$ (Fig. 10E, F, G, H, I).

Bu: Eastern Stara Planina Mt, the locality Karandila above the town Sliven, 42°29'N, 26°18'E, rocky places, 1986, *Markova L1645* (SOM).
— Thracian plain, Bessapara hills above the village of Trivodici, 42°07'N, 24°26'E, rocky places, 1989, *Markova & Goranova L1771* (SOM).
— Eastern Rodopi, at the locality Dupkata above the town of Ivailovgrad, 41°29'N, 26°08'E, rocky places, 1986, *Markova & Goranova L1616* (SOM).
— Eastern Rodopi, around the village of Ivanci, 41°39'N, 25°25'E, dry stony places, 1986, *Markova & Goranova L1604* (SOM).
— Eastern Rodopi, television transmission tower near the town of Kǎrdžali, 41°36'N, 25° 22'E, rocky places, 1986, *Markova & Goranova L1598* (SOM).
— North-eastern Bulgaria, at the locality Sazlagjol near the town of Bjala, 43°25'N, 25°45'E, stony places, 1975, *Markova L538* (SOM).
— North-Eastern Bulgaria, around the town of Madara, 43°14'N, 27°48'E, stony places, 1984, *Markova L1497* (SOM).

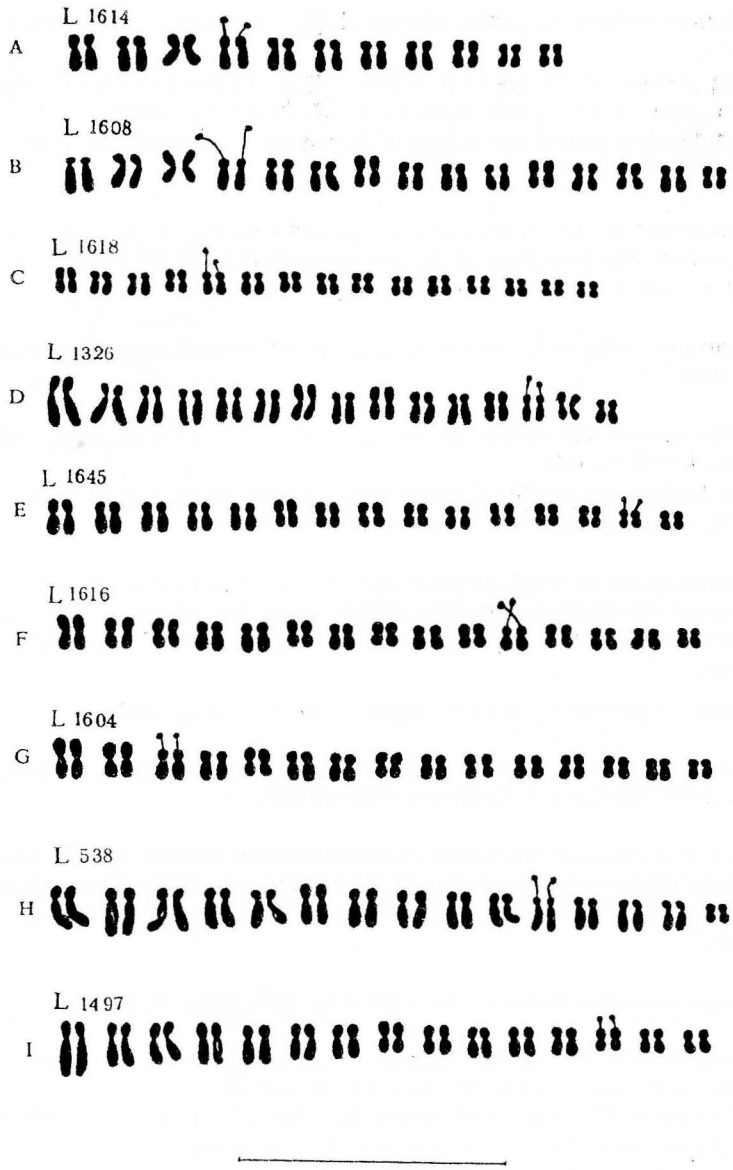

Fig. 10. Karyograms of: A-B, *Satureja:* A, *S. bulgarica*, 2*n* = 22; B, *S. juliana*, 2*n* = 30; C-D, *Origanum*: C, O. *vulgare* subsp. *hirtum*, 2*n* = 30; D, *O. vulgare* subsp. *viridulum*, 2*n* = 30; E-I, *Satureja coerulea*, 2*n* = 30. - Scale bar = 10 μm.

Distributed in SE Europe (Bu, Rm). There are two varieties of *S.coerulea* in the Bulgarian Flora: the typical one and var. *brachyphylla* Vel. (Ancev 1989). The present investigation is on the typical variety. According to Darlington & Wylie (1955), the basic chromosome number in the genus *Satureja* is $x = 5$. Consistent with this are most Bulgarian taxa of the genus *Satureja* investigated until now, which appear to be hexaploid. The chromosome number, $2n = 30$ (L538), was initially given by Markova (1983b). Seven populations were examined karyologically and five cytotypes are presented here. The karyotype of populations L1645 and L1771 has $2n = 6x = 16m + 2m - SAT + 12sm = 30$ (Fig. 10E), L1616 $2n = 6x = 14m + 14sm + 2sm - SAT = 30$ (Fig. 10F), L1604 and L1598 $2n = 6x = 12m + 16sm + 2sm - SAT = 30$ (Fig. 10G), L538 $2n = 6x = 2m + 26sm + 2sm - SAT = 30$ (Fig. 10H), and L1497 $2n = 6x = 2m + 2m - SAT + 26sm = 30$ chromosomes (Fig. 10I). In some root-tip cells of an individual from population L1497, the chromosome numbers $2n = 30$ and $2n = 60$ were observed, suggesting endopolyploidy.

465. *Satureja cristata* (Hampe) Nyman — $2n = 30$ (Fig. 9I).

Bu: Znepole region, Mt Konjavska planina, 42°22'N, 22°55'E, in rocky crevices, 1971, *Markova L88* (SOM).

Distributed in N & C parts of the Balkan Peninsula and throughout Turkey. An earlier chromosome number, referring to the same population (Markova & Thu 1974) is presumably the only count for this species. The karyotype consists of $2n = 6x = 4m + 24sm + 2sm - SAT = 30$ chromosomes.

466. *Satureja cuneifolia* Ten. — $2n = 30$ (Fig. 11A).

Bu: Struma valley, at the locality Kǎrtaleca near the village of Kulata, 41°22'N, 23°22'E, dry grassy places, 1983, *Markova & Ančev L1406* (SOM).

Distributed in the Mediterranean region (Al, Bu, Hs, It, Ju). This species has a limited distribution in Bulgaria, on southern Pirin Mt and Struma valley (Ančev 1989). The chromosome number $2n = 30$ has been established from the study of the same population, L1406 (Markova 1989).

467. *Satureja juliana* L. — $2n = 30$ (Fig. 10B).

Bu: Eastern Rodopi, locality Boruna near the village of Zelezino, 41°26'N, 25°57'E, rocky slopes, 1986, *Markova & Vasileva L1608* (SOM).

The chromosome number $2n = 30$ was found in a study from the same population L1608 (Markova 1989). That result is in agreement with the data previously reported for plants from Italy, Greece, Crete, Portugal and Yugoslavia (see Löve & Löve 1982, Fernándes & Leitão 1984, Loon 1987, Goldblatt 1988, Goldblatt & Johnson 1990, 1991, for references). The karyotype includes $2n = 6x = 10m + 16sm + 2sm - SAT + 2st = 30$ chromosomes.

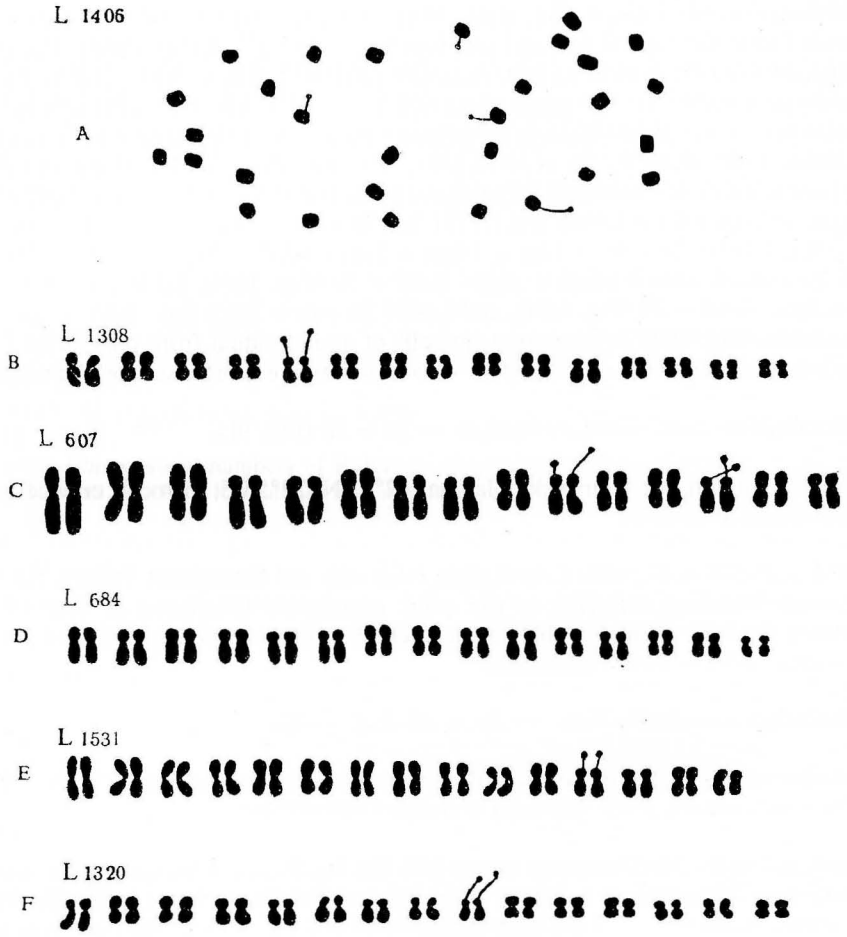

Fig. 11. Karyotype and karyograms of *Satureja*: A, *S. cuneifolia*, 2*n* = 30; B-D, *S. kitaibelii*, 2*n* = 30; E, S. *pilosa* var. *pilosa*, 2*n* = 30; F, S. *pilosa* var. *skorpilii*, 2*n* = 30. - Scale bar = 10 µm.

468. *Satureja kitaibelii* Heuffel — 2*n* = 30 (Fig. 11B, C, D).

Bu: Mt Sredna Gora, at the locality Bučeto, Losenska planina, 42°33'N, 23°32'E, stony places, 1982, *Markova & Goranova L1308* (SOM).
— Balkan foothill region, around the village of Emen, 43°06'N, 25°25'E, rocky places, 1976, *Markova L607* (SOM)
— Znepole region, at the locality Božurite near the village of Vasilevci, 42°56'N, 23°09'E, rocky places, 1976, *Markova L684* (SOM).
— Balkan foothill region, near the town of Lovec, 43°06'N, 24°45'E, stony places,

1982, *Goranova L1323* (SOM).

S. kitaibelii is a Balkan endemic species distributed in the N & C part of the Balkan Peninsula. The chromosome number $2n = 30$ agrees with previous counts (see Loon 1987, for references. The karyotype of population L1308 consists of $2n = 6x = 20m + 8sm + 2sm$ - SAT = 30 (Fig. 11B), of L607 $2n = 6x = 10m + 16sm + 4sm$ - SAT = 30 (Fig. 11C), and of L684 and L1323 $2n = 6x = 8m + 22sm = 30$ chromosomes (Fig. 11D).

469. *Satureja pilosa* Velen. var. ***pilosa*** — $2n = 30$ (Fig. 11E).

Bu: Central Stara Planina Mt, above the village of Karnare, 42°42'N, 24°38'E, dry stony places, 1984, *Markova L1531* (SOM).
— Eastern Rodopi, along the river Arda, near the town of Momčilgrad, 41°28'N, 25°24'E, rocky places, 1986, *Markova & Goranova L1627* (SOM).

Balkan endemic (Bu, Gr, Ju?). There are three varieties of *S. pilosa* in the Bulgarian Flora (Ančev 1989). Two of them have been studied karyologically, the typical one and var. *skorpilii* (Markova 1983b). The chromosome number 2n = 30 and the karyotype of var. *pilosa* were established here from two additional populations. The karyotypes of populations L1531 and L1627 consist of $2n = 6x = 22m + 6sm + 2sm$ - SAT = 30 chromosomes (see karyogram Fig. 11E).

469a. *Satureja pilosa* var. ***skorpilii*** (Vel.) Hayek — $2n = 30$ (Fig. 11F).

Bu: Central Stara Planina Mt, around the town of Kotel, 42°51'N, 26°26'E, stony places, 984, *Markova L1320* (SOM).

The karyotype consists of $2n = 6x = 14m + 14sm + 2sm$ - SAT = 30 chromosomes.

470. *Scutellaria albida* L. s. l. — $2n = 32$ (Fig. 12A), $2n = 64$ (Fig. 12B).

Bu: North-eastern Bulgaria, at the locality Dervişa near the town of Preslav, 43°07'N, 26°46'E, stony places, 1978, *Markova L960* (SOM), $2n = 32$.
— Eastern Rodopi, in the scrub along the river Arda near the town of Momčilgrad, 41°27'N, 26°46'E, 1986, *Markova & Vasileva L1624* (SOM).

The chromosome numbers found, $2n = 32$ and $2n = 64$ are reported here for the first time for Bulgarian material. In addition, the number $2n = 64$, is probably reported here for the first time for this taxon. Several authors have previously given 2n = 32 for *S. albida* s.l. (see Fedorov 1969, Goldblatt 1988, for references). The karyotype of population L960 consists of $2n = 4x = 4m + 26sm + 2sm$ - SAT = 32 chromosomes (Fig. 12A), and L1624 has $2n = 8x = 14m + 46sm + 4sm$ - SAT = 64 chromosomes (Fig. 12B).

470a. *Scutellaria albida* L. subsp. ***velenovskyi*** (Rech. fil.) Greuter & Burdet — $2n = 34$ (Fig. 12D).

Bu: Eastern Stara Planina Mt, the hill Gagovec in the town of Sliven, 43°25'N, 25°45'E, dry rocky places, 1969, *Markova L136* (SOM).

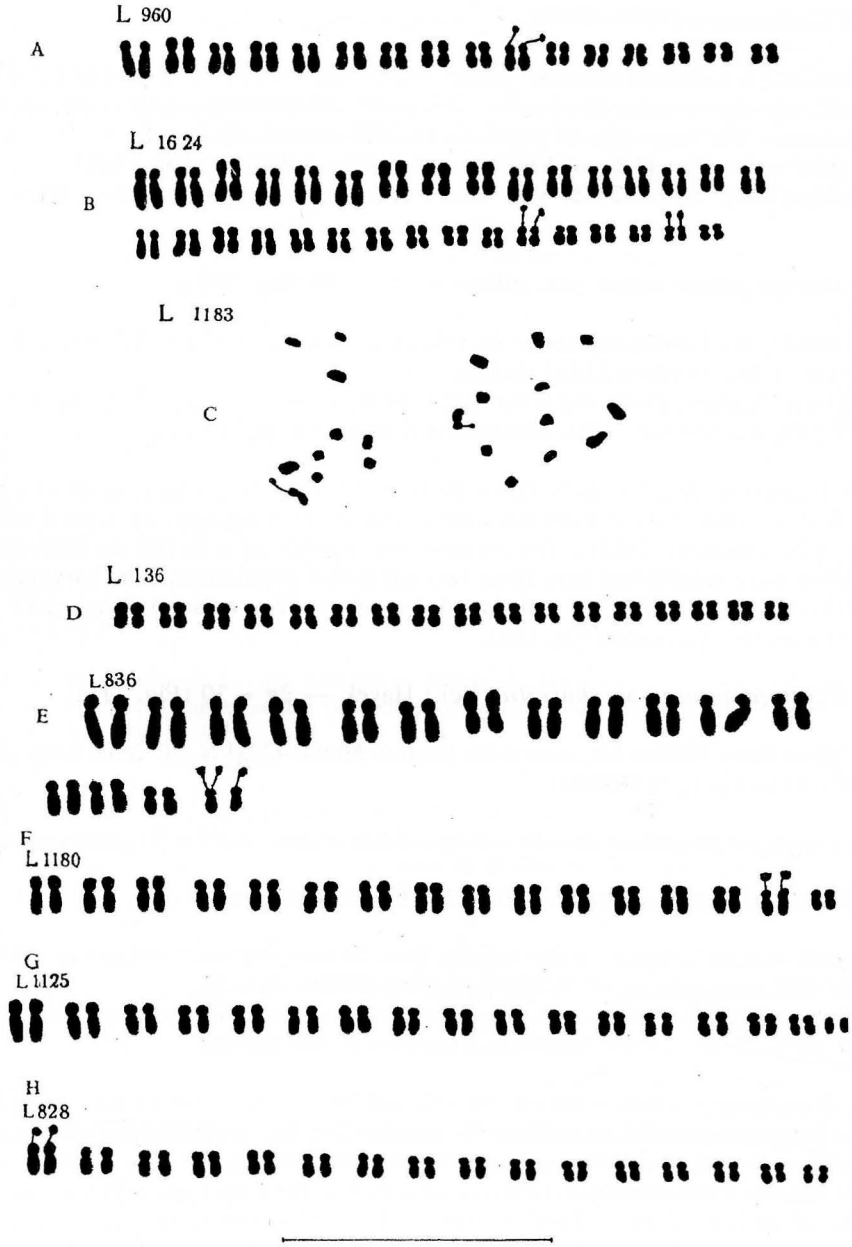

Fig. 12. Karyograms and karyotype of: A-D, *Scutellaria*: A-B, *S. albida* s.l.: A, $2n = 32$; B, $2n = 64$; C, *S. orientalis* subsp. *pinnatifida*, $2n = 22$; D, *S. albida* subsp. *velenovskyi* $2n = 34$; E-H, *Teucrium*: E, *T. lamifolium*, $2n = 32$; F-G, *T. scordium* subsp. *scordium*: F, $2n = 32$; G, $2n = 32 + 2B$; H, *T. scordium* subsp. *scordioides*, $2n = 32$. - Scale bar = 10 µm.

Distributed in the S Balkans and E Mediterranean region. The chromosome number $2n = 34$ confirms previous counts from two Bulgarian populations (see Loon 1987, for references). The karyotype of population L136 consists of $2n = 34$ small, mainly submetacentric chromosomes.

471. ***Scutellaria orientalis*** L. subsp. ***pinnatifida*** J. R. Edmondson — $2n = 22$ (Fig. 12C).

Bu: North-eastern Bulgaria, at the locality Saslagjol near the town of Bjala, 43°25'N, 25°45'E, dry rocky places, 1975, *Markova L537* (SOM).
— Eastern Stara Planina Mt, the hill Gagovec in the town of Sliven, 42°38'N, 26°18'E, dry rocky places, 1981, *Markova L1183* (SOM).

Distributed in Greece, Bulgaria, N Iran and Turkey. This is the first report for this taxon based on Bulgarian material. The chromosome number found here agrees with counts on material from Iran (Aryavand 1977) and Greece (Baden 1981b). The karyotype of the two Bulgarian populations consists of 2n = 22 small metacentric and submetacentric chromosomes, two of which presenting satellites.

472. ***Teucrium lamifolium*** Dum.-Urville — 2n = 32 (Fig. 12E)

Bu: Mt Strandža, the village of Fasanovo, 42°12'N, 27°43'N, grassy places in clearings of *Quercus* forest, 1977 , *Markova L836* (SOM).
— Mt Strandža, at the locality Supotloto above the village of Brodilovo, 42°03'N, 27°48'E, grassy places in clearings of *Quercus* forest, 1977, *Markova L814* (SOM).

Distributed in Bulgaria (only on Mt Strandža), NW Turkey and S Anatolia. The number $2n = 32$ established from two populations agrees with the data published for one of them, L836 (Markova 1982). The karyotype of populations L836 and L814 has $2n = 2m + 28sm + 2sm$ - SAT = 32 chromosomes.

473. ***Teucrium scordium*** L. subsp. ***scordium*** — $2n = 32$ (Fig. 12F), $2n = 32 + 2B$ (Fig. 12F, G).

Bu: Thracian plain, around the town of Sadovo, 42°06'N, 24°58'E, damp places, 1977, *Markova L778* (SOM).
— Thracian plain, around the village of Kirilovo, 42°23'N, 25°38'E, damp grassy places, 1981, *Markova L1180* (SOM).
— MtStrandža, in the Silkosia forest reserve, 42°02'N, 27°45'E, damp places, 1980, *Markova L1121* (SOM).
— Black Sea coast, around the town of Varna, 43°11'N, 27°48'E, damp places, 1980, *Markova L1125* (SOM).

This is the first report based of Bulgarian material. The data found here agrees with the report of Morton (1973) for *T. scordium* s.l. The karyotype morphology of populations L778, L1121 and L1180 is $2n = 4x = 30sm + 2sm$ - SAT = 32 chromosomes (Fig. 12F), while L1125 consists of $2n = 4x + 2B = 32sm + 2B$ chromosomes (Fig. 12G).

473a.*Teucrium scordium* L. subsp. ***scordioides*** (Schreber) Arcangeli — $2n = 32$ (Fig. 12H).

Bu: Mt Strandža, by the village Brodilovo, 42°03'N, 27°48'E, damp places, 1977, *Markova L828* (SOM).

The chromosome number $2n = 32$ is reported here for the first time from Bulgarian material. The chromosome number agrees with that given by several authors (Fernández Casas 1976, Fernándes & Leitão 1984, Bayon 1988, and see Goldblatt & Johnson 1991 for references), but not with $2n = 2x = 16$ found by Fernándes & Leitão (l.c.) and Bayon (l.c.). The karyotype has $2n = 4x = 30sm + 2sm - SAT = 32$ chromosomes. A karyotype drawing by Fernándes & Leitão (l.c.) from a Portuguese population shows that more than half of its chromosomes are metacentric, while this chromosome type does not occur in the material examined here (Fig. 21H). In addition to 2n = 32, the number 2n = 64 was counted in some root-tip cells of the same individual, indicating endopolyploidy.

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Reports (474-478) by Dolja Pavlova

474. ***Astragalus alopecurus*** Pallas — $2n = 16$ (Fig. 1).

Bu: Western Rhodopi Mts, at the locality Beglika, 41°50'N, 24°10'E, on the road to the summit Malka Sutka at the end of the forest, 1500 m, *Pavlova 97 200* (SO).

Distributed in Ga, It, Bu and An. A rare plant in Bulgaria with only one known locality.

The chromosome number $2n = 16$ confirms previous counts (Kožuharov & Petrova 1973) from the same population.

The karyotype consists of $2n = 2x = 12m + 4sm = 16$ chromosomes. It is symmetrical but heterogeneous with respect to chromosome length. Endopolyploidy ($2n = 32$) was observed.

475. ***Astragalus contortuplicatus*** L. — $2n = 16$ (Fig. 3).

Bu: Danube plain, in the eastern part of the town of Svishtov, 43°40'N, 25°20'E, on sandy places near the river Danube, *Pavlova DK - 24* (SO).

Distributed in Ju, Bu, Crimea. The chromosome number $2n = 16$ confirms earlier reports (see Fedorov 1969: 284) on populations from Russia.

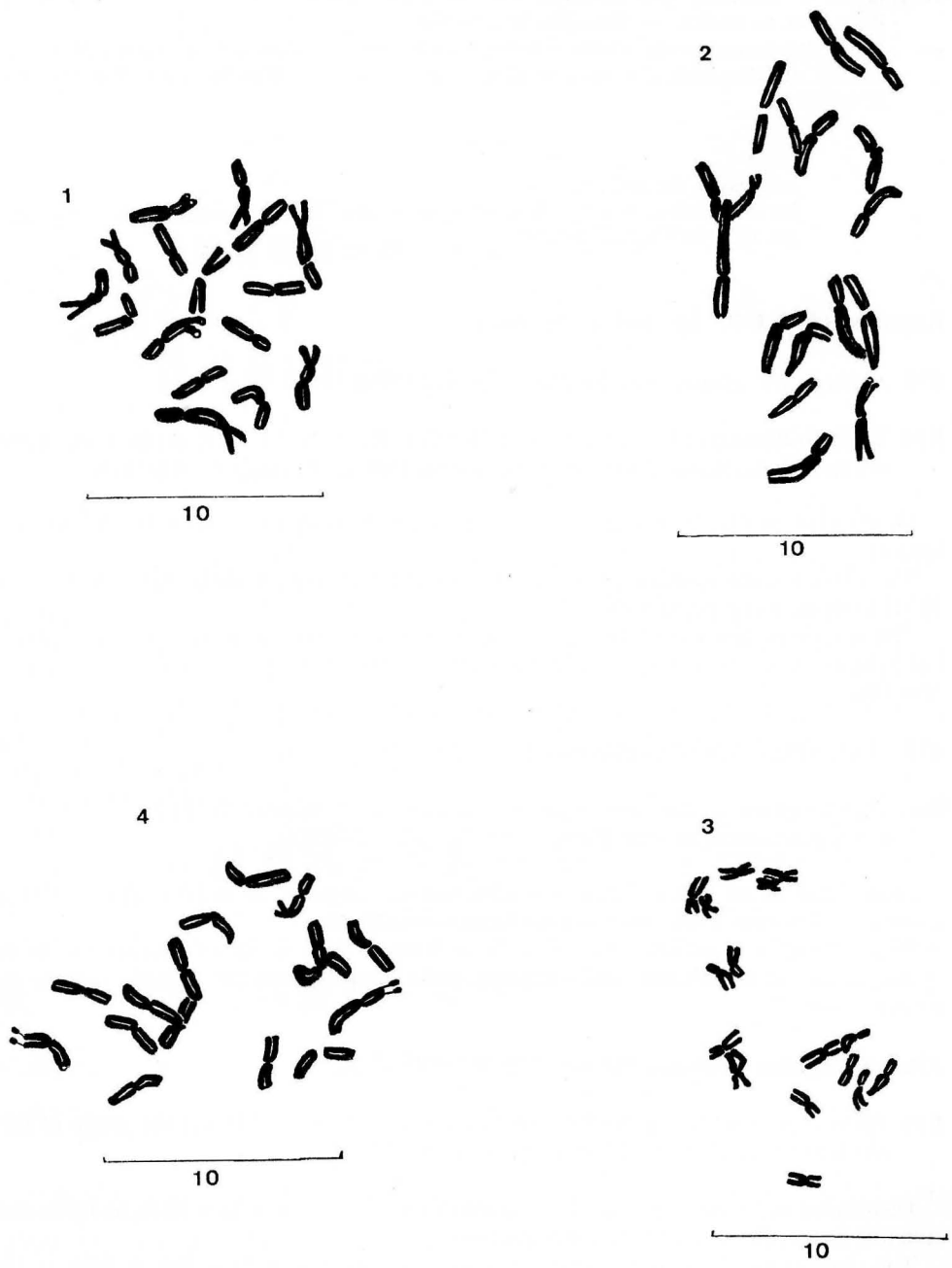
The karyotype consists of $2n = 2x = 14m + 2sm = 16$ chromosomes. It is symmetrical; the metacentric and submetacentric chromosomes are slightly variable in length.

476. ***Astragalus ponticus*** Pallas — $2n = 16$ (Fig. 2).

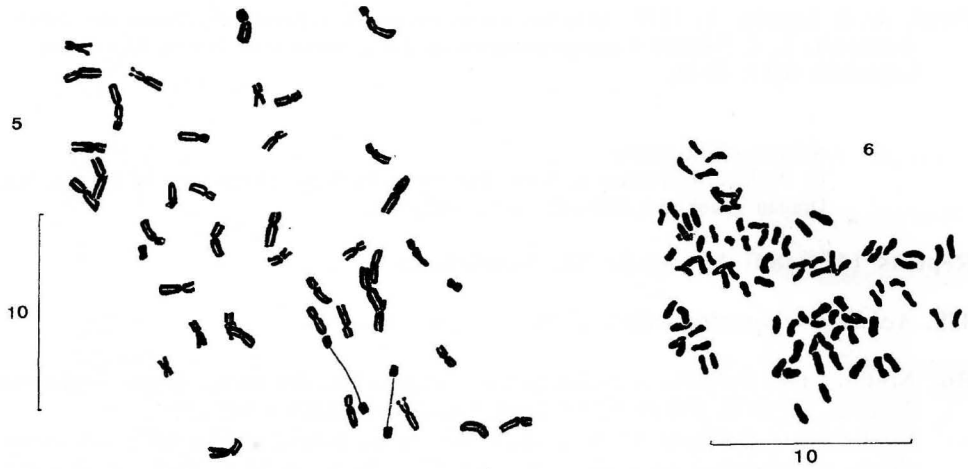
Bu: Znepole region, Konjavska Mts, on calcareous and stony places in the gorge of the Shagava river, 42°20'N, 22°40'E, *Pavlova 96 431* (SO).

Distributed in Ju, Bu, RK, An. The chromosome number $2n = 2x = 16$ is, as far as the author is aware, the first record for this species.

The karyotype is symmetrical, and consists of $2n = 2x = 8m + 8sm = 16$ chromosomes.



Figs. 1-4. Karyotypes of *Astragalus* species from Bulgaria: 1, *A. alopecurus*, $2n = 16$; 2, *A. ponticus*, $2n = 16$; 3, *A. contortuplicatus*, $2n = 16$; 4, *A. suberosus* subsp. *haarbachii*, $2n = 16$. - Scale bar = 10 µm.



Figs. 5-6. Karyotypes of *Astragalus hamosus*: 5, $2n = 44$; 6, $2n = 88$. - Scale bar = 10 µm.

478. *Astragalus hamosus* L. — $2n = 40, 42, 44, 46, 48, 88$ (Figs. 5, 6).

Bu: Black Sea coast, north of the town of Nessebar, 42°42'N, 27°41'E, on grassy places near the Hadziiska river in the region of the Sunny Beach resort, *Pavlova 96 790* (SO).

Distributed in S Europe. The chromosome numbers $2n = 40, 42, 44, 46, 48$ agree with previous counts (Horjales 1976; Pretel & Sanudo 1978; Maassoumi 1987, Fedorov 1969: 285). The chromosome number $2n = 32$ previously reported by Kuzmanov & Georgieva (1976) for a Bulgarian population and also by Dalgaard (1987) and Colombo & al. (1983) was not found here. The investigated population of *A. hamosus* exhibits an unusual variation in chromosome number and a clearly expressed dysploidy.

The karyotype with $2n = 44$ consists of $2n = 2x = 16m + 24sm + 4sm$ - SAT = 44.

The chromosome number $2n = 88$ is reported here for the first time from the same population. The chromosomes are relatively small, and their morphology could not be clearly examined.

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Reports (479-480) by Anely M. Nedelcheva

479. *Achillea clypeolata* Sibth. et Sm. — $2n = 18$.

Bu: North-eastern Bulgaria: Strazha, district Turgovishte, dry rocky slopes, limestone 43°13'N, 26°35'E, 300 m, 12 Jul 1993, *Nedelcheva, AMN 1/936* (SO).
— North-eastern Bulgaria: Madara, Madarsko Plato, district of Shoumen, dry sunny places, on limestone rock, 43°17'N, 27°09'E, 430 m, 08 May 1994, *Nedelcheva, AMN 1/9434* (SO).
— Balkan foothill region: Arbanasi, district Veliko Turnovo, dry rocky southern slopes on limestone, 43°06'N, 25°39'E, 420 m, 15 May 1994, *V. Georgiev, AMN 1/9440* (SO).
— Western Stara Planina Mt: Stanintsi, district of Godech, dry stony places, on sunny slopes, limestone, 43°03'N, 22°54'E, 800 m, 27 May 1994, *V. Georgiev, AMN 1/9437* (SO).
— Western Stara Planina Mt: Chepan, district of Dragoman, dry grassland, southern slopes, on limestone, 42°57'N, 22°57'E, 1100 m, 27 May 1994, *D. Petkova & V. Georgiev, AMN 1/9439* (SO).
— Western Stara Planina Mt: Sokolets, distrct of Vratsa, rocky western slopes, 43°08'N, 23°23'E, 820 m, 26 Jun 1994, *V. Georgiev, AMN 1/9443* (SO).
— Znepole region: Orlite, Golo Burdo Mt, sunny places in coniferous forest, WSW slopes on limestone, 42°34'N, 23°00'E, 1000 m, 28 Jul 1993, *Nedelcheva, AMN 1/937* (SO).
— Znepole region, Peshtera: district of Pernik, dry stony places, limestone, 42°30'N, 22°45E, 700 m, 11 Aug 1993, *Nedelcheva, AMN 1/9315* (SO).
— Znepole region: Viden, Konyavska Planina Mt, mountain rocks, limestone, 42°22'N, 22°51'E. 1487 m, 12 Aug 1993, *Nedelcheva, AMN 1/9317* (SO).
— Western Rhodopi Mts: district of Dubravite, Pazardzhik, dry rocky limestone slopes, 42°14'N, 24°02'E, 400 m, 23 Aug 1994, *Nedelcheva, AMN 1/9462* (SO).
— Thracian plain: Tri Voditsi, district of Plovdiv, dry stony places on marble, 42°08'N, 24°28'E, 500 m, 19 Aug 1994, *D. Petkova, AMN 1/9468* (SO).
— Strandža Mt: Malko Turnovo, dry sunny grassland on limestone, 41°58'N, 27°32'E, 347 m, 25 May 1994, *J. Koeva, AMN 1/9436* (SO).
— Strandža Mt: Brushlyan, district of Malko Turnovo, dry stony slopes on limestone, 42°03'N, 27°26'E, 380 m, 03 Aug 1994, *J. Koeva, AMN 1/9470* (SO).

Endemic to the Balkan Peninsula. Distributed in Al, Bu, Gr, Ju, Rm, Tu. The somatic chromosome number found, $2n = 18$ (Fig. 1a), agrees with that given for this species by Kuzmanov & Kožucharov (1970, 1973), Androshchuk & Kostinenko (1981). The karyotype consists of $2n = 14$ m + 4 st - SAT (Fig. 2a).

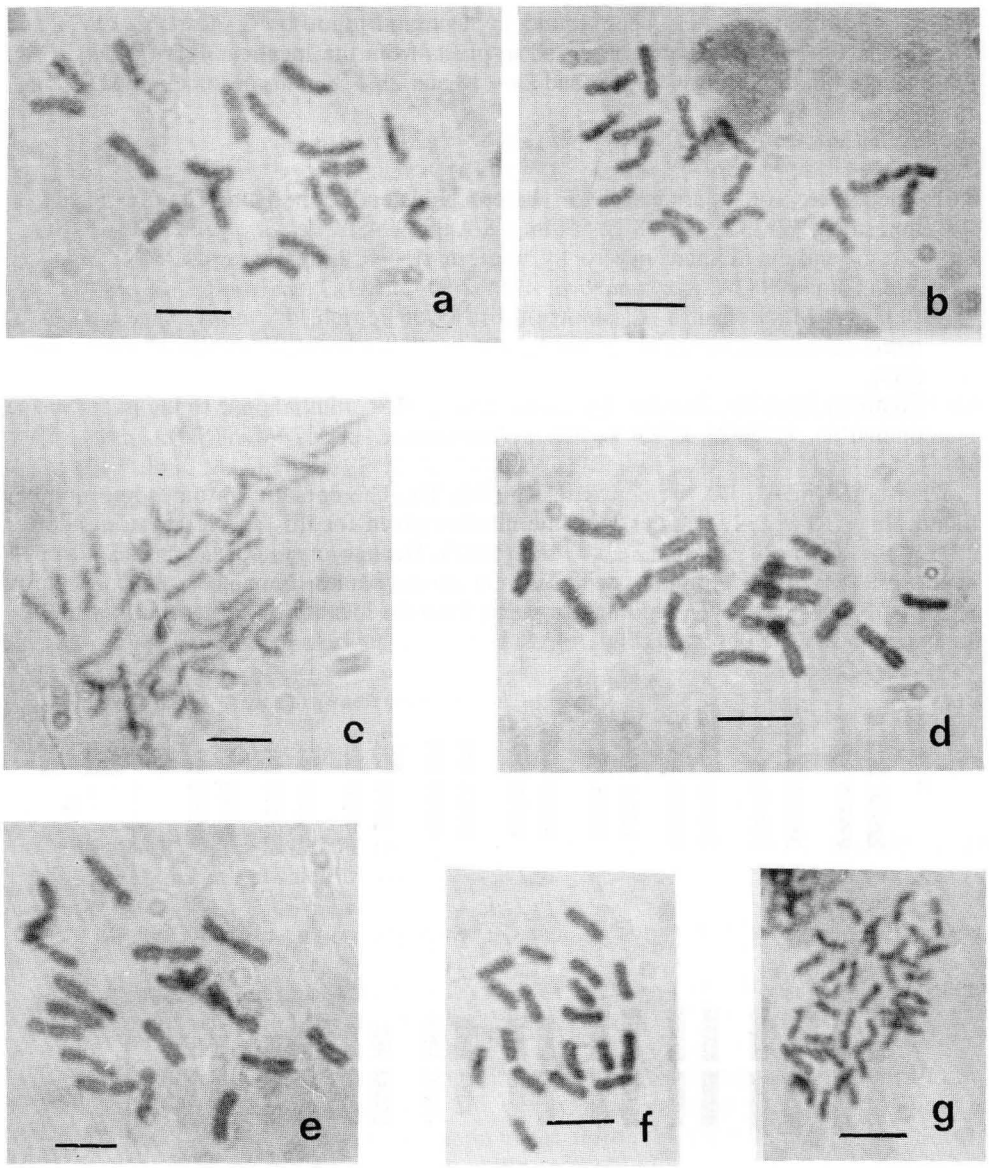

Fig. 1. Photomicrographs of the chromosomes of: a, *Achillea clypeolata* (AMN 1/9462), $2n$ = 18; b, *A. clypeolata* (AMN 1/9434), $2n$ = 18; c, *A. clypeolata* (AMN 1/9434), $2n$ = 36; d, *A. clypeolata* (AMN 1/9468), $2n$ = 18 + 0 + 1B; e, *A. coarctata* Poir. (AMN 1/9467), $2n$ = 18; f, *A. coarctata* (AMN 2/9441), $2n$ = 18; g, *A. coarctata* (AMN 2/9441), $2n$ = 36. - Scale bar = 5 µm.

One B chromosome has been found by Contandriopoulos & Martin (1967) and Richardson (1976). It was also observed in plants from the locality of Tri Voditsi (Fig. 1d). Plants from the locality Madara had $2n = 18$ and $2n = 36$ chromosomes (Fig. 1b, c).

480. ***Achillea coarctata*** Poir. — $2n = 18$.

Bu: Znepole region: Goranovtsi, district of Kyustendil, dry sunny stony places on limestone, 42°23'N, 22°38'E, 550 m, 08 Aug 1994, *Nedelcheva, AMN 2/938* (SO).
— Struma valley: Zemen, dry rocky western slopes, limestone, 42°28'N, 22°45'E, 590m, Jun 1994, *E. Kozhuharova, AMN 2/9441* (SO).
— Belasitsa Mt: Belasitsa (Eleshnitsa), district of Petrich, dry stony places, edges of wood on silicate, 41°22'N, 23°08'E, 450 m, 01 Sep 1994, *D. Petkova, AMN 2/9467* (SO).
— Southern Pirin Mt: Bansko, dry sunny stony places, alluvial cone to the river Glazne on marble, 41°50'N, 23°29'E, 925 m, *Nedelcheva, AMN 2/9458* (SO).

Distributed in Al, Bu, Gr, Ju, Rm, Rs (W), Tu. The somatic chromosome number found, $2n = 18$ (Fig 1e) agrees with the number given for this species by Ehrendorfer (1959), Sz.-Borsos (1970) and Dabrowska (1982). The karyotype consists of $2n = 14$ m + 4 sm-SAT (Fig. 2b). Tetraploids with $2n = 36$ chromosomes (Kuzmanov & Kozucharov 1970, 1973) have also been reported. In plants from the locality of Zemen, cells with $2n = 18$ and $2n = 36$ were observed (Fig 1f, g).

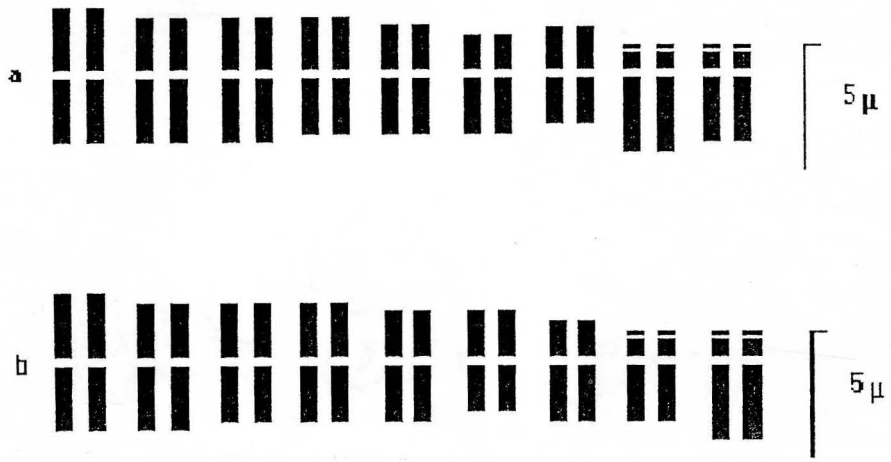

Fig. 2. Idiograms of the chromosomes of: a, *Achillea clypeolata*; b: A. *Achillea coarctata*. Scale bar = 5µm.

The karyotypes of *A. clypeolata* and *A. coarctata* are similar. The chromosomes are generally of the "m" and "sm-SAT" type, which agrees with findings from other Bulgarian species of the genus *Achillea*, sect. *Filipendulinae* (DC.) Afan (Nedelcheva, in press).

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Reports (481-490) by J. Simon, M. Bosch, C. Blanché & J. Molero*

481. ***Ambrosinia bassii*** L. — $2n = 22$ (Fig. 1A).

Tn: Tabarka to Neffza, near Ouchtatoua, 36°48'N, 08°57'E, 400 m, margin of a *Quercus* suber-forest, 28 May 1992, *Blanché, Issaoui, Molero & Vicens* (cult. *CB-474* bis, 24 Nov 94) *40425* (BCF).

This species is restricted to C and S Italy, islands of the Mediterranean region and N Tunisia. According to Petersen (1989) and Grayum (1990), the basic chromosome number for the monotypic Mediterranean subtribe *Ambrosininae* is x = 11. This number is in agreement with the previously published reports of 2n=22 by Vignoli (1939), Scrugli & Bocchieri (1976) and Petersen (1989). This chromosome count is, presumably, the first record for African populations.

The karyotype is of a high mean chromosome length, and contains 5 pairs of submetacentric chromosomes (some of them up to 17 μm), 5 pairs of long acrocentric to subtelocentric chromosomes (one of them satellited in the short arm) and one pair of shorter acrocentric to subtelocentric chromosomes.

This karyotype differs significantly from that reported by Petersen (l.c.) from Italian populations, where acrocentric chromosomes were the predominant ones, but more material is still needed for a statistical karyotype analysis.

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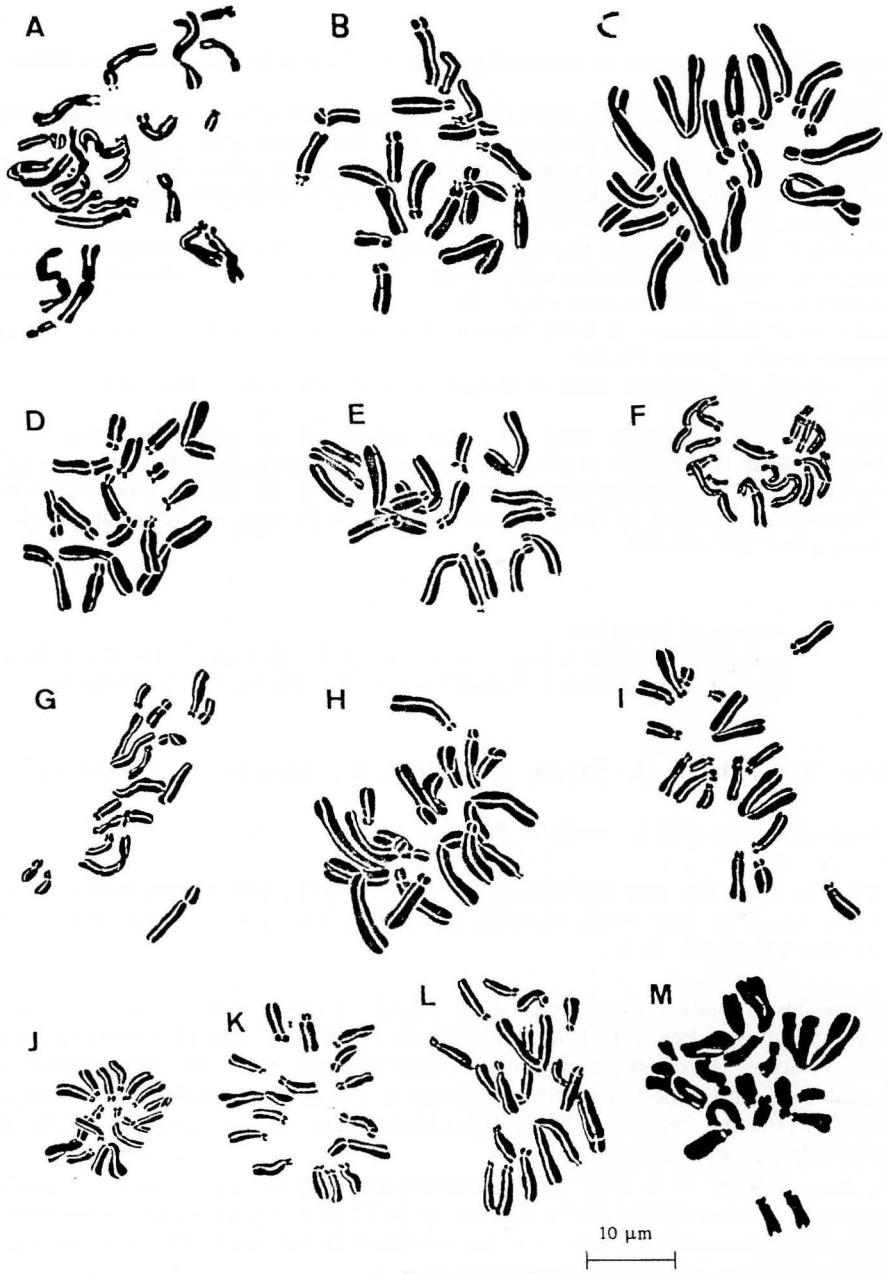

Fig. 1.A-M: Metaphase plates: A, *Ambrosinia bassii*, (2*n* = 22); B, *Delphinium bolosii*, (2*n* = 18); C, *D. emarginatum* susbp. *nevadense*, (2*n* = 16); D, *D. fissum* subsp. *fissum*, Saint Dalmas population, (2*n* = 16); E, id. Saint Valier population, (2*n* = 16); F, *D. nydeggeri*, (2*n* = 16); G, *D. pictum* subsp. *pictum*, Bóquer population, (2*n* = 16); H, id. Tuent population, (2*n* = 16); I, *D. staphisagria*, (2*n* = 18); J, *D. verdunense*, St. Llorenç population, (2*n* = 16); K, id. Castelló, (2*n* = 16); L, *Consolida ajacis*, (2*n* = 16); M, *C. regalis* subsp. *paniculata*, (2*n* = 16). - Scale bar = 10 µm.

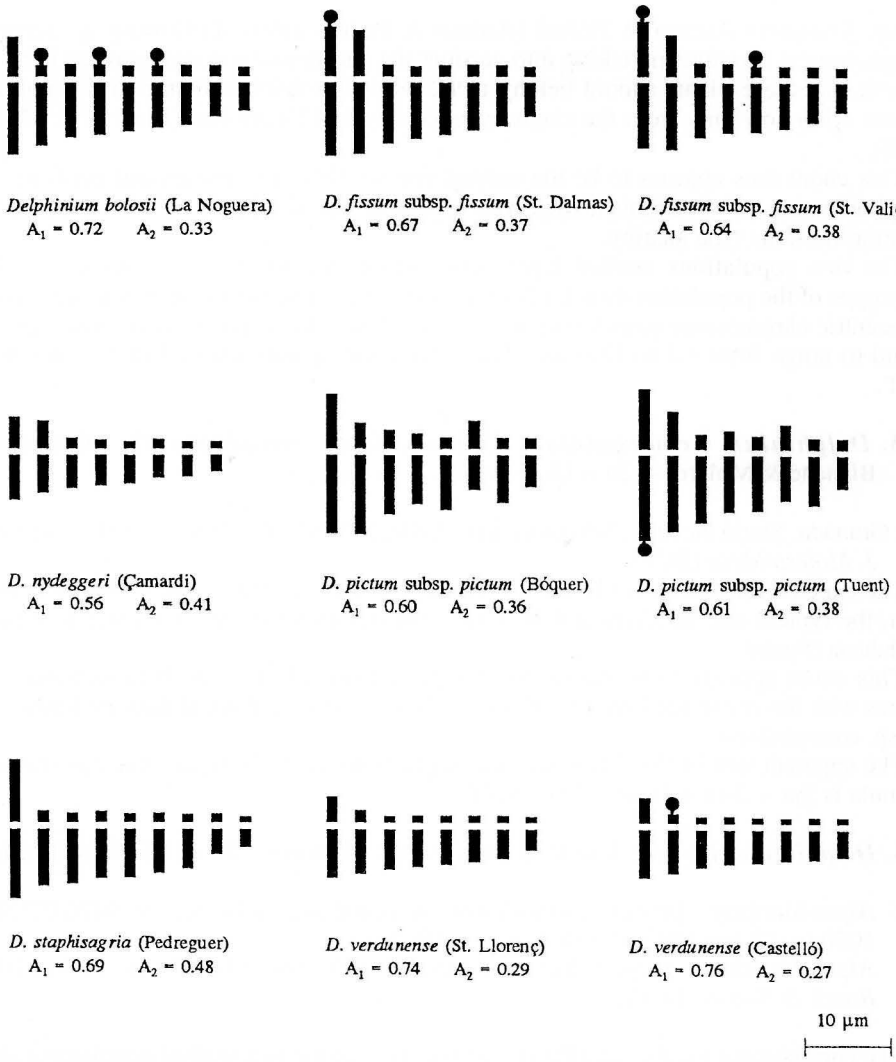

Fig. 2. a-i: Haploid idiograms obtained by measuring at least 5 good mitotic metaphases, 4 hours after pretreatment with 0.02 M 8-hydroxyquinoline. Asymmetry indeces A1 and A2 are calculated following Romero (1986).- a, *Delphinium bolosii*, ($2n$ = 18); b, *D. fissum* subsp. *fissum*, Saint Dalmas population, ($2n$ = 16); c, id. Saint Valier population, ($2n$ = 16); d, *D. nydeggeri*, ($2n$ = 16); e, *D. pictum* subsp. *pictum*, Bóquer population, ($2n$ = 16); f, id. Tuent population, ($2n$ = 16); g, *D. staphisagria*, ($2n$ = 18); h, *D. verdunense*, St. Llorenç population, ($2n$ = 16); i, id. Castelló, ($2n$ = 16). - Scale bar = 10 µm.

482. *Delphinium bolosii* C. Blanché & Molero — $2n$ = 18 (Fig. 1B).

Hs: Catalonia (La Noguera), Rubió de Baix, 41°54'N, 01°00'E, below an old tower in a fluvial terrace, 280 m, 05 Jul 1992, *Bosch 40088* (BCF).

This population has recently been described as a new subspecies, *Delphinium fissum*

subsp. *fontqueri* Ascaso & Pedrol (Ascaso & Pedrol 1991). Following an accurate morphological revision and taking into account the chromosome count reported here, we believe that these plants should belong to *D. bolosii*, a taxon endemic to S Catalonia, known up to now only from the single type locality in Ulldemolins (Blanché & Molero 1983).

This count thus appears to be the second one for this rare species and confirms the dysploid nature ($x = 9$) of this taxon given by Blanché & Molero (l.c.), who studied plant material from the type locality.

The two populations studied have very similar uniform mitotic karyotypes. The karyotype of the population from La Noguera (Fig. 2a) consists of 1 submetacentric and 8 acrocentric chromosome pairs with pairs 2, 4 and 6 satellited. The chromosome size was found to range from 4.1 to 12.6 µm. The corresponding formula is 2sm + 10st + 6st - SAT.

483. *Delphinium emarginatum* C. Presl. subsp. ***nevadense*** (G. Kunze) C. Blanché & Molero — $2n = 16$ (Fig. 1C).

Hs: Granada, Sierra Nevada, Vereda de la Estrella, 37°06'N, 03°22'W, 1200 m, Jun 1993, *J. Molero Mesa* (BCF).

There are two subspecies of *D. emarginatum*, a species endemic to the W Mediterranean area, the typical one in Sicily and N Africa and susbp. *nevadense* endemic to eastern Andalucia (Spain).

This count appears to be the second for plant material of Spanish provenance, and agrees with the result published by Blanché (1991). No karyological data are known for subsp. *emarginatum*.

The apparent size of the chromosomes ranges from 4.9 to 17.6 µm. The chromosome formula is 2m + 2sm + 10 st + 2 st - SAT.

484. *Delphinium fissum* Waldst. & Kit. subsp. ***fissum*** — $2n = 16$ (Figs. 1D, E).

Ga: Alpes Maritimes, between Saint Dalmas de Tende and La Brigue, 44°04'N, 07°38'E, 1050 m, 15 Jun 1993, *Bosch & Simon* (BCF).

— Alpes Maritimes, Saint Valier de Thiey, 43°42'N, 06°45'E, 600 m, 14 Jun 1993, *Bosch & Simon* (BCF).

The chromosome number and karyotype structure of the two studied populations show the normal $2n = 16$ diploid number, as reported by Tischler (1927), Wilde (1931), Sopova & Sekovsky (1981), Altamura & al. (1983) and Koeva-Todorovska (1985). The ideograms consist of 1 metacentric, 1 submetacentric and 6 acrocentric chromosome pairs in the population from Saint Dalmas (Fig. 2b), of which the first longest metacentric chromosome pair has a satellite on its shorter arm which is not always visible. For the population from Saint Valier, an additional chromosome pair (no. 5) is satellited. The chromosome size for the two populations studied ranges from 4.2 to 13.8 µm and their chromosome formulas are 2m - SAT + 2sm + 12st and 2m - SAT + 2sm + 10st + 2st - SAT, for the Saint Dalmas and Saint Valier populations, respectively.

These are the first records for French populations of this species and they are in agreement with those reported for the other W Mediterranean subspecies *D. fissum* subsp. *sordidum* (Cuatrec.) Amich & al. ($2n = 16$ given by Rico & al. 1981 and Blanché 1991). According to a recent paper on dysploidy in *Delphinium* (Blanché & al., in press), certain

cases of $2n = 18$ populations also occur in the group of *D. fissum*. The populations of this group from the Alpes Maritimes have been called *D. fissum* var. *narbonense* Huth (cf. Huth 1895). In addition, tetraploid cytotypes of *D. fissum* were reported by Hocquette (1922) and Propach (1940).

485. *Delphinium nydeggeri* Hub.-Mor. — 2n = 16 (Fig. 1F).

An: Niğde, near Çamardi, gorges at the foot of Demirkazik massif, 37°48'N, 35°06'E, 1600 m, 17 Jun 1989, *Blanché, De la Fuente & Molero CB-345*, (BCF).

The authors are not aware of any previous karyological study on this endemic species of Central Anatolia.

It has a diploid karyotype (obtained from flower bud preparations) of 4.84 µm mean chromosome length, clearly bimodal, with two pairs of long, ± metacentric chromosomes and six pairs of acrocentric chromosomes of decreasing size (Fig. 2d). This is highly asymmetric, and corresponds to the general pattern established by Stebbins (1971) for the genera *Delphinium* and *Aconitum* and by Blanché (1991) for perennial species of *Delphinium*. The karyotype formula is $2n = \pm 4m + 12st$.

486. *Delphinium pictum* Willd. subsp. ***pictum*** — $2n = 16$ (Figs. 1G, H).

Bl: Mallorca, Pollensa, Cala Bóquer, 39°54'N, 03°02'E, 100 m, 27 May 1993, *Bosch, Blanché, Orell & JJ. Orell 40096* (BCF).

— Mallorca, road to Cala Tuent, 39°48'N, 02°48'E, 100 m, 27 May 1993, *Bosch, Blanché, Orell & JJ. Orell 40097* (BCF).

In this subspecies, endemic to the Mediterranean islands of Mallorca and Corsica, the chromosome number $2n = 16$ found is the same as that previously reported by Gregory (1941), Contandriopoulos & Cardona (1984) and Blanché (1991). Verlaque et al. (1991) also reported $2n=16$ but they presented some karyotype differences at population level. The karyotype of the Bóquer population consists of 2 metacentric, 1 submetacentric and 5 acrocentric chromosome pairs, while the Cala Tuent population differs by having 3 submetacentric and 5 acrocentric pairs with the longest submetacentric chromosome having a satellite on its long arm. The respective formula for both populations is: 4m + 2sm + 10st, and 2sm - SAT + 4sm + 10st. The presence of a third submetacentric pair has also been reported by Verlaque et al. (1991) for Balearic populations. From the populations added in this paper, the karyotype differentiation pattern in this taxon seems to show distinct variation at island level.

487. *Delphinium staphisagria* L. — $2n = 18$ (Fig. 1I).

Hs: País Valencià (La Marina Alta) , Pedreguer to Llosa de Camatxo, 38°46'N, 00°02'E, 150 m, 26 May 1994, *Bosch, J. Soler & Blanché 39392* (BCF).

In the reviewed literature only the diploid and tetraploid chromosome numbers are mentioned for this species ($2n = 16$ by Hocquette 1922, Lewitsky 1931, Gregory 1941, Maire 1964, Blanché 1991, and $2n = 32$ by Langlet 1927, Gregory 1941, Maire 1964), but our sample had $2n = 18$ chromosomes. As far as we know, this is the first count of a dysploid population of *D. staphisagria* and must be added to the recent cases of dysploids

discovered in the tribe *Delphineae* presented by Blanché* & al. (in press). In the genus *Delphinium*, only *D. bolosii* (this paper) with $2n = 18$ and *D. denudatum* Wallich ($2n = 20$, Sarkar & al. 1982) have been reported as having a different basic number from the general x=8 (Stebbins 1971).

The karyotype of this dysploid taxon (Fig. 2g) consists of 1 very long metacentric and 8 acrocentric chromosome pairs. This fact implies significant differences in the second chromosome pair between euploid diploids (with the second chromosome pair submetacentric) and dysploids of *D. staphisagria*. It is possible that the $2n = 18$ karyotypes could be directly derived from those of $2n = 16$ through fission of the second pair at centromeric level, each pair giving rise to a new chromosome (centric fission) but maintaining the *nombre fondamental*.

The karyotype described here is highly asymmetric and belongs to class 3C in the karyotype classification system established by Stebbins (1971). This result does not correspond to the class that, according to Stebbins, is characteristic for the whole tribe Delphineae, namely 3B.

488. *Delphinium verdunense* Balb. — $2n = 16$ (Figs. 1J, K).

Hs: Catalonia (Alt Penedès), Sant Llorenç d'Hortons, 41°27'N, 01°50'E, fields, 190 m, 10 Jul 1993, *Bosch 40092* (BCF).

— Catalonia (Alta Ribagorça), Castelló de Tor, 42°27'N, 00°44'E, 900 m, 26 Jul 1994, *Blanché 40094* (BCF).

The chromosome number $2n = 16$ corresponds to most of the citations in the literature (Tjebbes 1928, Lewitsky 1931, Mehra & Ramanandan 1972, Al-Kelidar & Richards 1981, Queirós 1990, Blanché 1991). No previous cytological study of this species has been reported from Spain.

The karyotype of all the plants examined (two localities) showed one submetacentric and 7 acrocentric chromosome pairs with sizes ranging from 3.05 to 8.50 μm, considerably shorter than in the perennials (Figs. 2h, i). This karyotype morphology is uniform among all the annual species of *Delphinium*, corresponding to the formula $n =$ 1sm + 7 st.

489. *Consolida ajacis* (L.) Schur — $2n = 16$ (Fig. 1L).

Hs: Catalonia (Alt Penedès) Sant Llorenç d'Hortons, 41°27'N, 01°50'E, 190 m, 04 Jul 1993, *Bosch 40091* (BCF).

The chromosome number $2n = 16$ confirms the result obtained by various authors over a long period (Guignard 1889, Osterwalder 1898, Langlet 1927, Tjebbes 1927, 1928, Kurita 1957, Maire 1964, Mehra & Ramadan 1972, Koul & Gohil 1973, Mandal & Basu 1978, Singh 1982, Subramanian 1985, Bir & al. 1987, and Blanché & al. 1987, for references). The chromosome numbers $2n = 24$ has also been reported for the same species (Bönicke 1911, Maire 1964, Mandal & Basu 1978). Those triploid cytotypes belong to plants cultivated as ornamentals or produced by experimentally induced mutations.

This species shows the chromosome formula 1m + 1m - SAT + 6st, which is asymmetrical and bimodal and has a similar pattern to that observed in most *Delphineae*

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* but see also report 405 by Constantinidis & Kamari in this column. [Ed.]

species. A satellite is present on the short arm of the first metacentric chromosome pair.

490. *Consolida regalis* Gray subsp. ***paniculata*** (Host) Soó — $2n = 16$ (Fig. 1M).

Bu: OPTIMA Excursion to Mts Pirin, Rogen to Rogenski Monastir, 41°34'N, 23°23'E, Jul 1993, *Molero, Rovira & Vallès 40426* (BCF).

There are 2 subspecies of *C. regalis* Gray in the European flora: *C. regalis* subsp. *regalis* and *C. regalis* subsp. *paniculata* (Chater 1993), and the result obtained here ($2n = 16$) is in agreement with most reports given for the species (see Loon 1987, for references), although no distinction into subspecies is made.

The chromosome number for *C. regalis* subsp. *paniculata* was established by Trifonova (1973), Férakóva & Murin (1981), Magulaev (1984) and Hong De-Yuan (1986). The karyotype, reported here for the first time for Bulgarian populations, is to our knowledge similar to those given by Trifonova (l.c.) and Hong De-Yuan (l.c.), both from the easternmost countries of the Caucasian region, and consists of 2 very long submetacentric and 6 acrocentric chromosome pairs, progressively decreasing in size (Fig. 1M).

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Reports (491-517) by Sven Snogerup

491. ***Acanthus spinosus*** L. — $2n = 56$.

Gr: Kiklades, Andros: the village of Amolochos, 500 m, 37°54'N, 24°45'E, 26 Aug 1994, *Snogerup 11601* (LD).

492. ***Achillea ligustica*** All. — $2n = 18$.

Gr: Kiklades, Andros: Ag. Simeon, the vilage area, 450 m, 37°56'N, 24°48'E, 26 Aug 1994, *Snogerup 11598* (LD).

493. ***Atriplex hortensis*** L. — $2n = 18$.

Gr: Kiklades, Andros: the SW part of Batsi near the sea, 37°51'N, 24°47'E, 22 Aug 1994, *Snogerup 11495* (LD).

494. ***Bubonium aquaticum*** (L.) Hill — $2n = 14$.

Gr: Chiou, Chios: Lilikas, fallow field E of the village, near sea level, 38°12'N, 26°04'E, 26 Sep 1993, *Snogerup 10912* (LD).

495. ***Cardopatium corymbosum*** (L.) Pers. — $2n = 36$.

Gr: Chiou, Chios: Lilikas, fallow field E of the village, near sea level, 38°12'N, 26°04'E, 26 Sep 1993, *Snogerup 10913* (LD).

496. ***Carex otrubae*** Podp. — $2n = 60$.

Gr: Kiklades, Andros: Varidion, near the road NW of Tris Pedes, 150-200 m, 37°57'N, 24°45'E, 1 Sep 1994, *Snogerup 11717* (LD).

497. ***Carthamus lanatus*** L. subsp. ***baeticus*** (Boiss. & Reuter) Nyman — $2n = 64$.

Gr: Kiklades, Andros: Moussionas, 200 m, 37°45'N, 24°56'E, 29 Aug 1994, *Snogerup 11663* (LD).
— Kiklades, Andros: c. 1.5 km NE of Batsi, 150 m, 37°52'N, 24°48'E, 26 Aug 1994, *Snogerup 11723* (LD).

498. ***Cirsium creticum*** (Lam.) D'Urv. subsp. ***creticum*** — $2n = 34$.

Gr: Kiklades, Andros: the village of Amolochos, 500 m, 37°54'N, 24°45'E, 26 Aug 1994, *Snogerup 11605* (LD).

499. ***Cirsium steirolepis*** Petrak — $2n = 34$.

Gr: Chiou, Chios: Vikion, near the well NW of the village, 350 m, 38°35'N, 26°01'E, 25 Sep 1993, *Snogerup 10894* (LD).

This species was formerly believed to be a local endemic of Tu: B1 Balikesir, Kaz Dag. It occurs in several localities on Chios.

500. ***Crepis zacintha*** (L.) Babcock — $2n = 6$.

Gr: Kiklades, Andros: SW of Kato Fellos, 50 m, 37°54'N, 24°42'E, 1 Sep 1994, *Snogerup 11708* (LD).

501. ***Crupina crupinastrum*** (Moris) Vis. — $2n = 28$.

Gr: Chiou, Chios: 1.5 km NNW of Emborios, 38°12'N, 26°01'E, 27 Sep 1993, *Snogerup 10943* (LD).

502. ***Cynosurus effusus*** Link — $2n = 14$.

Gr: Kiklades, Andros: Fallikia, 37°48'N, 24°54'E, 31 Aug 1994, *Snogerup 11697* (LD).

503. ***Echinops spinosissimus*** Turra subsp. ***spinosissimus*** — $2n = 28$.

Gr: Chiou, Chios: Ag. Joannis, 1 km NNE of the village, fallow fields, 50-100 m, 38°13'N, 26°04'E, 26 Sep 1993, *Snogerup 10906* (LD).

504. ***Gynandriris sisyrinchium*** (L.) Parl. — $2n = 24$.

Gr: Kiklades, Andros: 2.5 km NE of Akra Apothikes, 300 m, 37°47'N, 24°52'E, 7 Mar 1969, *Snogerup & v. Bothmer 38641* (LD).

505. ***Jurinea mollis*** (L.) Reichenb. — $2n = 34$.

Gr: Chiou, Chios: the village of Amades, 350 m, 38°34'N, 26°02'E, 25 Sep 1993, *Snogerup 10890* (LD).

Subspecies names have not been applied to the plants from Chios, as the infraspecific division is not well understood. This material is very similar to that from W Anatolia and should probably be regarded as belonging to the typical subspecies.

506. ***Lavatera bryoniifolia*** Miller — $2n = 42$.

Gr: Kiklades, Andros: Moussionas, 200 m, 37°45'N, 24°56'E, 29 Aug 1994, *Snogerup*

11662 (LD).

507. ***Milium vernale*** MB. subsp. ***vernale*** — $2n = 10$.

Gr: Chiou, Chios: hill 2 km SW of Kambia, 500 m, 38°34'N, 25°58'E, 30 Sep 1993, *Snogerup 11028* (LD).

The chromosome number $2n = 8$ was found in populations from several localities in Europe (Bennett & Thomas 1991), while the numbers $2n = 10 + 0\text{-}1B$, 14 and 18 have been reported from populations from the former USSR (see Bennett & Thomas l.c., for references). Specimens from Sicily and NW Africa differ in having larger glumes. They will probably have to be regarded as another subspecies. The E Mediterranean material corresponds very well to that from the Black Sea and Caucasus regions on which the original description was founded. The species is comparatively common throughout Greece but appears to be more or less calcifuge and therefore scattered.

508. ***Onopordon illyricum*** L. — $2n = 34$.

Gr: Chiou, Chios: SE of Dievcha, 38°28'N, 25°59'E, 30 Sep 1993, *Snogerup 11022* (LD).

509. ***Phalaris paradoxa*** L. — $2n = 14$.

Gr: Chiou, Chios: NNW of Lithion, the harbour area of Paralia Papouri, 38°21'N, 25°59'E, 24 Sep 1993, *Snogerup 10852* (LD).

510. ***Plantago commutata*** Guss. — $2n = 20$.

Gr: Chiou, Chios: 1.5 km NNW of Lithion, Paralia Papouri, saline marsh and fields S-SE of the harbour, 0-5 m, 38°21'N, 25°59'E, 24 Sep 1993, *Snogerup 10838* (LD).
— Chiou, Chios: Ag. Joannis, 1 km NNE of the village, fallow fields, 50-100 m, 38°13'N, 26°04'E, 26 Sep 1993, *Snogerup 10907* (LD).

This species differs cytologically from *P. coronopus* L. which has $2n = 10$ as well as with respect to several morphological characters. The clavate scape, shorter than or equalling the leaves, is a good character to distinguish it from *P. coronopus*, which also occurs in N Greece and some Aegean islands. The name *P. weldenii* Reichenb., sometimes applied to *P. commutata*, was given to a dwarf form with short but non-clavate scape and short, lax spike. The group is in need of further revision.

511. ***Poa bulbosa*** L. — $2n = 28$.

Gr: Kiklades, Andros: Fallikia, 37°48'N, 24°54', 31 Aug 1994, *Snogerup 11698* (LD).

512. ***Pulicaria dysenterica*** (L.) Bernh. — $2n = 18$.

Gr: Kiklades, Andros: Moussionas, 200 m, 37°45'N, 24°56'E, 29 Aug 1994, *Snogerup 11665* (LD).

513. ***Reseda luteola*** L. — $2n = 26$.

Gr: Chiou, Chios: 1 km SE of Chalandra, roadside, 550 m, 38°32'N, 25°56'E, 28 Sep 1993, *Snogerup 10967* (LD).

514. ***Sinapis alba*** L. subsp. ***mairei*** (Lindb. fil.) Maire — $2n = 24$.

Gr: Kiklades, Andros: Opiso Meria, 100-150 m, 37°44'N, 24°55'E, 29 Aug 1994, *Snogerup 11679* (LD).

This subspecies differs from the typical one in having one or a few seeds in the rostrum and always brown seed. It occurs as a weed and in ruderal places and roadsides throughout Greece and has not been seen cultivated.

515. ***Scrophularia lucida*** L. — $2n = 26$.

Gr: Kiklades, Andros: Moussionas, 200 m, 37°45'N, 24°56'E, 29 Aug 1994, *Snogerup 11667* (LD).

516. ***Smyrnium olusatrum*** L. — $2n = 22$.

Gr: Chiou, Chios: the NW part of the town, 38°22'N, 26°07'E, 1 Oct 1993, *Snogerup 11032* (LD).
— Chiou, Chios: the town of Chios, around the castle ruins, 38°23'N, 26°08'E, 29 Sep 1993, *Snogerup 11021* (LD).

517. ***Trachynia distachya*** (L.) Link — $2n = 20$.

Gr: Kiklades, Andros: c. 1.5 km ESE of Akra Apothikes, 80-200 m, 37°47'N, 24°52'E, 21 May 1968, *Snogerup & v. Bothmer 32622* (LD).

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Reports (518-523) by Marta Margelí, Josep M. Montserrat, Joan Pedrola-Monfort & Joan Vallès

518. ***Androcymbium gramineum*** (Cav.) McBride — $2n = 18$ (Fig. 1a, b).

Hs: Almería, Charco del Lobo, 37°06'N, 02°20'W, Dec 1989, *Caujapé-Castells & Pedrola-Monfort 818175*, cultivated in Jardí Botànic Marimurtra (BC).

Ma: Dar el Beida, Aïn Harrouda, geophyte meadow, 33°30'N, 07°28'W, 1 Dec 1990, *Herrero-Borgoñon, Pedrola-Monfort & Vallès 40432*, cultivated in Jardí Botànic Marimurtra (BC).

The count from the Spanish population confirms those previously published by Angulo (1954 - cited under her second name, Carpio) and Fedorov (1969). The somatic number of the Moroccan population agrees with that of the Iberian one, but not with the only previous report from North African plants, published by Reese (1957, sub *A. punctatum* (Cav) Baker), who counted $2n = 16$ chromosomes in material from N Sahara, without indicating specific provenance.

519. *Androcymbium hierrense* Santos-Guerra — $2n = 18$ (Fig. 1c, d).

Cn: Gomera, Hermigua, 29°08'N, 17°04'W, Nov 1990, *Pedrola-Monfort 818181*, cultivated in Jardí Botànic Marimurtra (BC).
— La Palma, Mazo coast, 29°32'N, 17°48'W, Dec 1989, *Pedrola-Monfort & Santos-Guerra 818180*, cultivated in Jardí Botànic Marimurtra (BC).

The chromosome number reported here for this endemic of the W Canary islands agrees with the only previous count based on material from Hierro island (Ortega 1980). The counts from the Gomera and La Palma populations are the first reports for this taxon from those islands. In both populations a satellited chromosome pair was observed.

520. *Androcymbium palaestinum* Baker — $2n = 18$ (Fig. 1e).

IJ: Dimona, 31°30'N, 35°10'W, Feb 1989, *Avishai 818187*, cultivated in Jardí Botànic Marimurtra (BC).

Our results agree with the only published count for this taxon (Cave 1967). The presence of one pair of satellited chromosomes was observed.

521. *Androcymbium psammophilum* Svent. — $2n = 18$ (Fig. 1f).

Cn: Lanzarote, Famara beach, 29°10'N, 13°24'W, Dec 1989, *Pedrola-Monfort* (Jardí Botànic Marimurtra (BC), cultivated *1322*).

The chromosome number $2n = 18$ for this species, endemic to the Eastern Canary islands agrees with those of Borgen (1970, sub. *A. fuerteventurae* Kunkel & Sunding) and Bramwell & al. (1971), both carried out on material from Fuerteventura.

522. *Androcymbium rechingeri* Greuter — $2n = 18 + 0\text{-}2B$ (Fig. 1g).

Cr: Kisamos, Elaphonisi islet, 35°16'N, 23°32'E, Dec 1991, *Pedrola 818192*, cultivated in Jardí Botànic Marimurtra (BC).

To our knowledge this is the first report on the chromosome number of this taxon, growing on the islet of Elaphonisi (Kriti) and in some parts of the North African coast. It confirms the most frequent basic number ($x = 9$) and the only ploidy level ($2x$) currently known in the genus. The presence of 0-2B chromosomes was observed.

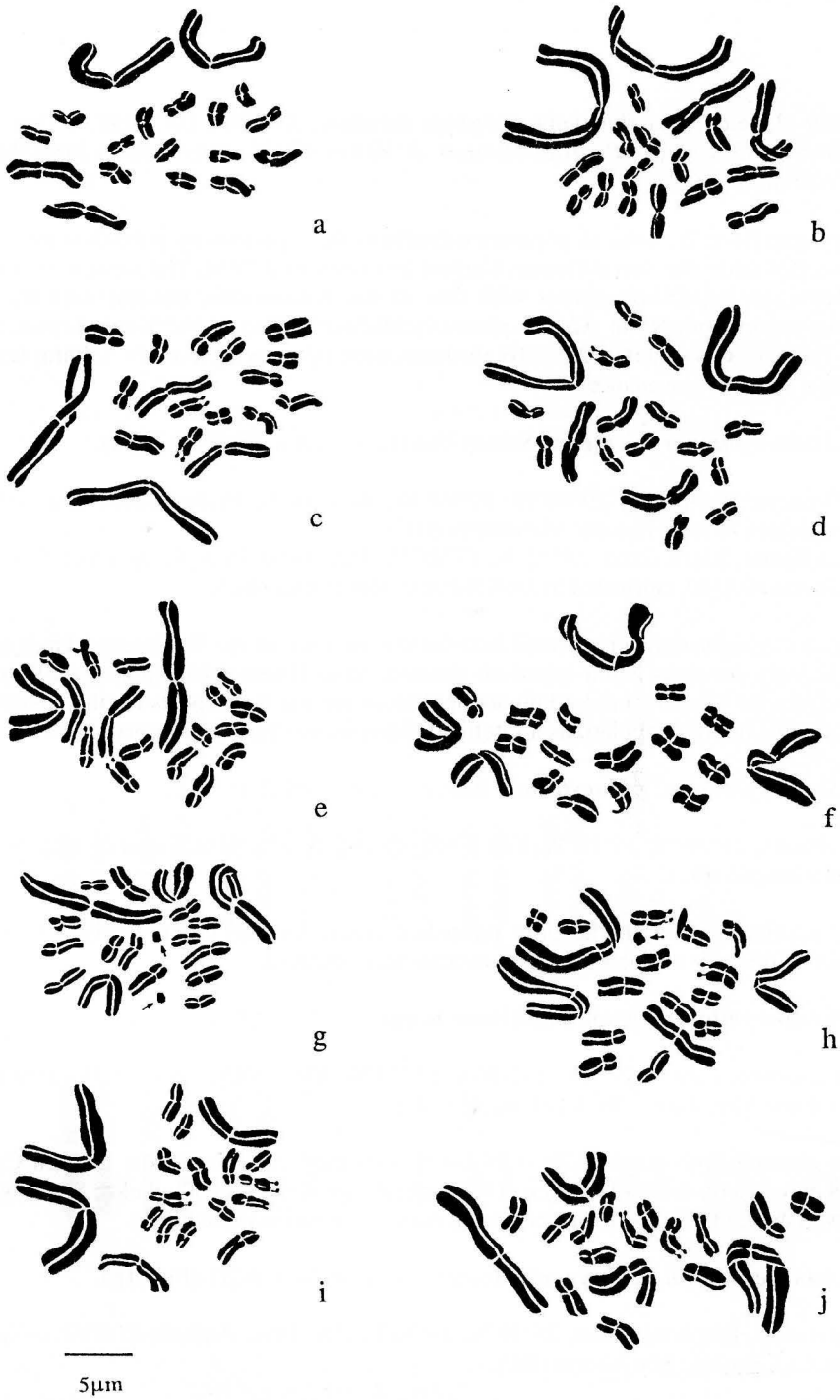

Fig. 1. a-j: Mitotic metaphase of *Androcymbium*. a-b, *A. gramineum*: a, Charco del Lobo; b, Aïn Harrouda; c-d, *A. hierrense*: c, Hermingua; d, Mazo; e, *A. palaestinum*; f, *A. psammophilum*; g, *A. rechingeri* (arrow indicates B-chromosomes); h-i, *A. wyssianum*: h, Igli; i, Meski; j, Nefta. - Scale bar = 5µm.

523. ***Androcymbium wyssianum*** Beauverd & Turrett — $2n = 18 + 0\text{-}1B$ (Figs. 1h, i, j).

Ag: Saoura, Igli, 30°21'N, 02°25'E, Apr 1990, *Montserrat & Pedrola-Monfort* (Jardí Botànic Marimurtra (BC), cultivated *1322*).
Ma: Qsar es Souk, Source Bleue de Meski, 31°55'N 05°42'E, Feb 1992, *Caujapé-Castells & Pedrola-Monfort 818184*, cultivated in Jardí Botànic Marimurtra (BC).
Tn: Gafsa, 6km SW of the town of Nefta, 33°50'N, 07°48'E, Jan 1991, *Caujapé-Castells & Pedrola-Monfort 818184*, cultivated in Jardí Botànic Marimurtra (BC).

Our results constitute, according to our data, the first chromosome number report for this species. One pair of satellited chromosomes was observed in all populations. The presence of 0-1B chromosomes was also noted for the Algerian population.

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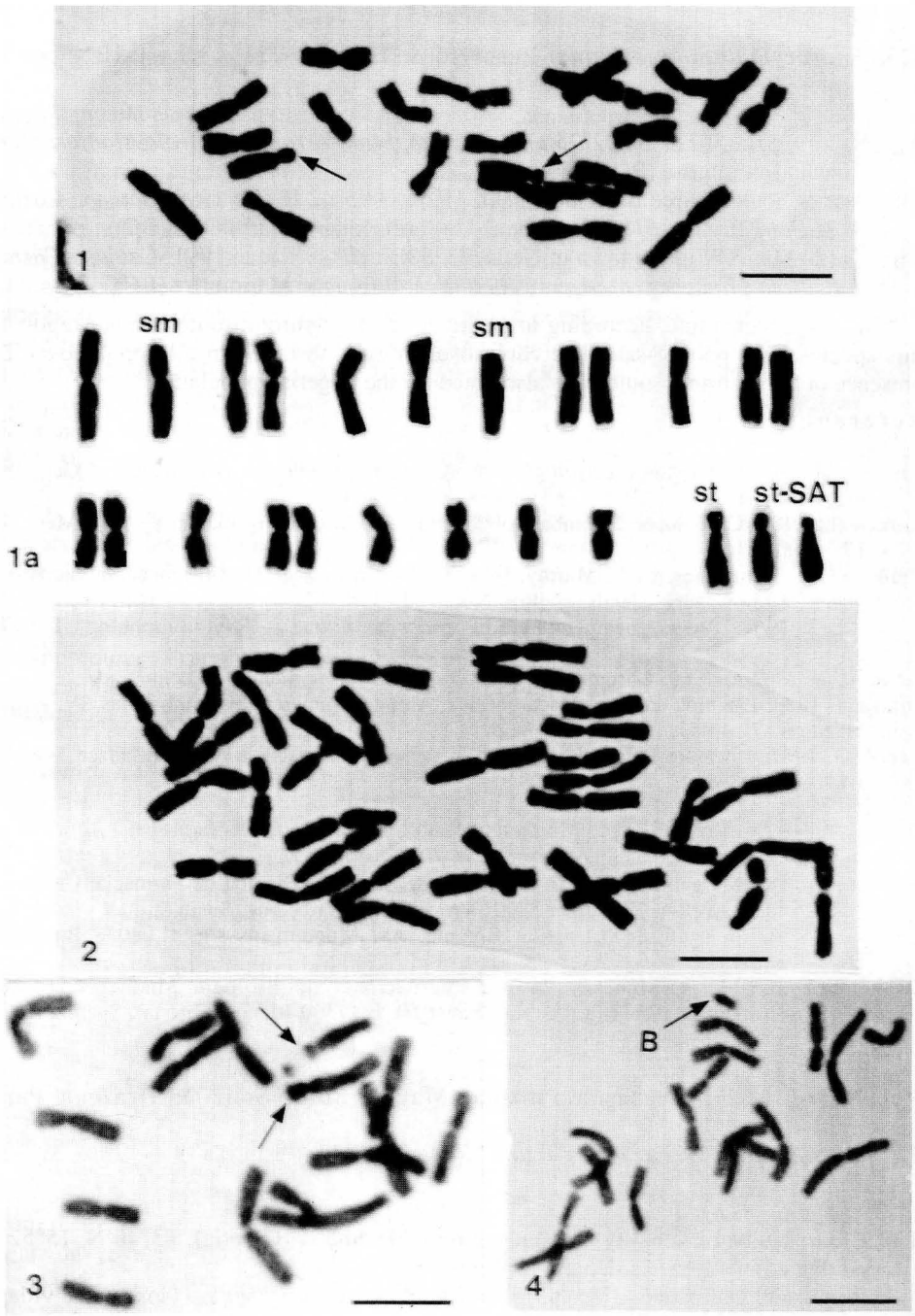
Reports (524-527) by Jasna Puizina, Marija Edita Solič & Dražena Papeš

524. ***Allium cepa*** L. var. ***viviparum*** (Metzg.) Alef. ("Ljutika") — $2n = 3x = 24$ (Fig. 1).

Ju: Croatia, Sibenik locality, coastal region of Dalmatia (Croatia), 43°46'N, 15°52'E, cultivated in a local garden, 55 m, Aug 1987.
— Primosten, Dalmatia, 43°35'N, 15°57'E, cultivated in a vineyard close to the village, 250 m, 1992.
— Rijeka, the North Adriatic coastal region of Kvarner 45°20'N, 14°23'E, cultivated in a local garden, 150 m, 1994.
— Selca, the island of Brač, 43° 00'N, 16°41'E, cultivated in a local garden in the village, 114 m, 1995.



Figs. 1-4. *Allium*: 1, Karyotype and 1a, karyogram of *Allium cepa* var. *viviparum*, $2n = 3x = 24$; 2, *Allium neapolitanum*, $2n = 5x = 35$; 3, *Allium cepa* var. *viviparum*, $2n = 16$; 4, *Allium pallens* subsp. *pallens*, $2n = 16 + 1B$. - Arrows indicate satellite chromosomes. Scale bar = 10 µm.

This is the first count of the European natural triploid variety of the common onion, *Allium cepa* L. It was recorded by Papeš & Bilić (1988) and Puizina & Papeš (1995). "Ljutika" (shallot in Croatian) is widespread and traditionally cultivated in the coastal regions of Croatia. The only previously known spontaneous polyploid cultivar of the common onion was the Indian triploid viviparous onion "Pran" ($2n = 3x = 24$) which is extensively grown in Kashmir (India) (Singh & al. 1967).

The karyotype of the material examined consists of $2n = 3x = 19m + 2sm + 1st + 2st$ -SAT = 24 chromosomes with sizes ranging from 5.7-13.2 µm (Fig. 1a). Very small satellites were observed on two smaller subtelocentrics. Structural heterozygosity is very pronounced in the triploid karyotype indicating its allopolyploid origin. Occasional homology was observed between two or three chromosomes with predominant heteromorphy.

525. ***Allium cepa*** L. var. ***viviparum*** (Metzg.) Alef. - ("Ljutika talijanka" or "Italian shallot") — $2n = 16$ (Fig. 3).

Ju: Croatia, the village of Muc, near Split, Dalmatia, 43°41'N, 16°28'E, cultivated in a local garden, 470 m, Jul 1990.
— Split, Dalmatia, 43°30'N, 16°27'E, cultivated in a garden in a suburb of Split, 34 m, 1995.

Our count of $2n = 16$ agrees with that reported by several other authors (Jones & Mann 1963, Bozzini 1964, Singh & al. 1967, Koul & Gohil 1971, Vosa 1976, Langer & Koul 1983).

526. ***Allium pallens*** L. subsp. ***pallens*** - $2n = 16 + 0$ -1B (Fig. 4).

Ju: Croatia, Osejava, Makarska, Dalmatia, 43°17'N, 17°02'E, sandy stony places near the sea, 0-100 m, Jul 1994.

The chromosome number $2n = 16$ confirms earlier counts cited by Fedorov (1969) and Stearn (1980). The finding of a B chromosome in some individuals from the Makarska population is reported here for the first time. Tetraploid reports ($2n = 32$) are known for Italy (Marchi & al. 1974).

527. ***Allium neapolitanum*** Cyr. — $2n = 5x = 35$ (Fig. 2).

Ju: Croatia, Osejava, Makarska, Dalmatia, 43°17'N, 17°02'E, dry open and sandy habitats, 0-400 m, 1993.

Our finding of $2n = 5x = 35$ for this Mediterranean species is in agreement with reports by Bruhns (1980) and Pejčinović (1991) for Croatia.

According to many previous studies, *A. neapolitanum* is represented by a polyploid and an aneuploid series ($2n = 14, 21, 28, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40$) with $x = 7$ as the basic chromosome number (Darlington & Wylie 1955, Fedorov 1969, Stearn 1980). Diploid, triploid and tetraploid populations from Palestine were investigated by Kollmann (1973) and Badr & Elkington (1976). In Greece, triploid, tetraploid and pentaploid populations were found (Tzanoudakis 1986). For the Iberian peninsula as well as for the Mediterranean regions of Slovenia, Croatia and Monte Negro, only pentaploid populations were recorded (Bruhns 1980, Pejčinović 1991, Puizina & al. 1994).

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Reports (528-542) by Estella Nazarova & Anahit Goukasian

528. ***Anisantha sterilis*** (L.) Nevski — $2n = 14$.

Cc: Armenia, Yerevan, Avan, 40°08'N, 44°32'E, 1250 m, 1 Jun 1991, *Manakyan 2078* (ERE).

The species is distributed in the Mediterranean area and its surroundings. This is the

first count on Caucasian material of this species. This result is in agreement with many previous records from different areas (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1985, Goldblatt & Johnson 1990, 1991, 1994, Takhtajan 1993). The tetraploid cytotype ($2n = 4x = 28$) is cited by Schulz-Schaeffer (1956), Queiros (1980), Devesa & al. (1990) and Luque & al. (1991).

529. *Arrhenatherum elatius* (L.) J. et C. Presl. — $2n = 28$.

Cc: Armenia, Yerevan, Avan, 40°08'N, 44°32'E, 1250 m, 19 Jun 1991, *Nazarova 2019* (ERE).

This rather small genus is mainly distributed in the Mediterranean region. This result is in agreement with many previous records from other regions (see Fedorov 1969, Moore 1973, 1974, 1977, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, 1991, 1994, Takhtajan 1993). Apparently, the tetraploid cytotype is widespread, as the existence of the diploid cytotype ($n = 7$, $2n = 14$) is mentioned by three authors only on material from Turkmenistan and Spain (Chopanov & al. 1976, Favarger & al. 1979, Romero Zarco 1985, Devesa & al. 1990). Mehra and Sharma (1975), in a study on Himalayan material, mentioned an octoploid cytotype ($n = 28$).

530. *Avena fatua* L. — $2n = 42$.

Cc: Armenia, Razdan region, Fontan, 40°23'N, 44°42'E, 1800 m, 14 Aug 1991, *Nazarova 2023, 2061* (ERE).
— Armenia, Yerevan, Nork, 40°08'N, 44°34'E, 1350 m, 15 Jul 1993, *Nazarova 2064* (ERE).

The species is widespread in the Mediterranean region. It is represented by a hexaploid cytotype which is apparently of hybrid origin. Numerous investigators give only $2n = 42$ for this species (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, 1994, Takhtajan 1993). Only Mehra & Remanadan (1973) have reported $n = 7$ and $n = 14$ on Himalayan material.

531. *Boissiera squarrosa* (Banks et Soland.) Nevski — $2n = 14$.

Cc: Armenia, Artashat region, Kakhtsrashen, 39°57'N, 44°39'E, 930 m, 15 Jun 1994, *Fajvush 2123* (ERE).

Monotypic genus, distributed in the eastern Mediterranean area, up to the Himalayas. This chromosome number, first reported for Caucasian material, agrees with previous counts for Afghanistan (Podlech & Dieterle 1969) and Turkmenistan (Chopanov & al. 1973).

532. *Briza media* L. — $2n = 14$.

Cc: Armenia, Dilijan, 40°45'N, 44°53'E, 1500 m, 30 Jun 1989, *Khandjian 1912* (ERE).

This species is widely distributed in Europe. This is the first count on Armenian material of this species. This result is in agreement with many previous records from

elsewhere. Many investigators have found a tetraploid cytotype with $2n = 28$ and the presence of 1-8 B-chromosomes in diploid and tetraploid cytotypes (Fedorov 1969, Moore 1973, 1977, Goldblatt 1984, 1985, 1988, Goldblatt & Johnson 1991, 1994, Takhtajan 1993).

533. *Bromus japonicus* Thunb. — $2n = 14$.

Cc: Armenia, Ararat region, Khosrov reserve, 40°55'N, 44°50'E, 1000 m, 12 Jul 1983, *Khandjian 1921* (ERE).

This species is widely distributed in the Old World. It was first counted in Transcaucasian material. The observed chromosome number is in agreement with counts from elsewhere (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1988, Goldblatt & Johnson 1990, 1991, Takhtajan 1993). The diploid cytotype has been published in several reports, but the tetraploid (Mehra & Sharma 1977, Sharma & Sharma 1979) and hexaploid cytotypes with $2n = 28$ and $2n = 36$, respectively have been found only in Himalayan material.

534. *Catabrosa aquatica* (L.) Beauv. — $2n = 30$.

Cc: Armenia, Dilijan, Golovino, 40°43'N, 44°54'E, 1500 m, 28 Jun 1989, *Khandjian 1920* (ERE).

Monotypic genus, rather widespread. Numerous investigators mention $2n = 20$ for this species (see Fedorov 1969, Goldblatt 1981, 1984, Goldblatt & Johnson 1990, 1991, Takhtajan 1993). $2n = 20$ is given for the Armenian flora by Sokolovskaya & Probatova (1977). The existence of a diploid cytotype with $2n = 10$ is noted by Sokolovskaya & Probatova (1975) and Davlianidze (1985). Both cytotypes are recorded in the Transcaucasian flora (Lenkoran and Southern Osetia). A hexaploid cytotype with $2n = 30$ was found here. Thus, in the genus *Catabrosa*, a polyploid series with $x = 5$, $2n = 10, 20, 30$ has so far been determined.

535. *Dactylis glomerata* L. — $2n = 14$.

Cc: Armenia, Razdan region, Fontan, 40°23'N, 44°42'E, 1800 m, 14 Aug 1991, *Nazarova 2028* (ERE).

Widely distributed in Eurasia and N Africa. The observed chromosome number is in agreement with many previous records from different areas (see Fedorov 1969, Moore 1973, 1974, 1977, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, 1991, 1994, Takhtajan 1993). For this species, a polyploid series with $2n = 14, 28, 42$ is given. This is the first count in Armenian material of this species.

536. *Echinochloa crus-galli* (L.) Beauv. — $2n = 54$.

Cc: Armenia, Echmiadzin region, Akna lake, 40°10'N, 44°14'E, 830 m, 25 Sep 1983, *Khandjian 1927*, (ERE).

Widely distributed in both hemispheres. Polymorphic species with many subspecies.

The count made on the Caucasian material agrees with many other reports. For this species a polyploid series with $2n = 18, 36, 54, 72$ is recorded. The octoploid cytotype is given only for the American material (Gould 1958). In the Indian material a diploid cytotype with $2n = 18$ and an aneuploid one with $n = 24, 25$ (Bir & Singh 1983, Bir & Sahni 1983, 1984) are mentioned.

537. *Festuca brunnescens* (Tzvel.) Galushko — $2n = 28$.

Cc: Armenia, Sevan, Lchashen (m. Bogu-dag), 40°31'N, 44°57'E, 2130 m, 7 Jul 1991, *Oganesian 2139* (ERE).

The chromosome number $2n = 28$ was reported by Alexeev (1974) for this species under the name *F. valesiana* subsp. *brunnescens* (Tzvel.) Alexeev, on material collected from Lake Sevan. The same chromosome number was determined in this study.

538. *Festuca valesiaca* Gaudin — $2n = 14$.

Cc: Armenia, Abovjan, Zovashen, 40°04'N, 44°34'E, 2010 m, 6 Sep 1992, *Oganesian 2138* (ERE).

Our data confirms that given in the literature (Fedorov 1969, Moore 1977, Goldblatt 1988, Takhtajan 1993, Goldblatt & Johnson 1994). Only the diploid cytotype is found in the Armenian flora. However, a polyploid series ($2n = 14, 28, 42$) is reported in the literature for this species.

539. *Melica ciliata* L. — $2n = 18$.

Cc: Armenia, Ashtarac region, Dzorap, 40°17'N, 44°15'E, 1340 m, 11 May 1994, *Nazarova 2069* (ERE).

This species is widely distributed in Europe and Asia Minor. The observed chromosome number is in agreement with counts from elsewhere (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1991, 1994, Takhtajan 1993). Apart from 2n = 18, Doulat (1943) and Baltisberger & Leuchtmann (1991) also give $2n = 20, 30$ and $2n = 36$, respectively.

540. *Melica uniflora* Retz. — $2n = 18$.

Cc: Armenia, Idjevan region, Ahnabad, 40°45'N, 45°02'E, 1450 m, 11 Jul 1990, *Khandjian 2086* (ERE).

This species is widely distributed in the Mediterranean area, extending in Europe up to the Southern Scandinavian area. The chromosome number $2n = 18$ confirms previous counts from elsewhere (Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1985, Goldblatt & Johnson 1991, 1994). This is the first study on Caucasian material. The genus *Melica* is of interest because its basic chromosome number, $x = 9$, is unusual for festucoid grasses. Also there is a complete absence of polyploids in this taxon.

541. ***Poa bulbosa*** L. — $2n = 14$.

Cc: Armenia, Yerevan, Avan 40°08'N, 44°32'E, 1250 m, 19 Jun 1991, *Nazarova 2018* (ERE).

This species is widely distributed in Eurasia. This result is in agreement with many previous records from different areas (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, Goldblatt & Johnson 1990, 1991, Takhtajan 1993). However, in this species considerable variation in chromosome number ($2n = 14, 21, 28, 42, 56$), and hence a long aneuploid series, is found.

542. ***Taeniatherum crinitum*** (Shreb.) Nevski — $2n = 14$.

Cc: Armenia, Artashat region, Eranos, 40°03'N, 44°40'E, 1300 m, 25 Jun 1991, *Manakjan 1987* (ERE).

Oligotypic genus, which includes three closely related species, distributed in the countries of the wider Mediterranean area. This is the first count on Armenian material for this species. The chromosome number $2n = 14$ confirms previous counts from elsewhere (see Fedorov 1969, Moore 1973, Goldblatt 1988, Goldblatt & Johnson 1990, Takhtajan 1993).

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Report (543) by Vesna Kostović-Vranješ & Dražena Papeš

543. *Fibigia triquetra* (DC.) Boiss. — $2n = 16$ (Fig. 1).

Ju: Croatia, Klis, *locus classicus*, near the citadel, on rocks, 43°25'N, 14°12'E, c. 360 m, 15 Jun 1993. Material: seeds and *exsiccata* in Split.
— Gata, near the town of Omiš, on rocks, 43°26'N, 14°12'E, c. 245 m, 20 Jun 1994. Material: seeds and *exsiccata* in Split.
— River Cetina canyon, near the town of Omiš, on rocks, 43°25'N, 14°22' E, c. 10 m, 18 Jun 1994. Material: seeds and *exsiccata* in Split.

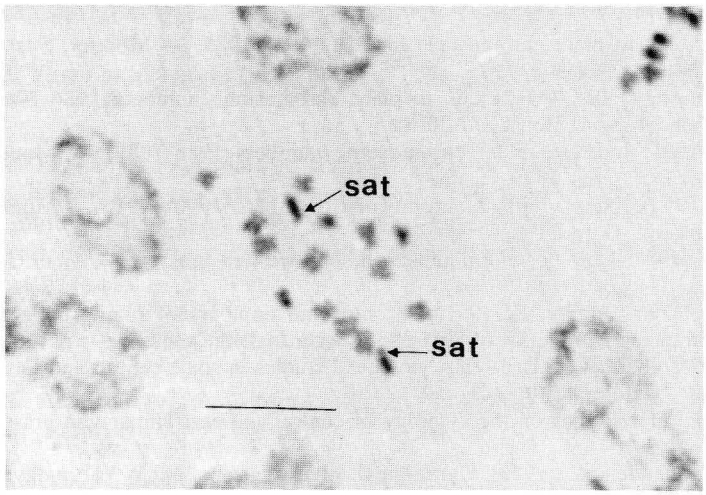

Fig. 1. Metaphase plate of *Fibigia triquetra* (DC.) Boiss., $2n = 16$. - Scale bar = 10 μm.

Endemic to Croatia (central Dalmatia). The chromosome number $2n = 16$ was reported for the first time by Kostović-Vranješ & al. (1994). All cells examined have $2n = 2x = 16$ chromosomes. The karyotype consists of $2n = 2x = 14m + 2m\text{-SAT} = 16$ chromosomes. The chromosomes are small and gradually decreasing in size. Chromosome sizes vary from 2 to 0.9 μm.

Reference

Kostović-Vranješ, V., Vladovic, D. & Papeš, D. 1994: Cytogenetics and new localities of the endemic species *Fibigia triquetra* (DC.) Boiss. — Period. biol. **96**: 372-374

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Report (544) by Riccardo Maria Baldini

544. ***Narcissus tazetta*** L. subsp. ***tazetta*** — $2n = 20 + 1B$ (Figs. 1-2).

It: Island of Giannutri (Tuscany), Vigna vecchia, in a moist small place, 42°15'N, 11°06'08"E, 5 m, 1 Jun 1991, *Z. R. Abrahao da Silva & R. M. Baldini* (cult. Hort. Bot. Firenze BA 4095; *exsicc.* FI, *s.n.*).

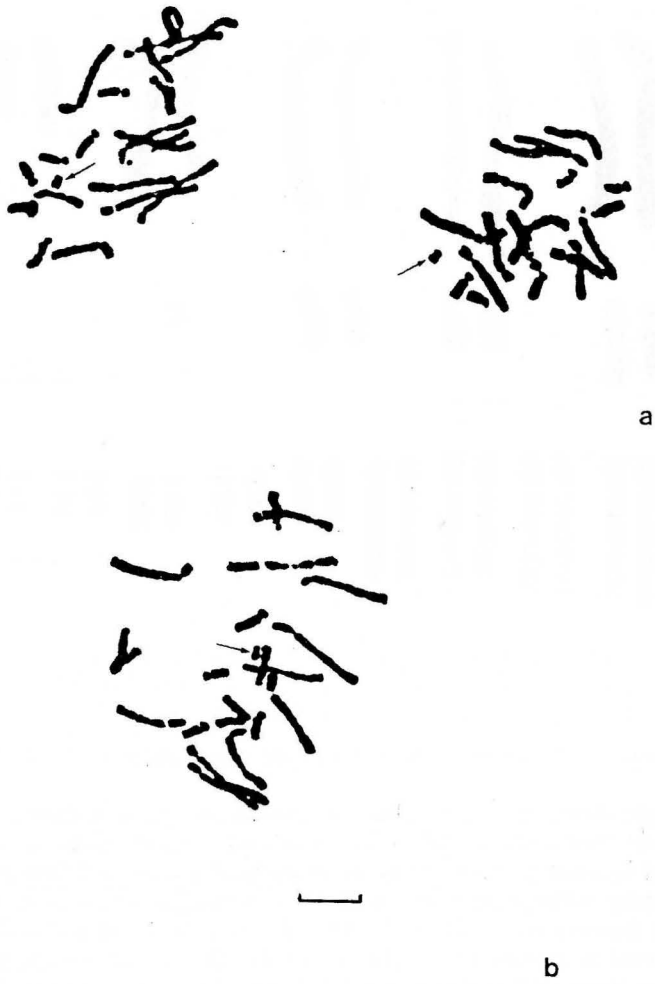

Fig. 1. *Narcissus tazetta* L. subsp. *tazetta*. -- Mitotic methaphase plates (a, b) with B-isochromosomes (arrows). Scale bar = 10μm.

Karyological investigations were made on c-metaphases of meristematic cells from root tips of plants cultivated in 'Horto Botanico Universitatis Florentinae'. After pretreatment with 8-oxyquinoline for 2 hours at room temperature, the root tips were fixed in Carnoy 3:1 for 15 minutes. Hydrolysis in HCl 1N for 4 minutes at 60°C was followed by staining with Feulgen. Squashes were made in 45% acetic acid. The same method was been applied also to the next taxon.

Our investigation confirms the presence of B-chromosomes in this species as pointed out by Weiz & Feinbrun (1972) for populations from Israel.

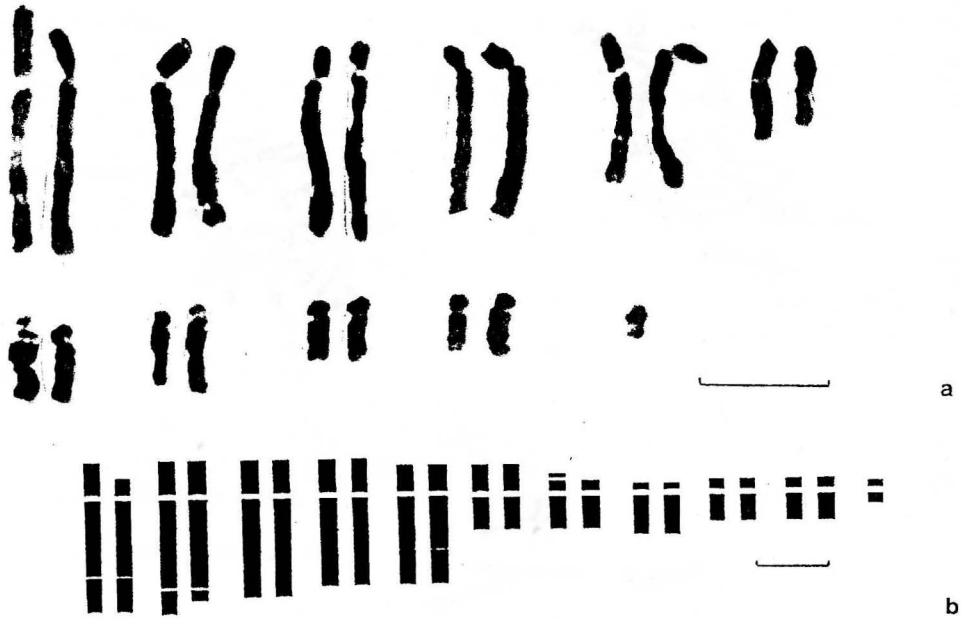

Fig. 2. *Narcissus tazetta* L. subsp. *tazetta* -- Karyotype (a) and idiogram (b). Scale bar = 10μm.

The karyotype shows 20 somatic chromosomes, 6 long pairs, 4 short pairs and one B-isochromosome (Battaglia, 1964). The first and second pairs have a structural heterozygosity. Secondary constrictions are in the first, second and fifth pairs, while two microsatellites are in the seventh and ninth pairs. According to Levan & al. (1964: 217) the karyotypic formula is: $z = 2n = 20$ +1B : 10 sm + 2m + 8st + B and the karyotype can be interpreted as asymmetric (Stebbins, 1971). The present karyotype is similar to that reported by Hong (1982) for Greece (Cyclades, Naxos) without any B-chromosome and Weitz & Feinbrun (1972) for Israel with 1, 2 or 3 B-chromosomes. The mitotic behaviour of the B-chromosome was seen always regular in all counts made (12), without anomalies. This species, investigated cytologically for the near Mount Argentario (Baldini 1990a), and for 'Formiche di Grosseto' (Baldini 1990b), showed always $2n = 20$.

544a. *Narcissus tazetta* L. subsp. ***aureus*** (Loisel.) Baker — $2n = 22$ (Fig.3).

It: Manciano (Tuscany), near 'La Sgrilla', in open fields along the road, 42°35'N, 11°31'E, c. 150 m, 16 Apr 1987, *R. M. Baldini* (cult. Hort. Bot. Firenze BA 4100; *exsicc.* FI, *s.n.*).

This chromosome count confirms the previous ones cited by Maugini (1953) under a different nomenclature. The karyotypic formula according to Levan & al. (1964: 217) is: $z = 2n = 22$: 12sm + 10st. The karyotype is asymmetric (Stebbins 1971). As in *N. tazetta* subsp. *tazetta* secondary constrictions are in the first, second and fifth pairs of chromosome.

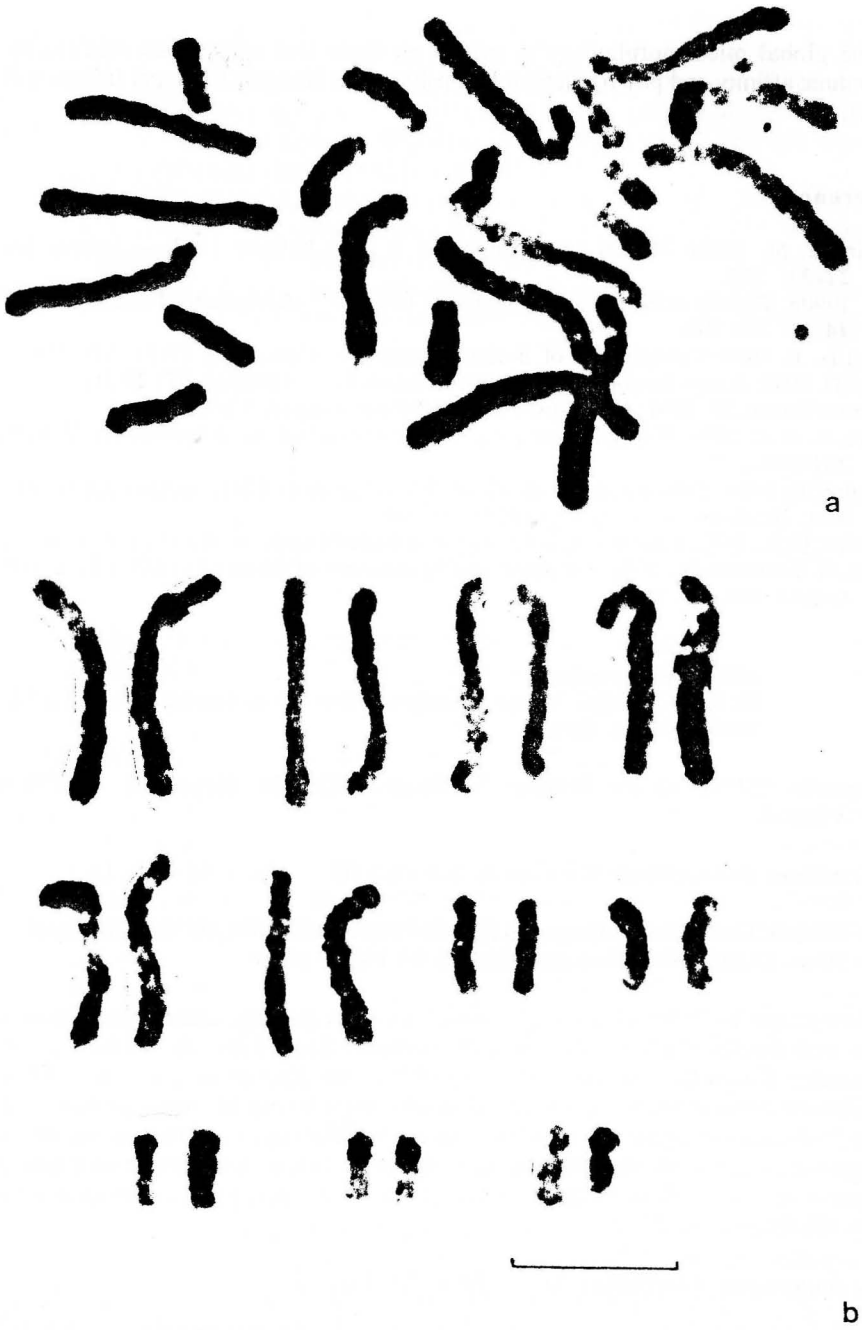

Fig. 3. *Narcissus tazetta* L. subsp. *aureus* (Loisel.) Baker -- Mitotic methaphase plate (a) and karyotype (b). Scale bar = 10μm.

The global micromorphology is similar in these two subspecies confirming their taxonomic affinity and phylogenetic relationships (see Maugini 1953 and Jefferson-Brown 1991).

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Rapports (545-551) de Régine Verlaque, Claude Reynaud & Christiane Vignal

545. ***Allium polyanthum*** Schultes & Schultes fil. — $2n = 32$ (Fig. 1).

Ga: Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, lisière de vignes, 50 m, 13 Juin 1993, *Verlaque* (MARS 93-14).

Cette géophyte du Sud-Ouest de l'Europe, des lieux incultes, champs et pâturages, a été assez peu étudiée du point de vue caryologique. Seuls Löve & Kjellqvist (1973) et Fernandez Casas & Garcia-Villaraco (1981) ont déterminé $2n = 4x = 32$ sur des populations espagnoles de Jaén et des Baléares respectivement. Notre premier comptage pour la France de ce taxon, sur des plantes de l'Hérault, confirme ce même nombre tétraploïde. L'apparente stabilité chromosomique d'*Allium polyanthum* contraste avec la longue série polyploïde de l'espèce voisine euryméditerranéenne *A. ampeloprasum* L. à $2n = 16, 32, 40, 48, 56, 80$.

546. ***Asparagus acutifolius*** L. — $2n = 20$ (Fig. 2).

Ga: Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, bord de garrigue, 50 m, 14 Avril 1993, *Verlaque* (MARS 93-4).
— Bouches-du-Rhône, Carry-le-Rouet, 43°20'N, 05°09'E, garrigue, 6 Mai 1994, *Verlaque* (MARS 94-10).

En dépit de sa fréquence dans les lieux secs et arides (fruticées notamment), cette Liliacée sténo-méditerranéenne (Sud de l'Europe et Afrique du Nord) est très peu connue sur le plan caryologique. *Asparagus acutifolius* présente pourtant deux valences chromosomiques, avec des populations tétraploïdes à $2n = 40$ trouvées en Italie, sur la côte Ligure (Bozzini 1959), et au Sud de l'Espagne, vers Grenade (Ruiz Rejon 1974). Par contre, l'examen de nos deux populations du Sud de la France corrobore l'existence d'un cytotype diploïde à $2n = 20$, décelé seulement par Vernet (1971) dans le Languedoc aux environs de Montpellier. Cette espèce assez polymorphe mériterait donc des recherches cytotaxonomiques plus approfondies, afin de préciser la répartition biogéographique respective et les caractères morphologiques discriminants de ces deux races chromosomiques.

547. *Arenaria serpyllifolia* L. subsp. ***leptoclados*** (Reichenb.) Nyman — $2n = 20$ (Fig. 3).

Ga: Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, pelouse en bordure de garrigue, 50 m, 20 Mai 1992, *Verlaque* (MARS 92-300, 92-301, 92-302).
— Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, lisière de vignes, 50 m, 14 Avril 1993, *Verlaque* (MARS 93-3, 93-4, 93-7).

Sur toutes les populations étudiées du Languedoc, nous avons observé le même nombre diploïde de $2n = 20$ chez ce taxon annuel euryméditerranéen, très fréquent dans les pelouses sèches et les garrigues méridionales. Ces comptages - les premiers pour la France - confirment les résultats obtenus dans d'autres régions de l'aire: Canaries (Larsen 1960), Espagne (Lara Ruiz 1993), Italie et Yougoslavie (Böcher & Larsen 1958), Grèce (Strid & Franzen 1981), Tchécoslovaquie (Dvořák 1984) et Turquie (Celebioglu & Favarger 1993) notamment. Dans l'acceptation taxonomique actuelle (Chater & Halliday 1993), le subsp. *leptoclados* appartient à la vaste "espèce" très polymorphe: *A. serpyllifolia* L. Ce complexe polyploïde, à deux valences chromosomiques, comprend cinq sous-espèces de répartition et d'écologie assez différentes:
- subsp. *serpyllifolia*: $2n = 40$, eurasiatique à subcosmopolite (assez mésophile), lieux incultes de 0 à 2000 m;
- subsp. *macrocarpa* (Lloyd) Perring & P.D. Sell: dunes des côtes européennes de l'Atlantique;
- subsp. *leptoclados* (Reichenb.) Nyman: $2n = 20$, pelouses xériques méditerranéennes, 0-1200 m;
- subsp. *marschlinsii* (Koch) Nyman: $2n = 20$ (Woess 1941), orophyte pyrénéo-alpin, 1800-3100 m;
- subsp. *aegaea* (Rech. fil.) Akeroyd: rochers du littoral centre et sud-égéen.

Bien que les deux cytotypes diploïdes se distinguent du subsp. type tétraploïde par les caractères de leurs capsules, certaines confusions taxonomiques semblent responsables de deux ou trois comptages à $2n = 20$ (contre une quarantaine à $2n = 40$) attribués sans doute à tort au subsp. *serpyllifolia* (Fernándes & Leitão 1971: Portugal près de Coimbra; Natarajan 1981: France près de Montpellier).

548. *Galium parisiense* L.— $2n = 44$ (Fig. 4).

Ga: Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, îlot de garrigue

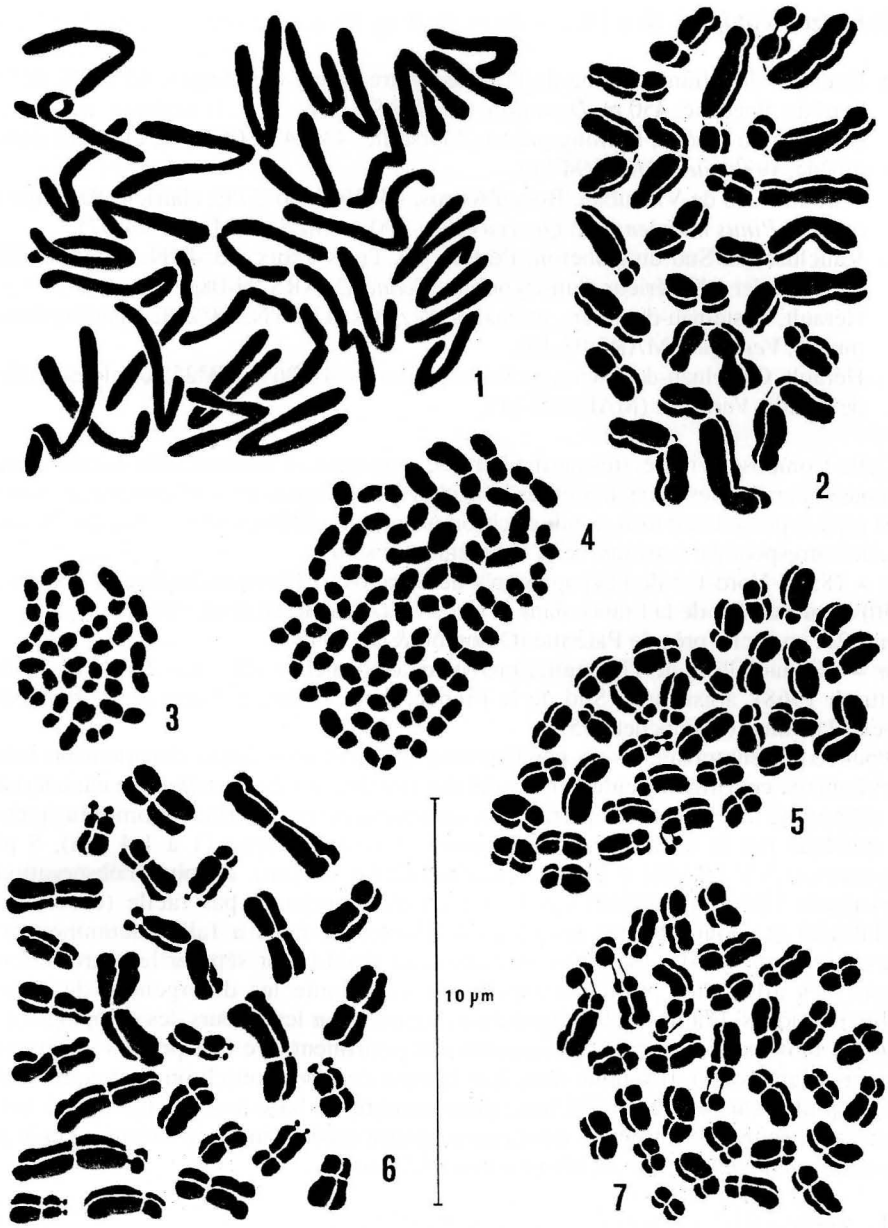
dans des vignobles, 50 m, 13 Juin 1993, *Verlaque* (MARS 93-5, 93-6).

Cette annuelle euryméditerranéenne (pelouses sèches et champs; S, O et C de l'Europe et Afrique du Nord) présente une grande variabilité morphologique et caryologique. En effet, les différentes études chromosomiques (souvent réalisées sur des plantes de jardins botaniques) ont montré l'existence d'une série polyploïde à $2n = 22, 44, (55), 66$ ($x = 11$); mais d'après Kliphuis (1986), les caractères morphologiques ne paraissent pas corrélés de façon évidente avec les niveaux de polyploïdie chez cette espèce. Par contre, du point de vue biogéographique, il semblerait que les trois valences se répartissent en Europe dans des territoires distincts, suivant un gradient plus ou moins polarisé (Nord-Sud). En l'état actuel des connaissances, chez *G. parisiense*, les diploïdes se localisent au Nord-Est de l'aire: en Hongrie (Sz.-Borsos 1971) et au Nord de la Bulgarie (Kliphuis 1986); d'ailleurs, selon ce dernier auteur, les 3/4 des *Galium* des Balkans sont diploïdes. Les tétraploïdes se trouvent dans la zone centrale (sans véritables précisions): Espagne, France et Yougoslavie (Ehrendorfer inédit *in* Moore 1982), Europe moyenne et méridionale (Hubácková inédit *in* Hess & al. 1972). Enfin, les hexaploïdes, souvent instables à $2n = 62, 64, 66$ (aneuploïdie), occupent le Sud du territoire: Baléares (Dahlgren & al. 1971), Sud-Ouest de la Bulgarie dans les Rhodopes (Ancév 1974, 1982) et Grèce (Thessalie: Strid & Franzen 1981; Macédoine: Kliphuis 1986). Nos comptages de populations à $2n = 44$ dans le Sud de la France confirment en partie les estimations (malheureusement non publiées et sans réelles localisations) relatives à la position de la race tétraploïde. Cependant, des recherches cytotaxonomiques complémentaires s'avèrent indispensables pour affiner ces résultats biogéographiques préliminaires et mettre peut-être en évidence les caractères morphologiques discriminants des différents cytotypes.

549. *Globularia vulgaris* L. — $2n = 32$ (Fig. 5).

Ga: Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, garrigue, 50 m, 20 Mai 1992, *Verlaque* (MARS 92-310).

Le genre *Globularia* renferme une trentaine d'espèces, toutes méditerranéennes, dont 2/3 d'endémiques méridionaux diploïdes et quelques polyploïdes souvent à large aire. Or, le groupe de *G. vulgaris* (= section *Aphyllantes* Schwarz) se démarque de ce schéma général. En effet, il comprend six taxons nord-méditerranéens: trois diploïdes ($2n = 16$) dont deux largement répandus (*G. trichosantha* Fischer & C.A. Meyer d'Asie Mineure, *G. bisnagarica* L. du Sud de l'Europe et *G. spinosa* L. du Sud de l'Espagne) et trois polyploïdes occidentaux à aire assez restreinte et parfois disjointe. Il s'agit de trois "espèces" polymorphes et très proches: *G. cambessedesii* Willk. (N de Majorque: $2n = 32$), *G. valentina* Willk. (N-E de l'Espagne: $2n = 32$) et *G. vulgaris* L. (territoire morcelé: C-N & E de l'Espagne, S de la France, îles au S-E de la Suède). Mais, le problème de la distinction et de la répartition respective de ces trois taxons, notamment les deux derniers, est loin d'être résolu. En fait, *G. vulgaris* semble plus variable que les deux autres; il présente des tétraploïdes à $2n = 32$: en Suède (Larsen 1957, Schwarz 1964), en Espagne (Larsen 1957, Contandriopoulos 1978, Rico Hernandez & al. 1982) et dans le Sud de la France en Languedoc ($4x$ compté pour la première fois sur notre territoire), ainsi que des octoploïdes à $2n = 64$ dans le Massif Central (Aveyron: Loon & al. 1971). Le groupe de *Globularia vulgaris* constitue donc un complexe polyploïde en pleine différenciation qui mériterait une étude plus approfondie surtout en France.



Figs. 1-7. Métaphases somatiques de l'ovaire, sauf Fig. 6: méristème radiculaire.- **1**, *Allium polyanthum*, $2n = 32$; **2**, *Asparagus acutifolius*, $2n = 20$; **3**, *Arenaria serpyllifolia* subsp. *leptoclados*, $2n = 20$; **4**, *Galium parisiense*, $2n = 44$; **5**, *Globularia vulgaris*, $2n = 32$; *Leuzea conifera*, $2n = 26$; **7**, *Verbascum sinuatum*, $2n = 30$.

550. *Leuzea conifera* (L.) DC.— $2n = 26$ (Fig. 6).

Ga: Bouches-du-Rhône, chaîne de l'Etoile, Notre-Dame-des-Anges, 43°25'N, 05°31'E, bord de pinède, c. 450 m, *Donadille* (MARS 94-05).
— Bouches-du-Rhône, Luminy près de Marseille, 43°14'N, 05°27'E, clairière dans une pinède, *Verlaque* (MARS 94-06).
— Var, au Nord de Vidauban, Bois d'Astros, 43°26'N, 06°27'E, clairière dans une forêt mixte à *Pinus halepensis* et *Quercus ilex*, 100 m, *Médail* (MARS 94-07).
— Vaucluse, au Sud du Luberon, Pertuis, les Trois Croix, 43°41'N, 05°30'E, 335 m, îlot forestier à l'intérieur d'un vignoble, *Médail* (MARS 94-08).
— Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, clairière dans une pinède, *Verlaque* (MARS 93-10).
— Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, pelouse en lisière de pinède, *Verlaque* (MARS 93-11).

Cette Composée vivace, très particulière, se rencontre en Méditerranée occidentale dans les coteaux arides, les garrigues et les bois clairs. Or, d'après les sept comptages recensés, cette espèce possèderait trois nombres chromosomiques différents ($2n = 18, 22, 26$) qui, en fait, ne correspondent à aucune série cohérente. Ce sont :
• $2n = 18$: au Nord-Est de l'Espagne près de Saragosse (Lorenzo-Andreu & Garcia-Sanz 1950) et au Sud-Est de la France dans le Luberon (Afzal-Rafii & al. 1985) ;
• $2n = 22$: en Sicile près de Palerme (Colombo & al. 1979) ;
• $2n = 26$: dans l'Est de l'Espagne, provinces de Valence (Hellwig 1994) et d'Aragon (Dittrich 1968), ainsi qu'au Sud de la France, dans l'Hérault (Loon & al. 1971) et les Alpes-Maritimes (Guinochet 1957).

Pour ce présent travail, les six populations examinées, dans quatre départements français méridionaux, confirment seulement ce dernier nombre. *Leuzea conifera* se caractérise par un caryotype complexe (constrictions secondaires et satellites nombreux) et très asymétrique par la taille des chromosomes: 5 paires courtes (1 à 1,4 µm), 5 paires moyennes (1,8 à 2,2 µm) et 3 paires longues (2,7 à 3,1 µm). De plus, l'observation des méristèmes fixés directement sur le terrain n'est vraiment pas facile (chromosomes agglutinés) et, pour obtenir des résultats fiables, il nous a fallu recommencer nos dénombrements sur des plantules prétraitées au froid (pour séparer les chromosomes). Toutes ces difficultés pratiques expliquent sans doute les divergences des données bibliographiques. D'ailleurs, les illustrations fournies par les auteurs des comptages à $2n = 18$ et 22 nous paraissent peu convaincantes et pourraient être interprétées différemment (nombres supérieurs). Il semble donc que *Leuzea conifera* soit chromosomiquement une espèce plutôt stable à $2n = 26$, avec pour nombre de base $x = 13$. Ce même nombre caractérise, en outre, l'ensemble des *Leuzea* (quatre espèces méditerranéennes) et le genre voisin *Stemmacantha* Cass. (= *Rhaponticum* Adanson).

551. *Verbascum sinuatum* L.— $2n = 30$ (Fig. 7).

Ga: Bouches-du-Rhône, au Sud de Peyrolles-en-Provence, 43°37'N, 05°35'E, friches, 5 Juin 1992, *Filosa* (MARS 92-12).
— Hérault, Castelnau-de-Guers, au Sud de Pézenas, 43°26'N, 03°25'E, îlot de garrigue dans un vignoble, 50 m, 13 Juin 1993, *Verlaque* (MARS 93-16).

D'après la bibliographie, trois nombres chromosomiques différents ($2n = 18, 24, 30$)

ont été trouvés chez cette espèce bisannuelle euryméditerranéenne, assez commune dans les terrains incultes et arides. L'étude de deux populations provençale et languedocienne confirme le nombre le plus courant de $2n = 30$, déjà signalé en divers points de l'aire de *V. sinuatum* par: Fernandes & al. (1977) au Portugal, Nilsson & Lassen (1971) à Majorque, Mori (1957) en Italie, Strid (1971) en Albanie et Demeriz & Koktay (1980) en Turquie. Les deux autres cytotypes signalés sont: un diploïde à $2n = 18$ sur le littoral languedocien (Labadie 1976) et peut-être (s'il s'agit vraiment de la même espèce ?) un triploïde à $2n = 24$ dans le Turkménistan (Chuksanova & Kaplanbekova 1971). Ces deux comptages semblent inexplicable, compte tenu des nombres chromosomiques recensés chez les *Verbascum* où prédominent les tétraploïdes à $2n = 30$ ou 32, et où les diploïdes demeurent quasiment inconnus (excepté les deux espèces étudiées par Labadie en 1976). En l'état actuel des connaissances, *V. sinuatum* paraît donc essentiellement constitué de populations aneutétraploïdes (le nombre de base le plus fréquent du genre étant $x = 8$).

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Reports (552-558) by Joan Vallès & Montserrat Torrell

552. ***Artemisia absinthium*** L. — $n = 9$ (Fig. 1 a).

Hs: Castille, Burgos: between Vadocondes and La Vid, cultivated fields in the road verges, 41°35'N, 03°28'W, 50 m, 19 Jul 1984, *Blanché & Vallès* (BCF 33084).

This report of the gametic number is, as far as we are aware, the first count on Iberian material of this species. The chromosomes regularly form 9 bivalents. The number agrees with counts ($n = 9$ or $2n = 18$) carried out on plants coming from neighbouring territories (France: Afzal-Rafii & al. 1985, Verlaque & al. 1987, Morocco: Ouyahya & Viano 1988). This number is shown to be very stable, because it is also the same in many other reports based on plants from very different regions, as for instance Afghanistan (Podlech & Dieterle 1969), Armenia (Agapova & al. 1990), Bulgaria (Kuzmanov 1993, Kuzmanov, Georgieva & Nikolova 1993), Byelorussia (Semerenko 1989), India (Khoshoo & Sobti 1958, Mehra & Remanandan 1974), North America (Morton 1981, Stahevitch & Wojtas 1988), Poland (Skalinska & al. 1959), and Switzerland (Mendelak & Schweizer 1986).

553. ***Artemisia alba*** Turra — $2n = 36$ (Figs. 1 b & 1 c).

Ga: Languedoc-Roussillon, Aude: Tuchan, Montagne de Tauch, summit calcareous rocks of Pech de Fraysse, 42°55'N, 02°42'E, 900 m, 7 Oct 1988, *Blanché, Cauwet-Marc, Simon & Vallès* (BCF 40430) (Fig. 1 b).

Hs: Aragon, Huesca: L'Ainsa del Sobrarbe, slopes 1 km E of the village, in the road to Boltaña. 42°25'N, 0°08'E, 200 m, 16 Jul 1993, *Vallès* (BCF 40429) (Fig. 1 c).

The count in the second population (L'Ainsa) is in fact the first one on Iberian material of the species. Only Valdés-Bermejo (1985) cited $2n = 18$ (for subsp. *glabrescens* (Willk.) Valdés-Bermejo) and $2n = 36$ (for subsp. *alba*) based on his unpublished counts - presumably from Spanish material, but without specifying the provenance of the plants. On the other hand, Ouyahya and Viano (1981) reported the gametic number $n = 9$ for the Moroccan subsp. *chitachensis* (Coss.) Maire, and Cesca (1972) gave the somatic number $2n = 36$ from Italian material of var. *incanescens* (Jord.) Fiori.

Kawatani & Ohno (1964) also counted $2n = 36$ chromosomes for different subspecies and varieties coming from four European origins, at least in part from Botanic Gardens. The same number ($2n = 36$) was given for Bulgarian plants, without specification of infraspecific level (Kuzmanov & Georgieva 1983, cited by Loon 1987) and Sicily (Raimondo et al. 1984). For Central Italy $2n = 54$ was recorded by Capineri et al. (1979).

Lambinon (1986) disagreed with Valdés-Bermejo (1985) in reporting $2n = 36$ chromosomes for what he named *A. alba* cf. subsp. *glabrescens*.

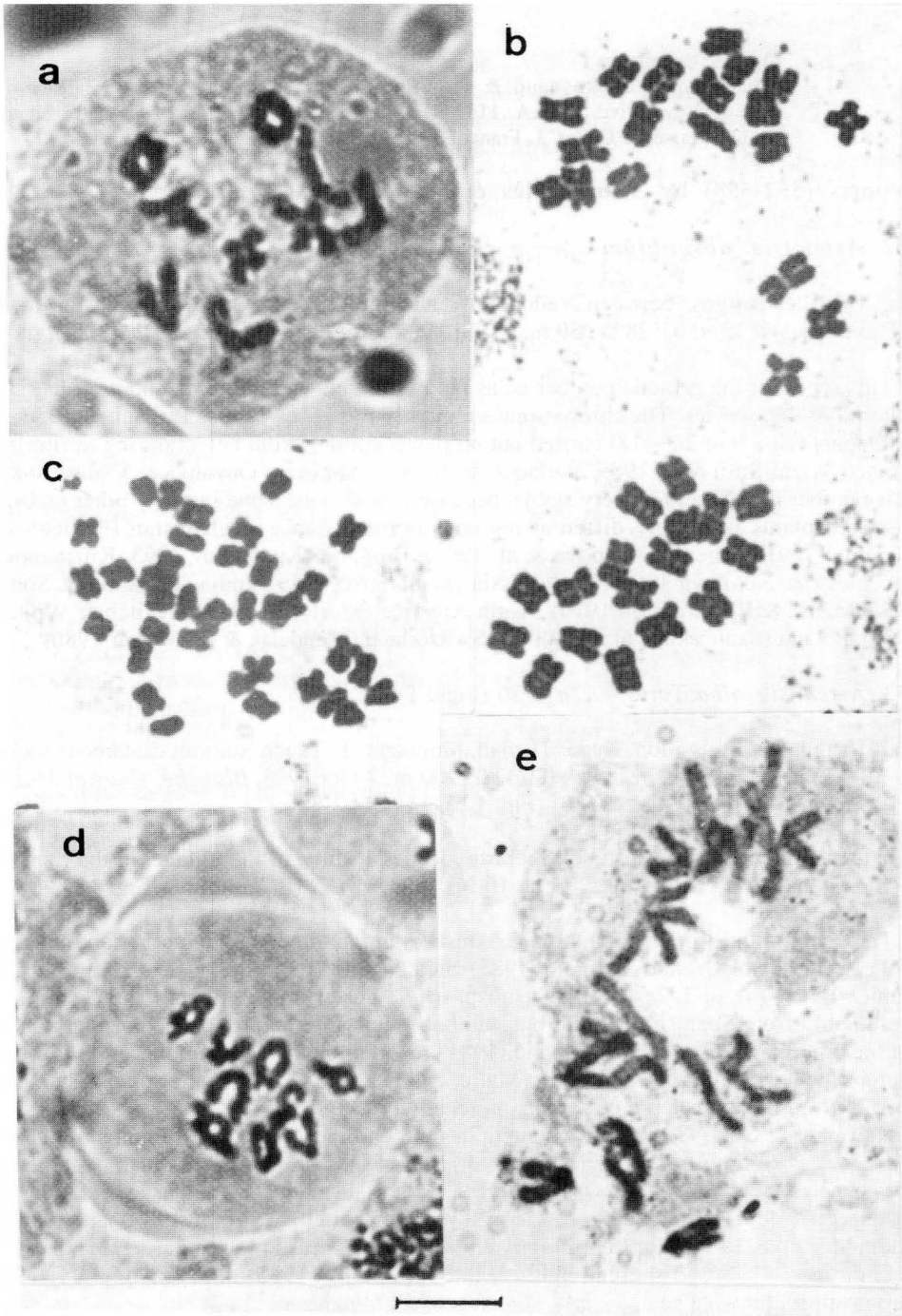

Fig. 1 a-e. *Artemisia*. - Diakinesis of *A. absinthium* (1 a). Mitotic metaphases of *A. alba* (French population - 1 b -, and Iberian population - 1 c). Diakinesis of *A. arborescens* (1 d). Mitotic metaphase of *A. campestris* (1 e).- Scale bar = 5 µm.

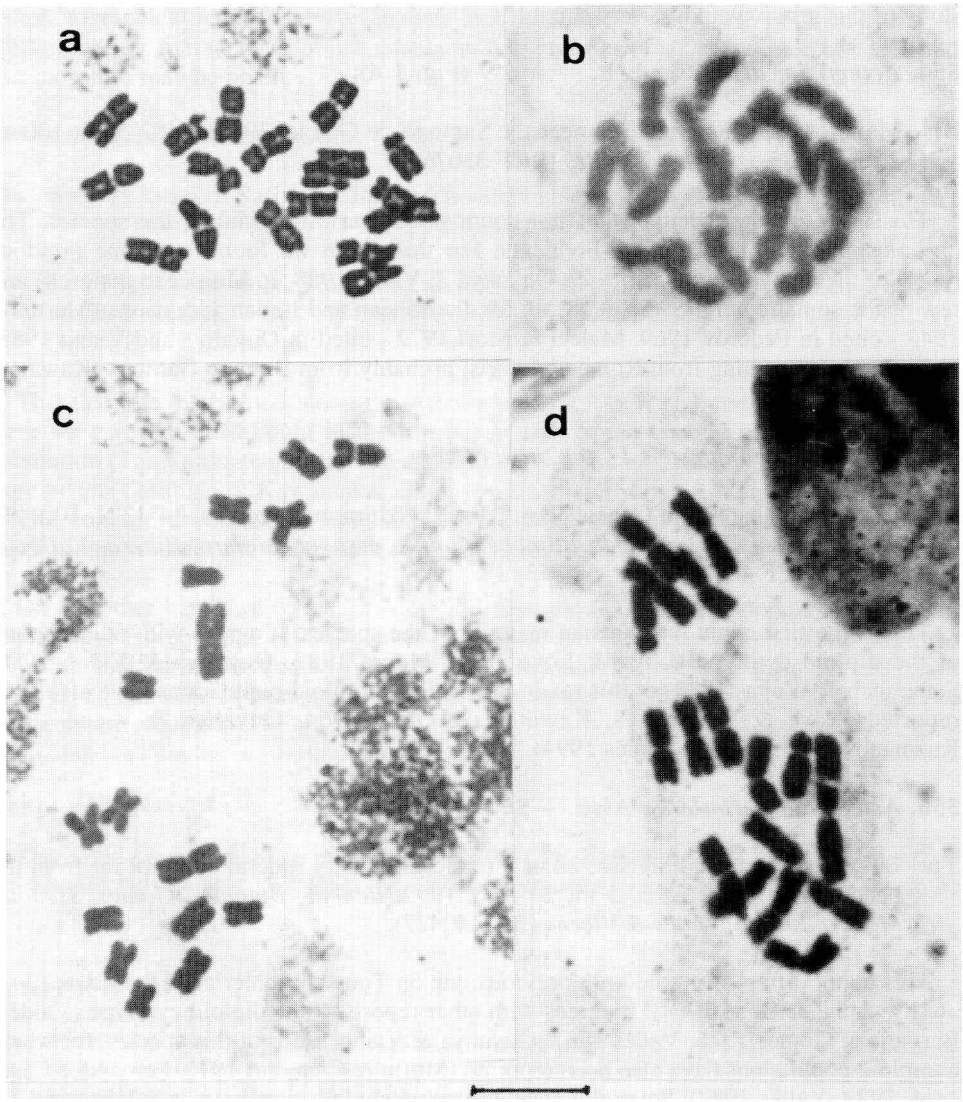

Fig. 2 a-d. *Artemisia*. - Mitotic metaphases of *A. herba-alba* (2 a), *A. molinieri* (2 b), and *A. reptans* (Safi population - 2 c -, and Tan Tan population - 2 d).- Scale bar = 5 μm.

We can now confirm this somatic number with our data from the same population, for which we give, in addition, the photographic record.

If the traditional subdivision of *A. alba* in subspecies is maintained, we agree that this population may belong to subsp. *glabrescens*, but we believe that, as Lambinon (1986) himself stated, the problem is far from being solved and a biosystematic and karyological

study of this group would be very suitable.

554. ***Artemisia arborescens*** L. — $n = 9$ (Fig. 1 d).

Bl: Mallorca: Llucmajor, slopes near the Santuari de Gràcia, 39°33'N, 02°53'E, 100 m, 26 Jun 1985, *Blanché & Vallès* (BCF 33076).

This is, to our knowledge, the first count on Balearic material of the species. The chromosomes regularly form 9 bivalents. For this taxon we found only one previous report of the gametic number ($n = 9$: Ouyahya & Viano 1988, in Moroccan material) and few of the somatic number ($2n = 18$), in Mediterranean and Italian accessions (Martinoli 1943 - cited in Fedorov 1969, Maleci & Mori 1972 - cited in Ouyahya and Viano 1988) and in material coming from Rome and Paris, probably from Botanic Gardens (Kawatani & Ohno 1964).

555. ***Artemisia campestris*** L. — $2n = 18$ (Fig. 1 e).

Tn: Between Maharès and Gabès, 3 km N of Es Skhira, road verges, 34°13'N, 10°04'E, 25m, 24 May 1992, *Benedí, Blanché, Gómez, Issaoui, Molero, Ribera, Vallès & Vicens* (BCF 40428).

This is the first count on Tunisian material of the species. It agrees with other reports of the diploid cytotype (Löve & Löve 1948, Moore 1982, Ouyahya & Viano 1988, Stahevitch & Wojtas 1988) of this taxon, for which tetraploid populations have also been reported (Löve & Löve 1948, Kawatani & Ohno 1964, Ouyahya & Viano 1988, Kuzmanov 1993, Oliva & Vallès 1994).

556. ***Artemisia herba-alba*** Asso — $2n = 18$ (Fig. 2 a).

Tn: Between Hergla and Sousse, 2 km S of Hergla, sandy ruderal sites not far from the beach, 36°2'N, 10°32'E, 5 m, 23 May 1992, *Benedí, Blanché, Gómez, Issaoui, Molero, Ribera, Vallès & Vicens* (BCF 40427).

This count differs from the only previous one on Tunisian material of the taxon ($2n = 36$: Kawatani & Ohno 1964). It agrees with other reports of the diploid cytotype (Valdés-Bermejo & Gómez 1976, Vallès 1987, Ouyahya & Viano 1988) of this species, for which tetraploid populations have also been reported (Murin & Chaudhri 1970, Fernández Casas & al. 1979, Vallès 1987). Several names and taxonomical status have been proposed for different North African populations of this species, which form a complex that deserves a detailed biosystematic study.

557. ***Artemisia molinieri*** Quézel, M.Barbero & R.J.Loisel — $2n = 18$ (Fig. 2 b).

Ga: Provence-Côte d'Azur, Var: Flassans, near the lake Redon, 43°24'N, 06°12'E, *Kerguélen* (MARSSJ; cultivated in the Botanical Garden of Barcelona from material sent in 1989).

This is the second report of the chromosome number of this French endemic and it agrees with the first (Quézel, Barbero & Loisel 1966). In respect to the first count, we add

the photographical record and we can state that the karyotype is rather symmetrical, with predominating metacentric and submetacentric chromosomes. One pair of satellited chromosomes may be noted.

558. ***Artemisia reptans*** Ch. Sm. in Buch — $2n = 16, 18$ (Fig. 2 c, d).

Ma: Safi, 15 km S of Safi, near Jorf el Yhoudi, calcareous sea cliffs, 32°18'N, 09°17'W, 100 m, 14 Jul 1990, *Garcia Jacas, Susanna & Vallès* (BCF 37108). ($2n = 16$, Fig. 2c).

— Tan Tan: 33 km to the North of Tan Tan, dry fields near the Oued Drâa, 28°33'N, 10°55'W, 100 m, 4 Dec 1990, *Herrero-Borgoñón, Pedrola & Vallès* (BCF 40431). ($2n = 18$, Fig. 2 d).

This taxon is distributed along the Atlantic coast of Morocco and in Canary Islands. Here we give the third count in the Moroccan area of the species, corresponding to a population (Tan Tan) situated ca. 700 and 500 km S from those in which previous reports were given (Casablanca: Kawatani & Ohno 1964, Safi: Ouyahya & Viano 1988).

The somatic chromosome number $2n = 18$ is coincident with the three Moroccan populations, whereas the only count from Canarian material gave $2n = 16$ chromosomes (Borgen 1969).

On the other hand, we found $2n = 16$ chromosomes in the same population (Safi) in which Ouyahya & Viano (1988) counted $n = 9$ and $2n = 18$ chromosomes. Although we are aware that our results come from only one individual (the only one from our collection to survive), this case of aneuploidy indicates that further detailed cytogenetical studies of this taxon are required.

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Rapports (559-589) de Lara Ruiz

559. *Cephalanthera damasonium* (Miller) Druce — $2n = 36$.

Hs: Almería, Sierra de María, lieux humides, 1475 m, 02°15'00"N, 37°35'00"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra del Buitre, lieux humides, 1300 m, 02°50'00"N, 37°50'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, Huerta del Cura, hallier humide, 575 m, 03°00'00"N, 38°00'00"E, Jul 1988, *J. Lara Vicente*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, bois, 1460 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, lieux humides, 1300 m, 02°00'00"N, 37°40'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de la plupart des auteurs (cf. Goldblatt 1984, 1985, Goldblatt & Johnson 1990, Mrkvicka 1992) même si d'autres comptages - $2n = 32$ (Goldblatt 1985), $2n = 54$ (Goldblatt 1985) - sont connus.

560. *Cephalanthera rubra* (L.) L.C.M. Richard — $2n = 48$.

Hs: Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Los Estrechos, hallier sec, 1050 m, 03°00'00"N, 38°00'00"E, Jun 1990, *J. Lara Vicente*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Bonestarre, bois sec, 1000 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Titz (1966), sur des plantes autrichiennes et ceux de la plupart des auteurs (cf. Tanaka & Kamemoto 1974, 1984; Goldblatt & Johnson 1990, Mrkvicka 1992) même si d'autres comptages - $2n = 36$, 44 (Tanaka & Kamemoto 1974, 1984, Golblatt 1984, 1985, 1988, Goldblatt & Johnson 1990, Mrkvicka 1992) - sont connus.

561. *Coeloglossum viride* (L.) Hartman — $2n = 40$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Clotada d'Aguiló, pré, 2000 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Richardson (1935), Heusser (1938), sur des plantes suisses, Löve & Löve (1944, 1956), islandaises, Mutsuura & Nakahira (1960), japonaises, Gadella & Kliphuis (1963), hollandaises, Kliphuis (1963) et Afzelius (1943) même si d'autres comptages - $2n = 41, 42$ (Goldblatt 1985, Mrkvicka 1992) - sont connus.

562. *Corallorhiza trifida* Chatel. — $2n = 42$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, bois humide, 1500m, 01°00'15"N, 42°00'30"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).

C'est le premier comptage sur des plantes ibériques. Nos résultats confirment ceux de Löve & Löve (1948, 1956), Löve (1954) et Jörgensen et al. (1958), sur des plantes du Groenlande et ceux de la plupart des auteurs (cf. Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, 1994, Mrkvicka 1992) même si d'autres comptages - $2n = 38$, 40, 48 (Golblatt 1984, 1988, Mrkvicka 1992) - sont connus.

563. *Dactylorhiza sambucina* (L.) Soó subsp. ***sambucina*** — $2n = 40$.

Hs: Almería, Sierra de María, pré humide, 1200 m, 02°15'00"N, 37°35'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra de Castril, pré humide, 1175 m, 02°50'00"N, 37°50'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, Cerrada del Yegüero, hallier humide, 1300 m, 03°00'00"N, 38°00'00"E, Jul 1985, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de la plupart des auteurs (cf. Heusser 1938, Goldblatt 1984, Goldblatt & Johnson 1990, Mrkvicka 1992) même si d'autres comptages - $2n = 42$ (Hagerup 1938, Goldblatt & Johnson 1985, Mrkvicka 1992) - sont connus.

564. *Dactylorhiza majalis* (L.) Soó — $2n = 40$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, pré humide, 1460 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Goldblatt 1985, 1988, Goldblatt & Johnson 1990) même si d'autres comptages - $2n = 80$ (Golblatt 1981, 1988, Goldblatt & Johnson 1990, Mrkvicka 1992) - sont connus.
Roberts (1966) a publié $4n = 80$, sur des plantes galloises.

565. *Epipactis atrorubens* (Hoffm.) Bess. subsp. ***atrorubens*** — $2n = 40$.

Hs: Lérida, Pyrénées, Alt Urgell, Sierra del Cadí, pré humide, 1600 m, 01°30'00"N, 42°15'00"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).

C'est le premier comptage sur des plantes ibériques.
Nos résultats confirment ceux de la plupart des auteurs (cf. Löve & Löve 1944, Kliphuis 1963, Goldblatt 1981, 1984, 1988, Goldblatt & Johnson 1990, Mrkvicka 1992) même si d'autres comptages - $2n = 36, 48, 60$ (Goldblatt 1985, Mrkvicka 1992) 38 + 2b

(Goldblatt 1988) - sont connus.

566. ***Epipactis microphylla*** (Ehrh.) Swartz — $2n = 40$.

Hs: Almería, Sierra de María, hallier, 1175 m, 02°15'00"N, 37°35'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra de Castril, hallier, 02°50'00"N, 37°50'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).
— Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, Arroyo de las Aguascebas de la Cueva delagua, lieux humides, 1350 m, 03°00'00"N, 38°00'00"E, Jul 1987, *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Alt Urgell, Sierra del Cadí, pré, 1500 m, 01°30'00"N, 42°15'00"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, hallier, 1150 m, 02°00'00"N, 37°40'00"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de la plupart des auteurs (cf. Hagerup 1945, 1947, Meili-Frei 1965, Goldblatt 1988, Mrkvicka 1992).

567. ***Epipactis palustris*** (L.) Crantz — $2n = 40$.

Hs: Almería, Sierra de María, joncs, 1100 m, 02°15'00"N, 37°35'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra de Castril, lieux humides, 1220 m, 02°50'00"N, 37°50'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, joncs, 550 m, 03°00'00"N, 38°00'00"E, Jul 1982, *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, lieux humides, 1460m, 01°00'15"N, 42°00'30"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, lieux humides, 1050 m, 02°00'00"N, 37°40'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Hagerup 1944, 1945, 1947, Löve & Löve 1944b, Gadella & Kliphuis 1963, Kliphuis 1963, Meili-Frei 1965, Goldblatt 1981, 1984, 1988, Goldblatt & Johnson 1990, Mrkvicka 1992).

568. ***Gennaria diphylla*** (Link) Parl. — $2n = 34$.

Hs: Albacete, Calar del Mundo, pinède, 1100 m, 02°30'00"N, 38°15'00"E, Apr 1992, *J. Lara Vicente*, s.n. (BC).
— Almería, Sierra de María, hallier, 1100 m, 02°15'00"N, 37°35'00"E, Apr 1992, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pinède, 1400 m, 03°00'00"N, 38°00'00"E, Apr 1991, *J. Lara Vicente*, s.n. (BC).
— Murcia, Sierra del Gigante, hallier, 1100 m, 02°00'00"N, 37°40'00"E, Apr 1991, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de Dolcher & Dolcher (1961) et de la plupart des auteurs (cf. Goldblatt 1984, Goldblatt & Johnson 1993, Mrkvicka 1992).

569. *Goodyera repens* (L.) R. Br. — $2n = 30$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Anàs, bois, 1100 m, 01°00'15"N, 42°00'30"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Richardson (1935), Löve & Löve (1942), Löve (1954, Malik (1961), Mehra et Bawa (1962) et Kliphuis (1963). Tanaka (1965) a publié $2n = 32$, sur des plantes japonaises. Gadella & Kliphuis (1963) ont publié $2n = 40$. Eftimiu-Heim (1941) a publié $2n = 28, 32$.

570. *Gymnadenia conopsea* (L.) R. Br. — $2n = 40$.

Hs: Albacete, Calar del Mundo, pré, 1050 m, 02°30'00"N, 38°15'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).
— Almería, Sierra de María, pré, 1150 m, 02°15'00"N, 37°35'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra del Buitre, pré, 1200 m, 02°50'00"N, 37°50'00"E, Jul 1986, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pré, 1400 m, 03°00'00"N, 38°00'00"E, Jul 1985 *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Tavascan, pré, 1200 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1000 m, 02°00'00"N, 37°40'00"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Fuchs & Ziegenspeck (1924) et Tischler (1934) ont publié $n = 20$. Heusser (1938) a publié $2n = 40$, $4n = 80$. Tanaka (1965) a publié $2n = 42$.

$2n = 80$, publié de Goldblatt & Johnson (1993), doit être referé à la subsp. *densiflora* (cf. Mrkvicka 1992).

571. *Gymnadenia odoratissima* (L.) L.C.M. Richard — $2n = 40$.

Hs: Lérida, Pyrénées, Alt Urgell, Sierra del Cadí, pré, 1900 m, 01°30'00"N,42°15'30"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Heusser (1938) et ceux de plusieurs Auteurs (cf. Goldblatt 1981, Mrkvicka 1992). Fuchs & Ziegenspeck (1924) ont publié $n = 20$.

572. *Himantoglossum hircinum* (L.) Spreng. — $2n = 36$.

Hs: Almería, Sierra de María, pré sec, 1000 m, 02°15'00"N, 37°35'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Bardazoso, pré sec, 1000 m, 03°00'00"N, 38°00'00"E, Jul 1989 *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Val de Cardós, Tavascan, pré sec, 1175 m, 01°00'15"N, 42°00'30"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré sec, 1000 m, 02°00'00"N, 37°40'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Déliot (1955) et Kliphuis (1963). Heusser (1915, 1938) a publié $2n = 24, 36$.

573. ***Listera cordata*** (L.) R. Br. — $2n = 40$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Val de Cardós, Anàs, bois, 1200 m, 01°00'15"N, 42°00'30"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Gadella & Kliphuis (1963) et Kliphuis (1963). La plupart des auteurs a publié $2n = 38$ ou $2n = 34 + 0\text{-}9b$ (cf. Goldblatt 1981, 1984, 1988, Goldblatt & Johnson 1990, 1993).

574. ***Neottia nidus-avis*** (L.) L.C.M. Richard — $2n = 36$.

Hs: Albacete, Calar del Mundo, hallier, 1200 m, 02°00'00"N, 38°15'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Almería, Sierra de María, halier, 1200 m, 02°15'00"N, 37°35'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, Cueva del Agua, bois, 1250 m, 03°00'00"N, 38°00'00"E, Jul 1987 *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Val de Cardós, Pla de Boavi, bois, 1500 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, hallier, 1150 m, 02°00'00"N, 37°40'00"E, Jul 1988, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de Tischler (1934), sur des plantes de Schleswig-Holsteins, Eftimiu-Heim (1941), Barber (1942), Kliphuis (1963), Meili-Frei (1965), Goldblatt (1981, 1988, 1989), Goldblatt & Johnson (1990) & Mrkvicka (1992).

575. ***Nigritella nigra*** (L.) Reichenb. f. (*sensu latissimo*)— $2n = 40$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Val de Cardós, Tavascan, pré, 1200 m, 01°00'15"N, 42°00'30"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).

Heusser (1938) a publié les mêmes résultats. Vis (1933) a publié $2n = 32$. Chiarugi (1929) a publié $2n = 38$. Afzelius (1932, 1943) et Knaben (1950), sur des plantes scandinaves, ont publié $4n = 64$.

Nigritella nigra n'existe pas en Espagne. Deux entités différentes ont été récemment décrites (cf. Teppner & Klein 1993), *N. gabasiana* a $2n = 40$ et *N. nigra* subsp. *pyrenaica* a $2n = 80$.

576. ***Ophrys fuciflora*** (F.W. Schimdt) Moench — $2n = 36$.

Hs: Albacete, Calar del Mundo, pré sec, 800 m, 02°30'00"N, 38°15'00"E, Jun 1991, *J. Lara Vicente*, s.n. (BC).
— Girona, Alt Empordà, Sierra de Rodes, pré sec, 500 m, 03°20'00"N, 42°15'00"E, Apr 1993, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra de Castril, pré sec, 700 m, 02°50'00"N, 37°50'00"E, May 1992, *J. Lara Vicente*, s.n. (BC).

— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Bardazoso, pré sec, 700m, 03°00'00"N, 38°00'00"E, Apr 1990, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Heusser 1938, Goldblatt 1981, 1984, 1988); des cas d'aneuploïdie, $2n = 37, 38$ ont été trouvés (cf. Goldblatt 1981, 1984, 1988).

577. *Ophrys insectifera* L. — $2n = 36$.

Hs: Lérida, Pyrénées, Alt Urgell, Sierra del Cadí, pré, 1400 m, 01°30'00"N, 42°15'00"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Afzelius 1943, Goldblatt 1981, 1988, Mrkvicka 1992); des cas d'aneuploïdie, $2n = 38$ ont été trouvés (cf. Kliphuis 1963. Mrkvicka 1992).

578. *Ophrys sphegodes* Mill. subsp. ***sphegodes*** — $2n = 36$.

Hs: Almería, Sierra de María, pré sec, 1200 m, 02°15'00"N, 37°35'00"E, Jun 1990, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pré sec, 1400 m, 03°00'00"N, 38°00'00"E, May 1990, *J. Lara Vicente*, s.n. (BC).
— Murcia, Sierra del Gigante, pré sec, 1200 m, 02°00'00"N, 37°40'00"E, May 1992, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Heusser 1938, Shimoya & Ferlan 1952, Goldblatt 1984, Goldblatt & Johnson 1990, Mrkvicka 1992); des cas d'aneuploïdie, $2n = 37$ ont été trouvés (cf. Goldblatt 1984).

579. *Orchis lactea* Poiret — $2n = 42$.

Hs: Almería, Sierra de María, pré sec, 1000 m, 02°15'00"N, 37°35'00"E, May 1991, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Cuesta de los Arrieros. pré sec, 1200 m, 03°00'00"N, 38°00'00"E, May 1990, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de Vermeulen (1949), sur des plantes hollandaises et ceux de plusieurs auteurs (cf. Goldblatt 1984, 1988)

580. *Orchis laxiflora* Lam. subsp. ***palustris*** (Jacq.) Bonnier et Layens — $2n = 42$.

Hs: Almería, Sierra de María, pré humide, 1175 m, 02°15'00"N, 37°35'00"E, Jul 1991. *J. Lara Vicente*, s.n. (BC).
— Girona, Pyrénées, Ripollès, Vall de Camprodon, Sierra Cavallera, pré humide, 1800m, 02°15'00"N, 42°15'00"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).
— Granada, Sierra de los Buitres, pré humide, 1200 m, 02°50'00"N, 37°50'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Villacarrillo, Arroyo de [illegible]

Aguascebas de la Cueva del Agua, 1250 m, 03°00'00"N, 38°00'00"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Heussler 1938, Vermeulen 1949, Goldblatt 1981, Mrkvicka 1992); $2n = 36$ a été également publié (cf. Goldblatt & Johnson 1993).

581. *Orchis militaris* L. — $2n = 42$.

Hs: Girona, Alt Empordà Sierra de Rodes, pré, 1000 m, 03°20'00"N, 42°15'00"E, Jul 1993, *J. Lara Ruiz*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Hagerup 1938, Heusser 1938, Vermeulen 1949, Gadella & Kliphuis 1963, Kliphuis 1963). Fuchs & Ziegenspeck (1924) ont publié $n = 20$.

582. *Orchis pallens* L. — $2n = 42$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Tavascan, pré, 1200 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).

Heusser (1938) a publié $2n = 40$; Vermeulen (1949) $2n = 40, 42$; la plupart des auteurs $2n = 42$ (cf. Goldblatt 1981, Mrkvicka 1992).

583. *Orchis provincialis* Balb. subsp. ***provincialis*** — $2n = 42$.

Hs: Albacete, Calar del Mundo, pré, 1000 m, 02°30'00"N, 38°15'00"E, May 1991, *J. Lara Vicente*, s.n. (BC).
— Almería, Sierra de María, pré, 1200 m, 02°15'00"N, 37°35'00"E, May 1990, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pré, 1400 m, 03°00'00"N, 38°00'00"E, May 1988, *J. Lara Vicente*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Anàs, pré, 1175 m, 01°00'15"N, 42°00'30"E, May 1992, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1000 m, 02°00'00"N, 37°40'00"E, May 1992, *J. Lara Vicente*, s.n. (BC).

Nos résultats confirment ceux de plusieurs auteurs (cf. Heusser 1938, Vermeulen 1949, Goldblatt 1988, Mrkvicka 1992).

584. *Orchis purpurea* Huds. — $2n = 42$.

Hs: Albacete, Calar del Mundo, pré, 1050 m, 02°30'00"N, 38°15'00"E, May 1991, *J. Lara Vicente*, s.n. (BC).
— Almería, Sierra de María, pré, 1100 m, 02°15'00"N, 37°35'00"E, May 1992, *J. Lara Vicente*, s.n. (BC).
— Granada, Sierra del Buitre, pré, 1000 m, 02°50'00"N, 37°50'00"E, May 1991, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Bardazoso, pré,

1000m, 03°00'00"N, 38°00'00"E, May 1987, *J. Lara Vicente*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, pré, 1500 m, 01°00'15"N, 42°00'30"E, May 1990, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1000 m, 02°00'00"N, 37°40'00"E, May 1992, *J. Lara Vicente*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Hagerup 1938, Heusser 1938, Vermeulen 1949, Gadella & Kliphuis 1963, Kliphuis 1963, Goldblatt 1981, Mrkvicka 1992). Eftimiu-Heim (1941) a publié $2n = 40$.

585. *Orchis simia* Lam. — $2n = 42$.

Hs: Almería, Sierra de María, pré, 1050 m, 02°15'00"N, 37°35'00"E, Jun 1990, *J. Lara Vicente*, s.n. (BC).
— Girona, Alt Empordà Sierra de Rodes, pré, 900 m, 03°20'00"N, 42°15'00"E, May 1993, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Bardazoso, pré, 975 m, 03°00'00"N, 38°00'00"E, May 1986, *J. Lara Vicente*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1000 m, 02°00'00"N, 37°40'00"E, May 1990, *J. Lara Vicente*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Heusser 1938, Vermeulen 1949, Kliphuis 1963, Mrkvicka 1992).

586. *Orchis tridentata* Scop. — $2n = 42$.

Hs: Almería, Sierra de María, pré, 975 m, 02°15'00"N, 37°35'00"E, Jun 1990, *J. Lara Vicente*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, Bardazoso, pré, 1000m, 03°00'00"N, 38°00'00"E, May 1989, *J. Lara Vicente*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1000 m, 02°00'00"N, 37°40'00"E, May 1991, *J. Lara Vicente*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Hagerup 1938, Heusser 1938, Vermeulen 1949, Goldblatt 1981, 1984, 1988, Goldblatt & Johnson 1990, Mrkvicka 1992).

587. *Platanthera bifolia* (L.) L.C.M. Richard — $2n = 42$.

Hs: Albacete, Calar del Mundo, hallier, 1200 m, 02°30'00"N, 38°15'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).
— Almería, Sierra de María, pré, 1300 m, 02°15'00"N, 37°35'00"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pré, 1400 m, 03°00'00"N, 38°00'00"E, Jul 1985, *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Anàs, bois, 1250 m, 01°00'15"N, 42°00'30"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1200 m, 02°00'00"N, 37°40'00"E, Jul 1990, *J. Lara Ruiz*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Afzelius 1922, Tischler 1934, Heusser 1938, Diannelidis 1949, Gadella & Kliphuis 1963, Kliphuis 1963, Goldblatt 1981, 1984, 1985, 1988, 1989, Goldblatt & Johnson 1990, 1993).

588. ***Platanthera chlorantha*** (Custer) Reichenb. — $2n = 42$.

Hs: Almería, Sierra de María, pré, 1300 m, 02°15'00"N, 37°35'00"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).
— Jaén, Sierra de Cazorla, Sierra de las Cuatro Villas, Iznatoraf, La Muela Alta, pré, 1400 m, 03°00'00"N, 38°00'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).
— Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Clotada d'Aguiló, pré, 2000 m, 01°00'15"N, 42°00'30"E, Jul 1991, *J. Lara Ruiz*, s.n. (BC).
— Murcia, Sierra del Gigante, pré, 1200 m, 02°00'00"N, 37°40'00"E, Jul 1989, *J. Lara Ruiz*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Afzelius 1922, Tischler 1934, Richardson 1935, Heusser 1938, Löve & Löve 1942b, Hagerup 1947, Gadella & Kliphuis 1963, Kliphuis 1963, Goldblatt 1981, 1984, 1985, 1988, 1989, Mrkvicka 1992).

589. ***Pseudorchis albida*** (L.) A. et D. Löve — $2n = 42$.

Hs: Lérida, Pyrénées, Pallars Sobirà, Vall de Cardós, Pla de Boavi, pré, 1500 m, 01°00'15"N, 42°00'30"E, Jul 1992, *J. Lara Ruiz*, s.n. (BC).

Plusieurs auteurs ont publié les mêmes résultats (Heusser 1938, Löve & Löve 1944, 1948, Knaben 1950, Löve 1954, Goldblatt 1981, 1989, Mrkvicka 1992).

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