

*Revision of spanish Mniaceae (Musci) I.  
Plagiomnium undulatum (Hedw.) Kop. and two  
species from Sect. Rosulata (Kindb.) Kop.*

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**Resumen:**

GOMEZ-MENOR ROBLES, J. M. & FUERTES LASALA, E. 1993. Revisión de las Mniaceae (Musci) españolas. I. *Plagiomnium undulatum* (Hedw.) Kop. y dos especies de la Sect. Rosulata (Kindb.) Kop. *Bot. Complutensis* 18: 51-65

Se realiza una revisión taxonómica y corológica de tres especies de la familia *Mniaceae*: *Plagiomnium undulatum* (Hedw.) Kop., *P. affine* (Bland.) Kop. y *P. elatum* (B. & S.) Kop.. Se presentan las diferencias más características, para España, así como una clave y los mapas de distribución de los tres táxones en el área estudiada.

Palabras clave: Taxonomía, Corología, Clave y Mapas de distribución.

**Abstract:**

GOMEZ-MENOR ROBLES, J. M. & FUERTES LASALA, E. 1993. Revision of Spanish Mniaceae (Musci). I. *Plagiomnium undulatum* (Hedw.) Kop. and two species belonging to Sect. Rosulata (Kindb.) *Bot. Complutensis* 18: 51-65

A taxonomical and chorological revision of three species of *Mniaceae*: *Plagiomnium undulatum* (Hedw.) Kop., *P. affine* (Bland.) Kop. and *P. elatum* (B. & S.) Kop. is performed. The most characteristic differences, for Spain, a key and the distribution maps of the three taxa in the area studied, are presented.

Key words: Taxonomy, Chorology, Key and Distribution maps.

## PREFACE

According to CASAS (1991), genus *Plagiomnium* is represented in Spain by the taxa: *Plagiomnium undulatum* (Hedw.) Kop., *P. rostratum* (Schrad.) Kop., *P. cuspidatum* (Hedw.) Kop., *P. ellipticum* (Brid.) Kop., *P. medium* (B. & S.) Kop., *P. affine* (Bland.) Kop. and *P. elatum* (B. & S.) Kop.

Although there are excellent monographies on *Mniaceae*, most of the vouchers found in Spanish herbaria have been collected before 1971 and they haven't been revised since then, therefore some taxa of the genus, under study by the authors, were considered to be absent in our Flora (CASAS 1981). This is the reason that we took into consideration, so as to start the revision of the *Mniaceae* and confirm the taxa present and their corology in Spain.

Their ecological demands are, more or less, the same as in the rest of Europe (KOPONEN 1968, 1971, 1980; SMITH 1978), being frequent in deciduous and their substitution phases in the Eurosiberian region.

This paper is the result of a revision of the vouchers, from several herbaria, of the three species under study and intends to be a help for their correct classification, being the result of a redefinition of their differential characters. Also, it updates their geographical distribution in Spain, at the moment only for the Iberic Peninsula and the Balear Islands.

## MATERIAL AND METHODS

Specimens from the following herbaria have been examined and revised: BCB (Universidad Autónoma de Barcelona), BH (Biblioteca Hispánica), MA (Real Jardín Botánico de Madrid = the herbarium of Prof. A. Casares Gil), MACB (Universidad Complutense de Madrid.- h = the herbarium of Prof. E. Fuertes), MUC (Universidad de Murcia), NAU (Universidad de Navarra) and hh (J. Muñoz).

As we used dry material for this study, the first step was to reconstitute it so as to follow a microscopical study. We used the method described by KOPONEN (1974); this method has the advantage of destroying the chloroplasts and staining cell walls with a colour that goes from yellow to brown, being this a good taxonomical character in some species of other genus of *Mniaceae*. The nomenclature follows CORLEY *et al.* (1981), and the abbreviation of author's names follows SAYRE *et al.* (1964).

## RESULTS

After making a morphometric analysis, we have concluded that the most significant characters, in order of importance, are the following: size and morphology of leaf cells, size and number of cells in the leaf margin teeth and the length-width of the decurrent part of the leaf. We didn't take into consideration the capsules, spores, and other characters because it's very unfrequent to find them in spanish vouchers, and as this paper is intended to be of help to botanists working with spanish specimens, so we thought it to be reasonable to proceed with this criteria.

Mean measures of lamina cells (Fig. 1)

|                     | Length ( $\mu\text{m}$ ) | Width ( $\mu\text{m}$ ) |
|---------------------|--------------------------|-------------------------|
| <i>P. undulatum</i> | 31.9                     | 21.1                    |
| <i>P. affine</i>    | 76.7                     | 42.6                    |
| <i>P. elatum</i>    | 65.1                     | 33.4                    |

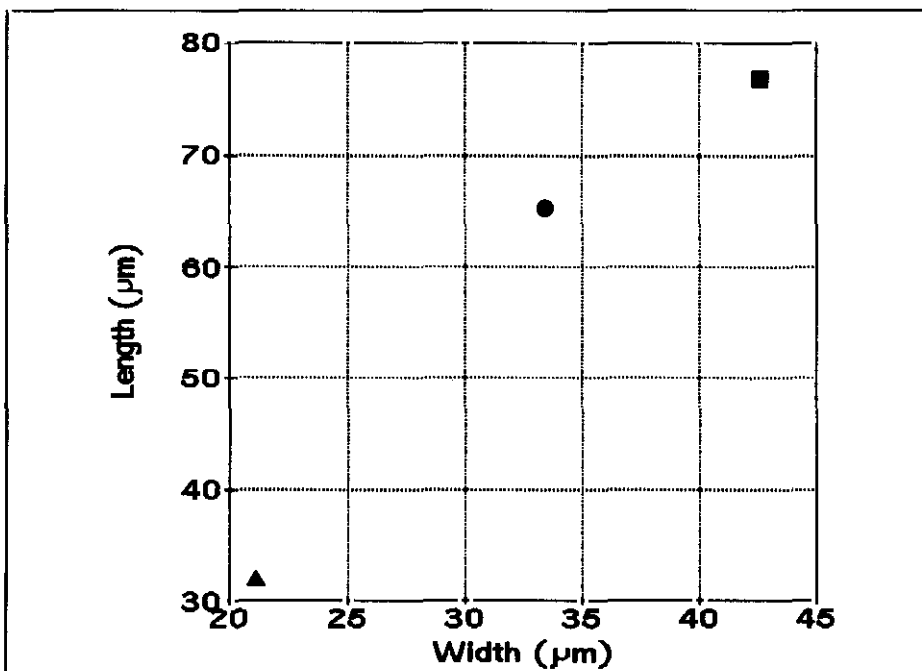


Fig. 1. Lamina cells: length and width mean values; (▲) *Plagiomnium undulatum* (Hedw.) Kop.; (■) *Plagiomnium affine* (Bland.) Kop.; (●) *Plagiomnium elatum* (B. & S.) Kop.

Mean Length/width ratios of lamina cells (Fig. 2)

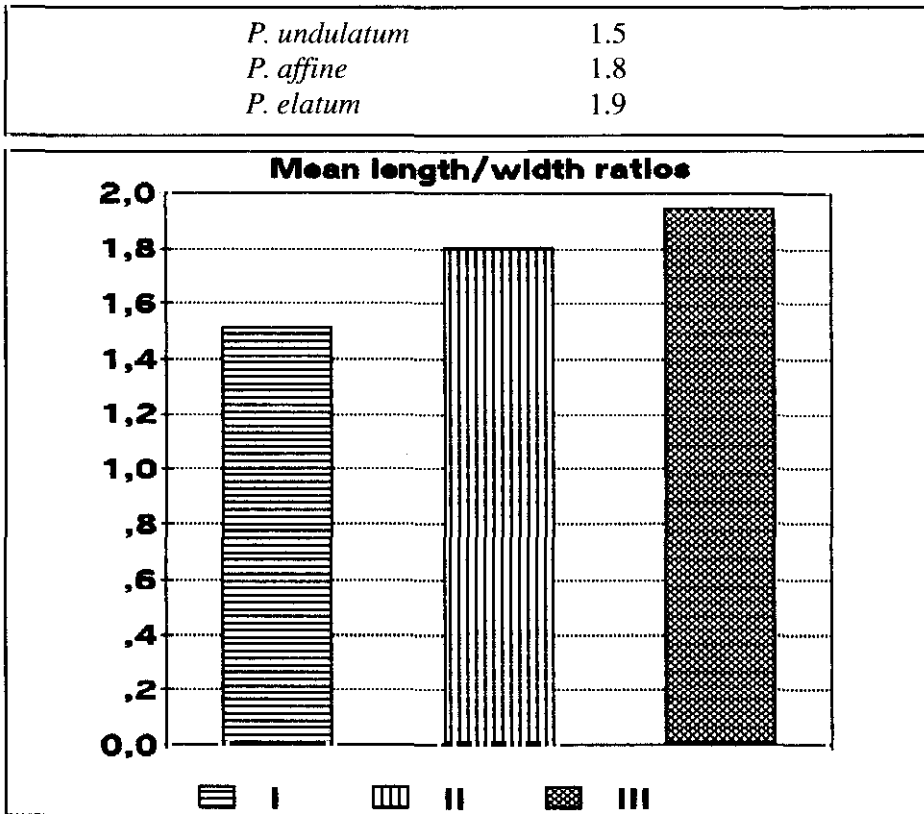


Fig. 2. Lamina cells: Mean length/width ratios; I, *Plagiomnium undulatum*; II, *Plagiomnium affine* (Bland.) Kop.; III, *Plagiomnium elatum* (B. & S.) Kop.

We have elaborated a key to differentiate the species under study.

#### ANALYTIC KEY

1 - Mid leaf cells small, 20 ( $\pm$  10)  $\mu$ m wide,  $\pm$  isodiametric, swelling and scarcely porose; margin teeth spinose usually 1 cell long, toothed  $\pm$  from base, (Fig. 3) **Plagiomnium undulatum** (Hedw.) Kop.....

1' - Mid leaf cells bigger, 20 - 50  $\mu$ m wide, never isodiametric,  $\pm$  hexagonal and clearly porose; margin teeth 1-2 cells long, the latter very frequent, toothed  $\pm$  from base. ....

2 - Decurrent part of the leaf base narrow but very long; leaf cells hexagonal, 1,5-2 times as long as wide in mid-leaf, clearly collenchymatous, (Fig. 4) **Plagiomnium affine** (Bland.) Kop. ....

2' - Decurrent part of the leaf base very long and wide; leaf cells hexagonal-rectangular, 2-3 times as long as as wide in mid leaf, not collenchymatous, (Fig. 5). **Plagiomnium elatum** (B. & S.) Kop. ....

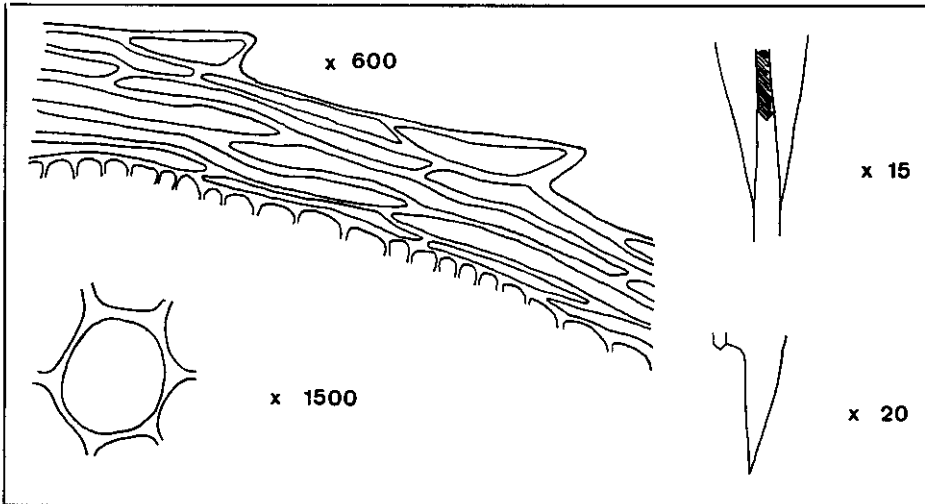


Fig. 3. *Plagiomnium undulatum* (Hedw.) Kop.: a, leaf border; b, lamina cell; c, decurrent part of leaf.

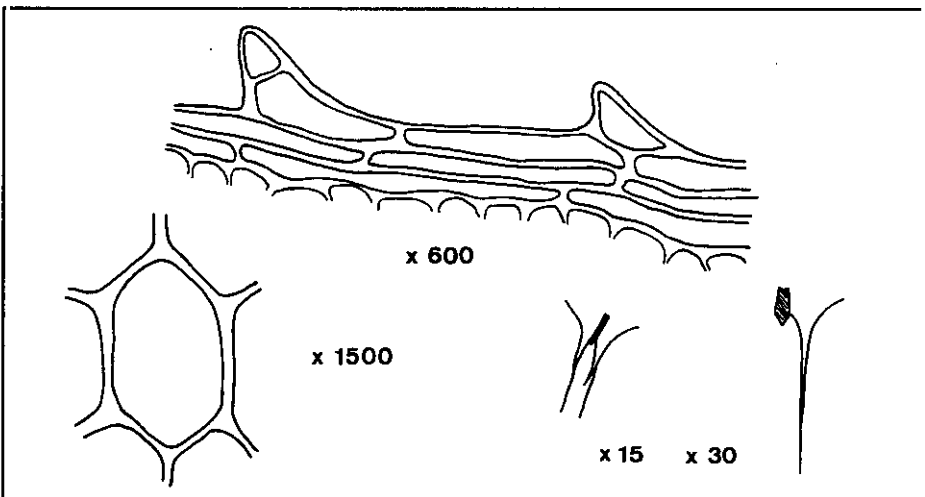


Fig. 4. *Plagiomnium affine* (Bland.) Kop.: a, leaf border; b, lamina cell; c, decurrent part of leaf.

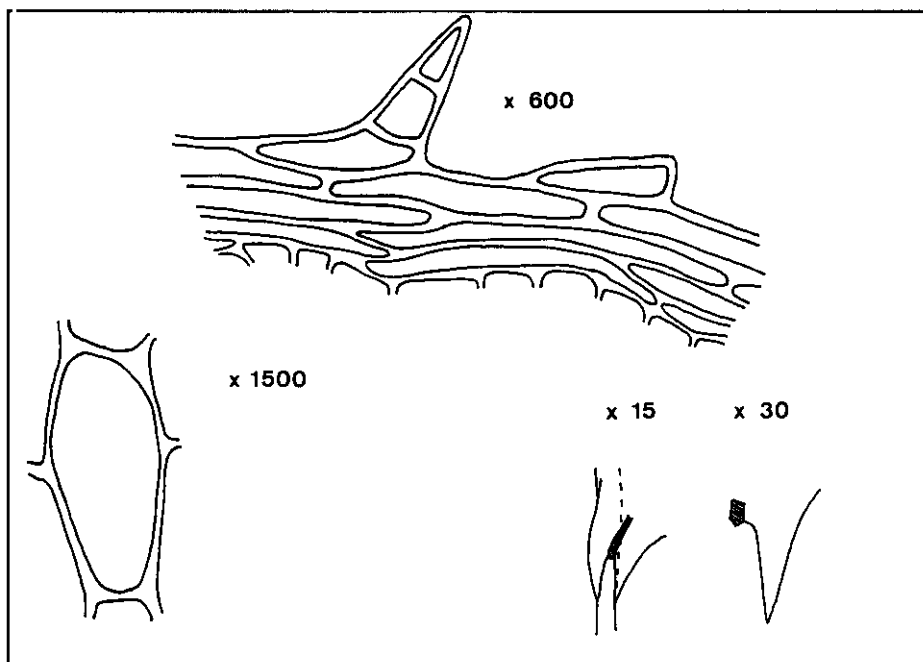


Fig. 5. *Plagiomnium elatum* (B. & S.) Kop.: a, leaf border; b, lamina cell; c, decurrent part of leaf.

### LIST OF SITES

The location of the sites, of the material revised, is indicated in U.T.M. coordinates (10 x 10 Km). We indicate, in brackets, the name under which it was originally classified.

#### Sites for *Plagiomnium undulatum* (Hedw.) Kop. (Fig. 6):

- WN 21 Alava: Pipaon, Leg. M. Losa, det. C. Casas, undated, BCB 17363 and 17366.
- WH 46 Albacete: Sierra del Calar del Mundo, alt. 1200 m., Leg. R. M. Ros and N. Jiménez, det. N. Jiménez (as *P. medium*), 25.4.1984, MUC 1576.
- QH 27 Asturias: Puerto de Somiedo, alt. 800 m., Leg. et det. J. Muñoz, hh 1459.
- QH 47 Asturias: Puerto Ventana, alt. 1325 m., Leg. et det. R. M. Simó, 8.7.1969, BH 58.
- TP 50 Asturias: Udrión, alt. 70 m., Leg. et det. J. Muñoz, 20.2.1990, hh 1521.
- UN 39 Asturias: Covadonga, Leg. et det. M. León, 15.8.1971, BCB 3766.
- UP 11 Asturias: Colunga, alt. 100 m., Leg. M. J. Alvarez, det. J. Muñoz, 20.12.1985, hh 253.
- UK 26 Avila: Cuevas del Valle, alt. 1060 m., Leg. et det. A. Soria and E. Ron, 23.2.1985, MACB 13804.
- DE 81 Baleares: La Calobra, Leg. et det. nameless, 9.4.1965, BCB 3767.
- DF 08 Barcelona: Castellvi de Rosanes, Leg. et det. M. Brugués, 23.1.1974, BCB 3779.

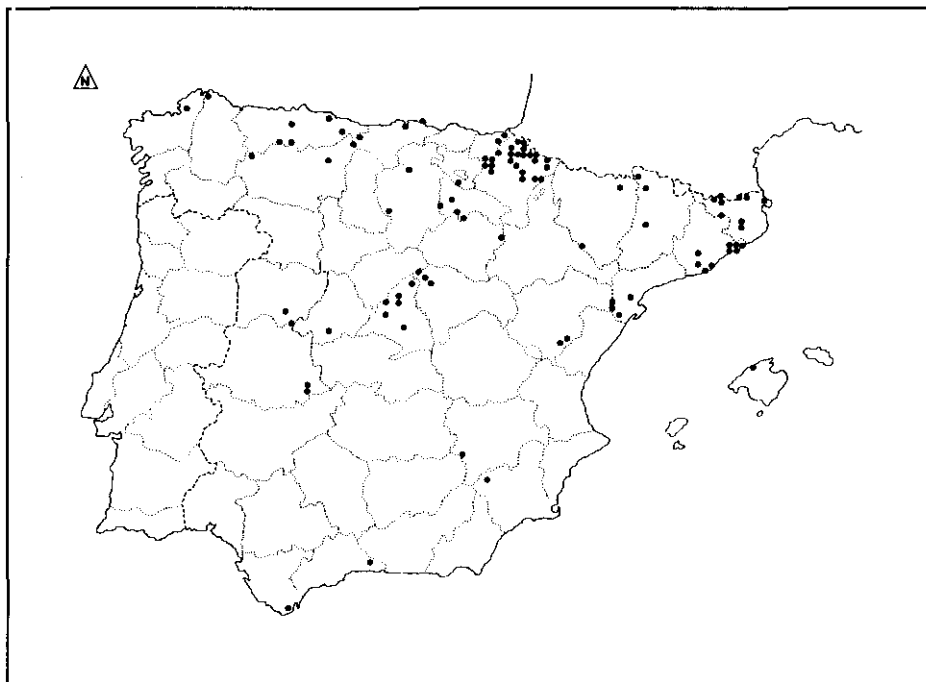


Fig. 6. Distribution map of *Plagiomnium undulatum* (Hedw.) Kop.

DF 17 Barcelona: Gavà, Leg. et det. C. Casas, 5.1949, BCB 17345.

DF 28 Barcelona: Tibidabo, alt. 500 - 600 m., Leg. et det. M. Moncó (as *P. elatum*), 21.3.1969, MACB 2519.

DG 00 Barcelona: Montserrat, alt. 700 - 800 m., Leg. et det. M. Moncó, 24.3.1969, MACB 2525.

DG 50 Barcelona: El Montnegre, alt. 230 m., Leg. et det. R. M. Cros, 4.3.1977, BCB 9247. Ibidem alt. 210 m., Leg. et det. R. M. Cros, 4.3.1977, BCB 9250.

DG 51 Barcelona: El Montnegre, alt. 170 m., Leg. et det. R. M. Cros, 15.3.1977, BCB 9246. Ibidem Barranco de Vallgorguina, alt. 200 m., Leg. et det. R. M. Cros, 9.11.1974, BCB 9253.

DG 51 Barcelona: El Montseny, Leg. et det. C. Casas, 7.1945, BCB 17362.

DG 60 Barcelona: El Montnegre, alt. 120 m., Leg. et det. R. M. Cros, 4.3.1977, BCB 9252.

DG 61 Barcelona: El Montnegre, alt. 320 m., Leg. et det. R. M. Cros, 27.11.1976, BCB 9248. Ibidem alt. 280 m., Leg. et det. R. M. Cros, 26.2.1977, BCB 9251. Ibidem alt. 230 m., Leg. et det. R. M. Cros, 26.2.1977, BCB 9263, 9264, 9265, 9266, 9267 and 9268. Ibidem alt. 180 m., Leg. et det. R. M. Cros, 26.2.1977, BCB 9262, 9269, 9261, 9244 and 9259. Ibidem alt. 480 m., Leg. et det. R. M. Cros (as *P. rostratum*), 26.2.1977, BCB 9242 and 9241. Fuente de Laram, alt. 190 m., Leg. et det. R. M. Cros, 19.1.1976, BCB 9254, 9255, 9256, 9257, 9240 and 9258.

DG 71 Barcelona: Fuirosos (El Montnegre), alt. 210 m., Leg. et det. R. M. Cros, 26.4.1978, BCB 9249.

- VM 16 Burgos: Santa María de la Cabeza, alt. 1400 m., Leg. et det. C. Casas, 8.1950, BCB 17364.
- VN 43 Burgos: Huidobro, Leg. et det. E. Fuertes, 7.6.1988, MACB 29926.
- TJ 96 Cáceres: Guadalupe, Leg. Rodríguez, det. Cortés Latorre, 22.6.1948, MA 3993 and 3995.
- TJ 96 Cáceres: Sierra de la Villuerca, Leg. C. Viera, det. E. Ron, 2.5.1981, MA 29.
- TJ 97 Cáceres: Río Ibor, alt. 710 m., Leg. et det. C. Viera, 10.11.1979, MA 5133.
- TF 70 Cádiz: Los Barrios, Leg. C. Morla, det. M. Acón *et al.* (as *P. rostratum*), 19.5.1989, MACB unnumbered.
- UN 57 Cantabria: Cosgaya. Leg. C. Viera y E. Ron, det. P. Herguido and E. Ron, 10.8.1979, MACB 31381.
- UN 68 Cantabria: Sierra de Beges; Leg. et det. E. Fuertes and E. Martínez-Conde, 15.6.1984, MACB 20714.
- VP 30 Cantabria: Camargo, alt. 25 m., Leg. et det. J. Muñoz, 1.5.1988, hh 893.
- VP 61 Cantabria: Santoña, alt. 200 m., Leg. et det. J. Muñoz, 2.5.1988, hh 860.
- BF 61 Castellón: Fredes, Leg. et det. C. Casas, 4.1976, BCB 3781. *Ibidem* alt. 800 - 1000 m., Leg. C. Casas *et al.*, det. R. M. Cros, 4.6.1984, BCB 13317 and 13318.
- DG 39 Gerona: Santuario de Nuria. Leg. et det. A. Casares Gil, undated MA-h 9035.
- DG 46 Gerona: Vidrá. Leg. et det. C. Casas, 25.5.1952, BCB 17365.
- DG 48 Gerona: Vilallonga de Ter, alt. 1350 m., Leg. et det. F. Lloret, 2.8.1986, BCB 24700 and 23964. *Ibidem* alt. 1200 m., Leg. et det. F. Lloret, 4.6.1985, BCB 24770.
- DG 49 Gerona: Setcases, Leg. et det. F. Lloret, 1.6.1984, BCB 24699. *Ibidem* 17.7.1985, BCB 23956.
- DG 74 Gerona: Bescanó. Leg. J. Girbal, det. C. Casas, 24.4.1975, BCB 3719 and 3775.
- DG 75 Gerona: Rocacorba, Leg. et det. nameless, 3.1978, BCB 3768.
- DG 79 Gerona: Massanet de Cabrenys, alt. 330 m., Leg. et det. M. Brugués, 28.8.1974, BCB 3777.
- DG 89 Gerona: Sant Esteve del Llop, Leg. et det. C. Casas, undated BCB 3778.
- EG 18 Gerona: Llansà, Leg. et det. R. M. Cros, 10.10.1984, BCB 14336.
- VL 66 Guadalajara: Cantalojas, alt. 1600 m., Leg. P. Riestra, det. P. Riestra and E. Ron, 30.10.1985, MACB 14715.
- VL 75 Guadalajara: Sierra del Robledal, alt. 1400 m., Leg. M. Ladero and Demetrio, det. C. Casas, undated, BCB unnumbered.
- VL 84 Guadalajara: Almiruete, alt. 900 m., Leg. et det. M. Ladero, 24.7.1969, BH 121.
- WN 65 Guipuzcoa: Puerto de Echegárate, alt. 650 m., Leg. et det. M. L. López, 11.10.1970, NAU 446 and BH 268.
- BH 81 Huesca: Sierra de Chía, alt. 1800 m., Leg. et det. C. Casas, 1948, BCB unnumbered.
- YM 21 Huesca: Castejón de los Monegros, alt. 900 m., Leg. et det. C. Casas, 8.1948, BCB 17368.
- NJ 71 La Coruña: Caaveiro. Leg. M. Losa, det. C. Casas, 9.4.1972, BCB 23989. *Ibidem* Leg. et det. J. Reinoso, 17.11.1979, BCB 3774. *Ibidem* Leg. et det. J. Reinoso, 24.7.1981, BCB 7459. *Ibidem* Leg. et det. J. Reinoso, 18.8.1981, NAU 2570 and BH 815.
- VM 97 La Rioja: Sierra de la Demanda. Leg. et det. J. Guerra, 7.1981, MUC 2339. *Ibidem* Posadas, Leg. et det. C. Casas, 29.6.1979, BCB 3773.



- WM 18 La Rioja: San Millán, Leg. M. Brugués, det. C. Casas, 24.6.1979, BCB 3772.
- WM 26 La Rioja: Villanueva de Cameros, Leg. et det. J. Martínez, 4.1.1983, NAU 2965. Ibidem Villoslada de Cameros, Leg. C. Casas and M. Brugués, det. C. Casas, 12.7.1974, BCB 3765.
- WM 35 La Rioja: Puerto de Piqueras, alt. 1500 - 1600 m., Leg. et det. C. Casas, 15.7.1974, BCB 3763.
- PH 84 León: Valle del Cuiña, alt. 1100 m., Leg. R. M. Cros and F. Lloret, det. C. Casas, 10.7.1984, BCB 12947. Ibidem Tejedo de Ancares, alt. 1000 m., Leg. C. Casas and R. M. Cros, det. C. Casas, 11.7.1984, BCB 12946.
- CH 13 Lérida: Viella. Leg. et det. González Guerrero and Ruiz de Azúa, 7.1927, MA 3994.
- CG 25 Lérida: Montsec d'Ares, alt. 700 m., Leg. A. M. Romo, det. C. Casas, 24.6.1983, BCB 12948.
- CH 21 Lérida: Caldas de Bohí, alt. 1500 m, Leg. et det. C. Casas, 10.7.1959, BCB 17369.
- PJ 03 Lugo: Río Sor, Leg. et det. M. Horjales, 16.8.1976, MACB 4623.
- VK 19 Madrid: Galapagar, Leg. Rivas Goday, det. Cortés Latorre (as *P. elatum*), 14.4.1954, MA 3985.
- VK 47 Madrid: Parque del Retiro, Leg. V. Mazimpaka, det. V. Mazimpaka and E. Ron (as *P. affine*), 18.5.1983, MACB 31344 and 31345.
- VL 11 Madrid: Sierra de Guadarrama, Leg. et det. A. Casares Gil, 1910, MA-h 8768. Ibidem Siete Picos, Leg. et det. E. Guinea, 22.1.1928, MA 6892.
- VL 31 Madrid: Miraflores, without data (as *P. medium*), MA 3568. Ibidem without data, MA 3570 and 3571.
- VL 32 Madrid: Puerto de Canencia, alt. 1200 m., Leg. S. Vicente and J. Vicente, det. J. Vicente and E. Ron, 17.3.1986, MACB 27816.
- VL 54 Madrid: Montejo de la Sierra, Leg. et det. E. Blanco, 14.12.1980, MACB 7924. Ibidem Leg. et det. E. Fuertes Lasala, 23.10.1980, MA 181.
- VF 08 Málaga: Sierra de Tejada. Leg. B. Cabezudo and J. M. Nieto, det. B. Cabezudo (as *P. medium*), 11.1982, MUC unnumbered.
- WH 82 Murcia: Sierra de los Alamos, alt. 1000 m., Leg. Egea and E. Ciller, det. R. M. Ros, 30.10.1982, MUC 841.
- WN 64 Navarra: Sierra de Urbasa, Leg. et det. A. Ederra, 13.3.1982, NAU 1786, 1787 and 1788.
- WN 73 Navarra: Río Urederra source, Leg. et det. A. Ederra, 23.10.1980, NAU 1782.
- WN 74 Navarra: Bacaicoa, Leg. et det. A. de Miguel, 10.3.1983, NAU 5274.
- WN 75 Navarra: Puerto de Lizarrusti, Leg. A. de Miguel and A. Ederra, det. A. de Miguel, 18.10.1984, NAU 5282. Ibidem Urdiain, Leg. et det. A. de Miguel, 25.10.1984, NAU 5286.
- WN 86 Navarra: Iribas, Leg. et det. A. de Miguel, 11.12.1983, NAU 5281.
- WN 88 Navarra: Arano, Leg. A. de Miguel y A. Ederra, det. A. de Miguel, 14.6.1985, NAU 5273.
- WN 99 Navarra: Peñas de Haya, Leg. et det. A. Ederra, 2.7.1982, NAU 3373.
- XN 05 Navarra: Arostegui, without data, NAU 5275. Ibidem Lizasoain, Leg. et det. A. de Miguel (as *P. rostratum*), 12.1.1984, NAU 5270. Ibidem Lizasoain, Leg. A. de Miguel y P. Vicente, det. A. de Miguel, 19.8.1984, NAU 5283.

XN 06 Navarra: Alcoz, Leg. et det. A. de Miguel, 29.3.1984, NAU 5272. Ibidem Elzaburu, Leg. et det. A. de Miguel, 5.5.1983, NAU 5279. Ibidem Iraitroz, Leg. et det. A. de Miguel, 25.11.1983, NAU 5280.

XN 07 Navarra: Monte Mendaur, alt. 850 m., Leg. et det. J. Arraiza, 22.8.1984, NAU 3369.

XN 14 Navarra: Zuriain, alt. 1200 m., Leg. et det. J. Arraiza, 9.1984, NAU 3372.

XN 16 Navarra: Puerto de Velate, Leg. et det. A. Ederra, 3.3.1980, NAU 1780 and 1781.

XN 18 Navarra: Señorío de Bertiz, Leg. M. Ladero and E. Fuertes, det. M. Ladero, 24.7.1973, NAU 444. Ibidem Leg. et det. E. Fuertes, 23.4.1972, MA-h unnumbered. Ibidem Leg. M. Ladero and E. Fuertes, det. C. Casas, 27.4.1972, BH 434.

XN 22 Navarra: Leoz; Leg. et det. A. Ederra, 27.11.1980, NAU 1779.

XN 23 Navarra: Peña de Izaga, Leg. et det. A. Ederra, 14.2.1980, NAU 1777, 1778 and 1776.

XN 26 Navarra: Quinto Real, Leg. et det. A. Ederra, 26.11.1981, NAU 1775. Ibidem, Leg. et det. A. Ederra (as *P. affine*), 26.11.1981, NAU 1767.

XN 27 Navarra: Elizondo, Leg. A. de Miguel and A. Ederra, det. A. de Miguel, 3.10.1985, NAU 5277.

XN 28 Navarra: Azpilicueta, Leg. A. de Miguel *et al.*, det. A. de Miguel, 26.6.1985, NAU 5276.

XN 36 Navarra: Puerto de Ibañeta, alt. 700 m., Leg. et det. E. Fuertes Lasala, 14.6.1969, NAU 445 and BH 85.

XN 42 Navarra: Foz de Arbayun, Leg. et det. A. de Miguel, 5.4.1981; NAU 2420, 2421, and 2419. Ibidem Leg. et det. A. de Miguel, 29.6.1982, NAU 2418 and 2419. Ibidem Leg. A. de Miguel *et al.*, det. A. de Miguel, 1.8.1982, NAU 2417.

XN 45 Navarra: Orbava, Leg. et det. A. de Miguel, 25.11.1982, NAU 5284.

XN 46 Navarra: Bosque de Irati, Leg. A. P. Losantos, det. A. Ederra, 25.3.1982, NAU 1783. Ibidem Leg. et Det. A. Ederra, 25.3.1982, NAU 1784, 1487 and 1785.

XN 52 Navarra: Sierra de Leyre, Leg. C.Casas and M. Brugués, det. C. Casas, 27.9.1972, BCB 3771. Ibidem Leg. C. Casas and M. Brugués, det. C. Casas, 28.9.1972, BCB 3770. Ibidem Leg. C. Casas and R. M. Cros, det. C. Casas, 28.9.1972, BCB 3769.

XN 64 Navarra: Urzainqui, Leg. et det. E. Fuertes, undated, BH unnumbered.

XN 65 Navarra: Sierra de Uztarroz, Leg. A. Ederra and A. Campoy, det. A. Ederra, 5.6.1980, NAU 998.

TK 59 Salamanca: Linares de Riofrio, Leg. et det. Elias, 27.5.1983, BCB 19715.

TK 67 Salamanca: Navacarros, Leg. et det. Elías, 13.7.1983, BCB 19714.

UN 14 Soria: Vozmediano, Leg. et det. A. Ederra, 31.5.1982, NAU 4034. Ibidem Leg. et det. E. Fuertes, 31.5.1982, MA 92.

BF 93 Tarragona: El Cardó, Leg. et det. M. Brugués, 1.10.1976, BCB 3776.

BF 62 Teruel: Beccite, Leg. et det. C. Casas, 4.3.1977, BCB 3780.

BF 70 Teruel: La Senia, alt. 1150 m., Leg. C. Casas *et al.*, det. C. Sergio *et al.*, 4.6.1984, BCB 14030.

XK 95 Teruel: Mora de Rubiclos, Leg. A. Santos, det. C. Casas, 8.4.1976, BCB 3782 and BCB 3783. Ibidem Leg. et det. E. Fuertes, 6.4.1976, MACB 32946.

YK 06 Teruel: Barranco del Tajal, alt. 1390 m., Leg. et det. E. Fuertes, 6.4.1976, MACB 22850 and MA 7699. Ibidem, alt. 1250 m., Leg. et det. E. Fuertes, 7.4.1976, MACB 28646.

WM 92 Zaragoza: El Moncayo, Leg. M. Brugués and R. M. Cros, det. C. Casas, 3.6.1982, BCB unnumbered and 8149. Ibidem, Leg. et det. C. Casas, 2.6.1982, BCB 8150.

Sites for *Plagiomnium affine* (Bland.) Kop. (Fig. 7):

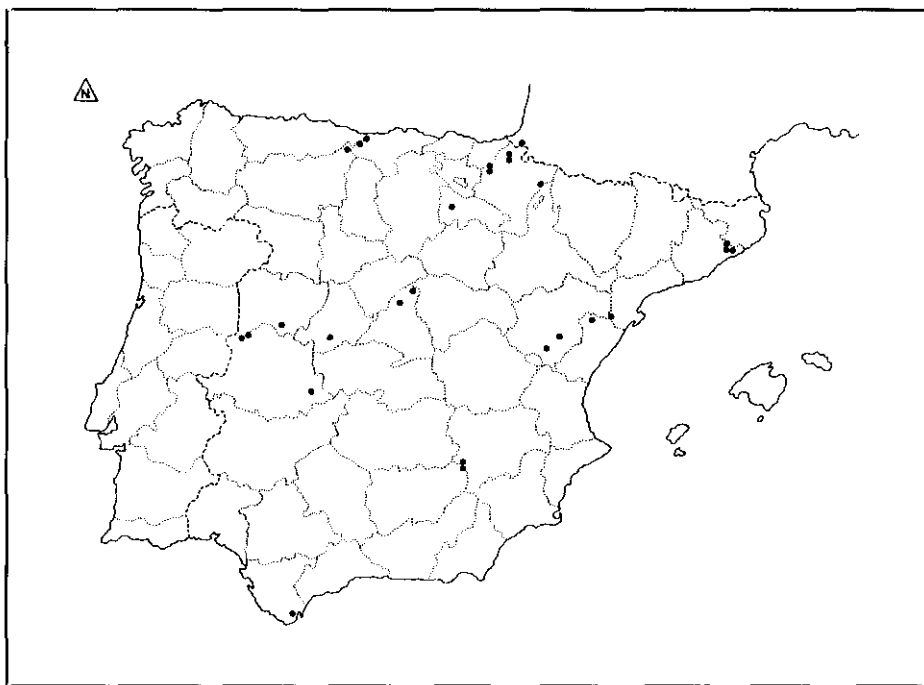


Fig. 7. Distribution map of *Plagiomnium affine* (Bland.) Kop.

WH 45 Albacete: Sierra del Calar del Mundo, alt. 1.400 m., Leg. et det. N. Jiménez, 27.5.1984, MUC 1573.

WH 46 Albacete: Sierra del Calar del Mundo, alt. 1.200 m., Leg. N. Jiménez and R. M. Cros; det. N. Jiménez, 14.10.1984, MUC 1574.

UN 79 Asturias: Peñamellera Baja, alt. 50 m., Leg. et det. J. Muñoz, 16.8.1987, hh 758.

UK 26 Avila: Puerto del Pico, alt. 1.200 m., Leg. et det. A. Soria and E. Ron, 8.9.1984 MACB 13803.

DG 51 Barcelona: El Montnegre, alt. 200 m.,

Leg. et det. R. M. Cros (as *P. rostratum*), 20.10.1978, BCB 9230, 9231 and 9239.

DG 52 Barcelona: El Montseny, Leg. et det. C. Casas, 26.4.1969, BCB 19463. Ibidem Leg. et det. C. Casas (as *P. ellipticum*), 18.3.1951, BCB unnumbered. Ibidem alt. 1000-1100 m., Leg. et det. M. Moncó, 27.3.1969, MACB 2537. Ibidem Leg. et det. C. Casas, 22.8.1951, BCB 17271. Ibidem alt. 450 m., Leg. et det. C. Casas (as *P. elatum*), 22.8.1951, BCB 17274.

DG 61 Barcelona: El Montnegre, alt. 320 m., Leg. et det. R. M. Cros, 24.11.1976, BCB 9234. Ibidem alt. 410 m., Leg. et det. R. M. Cros, 14.7.1979, BCB 9233. Ibidem lt. 230 m., Leg. et det. R. M. Cros (as *P. rostratum*), 26.2.1977, BCB 9236, 9243 and 9245. Ibidem alt. 230 m., Leg. et det. R. M. Cros (as *P. undulatum*), 26.2.1977, BCB 9266. Ibidem alt. 150 m.,

Leg. et det. R. M. Cros (as *P. rostratum*), 15.3.1977, BCB 9237. Ibidem alt. 210 m., Leg. et det. R. M. Cros (as *P. rostratum*), 19.1.1976 BCB 9240. Ibidem alt. 180 m.; Leg. et det. R. M. Cros, 26.4.1978, BCB 9232. Ibidem, Leg. et det. R. M. Cros, 27.11.1976, BCB 9229.

PE 95 Cáceres: Acebo, alt. 400 m., Leg. M. Brugués and R. M. Cros, det. R. M. Cros, 2.6.1986, BCB 22171.

TJ 97 Cáceres: Humilladero, alt. 800 m., Leg. et det. C. Viera, 20.10.1979, MA 5134.

TF 70 Cádiz: El Cobre, alt. 350 m.; Leg. et det. Illegible, 24.12.1969, BCB 3702.

UN 68 Cantabria: Sierra de Beges, Leg. et det. E. Fuertes and E. Martínez-Conde, 20.3.1982, MACB 21992. Ibidem Leg. et det. E. Fuertes and E. Martínez-Conde (as *P. medium*), 15.6.1984, MACB 20720.

BF 61 Castellón: Fredes, alt. 1050 m., Leg. C. Casas *et al.*, det. R. M. Cros, 4.6.1984, BCB 13313 and 13314.

YL 40 Castellón: Morella, alt. 140 m., Leg. et det. Akeroyd *et al.*, 21.4.1982, BCB 12290.

WM 18 La Rioja: Tobía, Leg. et det. C. Casas, 28.6.1979, BCB 3696.

UN 47 León: Sierra Cebollada, alt. 1800 m.; Leg. et det. J. Muñoz (as *P. elatum*), 16.8.1989, hh 1392.

VL 32 Madrid: Puerto de Canencia, alt. 1600 m., Leg. S. Vicente and E. Ron, det. J. Vicente and E. Ron (as *P. elatum*), 6.3.1983, MACB 27856.

VL 54 Madrid: Montejo de la Sierra, Leg. E. Fuertes Lasala *et al.*, det. E. Fuertes, 23.10.1980, MA 186. Ibidem, Leg. et det. F. Blanco, 8.3.1981, MACB 7923.

XN 06 Navarra: Alcoz, Leg. et det. A. de Miguel, 29.3.1984, NAU 5260.

XN 29 Navarra: Urdax, Leg. A. de Miguel *et al.*, det. A. de Miguel, 26.6.1985, NAU 5271.

WN 74 Navarra: Baciacoa, Leg. et det. A. de Miguel, 10.3.1983, NAU 5261.

WN 75 Navarra: Puerto de Lizarrusti, Leg. A. de Miguel and A. Ederria, det. A. de Miguel, 18.10.1984, MUC 5262 and 5269.

XN 07 Navarra: Monte Mendaur, Leg. et det. J. Arraiza, 22.8.1984, NAU 3368.

XN 52 Navarra: Sierra de Leyre, Leg. A. Ederria *et al.*, det. A. Ederria, 3.12.1981, NAU 1768.

QE 06 Salamanca: Villasrubias, Leg. M. Brugués and R. M. Cros, det. M. Brugués, 19.6.1986, BCB 22174 and 22175.

TK 48 Salamanca: Miranda del Castañar, Leg. et det. Elías, 27.5.1983, BCB 22172.

XK 75 Teruel: Puebla de Valverde, Leg. et det. C. Casas, 5.4.1976, BCB 3703.

XK 97 Teruel: Alcalá de la Selva, alt. 1800 m., Leg. et det. C. Casas, 8.4.1976, BCB 3700.

XK 97 Teruel: Gúdar, Leg. et det. E. Fuertes, MA 6015.

Sites for *Plagiomnium elatum* (B. & S.) Kop. (Fig. 8):

UK 26 Avila: Cuevas del Valle, alt. 1200 m.; Leg. A. Soria and E. Ron (as *P. cuspidatum*), 13.10.1984, MACB 13802.

UN 57 Cantabria: Fuente De, alt. 1100 m., Leg. et det. E. Fuertes (as *P. affine*), 11.7.1981, MA 7000.

DG 39 Gerona: El Catllar, alt. 1500 m., Leg. et det. F. Lloret, 29.7.1984, BCB 24776.

DG 48 Gerona: Vilallonga de Ter, alt. 1100 - 1200 m., Leg. et det. F. Lloret, 29.7.1984, BCB 24727 and 23953.

DG 49 Gerona: Setcases, alt. 1700 m., Leg. et det. Illegible and undated (as *P. affine*), BCB 23941.



Fig. 8. Distribution map of *Plagiomnium elatum* (B. & S.) Kop.

BH 81 Huesca: Sierra de Chia, alt. 1900 m., Leg. et det. E. Fuertes (as *P. cuspidatum*), 25.7.1987, MACB 28682 and MACB-h unnumbered.

BH 81 Huesca: Gistain, alt. 1400 m., Leg. P. Montserrat *et al.*, det. C. Casas (as *P. affine*), 15.5.1969, BCB 23942.

VL 11 Madrid: Puerto de Navacerrada, alt. 1100 - 1500 m.; Leg. Merino, det. Cortés Latorre, 13.5.1954, MA 3984.

VL 32 Madrid: Puerto de Canencia, alt. 1500 m., Leg. V. Mazimpaka *et al.*, det. J. Vicente *et al.* (as *P. rostratum*), 24.11.1984, MACB 27857.

XN 42 Navarra: Foz de Arbayun, Leg. A. de Miguel, det. A. Ederra (as *P. affine*), 5.4.1981, NAU 2412.

NH 00 Pontevedra: Castro Loureiro, Leg. et det. A. Casares Gil, 1.5.1914, MA-h 8770 and 9027.

PE 86 Salamanca: Navasfrías, alt. 1050 m., Leg. C. Casas *et al.*, det. R. M. Cros (as *P. affine*), 19.6.1985, BCB 22170.

QE 48 Salamanca: Puerto de las Mestas, alt. 1080 m., Leg. C. Casas *et al.*, det. R. M. Cros (as *P. affine*), 19.6.1985, BCB 22173.

XK 95 Teruel: Mora de Rubielos, Leg. A. Santos, det. C. Casas (as *P. affine*), 8.4.1976, BCB 3701. Ibidem Leg. A. Santos, det. C. Casas (as *P. undulatum*), undated, BCB 3783.

## DISCUSSION AND CONCLUSIONS

All the species studied, belong to the boreal courting and behave as hygrophilous (LECOINTE 1981), therefore they are distributed, in the Iberian Peninsula, preferably in the wooded areas. They grow both in the colinous and montane bioclimatic levels of the Eurosiberian region, as well in the meso- and supramediterranean levels of the mediterranean region.

As *P. undulatum* is a edaphically indifferent species (LECOINTE 1981), it is distributed throughout a wider area than the other taxa. It's humidity requirements, makes it more frequent in the septentrional part and seldom in the meridional part of Spain, where the oceanic influences are restricted to the Calar del Mundo (Albacete), Los Alamos (Murcia) and Tejada Sierras (Málaga) and Los Barrios (Cádiz). In the last locality, that bears a great oceanic influence, many Terciary relict species can be found.

This one is the most common of the species studied, being found, nearly all over the Spanish part of the Iberic Peninsula and Balear islands; nevetherless, we found several vouchers that resulted in being the first or second record for several provinces: Cádiz (MUC unnumbered) and Málaga (MUC unnumbered), and the second one for the province of Albacete (MUC 1576).

*P. elatum* behaves as a turfophilous and sciophilous species (LECOINTE 1981), and is mainly located on acid soils of the montanous and subalpine bioclimatic levels, in coniferous and decidous woods.

Only three sites were known, till now, for *Plagiomnium elatum*, having found new records in the following provinces: Avila (MACB 13802), Cantabria (MA 7000), Huesca (BCB 23942), Salamanca (BCB 22170 & 22173), Teruel (BCB 3701) and Navarra (NAU 2412); second record for Madrid (MACB 27857) and third for Gerona (BCB 23941). Its presence, in the Iberian Peninsula, not accepted (KOPONEN 1981) until recently (CASAS 1991), is definitely confirmed widening substantially its geographical distribution in Europe.

*P. affine* is acidophilous, rarely turfey (LECOINTE 1981), being it's distribution area, in the Iberian Peninsula, tied to the woods that grow on acid soil.

We also found a first record for León (hh 1392) and a second for Madrid (MACB 27856) of *Plagiomnium affine*. The key that goes with this paper, includes the morphological characters that we found to be the most useful to differ the species under study.

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