

## **The relationships between moth distribution and plant communities in Navarra (northern Spain) (Lepidoptera)**

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### **Summary**

Navarra is a territory located in the north of the Iberian Peninsula, where a large number of different habitats can be found : from the Pyrenees in the north to the Ebro River in the south. More than 600 species of moth in Navarra are reported. The diversity and abundance of species in each major plant community is studied.

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### **Introduction**

In the past, many studies on the relationships between Lepidoptera and plant communities have been performed with butterflies and skippers (Papilionoidea & Hesperioidea) (e.g. ERHARDT, 1985 ; VIEJO *et al.*, 1989), but only rarely with moths (e.g. in Spain : SARTO, 1985 ; YELA, 1992). However, these superfamilies represent only a small part of this phytophagous insect order. This paper reports a survey on the relationships between plant communities and 13 moth families : Hepialidae, Cossidae, Saturniidae, Lasiocampidae, Sphingidae, Drepanidae, Geometridae, Thyatiridae, Thaumetopoeidae, Notodontidae, Lymantriidae, Arctiidae and Noctuidae.

The work is based on 38105 specimens collected by means of lighttraps set in two dozen sites, scattered throughout Navarra Province (northern Spain), for ten years (from 1978 to 1988). For statistical purposes, we neglected the sites with less than 300 specimens, and so the number of moths was 29639 and the number of sites 18. The geographical and environmental features are summarised in Table 1.

### **Results**

The number of specimens, number of species of each family and diversity (SHANNON index) for each site is given in Table 2.

Table 1  
Geographical and environmental features of the sites

Site	Bioclimatic Zone	Potential forest type	Land uses near light-trap
Arizala	Supramediterranean	<i>Quercus faginea</i>	Cereal crops
Azcona	Mesomediterranean	<i>Q. ilex</i>	Cereal crops
Buñuel	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Irrigated crops
Cadreira	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Irrigated crops
Carcastillo	Mesomediterranean	<i>Q. ilex</i>	Cereal crops and vineyards
Cáseda	Mesomediterranean	<i>Q. faginea</i> & <i>coccifera</i>	Orchards and irrigated crops
Fontellas	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Irrigated crops
Ilundáin	Montane & Supramediterranean	<i>Q. pubescens</i> & <i>Q. faginea</i>	Forestry and cereal crops
Imoz	Montane	<i>Q. robur</i> & <i>Fagus sylvatica</i>	Forestry and cattle
La Oliva	Mesomediterranean	<i>Q. ilex</i>	Cereal crops and vineyards
Larraga	Mesomediterranean	<i>Q. ilex</i>	Cereal crops
Lecároz	Montane	<i>Q. robur</i>	Forestry and cattle
Marcilla	Mesomediterranean	<i>Q. ilex</i>	Orchards and irrigated crops
Mendavia	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Orchards and irrigated crops
Oteiza	Mesomediterranean	<i>Q. ilex</i>	Cereal crops, olives and vineyards
San Adrián	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Orchards and irrigated crops
Sartaguda	Mesomediterranean	<i>Q. coccifera</i> (riparian)	Orchards and irrigated crops
Ucar	Montane & Supramediterranean	<i>Q. robur</i> , <i>Q. pubescens</i> / <i>Q. faginea</i>	Cereal crops and vineyards

The total number of species found was 553, the majority Noctuidae (281, more than half) and Geometridae (167, about 30%). These families together therefore represent more than 80% of all species recorded. If one looks at the numbers of specimens, the Noctuidae comprise 52%, Geometridae 11%, Arctiidae 22%, Lasiocampidae 4%, Sphingidae and Thaumetopoeidae somewhat more than 2% each, and the Cossidae, Notodontidae and Lymantriidae were little more than 1% each. The remainder represent no more than 1% together.

The richest sites (highest number of species and diversity) belonged to those dominated by Lusitanian Oak (*Quercus faginea*) (Ilundáin, Cáseda and Ucar). The next richest were the holm oak (*Quercus ilex*) dominated sites at Marcilla, La Oliva and Larraga. Less rich were sites with kermes oak (*Quercus coccifera*) (Sartaguda, Mendavia and Cadreira), while the sites with the lowest number of species and diversity were those located in the oak (*Q. robur*) and beech (*Fagus sylvatica*) forests at Imoz and Lecároz.

However, the proportion of noctuid species was greatest in the kermes oak sites, with well over 50%, while the Lusitanian oak, and oak and beech sites had 50% or less; sites dominated with holm oak held an intermediate position.

Table 2  
 Number of specimens and species registered for each family, and the diversity index

Site	Hepial.	Cossid.	Saturn.	Lasoc.	Sphing.	Drepan.	Geom.	Thyatir.	Thaume.	Notod.	Lyman.	Arctiid.	Noctui.	Total	Diversity	
Arizala	1	1	1	155	9	14	5	0	0	17	7	169	430	66	926	5.7
Azcona	0	6	1	27	2	2	2	0	0	3	3	46	229	25	351	4.6
Buñuel	0	26	5	15	3	9	4	0	33	2	1	126	1095	79	1395	5.6
Cadreira	7	1	39	4	1	1	67	4	27	1	20	555	2145	77	3385	5.6
Carcastillo	0	0	55	3	0	0	28	5	277	1	0	80	626	61	1169	4.2
Cáseda	1	1	10	3	2	2	27	6	0	0	0	142	1431	116	3032	6.2
Fontellas	0	0	7	3	3	1	2	1	11	1	0	86	291	60	453	5.5
Ilundáin	3	1	6	2	3	1	159	10	257	2	41	2608	3238	159	7439	6.1
Imoz	2	1	3	1	0	0	69	7	41	1	5	15	203	32	333	4.7
La Oliva	6	1	15	4	3	1	116	11	10	0	37	757	909	105	2123	5.5
Larraga	0	0	11	3	3	1	100	8	10	1	12	148	664	100	1163	5.9
Lecároz	0	0	1	1	0	0	3	2	1	3	3	39	144	45	246	8.7
Marcilla	2	1	8	3	6	1	45	8	11	1	4	421	1493	122	2340	6.1
Mendavia	5	1	92	4	3	1	25	6	44	1	34	432	723	98	1615	5.8
Oteiza	0	0	15	2	0	0	252	6	8	1	0	53	888	58	1376	4.7
San Adrián	0	0	46	3	0	0	7	5	15	1	64	293	337	52	835	4.8
Sarraguda	3	1	108	4	11	1	116	8	27	1	18	1553	2666	108	5843	5.8
Ucar	1	1	9	3	6	2	104	7	56	1	85	374	1019	108	1953	5.9
Navarra	1	5	2	17	13	4	167	4	2	20	6	29	283	553		

## Discussion and Conclusions

The richest sites are located in areas with an abundance of Lusitanian oak. The beech and oak dominated sites were the poorest.

The faunal composition is reflected by the potential vegetation, not the type of land use near the light-traps.

The richness of the Lusitanian oak areas probably reflects not only the high botanical diversity, but also the biogeographical position. These sites are situated between the Atlantic (wet) and Mediterranean (dry) areas, thereby sharing many Atlantic and Mediterranean species.

## References

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