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Phytosociological study of the plant communities with *Stauracanthus boivinii* of the SW of the Iberian Peninsula and NW of Africa, using multivariate analysis

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Abstract

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A systematic revision of heaths ("brezales") with *Stauracanthus boivinii* from southern Portugal, south-western Spain and northern Morocco has been made, based on 103 phytosociological relevés. After a numerical analysis with ordination (PCA) and classification, 10 groups of relevés have been defined. From these groups we deduce two new subassociations: Querco lusitanicae–Stauracanthetum boivinii cistetosum sulcati subass. nova (in southern Portugal) and Stauracantho boivinii–Drosophylletum lusitanici saturejetosum salzmanii subass. nova (in south-western Spain). On the other hand, the Sedo brevifolii–Cytisetum tribracteolati Deil 1994 has been included in the Calluno-Ulicetea class.

Key words: Phytosociology, multivariate analysis, southern Iberian Peninsula, north-western Africa, southern Portugal.

Introduction

Plant communities with *Stauracanthus boivinii* of the Stauracanthenion boivinii suballiance are distributed from the Mira river in southern Portugal to the Lekkous river in northern Africa. These are the southernmost heaths of Europe. Together with the heaths in the north of Morocco they form many different associations rich in endemisms. The latter and the geographical isolation are the causes for the floristic isolation of the plant communities of the Ericion umbellatae iberoatlantic alliance.

Hitherto, a considerable number of authors made phytosociological relevés in this area (Rothmaler 1954, Braun-Blanquet et al. 1964, Rivas-Martínez 1979, Malato Beliz 1982, Quézel et al. 1988, Rivas-Martínez et al. 1990, Galán de Mera 1993, Pérez Latorre et al. 1993, Deil 1994). In the present paper we present some new ecological and systematic aspects of these communities.

Biogeography of the area studied

The area studied includes: Southern Portugal, the Monchique hills (902 m) with its spurs in Aljezur, Serra de Spinhaço de Câo, Cape of Sâo Vicente and the coastal band from the Mira river (Portugal) to Ayamonte (Spain); Southwestern Spain, from the Ayamonte coast to Tarifa and the Aljibe hills (1092 m) between Barbate, Guadiaro and Majaceite rivers in the province of Cádiz; Northern Morocco, the Tingitanean Peninsula from the Yebala mountains (855 m) to the Lekkous river mouth in the Larache sandy spots.

According to the bioclomatic classification of Rivas-Martínez (1994) and data obtained from Müller (1982), Le Houerou (1989), Rivas-Martínez et al. (1990) and the National Institute of Meteorology of Spain, the studied area is characteristic of a thermomediterranean thermoclimate. This ombroclimate ranges from dry to hyperhumid, with a pronounced oceanic character which explains the presence of these heaths.

Considering the analogies between flora and vegetation of the south of the Iberian Peninsula and the north-west of Africa and using the biogeographical sectorizations of Rivas-Martínez et al. (1990), Rivas-Martínez et al. (1991), Hammoumi (Deil in Refass, 1993) and Nezadal et al. (1994) observations, the Gaditano-Onubo–Algarviense province would be divided as described below, where the dominant vegetation series in each division are also indicated.

The Monchique sector

This sector encompasses the Monchique and Spinhaço de Câo siliceous mountains, with cork oak forests as potential vegetation (Myrto communis–Querceto suberis sigmentum), the African gall-oaks groves (Euphorbio monchiquensis–Querceto canariensis sigmetum) and the alder groves with "ojaranzos" (*Rhododendron ponticum*).

The Algarviense sector

This sector comprises the sandy spots and the calcareous hilly countries from Melides to the Guadiana river mouth. With a number of endemisms, it is characterized by two different potential vegetation types: the wild tree forests of the Oleo sylvestris–Querceto suberis sigmetum in the sandy spots and the Smilaco mauritanicae–Querceto rotundifoliae sigmetum in calcareous soils.

The Gaditano-Onubense sector

The Gaditano-Onubense sector is represented by the sandy spots and swamps from Huelva to Tarifa. The psamophilous cork oak forests (Oleo sylvestris–Querceto suberis sigmetum) and the halophilous and helophytic swamp vegetation of the southwestern river mouths, specially the Guadalquivir river, are the characteristic vegetation.

The Aljibico sector

The Aljibico sector includes the miocenic sandstones of the Aljibe (in the Spanish provinces of Cádiz and Málaga) and the Campo de Gibraltar mountains. The vegetation is represented by three types of characteristic forests, derived from humid to hyperhumid ombroclimate: the cork oak forests (Teucrio baetici–Querceto suberis sigmetum), the African gall-oak groves (Rusco hypophylli–Querceto canariensis sigmetum) and alder groves (Frangulo baeticae–Rhododendreto baetici sigmetum).

The Tangerino sector

This sector responds to the cork oak forests on sandy and silty soils (Myrto communis–Querceto suberis sigmetum) originating in Aljibe sandstones (Chauve, 1968), the evergreen oaks and the calcareous kermes tree size oaks (Smilaco mauritanicae–Querceto rotundifoliae sigmetum and Rusco hypophylli–Querceto cocciferae sigmetum).

The Bajo Loukkos (Lekkous) sector

This sector represents large coastal sandy spots similar to those in the provinces of Cádiz and Huelva (Spain). Psamophilous cork oak forests and other common plants of the Gaditano-Onubense sector are also found.

Figure 1 shows a map with the different biogeographical areas described and the localisations of the different plant communities studied. Heaths with *Stauracanthus boivinii* substitute stages of cork oak forests and gall-oak groves; however, we can also find them in ferrougineous and hydromorphic paleopodsols. A well conservated heath is a closed vegetation that results from burning and cutting of the cork oak forests and the gall-oak groves. These heaths are located in podsols.

Material and Methods

The present study has been made on the basis of 103 phytosociological relevés: 56 were made in Spain, Morocco and Portugal, using the method of Braun-Blanquet (1979) [Table 1]. The other 47 have been chosen from several references (Braun-Blanquet et al. 1964, Rivas-Martínez et al. 1979, Malato Beliz 1982, Quézel et al. 1988, Rivas-Martínez et al. 1990 and Pérez Latorre et al. 1993).

In order to have sufficient information available for automatic data processing, the abundance-dominance scale of Braun-Blanquet has been transformed according to Van der Maarel (1979): r = 1, + = 2, 1 = 3, 2 = 4, 3 = 5, 4 = 6, 5 = 7. A numerical matrix resulted from this conversion. For statistical analyses, the ANACOM program has been used (V. 3.0, De la Cruz, 1991). The index of Bray-Curtis (1957) has been chosen for ordination and classification analyses. This is a useful index for classifying similar data because it considers the distance percentage of each species and the distance of the most separated species.

Results and Discussion

Classification analysis

Figure 2 is a dendrogram that shows 10 groups. These groups have been generated considering the qualitative plant composition characteristic to each area: Spain (*Bupleurum foliosum, Satureja salzmannii, Serratula alcalae*), Morocco (*Cistus nigricans, Halimium halimifolium* subsp. *multiflorum, H. lasiocalycinum*) and Portugal (*Cistus ladanifer* subsp. *sulcatus, Lavandula viridis, Tuberaria major*).

Groups A, B, C and J represent the relevés of southern Portugal. Groups D, G, I and a part of H are the ones that represent south-western Spain. Groups E, F and the rest of H represent northern Morocco. Relevés from southern Portugal are better separated from the rest, so the floristic composition of the relevés of Aljibic and those of the African communities are more similar.

Group A is the Tuberario majoris–Stauracanthetum boivinii association, from the Algarve (Portugal). Group C represents the Querco lusitanicae–Stauracanthetum boivinii

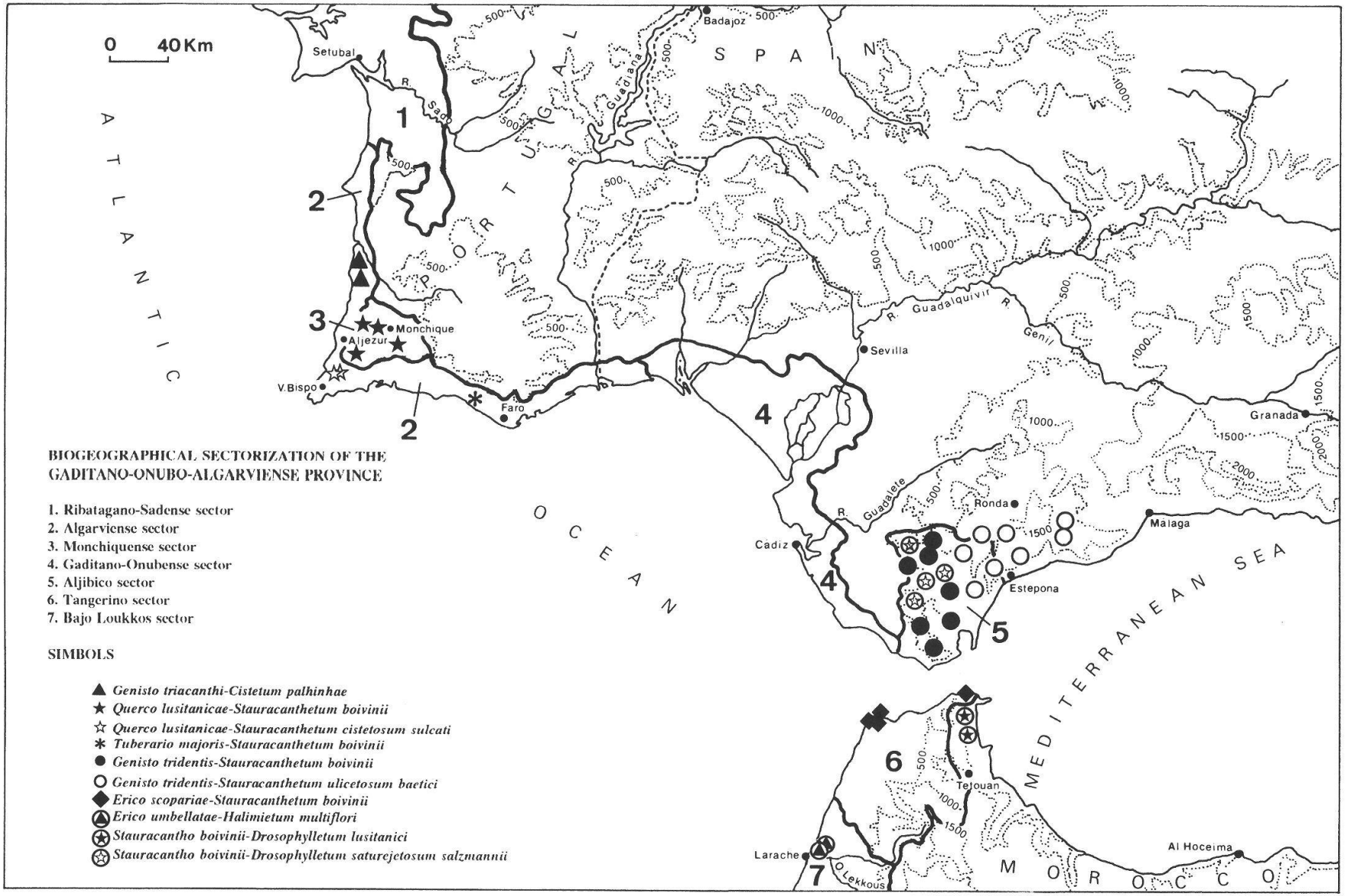

Fig. 1. Map of the studied territory, with the location of the relevés used in the analysis.

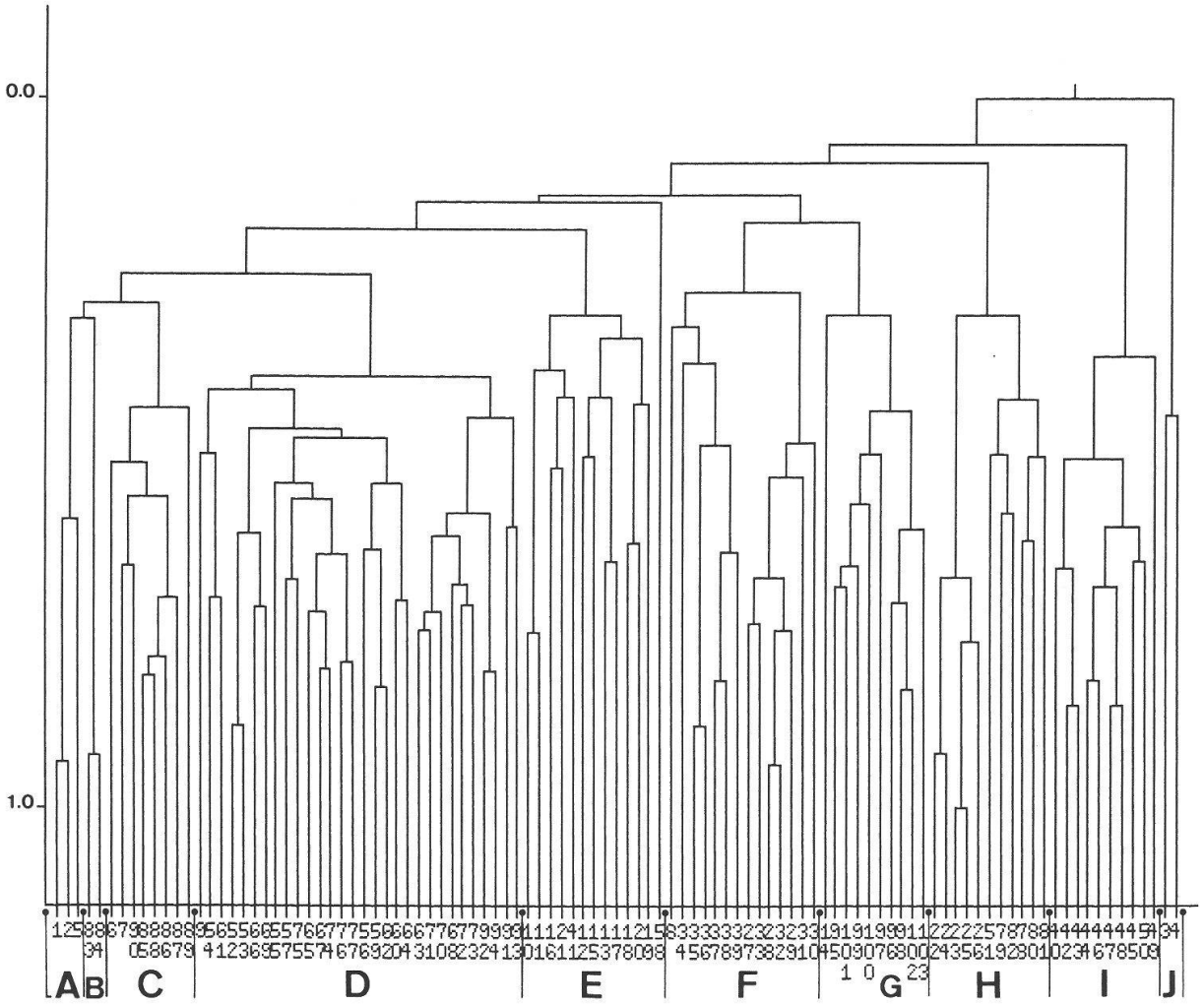

Fig. 2. Dendrogram of classification of the relevés.

association, in Monchique (Portugal). Our results confirm the description of relevé 7 in Aljezur by Rivas-Martínez et al. (1990), namely that relevé 7 belongs to this association. Group B belongs to the same association but includes *Cistus ladanifer* subsp. *sulcatus*. These communities are located on the western slope of Spinhaço de Câo hills (Vila do Bispo, Pedralva). This specific site, together with a more intense maritime influence led us to the description of the new Querco lusitanicae–Stauracanthetum boivinii cistetosum sulcati subassociation. Nevertheless, this subassociation appears widely separated from group J in the dendrogram (Genisto triacanthi–Cistetum palhinhae, Algarve). Both of them have *Cistus ladanifer* subsp. *sulcatus* in common, but group J lacks *Stauracanthus boivinii*, which is the reason for their separation.

Group D is defined by the Genisto tridentis–Stauracanthetum boivinii, an aljibic association. This group includes relevés with *Quercus lusitanica*. This taxon does not form a branch of the dendrogram, therefore we decided to question the quercetosum lusitanicae subassociation, described by Rivas-Martínez (1979) and confirmed by Pérez Latorre et al. (1993). We think that it is only a variant on deeper and eutrophic soils, as Díez Garretas et al. (1986) mentioned. On the other hand, the Genisto tridentis–Stauracanthetum boivinii ulicetosum baetici is a well defined group (group G). This subassoci-

ation is located in the eastern area of the Aljibico sector and the semi-occidental province of Málaga (Casares, Estepona, Ojén).

On less developed soils we can only distinguish communities with *Cytisus tribracteolatus* and *Drosophyllum lusitanicum*. Group H represents the Stauracantho boivinii–Drosophylletum lusitanici, an ibero-northafrican association, characteristic of talus, sandy soils and shrubs degradated by fire. Relevés 78 through 82 are different because of *Satureja salzmannii*, so we can describe the new aljibic subassociation: Stauracantho boivinii–Drosophylletum lusitanici saturejetosum salzmannii. Group I is the Sedo brevifolii–Cytisetum tribracteolati, an aljibic association with an evident rocky tendency.

Groups E and F represent the two main associations in northern Morocco. Group E is defined by the Erico scopariae–Stauracanthetum boivinii, a characteristic association of tangerine sandstones. Group F is the Erico umbellatae–Halimietum multiflori, typical of the sandy spots of Bajo Loukkos (Lekkous).

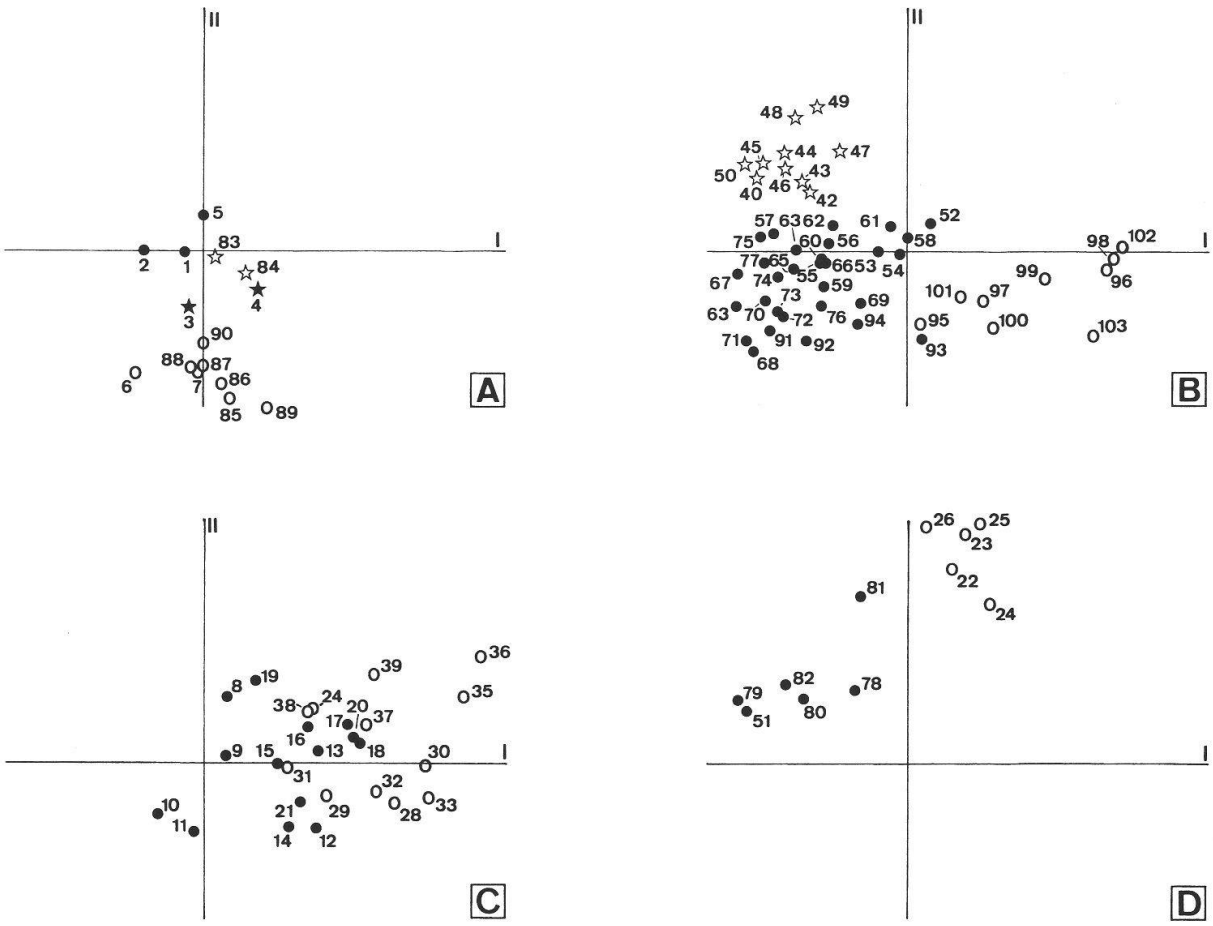

Fig. 3. Ordination (PCA) diagram of relevés. A: ● Tuberario majoris–Stauracanthetum boivinii, ○ Quercus lusitanicae–Stauracanthetum boivinii, ★ Genisto triacanthi–Cistetum palhinhae, ☆ Querco lusitanicae–Stauracanthetum boivinii cistetosum sulcati; B: ☆ Sedo brevifolii–Cytisetum tribracteolati, ● Genisto tridentis–Stauracanthetum boivinii, ○ Genisto tridentis–Stauracanthetum boivinii ulicetosum baetici; C: ● Erico scopariae–Stauracanthetum boivinii, ○ Erico umbellatae–Halimietum multiflori; D: ○ Stauracantho boivinii–Drosophylletum lusitanici, ● Stauracantho boivinii–Drosophylletum lusitanici saturejetosum salzmanii.

Ordination analysis

Results of the quantitative ordination analysis (PCA) are shown in Figure 3 (A–D), where the different phytosociological unities appear separated. The relevés of Genisto-Stauracanthetum boivinii with *Quercus lusitanica* are not isolated (Fig. 3 B). This confirms once more that relevés with *Q. lusitanica* are only variants of the association.

Syntaxonomy

As a result of the statistical study, two new subassociations are proposed (Table 1): Querco lusitanicae–Stauracanthetum boivinii cistetosum sulcati (typus: rel. 36) and Stauracantho boivinii–Drosophylletum lusitanici saturajetosum salzmannii (typus: rel. 22).

The aljibic communities with *Cytisus tribracteolatus* have already been described by Ceballos & Martín Bolaños (1930) as found in wide crevices with good soil accumulation. We can also find some characteristic heath elements, such as *Cistus populifolius* subsp. *major*, *Erica umbellata*, *Quercus lusitanica*, *Satureja salzmannii* and *Tuberaria lignosa*. Deil (1994) described the Sedo brevifolii–Cytisetum tribracteolati association assigning it to the Asplenietea thichomanis rocky class. Considering the phytosociological table, where we can see several elements characteristic of the Calluno-Ulicetea class, such as *Stauracanthus boivinii*, we think that this association is a version of the plant communities with *S. boivinii* from the Aljibe mountains on more rocky soils. So we suggest to include the Sedo brevifolii–Cytisetum tribracteolati association in the Calluno-Ulicetea class.

Conclusions

The following hierarchical order for the plant communities with *Stauracanthus boivinii* from the southern Iberian Peninsula and northern Africa is proposed:

C. CALLUNO-ULICETEA Br.-Bl. & R. Tx. 1943
O. Calluno-Ulicetalia (Quantin 1935) R. Tx. 1937
A. Ericion umbellatae Br.-Bl., P. Silva, Rozeira & Fontes 1952 em. Rivas-Martínez 1979
SA. Stauracanthenion boivinii Rivas-Martínez 1979
Tuberario majoris–Stauracanthetum boivinii Br.-Bl., P. Silva & Rozeira in Rivas-Martínez 1979
Querco lusitanicae–Stauracanthetum boivinii Rothmaler 1954 ex Malato Beliz 1982
stauracanthetosum boivinii
cistetosum sulcati subass. nova
Genisto tridentis–Stauracanthetum boivinii Rivas-Martínez 1979 (incl. variant of Quercus lusitanica)
stauracanthetosum boivinii
ulicetosum baetici Pérez Latorre, Nieto Caldera & Cabezudo 1993
Erico scopariae–Stauracanthetum boivinii Quézel, Barbero, Benabid, Loisel & Rivas-Martínez 1988
Erico umbellatae–Halimietum multiflori Quézel, Barbero, Benabid, Loisel & Rivas-Martínez 1988
drosophylletosum lusitanici
saturejetosum salzmannii subass. nova

Table 1. Relevés made by the authors in the studied area. Symbols: AC = association, VA = variant of association, SA = subassociation, SAL = suballiance, AL = alliance, O = order, CL = class, ● subspecie, ▲ variety.

	000000000111111111112222222	222333333333	34444	44444	45555555
Relevés	123456789012345678901234567	890123456789	90123	45678	90123456
Altitude (Dm)	141321241145453292555539999	666666633333	41414	11111	22336111
	640009789634423096109520000	222222200000	37361	00000	77280222
Orientation	--S---NS--N-N--N-WS--SNNNN	W-SSNSEN-S--	-----	-----	WWWSENWW
	-------W----W--W--W--E-WWW	--E---------	-----	-----	---W-E--
Area (1=10 m^2)	11111110110101111111111111	000000000000	00000	11111	11111111
	00000005005050000000000000	135242145543	11111	00000	00000000
Correspondence with	55555555666666666677777777	444444444455	77888	33333	88888988
the dendrogram	23456789012345678901234567	012345678901	89012	56789	56789034
Genisto tridentis-Stauracanthetum boivinii AC					
Genista tridens	11114.4112121211++.1+13+12	..........+	.....	.....	.....
Serratula alcalae	1.1.1..1.....+111++..+1...	1.........+	++...	.....	.....
Quercus lusitanica VA					
Quercus lusitanica	2211111121112	.1.....+..	.....	...+.	112112..
Sedum brevifolii-Cytisetum tribracteolati AC					
Cytisus tribracteolatus	.....	1.121221211.	.....	.....	.....
Stauracantho boivinii-Drosophylletum lusitanici AC					
Drosophyllum lusitanicum	.....+..1.....+	2	43333	....+	.....
saturejetosum salzmannii SA					
Satureja salzmannii	.1+..+.....1.11..1+1....	.....	+1+++	.....	.....
Erico umbellatae-Halimietum multiflori AC					
Halimium ● multiflorum	.....	.....	.....	32+.3	.....
Querco lusitanicae-Stauracanthetum boivinii AC					
Lavandula luisieri	.....	.....	.....	.....	1.12.112
Lavandula viridis	.....	.....	.....	.....	11111...
Dittrichia ● revoluta	.....	.....	.....	.....	1.+...11
cistetosum sulcati SA					
Cistus ● sulcatus	.....	.....	.....	.....	22

Table 1. (cont.)

Relevés	000000000111111111112222222 12345678901234567890123456	222333333333 789012345678	34444 90123	44444 45678	45555555 90123456
Stauracanthenion SAL, **Ericion umbellatae** AL					
Stauracanthus boivinii	32353414444444342323214444	12..++1++121	21212	.....	2222.344
Erica umbellata	..11.+...2.2...2+1121.1331	.....1.	11.11	1.+11	.131....
Halimium lasianthum	..+1.1..2..111.12111.121+1	1.....1	.1...	..11.	.....
Genista tridentata	...2....1.....11..1..1.+.	..+..+....1.	.....	.....	2222.211
Erica australis	.....3..1.4+4444....	.....	.....	.....	432321..
Thymelea villosa	..1.1+...1.1+....111++....	.....	....+	.....	.....
Polygala microphylla	....+...1...1....1+.1.1...	.....+.	+....	.....	.....
Genista triacanthos	.....	.2.....	1.1..	.....	2+112...
Cistus ● major	.....3...22....	+.....	.+...	.....	1..+....
Bupleurum foliosum	..+.....+..++.....+..	.....	..+..	.....	.....
Pedicularis ● lusitanica	.....1....+.1+.....	.....	.....	.....	.....
Polygala baetica	....1.+.....	.....	.....	..1.1	.....
Calluno-Ulicetealia O., **Calluno-Ulicetea** CL.					
Calluna vulgaris	11.112.12.12121112121111+1+	13+111111.11	.1+.1	..111	34443132
Erica scoparia	43.1131+..+..141.4.1..1+..	.4.....+1+..	..1..	..333	21...121
Tuberaria lignosa	111+1....+....1..1.1.1....	.....	1.1+.	..2..	11+11...
Centaurea africana	.....+..+...+.....	.....+...	.....	.....	.....
Simethis planifolia	...1.....+...	.....	.....	.....	....+...
Halimium ocymoides	.....	.....	.....	.....	...1....
Cisto-Lavanduletea and **Quercetea ilicis** CL.					
Lavandula stoechas	11++11..1+1.+11+.1+..1+1..	....+.++11+.	...4.	11111	.....
Cistus salvifolius	11++1.11++1.1++..1....+.1+	.1.....1....	....+	42212	11.1..+1
Cistus ladanifer	.++..1...+.++.....1.+1.+..	....+.+....+	.....	.....	3113.4..
Arbutus unedo	..+....+.....+++.+.....++	.1....+.....	.....	+.+..	111.1+.+
Cistus crispus	1.+.....1.....+.....	.....	1....	34444	+.1+.111
Lithodora ● lusitanica	....1..11+1.....1.....	.1.....+	.....	..+..	1+..11..
Pistacia lentiscus	++.....+...+.....	.1.....	.....	++++2	.....
Quercus suber	++.....+.....+.....+.	.....	.....	.....	++...+++
Daphne gnidium	.....+.....+.	.1...+...+.+	.....	..++.	.....
Myrtus communis	.....+.....	.....	.....	11+1.	.....1+
Phillyrea angustifolia	.....	.+.....	.....	+.1+.	1....+..
Teucrium ● baeticum	.+.+.....	1.111.....	.....	.....	.....
Halimium halimifolium	22.....	.....	.....	.....	.+....11
Erica arborea	..+.....+.....	.....	.....	1+...	...1....
Calicotome villosa	++.....	.....	.....	++...	.....
Quercus coccifera	.....+.....	+.....	.....	.+.+.	.....
Olea ▲ sylvestris	.+.+.....	.....+.....	.....	.....	.....
Chamaerops humilis	.....	.....	.....	11..+	.....
Companiers					
Agrostis curtisii	1.1....1...1+21+1.1.11.+..	..12.1+1..11	....+	.....	2.1111..
Avenula ● albinervis	12+111.....1.1211.111+1...	...1+.++.+1.	+.+..	.....	.....
Festuca ● baetica	.....+....+...11....	1.11.11...+.	..+..	.....	.....
Sedum brevifolium	.....	1.1111.++1+.	.....	.....	.....
Pteridium aquilinum	+.11..2.....+...	.....	.....	..1.1	....4...

Table 1. (cont.)

Relevés	000000000111111111112222222	222333333333	34444	44444	45555555
	123456789012345678901234567	789012345678	90123	45678	90123456
Pulicaria odora	1+.....1+..+++.....	.....	.....	.....	.1.....
Holcus grandiflorus	...+..+.....2.+.....111.	.....	.....	.....	.....
Rubus ulmifolius	..+.....	.....	.....	.....	+++++...
Pinus pinaster	.....+.....	.....	....+	.....	...+.+++
Helichrysum stoechas	.....	.....	.....	.....	++11.1..
Ulex borgiae	...1..22..1.....	.2.....	.....	.....	.....
Carex hallerana	.....	...2.1+.1...	.....	.....	.....
Briza maxima	..+.....	.....	.....	.....	.+.+....
Brachypodium phoenicoides	+1.....1.....	.....	.....	.....	.....
Centaurium erythraea	.....+...++.....	.....	.....	.....	.....
Festuca caerulescens	+.....1.....	.....1....	.....	.....	.....
Crepis tingitana	.....+.....+.....	.....	.....	.....	.....
Carex ● serrulata	.....	+.....	+....	.....	.....
Smilax aspera	.....1.....1.....	.....	.....	.....	.....
Holcus lanatus	.....+.+	.....	.....	.....	.....
Dittrichia viscosa	.....	.....	.....	..++.	.....

Other taxa only once represented. **Rel. 2**: Dactylis ● hispanica +; **Rel. 4**: Andryala integrifolia +; **Rel. 11**: Genista linifolia +; **Rel. 12**: Senecio lopezii +; **Rel. 13**: Scilla monophyllos +; **Rel. 15**: Carex distachya +, Thapsia villosa +; **Rel. 16**: Adenocarpus telonensis +, Phyllirea latifolia +; **Rel. 17**: Asphodelus villarsii +; **Rel. 20**: Conopodium capillifolium +; **Rel. 27**: Arisarum simorrhinum 1; **Rel. 28**: Umbilicus rupestris +; **Rel. 35**: Rumex bucephalophorus +; **Rel. 36**: Andropogon distachyos 2, Misopates ▲ grandiflorum +; **Rel. 41**: Bellis sylvestris 1; **Rel. 48**: Teucrium fruticans +, Cistus monspeliensis 1; **Rel. 50**: Smilax aspera +, Avenula sulcata +, Cynara algarbiensis +; **Rel. 51**: Prunella vulgaris +, Ulex argenteus 2; **Rel. 53**: Euphorbia monchiquensis 1; **Rel. 54**: Asphodelus ramosus +, Rhamnus alaternus + and Osyris alba 2.

Localities. **SPAIN**: 1 and 6- Los Calabozos, Sierra de Ojén (Tarifa, Cádiz); 2- Montera del Torero (Los Barrios, Cádiz); 3 and 11- Puerto de la Zarzuela, Sierra Blanquilla (Los Barrios, Cádiz); 4 and 14- El Cuervo (Benalup, Cádiz); 5- Puerto de las Cruces (Alcalá de los Gazules, Cádiz); 7- Moheda del Muerto, Sierra del Niño (Los Barrios, Cádiz); 8- El Aljibe (Alcalá de los Gazules, Cádiz); 9- Garganta del Niño (Los Barrios, Cádiz); 10- Las Caheruelas, Sierra de Ojén (Tarifa, Cádiz); 12 and 23- Zanona (Los Barrios, Cádiz); 13- Garganta de Ortela (Jerez de la Frontera, Cádiz); 15- Los Garlitos, Sierra Blanquilla (Los Barrios, Cádiz); 16 and 17- Garganta del Medio (Jerez de la Frontera, Cádiz); 18- Altos de Majada Escobar (Alcalá de los Gazules, Cádiz); 19- Cerro de las Gargantillas (Medina Sidonia, Cádiz); 20- Piedra de los Padrones (Alcalá de los Gazules, Cádiz); 21 and 22- Casas del Corchadillo (Jerez de la Frontera, Cádiz); 24- Puerto de la Yegua (Alcalá de los Gazules, Cádiz); 25 and 26- Garganta de Puerto Oscuro (Alcalá de los Gazules, Cádiz); 27- from Puerto de Galis to Ubrique (Cádiz); 28 to 33- Telephonic station of Jimena de la Frontera (Cádiz); 34 to 38- Loma del Cochino (Jimena de la Frontera, Cádiz); 39 and 41- Cerro de las Callejuelas at Puerto de Galis (Jerez de la Frontera, Cádiz); 40- Moheda del Muerto, Sierra del Niño (Los Barrios, Cádiz); 42- Casa de los Garlitos, Sierra Blanquilla (Los Barrios, Cádiz); 43- Piedra de los Padrones (Alcalá de los Gazules, Cádiz). **MOROCCO**: 44 to 48- Larache. **PORTUGAL**: 49 to 52- from Aljezur to Monchique (Algarve); 53- from Monchique to Foia (Algarve); 54- Alfambras (Algarve); 55 and 56- from Vila do Bispo to Pedralva (Algarve).

Sedo brevifolii–Cytisetum tribracteolati Deil 1994
Genisto triacanthi–Cistetum palhinhae Rivas-Martínez, Lousa, Díaz, Fernández-González & Costa 1990

Floristic appendix

The binomial nomenclature for the subspecies has been used in the text and in the phytosociological table. Taxa follow the references of Flora Europaea (Tutin et al. 1964–1980), Flora Iberica (Castroviejo et al. 1986–1993) and Flora Vascular de Andalucía Occidental (Valdés et al. 1987).

Resumen

Se realiza una revisión sistemática de los brezales con *Stauracanthus boivinii* del sur de Portugal, suroeste de España y norte de Marruecos en base a 103 inventarios fitosociológicos. Tras realizar un análisis numérico de clasificación y ordenación (ACP), se han establecido 10 grupos de los que deducimos dos nuevas subasociaciones: Querco lusitanicae–Stauracanthetum boivinii cistetosum sulcati subass. nova (sur de Portugal) y Stauracantho boivinii–Drosophylletum lusitanici saturejetosum salzmannii subass. nova (sur de España). Por otra parte, se propone la inclusión de Sedo brevifolii–Cytisetum tribracteolati Deil 1994 dentro de la clase Calluno-Ulicetea.

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