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Analysis of the bryoflora of Navarra (North of Spain)*

Abstract

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The knowledge about the bryoflora in both biogeographical zones of Navarra (Eurosiberian and Mediterranean regions) is commented and compared, and pieces of information about our most recent efforts to boost and balance the bryophytic studies in the Mediterranean zone are reported.

Introduction

The surface of the Navarra province (North of Spain) (Fig. 1) is distributed, due to its geographical situation, between the Eurosiberian Region in the north and the Mediterranean Region in the south (Rivas-Martínez 1987, Loidi & Báscones 1995). Although both areas have almost similar surface, the knowledge of their bryoflora is clearly unbalanced: whereas the Eurosiberian zone has been deeply studied and 512 species of bryophytes are known, the Mediterranean zone has very little been prospected and its bryofloristic richness appears much smaller: 246 species are recorded. This unbalance arises from the first main contributions on bryoflora of Navarra: Lacoizqueta (1885) reported 122 species from the northwest (Eurosiberian zone), while Ruiz de Casaviella (1880) reported only 3 species from the south (Mediterranean zone). Many bryologists studied the north of Navarra along the twentieth century (e.g. Allorge 1934, Allorge 1955, Ederra 1984, Miguel & Ederra 1990). On the contrary, very few bryologists have been interested in the south: the first main contribution dates back to the 70's decade (Fuertes Lasala & López Fernández 1975). Differences in the amount of data between both zones of Navarra appear very clear comparing the numbers of papers dealing with this item: 119 papers quote species from the Eurosiberian zone and only 52 study the Mediterranean zone (and more than half of them treats also the Eurosiberian zone). Fig. 2-3 show this situation.

During the last four years we have developed a research project in order to improve the knowledge of the bryoflora from the south of Navarra. First, we have made a study of bibliographic references to obtain a previous view of the situation. Based on bibliography, we made a preliminary catalogue of taxa recorded in Navarra. A quantity of taxa were reviewed, to confirm or reject their old identification.

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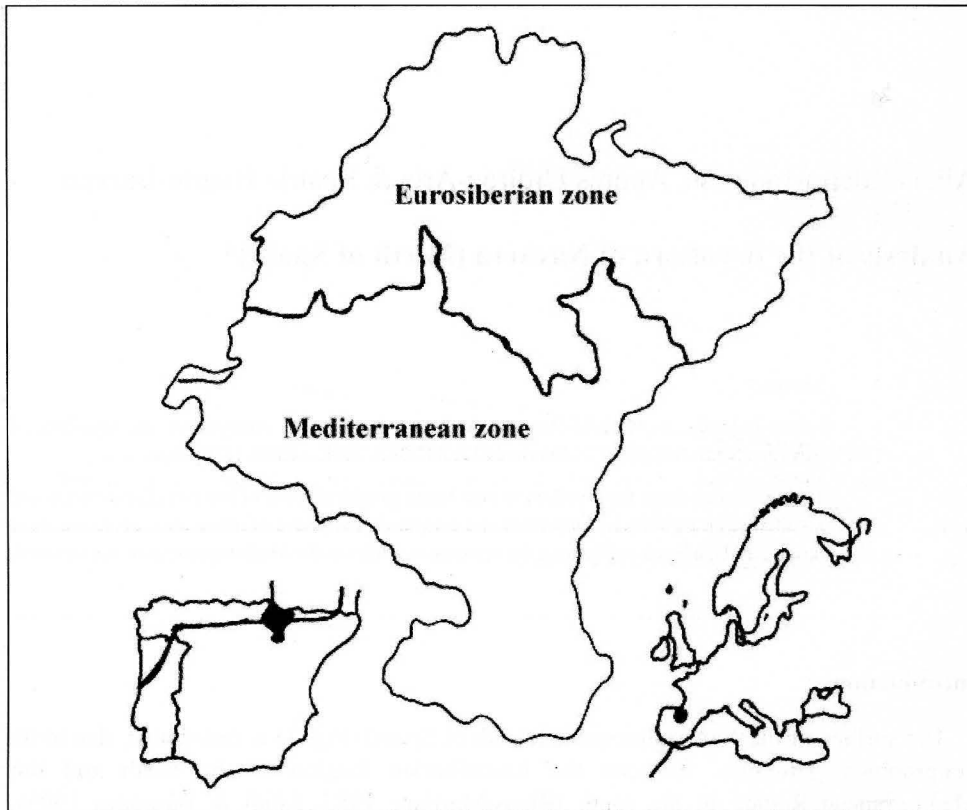


Fig. 1. Geographical extension of Eurosiberian and Mediterranean zones in Navarra (Spain).

Finally, we have prospected a lot of localities included in thirty three 10 ~ 10 Km UTM squares. Seventeen of them are totally or mainly included in the Mediterranean zone.

Results

Bibliographic references

Our list of bryophytic references concerning Navarra includes 135 records (books, monographies and papers). Fig. 2 shows the number of papers published about bryoflora of Navarra along time. Although Eurosiberian references have been always higher, in the last 30 years, the number of papers about Mediterranean bryoflora has boosted considerably; in fact 90,4% of these papers have been published since 1971.

Bryoflora

The current check-list of bryophytes of Navarra includes 560 taxa. The specific richness by regions is shown in the Table 1. There are four groups: the first one (Eur. only) includes bryophytes recorded only in the eurosiberian zone; the second one (Eur.) groups

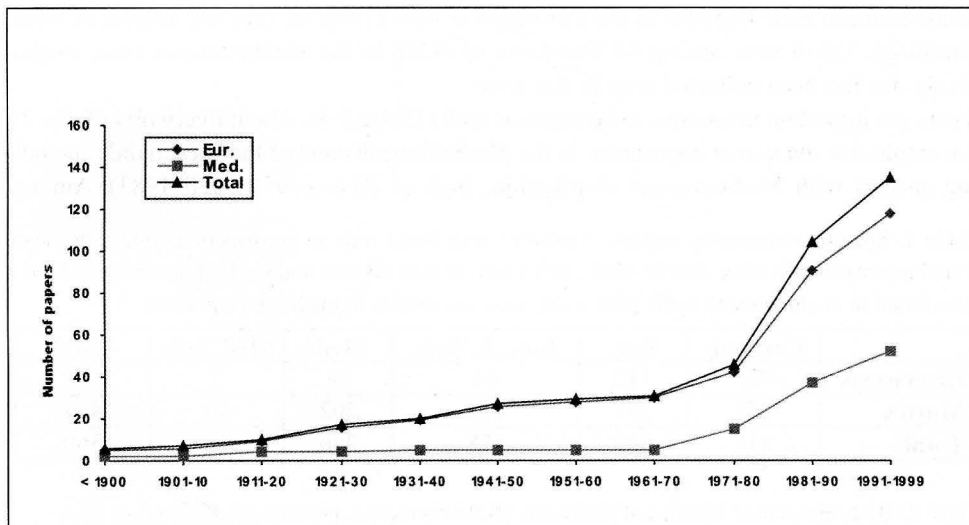


Fig. 2. Number of papers published along time.

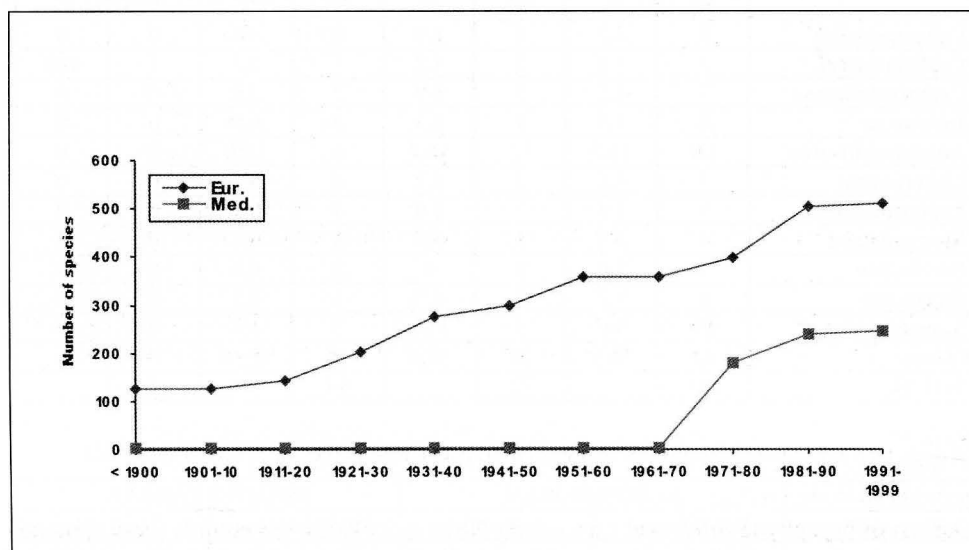


Fig. 3. Number of species described along time.

bryophytes recorded only in the Eurosiberian zone or in both; the third one (Med.) groups bryophytes recorded only in the Mediterranean zone or in both; and the fourth one (Med. only) includes bryophytes recorded only in the Mediterranean zone. The central column in Table 1 shows the number of species recorded in both Eurosiberian and Mediterranean zones. It is easy to see that there are much more species known only from the Eurosiberian zone (314) than from the Mediterranean zone (48): that is, a lot of species recorded in the

Mediterranean zone live also in the Eurosiberian zone (198); so, they are species of wide chorology. Up to now, among 44 liverworts recorded in the Mediterranean zone, exclusively one has been collected only in this zone.

There are important taxonomic differences as well (Tables 2-3). About liverworts (Table 2) we emphasize the scarce importance in the Mediterranean zone of families mainly including species with Mediterranean distribution, such as *Ricciaceae* (Duell 1983). Among

Table 1. Specific richness by regions. Eur.only.: taxa found only in eurosiberian zone. Eur.: taxa found in eurosiberian zone. Eur. & Med.: taxa found in eurosiberian and mediterranean zone. Med.: taxa found in mediterranean zone. Med. only.: taxa found only in mediterranean zone.

	Eur. only	Eur.	Eur. & Med.	Med.	Med. only	Total
Liverworts	72	115	43	44	1	116
Mosses	242	397	155	202	47	444
Total	314	512	198	246	48	560

Table 2. Best represented families of liverworts (Bold characters, percentages higher than 6%).

	EUROSIBERIAN				MEDITERRANEAN			
	Eurosiberian		Eur. only		Mediterranean		Med. only	
	Nº	%	Nº	%	Nº	%	Nº	%
Calypogeiaceae	5	4,3	5	6,9	0	0	0	0
Cephaloziaceae	3	2,6	3	4,2	1	2,3	1	100
Cephaloziellaceae	7	6,1	5	6,9	2	4,5	0	0
Jubulaceae	4	3,5	1	1,4	3	6,8	0	0
Jungermanniaceae	18	15,7	12	16,7	6	13,6	0	0
Lejeuneaceae	7	6,1	3	4,2	4	9,1	0	0
Lophocoleaceae	5	4,3	1	1,4	4	9,1	0	0
Metzgeriaceae	4	3,5	1	1,4	3	6,8	0	0
Porellaceae	3	2,6	0	0	3	6,8	0	0
Ricciaceae	6	5,2	5	6,9	1	2,3	0	0
Scapaniaceae	11	9,6	8	11,1	3	6,8	0	0
Others	42	36,5	28	38,9	14	31,8	0	0
TOTAL	115		72		44		1	

Table 3. Best represented families of mosses. (Bold characters, percentages higher than 6%)

	EUROSIBERIAN				MEDITERRANEAN			
	Eurosiberian		Eur. only		Mediterranean		Med. only	
	Nº	%	Nº	%	Nº	%	Nº	%
Brachytheciaceae	36	9,1	13	5,4	25	12,4	3	6,4
Bryaceae	28	7,1	21	8,7	9	4,5	3	6,4
Dicranaceae	32	8,1	30	12,4	3	1,5	0	0
Grimmiaceae	20	5	16	6,6	4	2	1	2,1
Orthotrichaceae	22	5,5	9	3,7	13	6,4	0	0
Pottiaceae	66	16,6	24	9,9	76	37,6	34	72,3
Sphagnaceae	16	4	15	6,2	0	0	0	0
Others	177	44,6	114	47,1	72	35,6	6	12,8
TOTAL	397		242		202		47	

mosses (Table 3) the dominance of *Pottiaceae* in the Mediterranean zone is clear, as logical; but it is interesting to pay attention to the abundance of other families, as *Brachytheciaceae* and *Bryaceae*, which are not as a whole typical of Mediterranean areas (Duell 1984, 1985).

In our opinion, the level of knowledge about the bryophytic flora of the Mediterranean zone of Navarra is weak: few papers published, few species recorded and a lack of typically Mediterranean species.

During the last four years we have prospected many 10 × 10 Km U.T.M. squares to, at least, widen the distribution area of as many species as possible. We have collected about two thousand samples, which are only partly identified. Table 4 shows the number of UTM squares prospected. Note that the total number of records in 1998 is considerably higher than in 1995, especially in those squares in which bryophytes were unknown in 1995, and that the number of Mediterranean squares with no records in 1995, which have now been studied (12), is higher than that of the Eurosiberian zones (4).

Table 4. Number of 10 × 10 Km UTM squares prospected in both zones during the last four years

EUROSIBERIAN REGION			MEDITERRANEAN REGION		
Nº UTM SQUARES	Nº SPECIES 1995	Nº SPECIES 1998	Nº UTM SQUARES	Nº SPECIES 1995	Nº SPECIES 1998
3	0	21-40	1	0	1-5
1	0	41-60	5	0	11-20
1	1-5	6-10	6	0	21-40
1	1-5	11-20	1	1-5	11-20
4	1-5	21-40	2	1-5	21-40
2	1-5	41-60	1	6-10	21-40
1	6-10	6-10	1	11-20	11-20
2	6-10	41-60			
1	11-20	11-20			

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