

This perennial of the S Balkans is usually found at altitudes above 1000 m. Our chromosome count of $2n = 40$, being the first report from Greece, agrees with a previous report from Bulgaria (Kuzmanov & Georgieva 1983).

Cruciferae

Thlaspi pindicum Hausskn. = *Th. tymphaeum* Hausskn. – Fig. 9.

$2n = 14$

GREECE: Sterea Ellas, Mt Gerania, between the summits Makriplagi and Tris Portes, ophiolitic slopes, c. 600–850 m, $38^{\circ}01'N$, $23^{\circ}06'E$, 8.4.1995, *Const.* 5242 (UPA).

Thlaspi pindicum is endemic to Albania and Greece (Franzén 1986). It is found mainly on serpentine, apparently depicting a disjunct distribution pattern with Mt Gerania as its southernmost limit. To our knowledge, no previous chromosome count of this species has ever been reported. The chromosome number of $2n = 14$ and a photomicrograph of a metaphase plate (Fig. 9) are presented here. The population examined is diploid, with mostly metacentric (m) small (c. 1.0 to 1.9 μm) chromosomes. Three to four small, poorly stained satellites were observed in some preparations.

Dipsacaceae

Cephalaria setulifera Boiss. & Heldr. – Figs 10, 10a.

$2n = 18 + 0-2B$

GREECE: Sterea Ellas, Mt Pateras, the summit of Mikri Kolosoura, stony calcareous slopes, c. 850 m, $38^{\circ}06'N$, $23^{\circ}17'E$, 29.9.1991, *Const.* 2280 (UPA).

The rare *Cephalaria setulifera* has been reported from Montenegro (Verlaque 1985: 211) and a few localities in Central Greece. Kokkini (1991), however, questions Verlaque's record and considers the taxon (sub *Cephalaria flava* subsp. *setulifera* (Boiss. & Heldr.) Kokkini) as endemic to Greece. Our count of $2n = 18$ (Figs 10, 10a), to our knowledge the first one from Greece, is in agreement with previous reports by Verlaque (1975, 1977, 1985) on material from Montenegro. The chromosome complement consists of eight metacentric, six submetacentric and four acrocentric chromosomes, ranging in size between 2.5 and 4.4 μm . One submetacentric chromosome pair bears small satellites on its short arms. One to two small, spherical B-chromosomes were detected in some metaphase plates. The karyotype formula is $2n = 2x = 8m + 4sm + 2sm-SAT + 4st = 18 + 0-2B$ (Figs 10, 10a). The karyotype of the material examined here shows considerable differences compared to the drawing and idiogram given by Verlaque (1985). Apparently, the taxonomic relationship between the Greek and Yugoslavian populations needs further investigations, but no herbarium material from Montenegro was available to the authors.

Labiatae

Thymus parnassicus Halácsy – Fig. 11.

$2n = 6x = 90$

GREECE: Sterea Ellas, Mt Kitheron, the summit Profitis Ilias, close to an abandoned military camp, calcareous substrate, c. 1380 m, $38^{\circ}11'N$, $23^{\circ}14'E$, 12.7.1992, *Const.* 2710 (UPA).

Thymus parnassicus, known from a few mountains of Central Greece, is also reported from the south of the former Yugoslavia and appears again disjunct in Central Anatolia (Baden 1991). Its chromosome number of $2n = 90$ and a photomicrograph of a somatic metaphase (Fig. 11) are given here for the first time. A fairly wide range of chromosome numbers ($n = 6, 7, 8, 9, 10, 13$ and 15) have been reported for *Thymus* (Darlington & Wylie 1961, Löve & Löve 1961, 1974, Fedorov 1969, and van Loon 1987). *Th. parnassicus* has a hexaploid cytotype ($x = 15$) with very small chromosomes of c. 0.7 to 1.6 μm , not suitable for detailed morphological studies. Three to four satellites, two of which are considerably larger, can be observed in most metaphase plates. Such a high chromosome number in the genus *Thymus* is quite rare, and to

our knowledge other examples of a hexaploid cytotype with $x = 15$ have been reported only for *Th. zygioides* var. *lycaonicus* (Čelak.) Ronniger by Jalas & Uotila (1976) in material from Turkey sub *Th. longedentatus* (Degen & Urum.) Ronniger, as well as by Markova (1989) and Markova & Goranova (1994) in material from Bulgaria.

***Thymus teucrioides* subsp. *candilicus* (Beauv.) Hartvig – Fig. 12.**

$2n = 30 + 0-1B$.

GREECE: Sterea Ellas, Mt Gerania, the western and south-western slopes of the summit Korifi, bushes and shrubs on ophiolithic substrate, c. 900 m, 38°02'N, 23°04'E, 20.6.1994, *Const. 4825* (UPA).

Thymus teucrioides subsp. *candilicus* is endemic to and scatteredly distributed in Greece, known mainly from localities in Central Greece (Hartvig 1987). It shows a particular preference for serpentine substrates, and its occurrence on Mt Gerania is the southernmost known limit of its distribution area. Its chromosome number as well as a photomicrograph of a somatic metaphase (Fig. 11) are presented here for the first time. Our investigated population is possibly diploid, with $x = 15$. The chromosomes appear to be metacentric (m) and submetacentric (sm), small in size (c. 0.8 to 1.4 μm), with one submetacentric chromosome pair bearing small satellites (sm-SAT).

Liliaceae

***Bellevalia ciliata* (Cyr.) Nees – Figs 13a-d.**

$2n = 8$

GREECE: Sterea Ellas, Mt Kitheron, c. 1.5 km south-west of the village of Kaparelli, edges of cultivated fields, c. 450 m, 38°13'N, 23°12'E, 17.4.1993, *Const. 2984* (UPA); Sterea Ellas, c. 5 km north of Ritsona area, cultivated land, c. 240–270 m, 38°25'N, 23°31'E, 20.3.1994, *Const. 4322* (UPA); Sterea Ellas, c. 2.5 km from the village of Dafni on the way to the village of Dafnoula, cultivated fields, c. 400 m, 38°14'N, 23°26'E, 16.4.1994, *Const. 4436* (UPA).

The combination of perigon colours during flower maturation in plants of the above cited populations of *Bellevalia ciliata* differs from those reported by Feinbrun (1938–40), and a more detailed study of the morphology of the species based on living material would be desirable (see also Berg & al. 1989). Earlier reports for *B. ciliata* (Feinbrun 1938–40, Chiarugi 1949, Fedorov 1969) all give the diploid chromosome number of $2n = 8$. This number is confirmed, and the karyotype and karyogram (Figs 13a-d) are presented here for the first time from Greece.

The largest pair of chromosomes (c. 14.5 to 18.9 μm in size) is metacentric in all populations examined and bears two small but conspicuous double satellites. It is followed by a pair of acrocentric chromosomes (c. 11.9 to 16.9 μm) which usually has a small satellite on its short arm (Figs 13a-b) and sometimes on its long arm too (Figs 13c-d). The last two pairs are metacentric to submetacentric, c. 7.8 to 12.5 μm in size, and bear small satellites on their short arms. The shorter pair of the metacentric to submetacentric chromosomes bears additional satellites on its long arms. Noteworthy is the presence of secondary constrictions in most chromosomes of the complement. Such constrictions are found in both arms close to the telomere in the longest metacentric chromosomes (Figs 13a-b), and in both arms but close to the centromere in the acrocentric chromosomes (Figs 13a,c). Constrictions occasionally occur also in around the middle of the short arm of the metacentric to submetacentric chromosome pair (Fig. 13a). A considerable variation was observed among the populations examined, particularly concerning the presence or absence of satellites and secondary constrictions. As a result, two karyotype formulas are given here: $2n = 4m\text{-SAT} + 2m/sm + 2st\text{-SAT} = 8$ (*Const. 2984*) and $2n = 2m\text{-SAT} + 4m/sm\text{-SAT} + 2st\text{-SAT} = 8$ (*Const. 4322*).

Orchidaceae

***Aceras anthropophorum* (L.) W.T. Aiton – Fig. 14.**

$2n = 42$

GREECE: Sterea Ellas, Mt Pateras, the area between the summits Liondari and Agios Ilias, stony

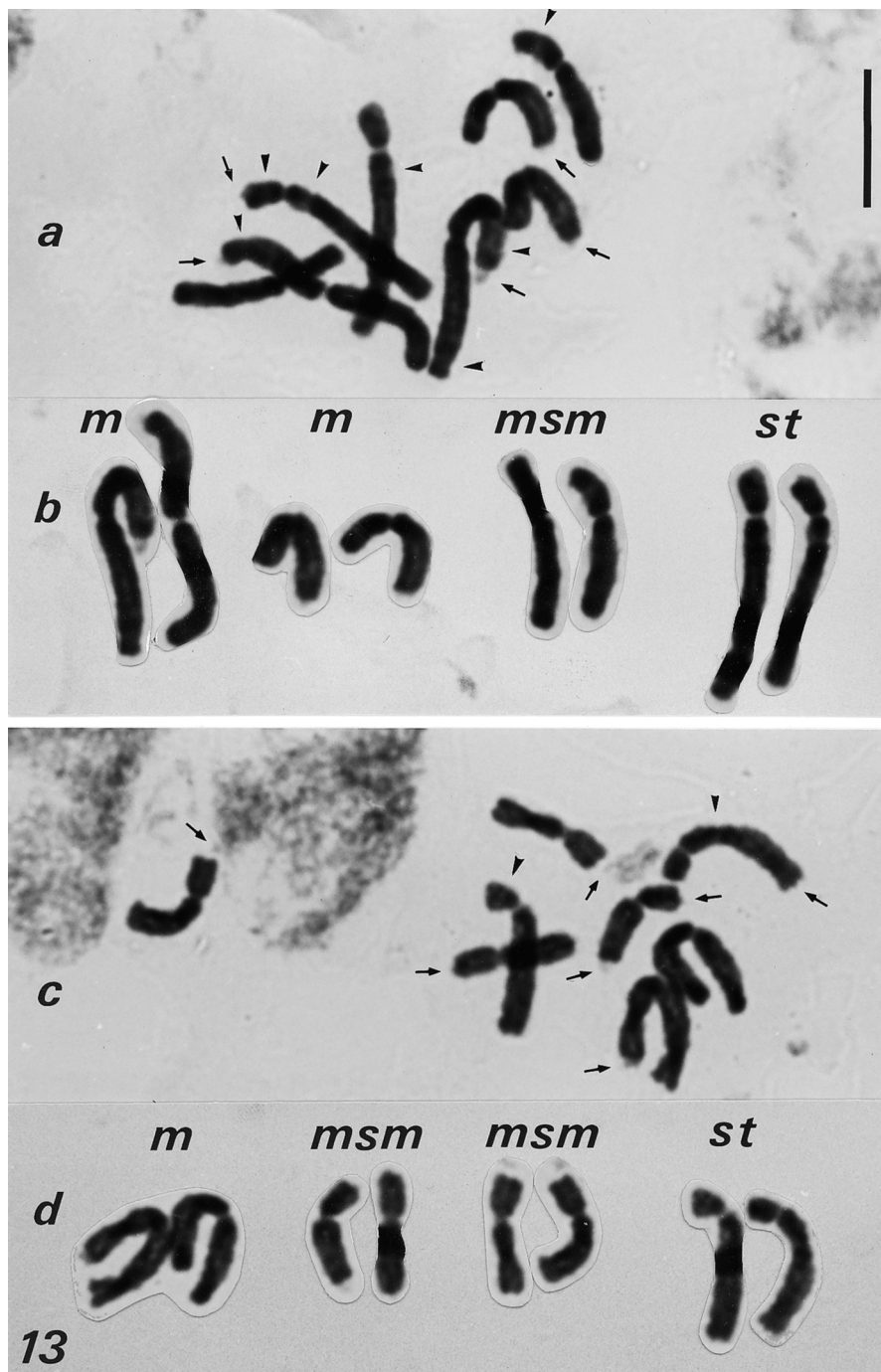


Fig. 13. Mitotic metaphase plates (a,c) and karyograms (b,d) of *Bellevalia ciliata*, $2n = 8$; 13a-b: material from Mt Kitheron (*Const.* 2984); 13c-d: material from the area of Ritsona (*Const.* 4322). – Arrows indicate SAT-chromosomes and arrowheads secondary constrictions. Scale bar: 10 μ m.

places with *Arbutus andrachne* and other bushes, c. 850–900 m, 38°06'N, 23°20'E, 29.4.1994, *Const.* 4475 (UPA).

The only member of the monotypic genus *Aceras* is widely distributed in the Mediterranean area and also in W and Central Europe. A chromosome number of $2n = 42$ was first counted in Swiss material (Heusser 1938), and has been reported later from several other countries, namely Britain (Fedorov 1969), the Netherlands (Kliphuis 1963) Spain (Löve & Kjellqvist 1973, Ruiz de Clavio Jiménez 1988), Italy (Scrugli 1977, Del Prete 1978, D' Emerico & al. 1993), and France (Balayer 1986, Cauwet-Marc & Balayer 1986). This is the first chromosome report based on Greek material. In our preparations, the chromosomes were strongly stained and not clear enough for detailed morphological analysis. However, most of them seem to be metacentric (m) (Fig. 14). The chromosome size ranges between c. 1.9 to 2.9 μm .

Primulaceae

***Coris monspeliensis* L.** – Fig. 15.

$2n = 18$

GREECE: Sterea Ellas, Mt Gerania, between the village of Pissia and the nunnery of Osios Patapios, calcareous slopes, c. 650 m, 38°00'N, 22°57'E, 5.6.1993, *Const.* 3737 (UPA).

Coris monspeliensis is rare in Greece, known only from a few localities, which apparently form the easternmost limit of its European distribution. Previous cytological reports, all giving $2n = 18$, include those by Puech (1963, 1968, material from France), Kress (1963, material from Italy), Delay (1971, material from France), Löve & Kjellqvist (1974, material from Spain), and Baldini (1988, material from Italy). A different chromosome number of $2n = 56$ reported from Europe (see Ferguson 1972) is unusual and needs confirmation. No chromosome count based on Greek material is known to the authors. Our count of $2n = 18$ confirms earlier records. The chromosomes are predominately metacentric (Fig. 15), varying in size from 1.6 to 3.1 μm . One of the metacentric pairs bears small satellites. The karyotype formula of the examined material can be given as $2n = 2x = 10m + 2m\text{-SAT} + 4sm + 2sm/st = 18$.

Ranunculaceae

***Clematis cirrhosa* L.** – Fig. 16.

$2n = 16 + 0\text{-}1\text{B}$

GREECE: Sterea Ellas, Mt Gerania, place known as Selki, between the villages of Schinos and Pissia, clearings of *Pinus* forest, c. 500 m, 38°02'N, 22°59'E, 6.2.1993, *Const.* 2853 (UPA).

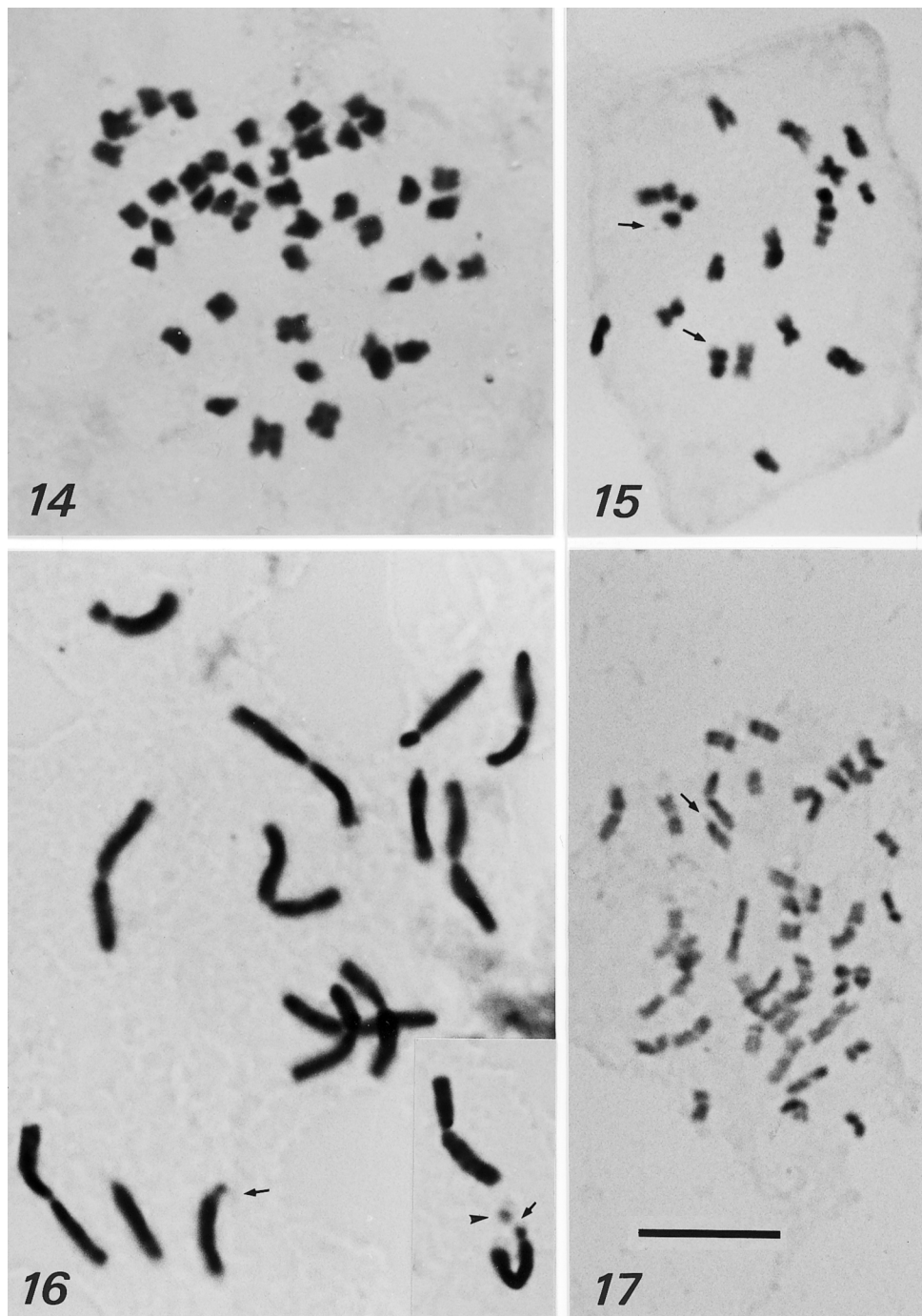
Clematis cirrhosa is a Mediterranean element with an early flowering period (winter to early spring). The species has been previously cytologically examined by Dahlgren & al. (1971) and Cardona & Contandriopoulos (1980) in material from the Balearic islands, as well as by Romano & al. (1987) in material from Sicily. They all give $2n = 16$. Our results, the first based on Greek material, are in agreement with these earlier records. The karyotype of the species is given in Fig. 16. Five chromosome pairs are metacentric, one is acrocentric and two are subtelocentric, one of which bears unequal satellites on its short arms. A small, spherical B-chromosome is usually present in the complement. The karyotype formula is $2n = 2x = 10m + 2st + 2t + 2t\text{-SAT} = 16 + 0\text{-}1\text{B}$. The chromosome size ranges between 7.0 and 12.5 μm .

Delphinium fissum* Waldst. & Kit. subsp. *fissum – Figs 18a-b.

$2n = 16 + 0\text{-}1\text{B}$

GREECE: Sterea Ellas, Mt Kitheron, between the summits Profitis Ilias and Rachi Frasouri, edges of *Abies* forest, c. 1200 m, 38°11' N, 23°14' E, 28.5.1994, *Const.* 4695 (UPA).

To our knowledge, this is the first report of a chromosome count for *Delphinium fissum* subsp. *fissum* based on Greek material. $2n = 16$ is the most common number found in this species, and has been reported from several other countries (see Simon & al. 1995 for references). The largest chromosome pair is metacentric, bearing clearly visible satellites, unequal in



Figs. 14–17. Mitotic metaphase plates – 14: *Aceras anthropophorum*, $2n = 42$; 15: *Coris monspeliensis*, $2n = 18$; 16: *Clematis cirrhosa*, $2n = 16 + 1B$; 17: *Asperula pulvinaris*, $2n = 44$. – Arrows indicate SAT-chromosomes and the arrowhead a B-chromosome. Scale bar: $10 \mu\text{m}$.

size (Figs 18a-b). The second largest pair is submetacentric, followed by six pairs of acrocentric to subtelocentric chromosomes, one pair of which has satellites on its short arms. Moreover, a small submetacentric B-chromosome is sometimes observed in metaphase plates. Thus, the karyotype formula is $2n = 2x = 2m\text{-SAT} + 2sm + 8st + 2st\text{-SAT} + 2st/t = 16 + 0\text{-1B}$. The chromosome size varies between 4.2 and 13.0 μm .

***Delphinium peregrinum* L. – Fig. 19.**

$2n = 16$

GREECE: Sterea Ellas, Mt Pateras, western slopes close to Petra Korakou summit, rocky calcareous substrate, c. 500–700 m, 38°07'N, 23°14'E, 16.6.1991, *Const. 2046* (UPA).

Delphinium peregrinum is an annual species with a predominantly E Mediterranean distribution. Previous chromosome counts are reported from plants of unknown origin (Gregory 1941), from Turkey (Demiriz & Misirdali 1980, Baltisberger 1991a) and Bulgaria (see Kuzmanov 1993), but not from Greece. Our count of $2n = 16$, apparently the most common chromosome number in the genus *Delphinium*, is in agreement with all previous reports for this species. The chromosomes (Fig. 19) vary in size from about 5.6 to 10.6 μm , depending on the degree of chromosome contraction. The largest chromosome pair in the complement is metacentric to submetacentric, the remaining seven pairs are acrocentric to subtelocentric and gradually decrease in size. One of the acrocentric pairs has large satellites on the short arms and a clear secondary constriction on its long arm close to the centromere. The karyotype formula is $2n = 2x = 2m/sm + 4st + 2st\text{-SAT} + 2st/t + 6t = 16$.

Rubiaceae

***Asperula baenitzii* Heldr. ex Boiss.**

$2n = 22$

GREECE: Sterea Ellas, Mt Pateras, small ravine north-east of the summit Liondari, gravel, c. 860 m, 38°06'N, 23°21'E, 22.6.1991, *Const. 2126* (UPA).

This endemic species, belonging to *A. sect. Thlipthisa*, is only known from a few localities in Attiki. Its chromosome number is given here for the first time. According to Schönbeck-Temesy & Ehrendorfer (1985) the members of this section are all “palaeo-Mediterranean” endemics, centred in the E Mediterranean area and showing the same diploid chromosome number of $2n = 22$.

***Asperula pulvinaris* (Boiss.) Heldr. ex Boiss. – Fig. 17.**

$2n = 4x = 44$

GREECE: Sterea Ellas, Mt Pateras, the summit Megali Kolosoura, open calcareous slopes, c. 1000–1100 m, 38°06'N, 23°17'E, 28.5.1994, *Const. 4714* (UPA).

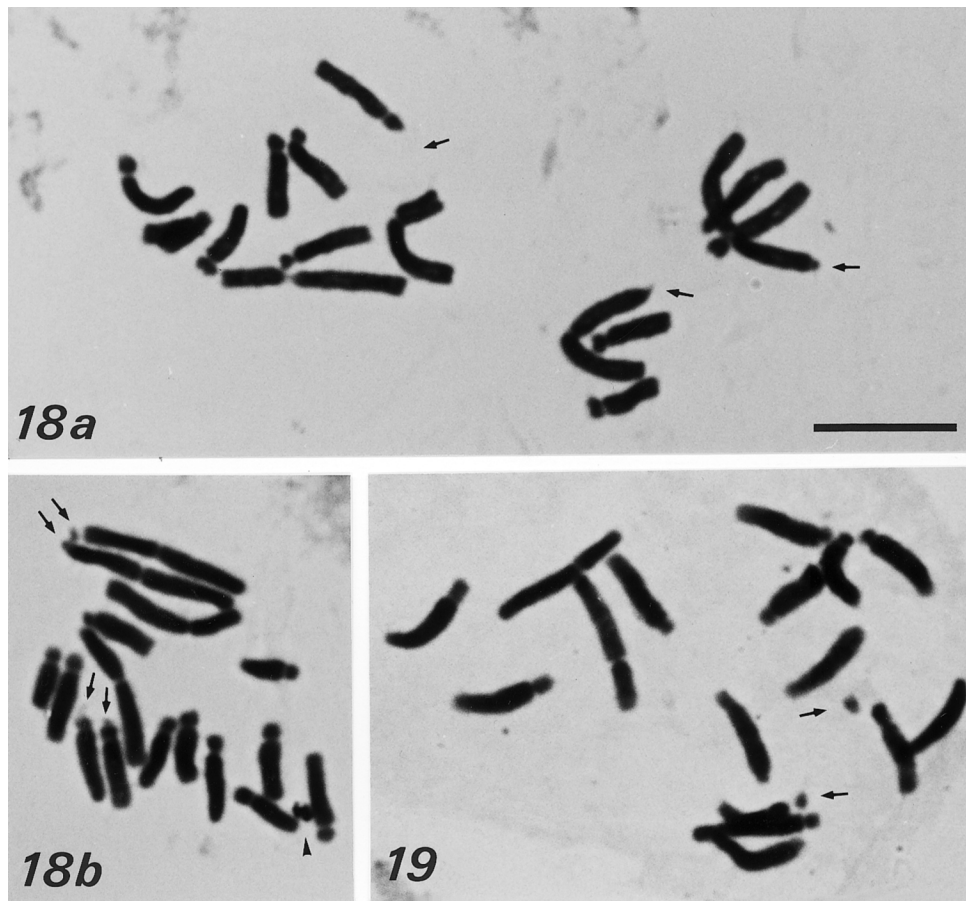
Asperula pulvinaris is restricted to the mountains of Attiki, where it forms densely pulvinate cushions at usually above 1000 m altitude (Schönbeck-Temesy & Ehrendorfer 1991). No previous chromosome number reports of this species were found in the literature; thus, the number $2n = 4x = 44$ and a metaphase photomicrograph are reported here for the first time. The population examined is tetraploid with $x = 11$ and chromosomes of small to medium size (between c. 1.7 to 4.8 μm). Its karyotype (Fig. 17) is symmetrical with metacentric (m) and submetacentric (sm) chromosomes. At least one small pair of faintly stained satellites exists on a submetacentric chromosome pair (sm-SAT).

***Asperula rigidula* Halácsy**

$2n = 44$

GREECE: Sterea Ellas, Mt Pateras, south-east of the village of Psatha, rocky places along a little frequented road, c. 300 m, 38°05'N, 23°13'E, 17.5.1994, *Const. 5895* (UPA).

Asperula rigidula is an endemic species of E Sterea Ellas, Evvia and Peloponnisos, closely related to *A. lutea* Sm. Its chromosome number, being $2n = 4x = 44$, is reported here for the first time.



Figs 18–19. Mitotic metaphase plates – 18: *Delphinium fissum* subsp. *fissum*, $2n = 16$ (a) and $2n = 16 + 1B$ (b); 19: *D. peregrinum*, $2n = 16$. – Arrows indicate SAT-chromosomes and arrowhead B-chromosome. Scale bar: $10\ \mu\text{m}$.

Scrophulariaceae

Verbascum boissieri (Heldr. & Sart. ex Boiss.) Kuntze – Fig. 20.

$2n = 36$

GREECE: Sterea Ellas, Mt Gerania, foothills between the settlements of Pefkogiali and Mavrolimni, ophiolitic substrate, c. 10–20 m, $38^{\circ}03'N$, $23^{\circ}07'E$, 30.4.1993, *Const.* 3237 (UPA).

Verbascum boissieri is an endemic species of *V.* subg. *Celsia*, distributed in Central Greece. Its chromosome number of $2n = 36$ and a metaphase photomicrograph (Fig. 20) are presented here for the first time. The chromosomes are small, c. 0.8 to 1.6 μm , and because of their size no detailed karyological analysis was carried out. In some cells up to four distinct satellites are visible, two of them quite large and always evident.

Umbelliferae

Conium divaricatum Boiss. & Orph. – Fig. 21.

$2n = 22 + 0-1B$