Lagascalia 19(1-2): 623-630 (1997)

CHAMAESYCE PROSTRATA COMMUNITIES IN THE WORLD

ANDRAÚ CARNI

Abstract

This work features the *Chamaesyce prostrata* communities in the world. The relevÉs pointing out ten different associations which are spread throughout the world were taken into consideration. The analyses that *Chamaesyce prostrata* appears in two well defined groups: one in the tropics and subtropics (classified within the *Eleusinion indicae* Leonard 50 (*Ruderali-Euphorbietalia, Ruderali-Manihotetea*) in the syntaxonomical terms) and the second one in the meridional region (classified within the *Euphiorbion prostratae* Rivas-Martinez 76 (*Eragrostietalia, Stellarietea mediae*).

Introduction

Chamaesyce prostrata is an annual, procumbent species that often appear on synanthropic sites with characteristic soils which are subject to frequent trampling. (BENEDI & ORELL, 1992) It is of the Central American origin and spread everywhere in the tropical and meridional regions. Recently it has been found in central Europe (TRPIN, 1991). According to COLLINS & JONES, (1986) it posseses the C4-photosynthetic pathway which is characteristic for hotter regions.

Material and methods

During the research it was found out that there are quite a lot of phytosociological relevés where *Chamaesyce prostrata* appear. Only those relevés were taken into account where *Chamaecyce prostrata* has the cover value at least 1. 46 relevés were found on Iberian peninsula, Canary Islands, in Madeira, Cuba, Brazil, Hawaii, Indonesia and Africa.

The map showing the distribution of the relevés and giving the information about the local climate is added in the figure 1 (WALTER & LIETH, 1960)

An ordination (principle co-ordinates analysis using similarity ratio as resemblance) of the relevés was performed using the programme PRINCOOR of the package SYN-TAX 5.0 (PODANI, 1993). The Braun-Blanquet cover values were transformed as proposed by VAN DER MAAREL (1979). The result is shown in the figure 2.

The relevÉs were organised in the table (Table 1) showing the three group of species: the common group, the tropical and subtropical group as well as the meridio-nal group. The species appearing only in one relevé were left out. In the table the information about each species added in view of its family, origin and growth form. The information about the families presented in the table is given in the figure 3.

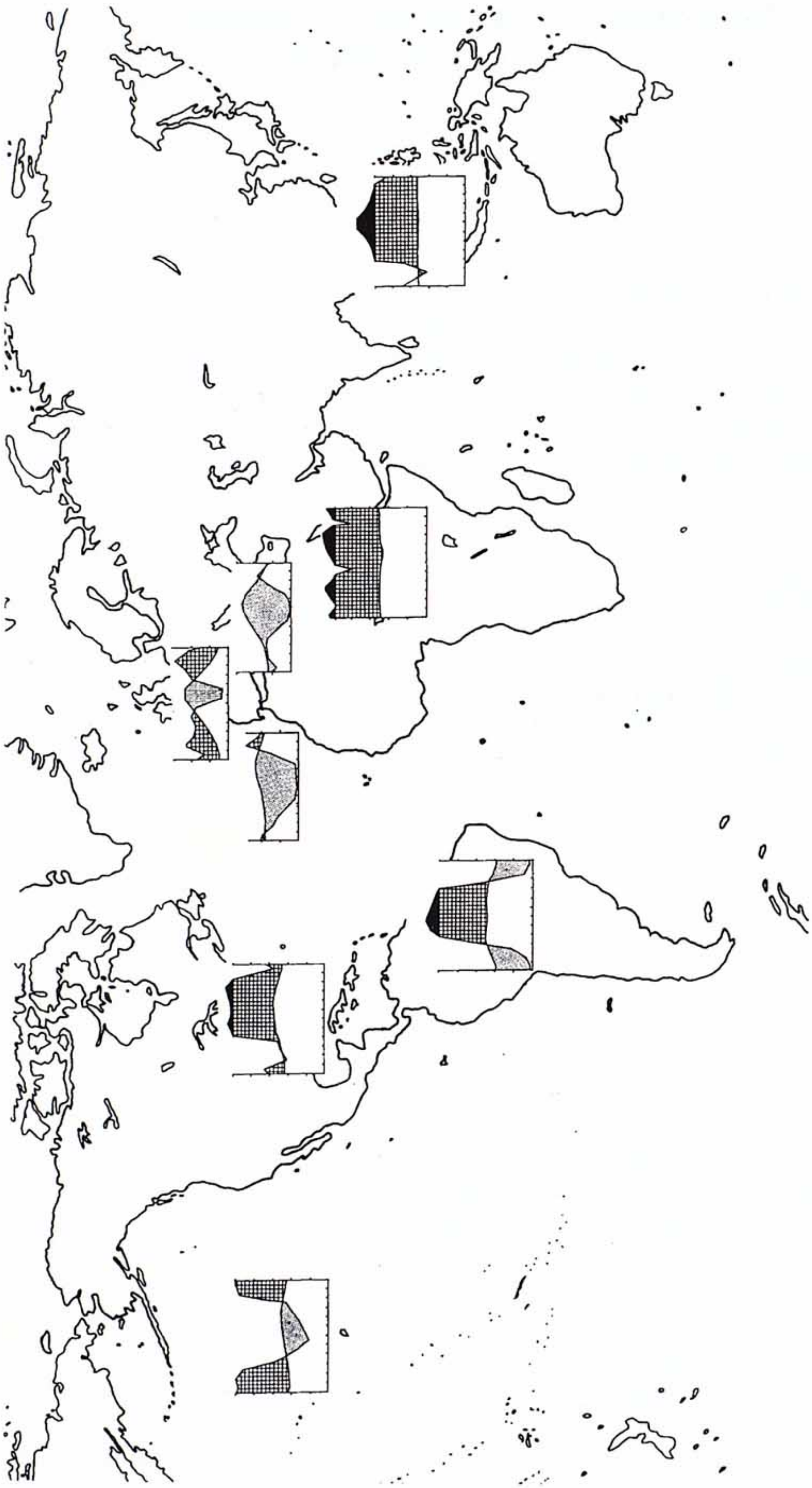

Fig. 1. Distribution of the relevés and the climatic diagrammes.

Results and discussion

In the table 1 two well distinguished groups can be found.

The first one appears in the tropical and subtropical regions:

Eragrostis amabilis-Euphorbia prostrata association from Cuba (GUTTE, 1989); *Synedrello-Eleusinetum indicae* prov. from Hawaii (OBERDORFER, 1983); *Portulaco-Euphorbietum prostratae* Lebrun 1947 from Central Africa (NYAKBWA, 1988); *Oxalido-Euphorbietum prostratae* Carni 1995 from SW Asia (CARNI, 1995). Also the *Eragrostio tenellae-Euphorbietum prostratae* Schulte 1993 from Brazil (SCHULTE & TEIXEIRA, 1993) was classified within this group.

This classification is justified because there are some characteristic species of the tropical trampled habitats such as *Chamaesyce hirta, Eragrostis tenella* etc. However there are some species that are not common with any of the treated associations such as *Oxalis refracta, Richardia brasiliensis,* etc. This could mean that this is another group but there are not enough data for such a conclusion. Temporarily, it has been decided to assign this association to the first group.

In the phytosociological term, the above mentioned associations are classified within the *Eleusinion indicae* Léonard 1950. Further they are classified within the *Ruderali-Euphorbietalia* Schmitz 1971 and *Ruderali-Manihotetea* Léonard in Tanton 1949.

The climate of tropical and subtropical regions is hot and wet with the average rainfall exceeding 1000 mm (except for Hawaii 700 mm) and the average year

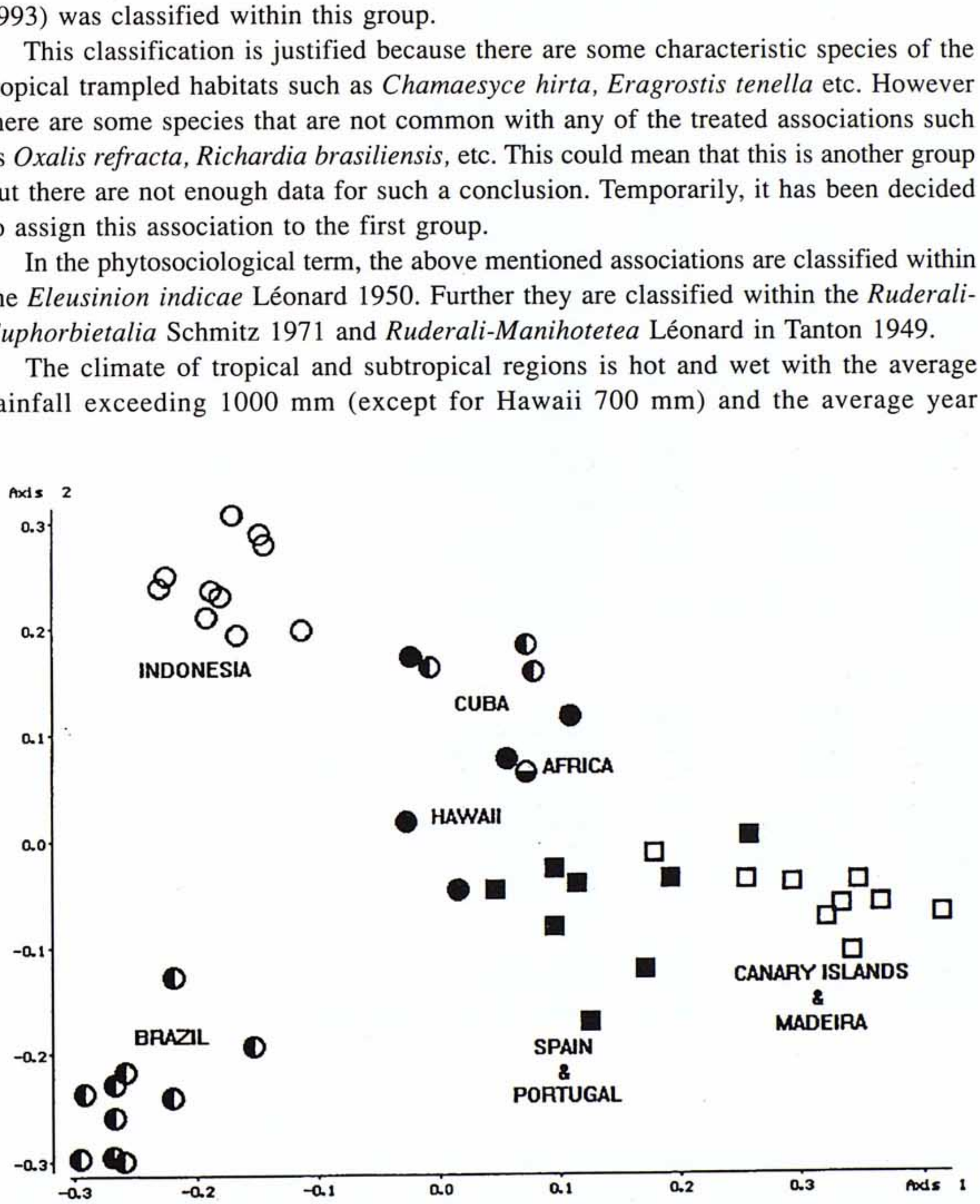

Fig. 2. Results of the principle co-ordinate analysis.

				CUBA			HAWAII				AFRICA			
			Numer of releve	1	2	3	4	5	6	7	8	9	10	11
Family	Origin	Growth form	Number of species	7	10	10	14	10	6	9	7	15	6	14
Euphorbiaceae	America	annual	Chamaesyce prostrata (Aiton) Small	3	1	2	1	2	1	2	2	1	4	3
Common species														
Poaceae	Old world	annual	Eleusine indica (L.) Beauv. ex R. et S.	r	1	r	+	3	1	+	2	+	+	
Portulacaceae	Europe/Sw Asia	annual	Portulaca oleracea L.		2	2	+	+		2	1			
Asteraceae	South America	perennial	Conyza bonariensis (L.) Cronq.				+	1	+					
Poaceae	Trop. Africa	perennial	Cynodon dactylon (L.) Pers.				3	+	+	+				
Oxalidaceae	-	perennial	Oxalis corniculata L.			r		+						
Amaranthaceae	Trop. America	annual	Amaranthus deflexus L.											
Brasicaceae	Eurasia	annual/perenn	Coronopus didymus (L.)Sm.								+			
Apiaceae	Brasil	annual	Ciclospermum leptophyllum (pers.)Sprange											
Only in the tropical group														
Euphorbiaceae	America	annual	Chamaesyce hirta (L.) Millsp.	2	1	1	+		+	1		1	2	1
Poaceae	Paleotropics	annual	Eragrostis tenella (L.) Beauv. ex R. et S.		3	2						+		2
Rubiaceae	Africa	annual/perenn	Hedyotis corymbosa (L.) Lam.										+	+
Amaranthaceae	-	annual	Amaranthus viridis L.		+									+
Asteraceae	Trop. America	annual	Synedrella nodiflora (L.)Gaertn.				1	2		1	+			+
Euphorbiacea	South India	annual	Phyllanthus niruri L.											1
Cyperaceae	-	annual	Cyperus compressus L.											+
Asteraceae	Trop. Asia	annual	Vernonia cinerea (L.) Less.											1
Asteraceae	Eurasia	perennial	Taraxacum officinale agg											
Malvaceae	-	annual/perenn	Malvastrum coromandelianum (L.) Gracke				+	+					+	+
Poacaea	Trop. America	perennial	Axonopus compressus (Swartz) Beauv.										+	
Asteraceae	Central America	perennial	Tridax procumbens L.											+
Oxalidaceae	Brazil	-	Oxalis refracta A. St. Hill											
Rubiaceae	South America	annual	Richardia brasiliensis Gomes											
Acanthaceae	Trop. America	perennial	Ruellia tuberosa L.	+										+
Poaceae	Cent & south America	annual	Paspalum notatum Flügge.											
Asteraceae	Cent. & south America	annual	Galinsoga quadriradiata Ruiz & Pav.											
-	-	-	Bryophyta indet.											
Cyperaceae	-	perennial	Abilgardia monostachya (L.) Vahl	1		2								
Poaceae	Trop. America	annual	Eragrostis tephrosanthus Schutt.	2		+								
Poaceae	-	annual/perenn	Digitaria serotina (Walt.) Michx.	+		2								
Poaceae	Neotropics	annual	Cenchrus echinatus L.				+				+			
Fabacaea	South America	annual/perenn	Mimosa pudica L.				+							
Cyperaceae	-	-	Cyperus sp.				+							
Amaranthaceae	Neotropics	perennial	Althernanthera pungens Kunth					1	+					
Amaranthaceae	Paleotropics	annual	Amaranthus dubius Mart. ex Thell.							+	+			
Euphorbiaceae	-	-	Acalypha indica L.											+
Poaceae	Cent. & south America	annual	Chloris barbata (L.) Swartz											
Asteraceae	Cent. & south America	annual	Galinsoga parviflora Cav.											
Malvacaea	-	-	Sida rhombifolia L.											
Only in the subtropical group														
Poaceae	Europe	annual	Poa annua L.											
Caryophyllaceae	Europe	annual	Polycarpon tetraphyllon (L.) L.											
Polygonaceae	Europe	annual	Polygonum aviculare agg											
Asteraceae	Australia	annual	Cotula australis (Sieber ex Spreng.) J. D. Hook											
Asteraceae	-	-	Gnaphalium luteo-album L.											
Amaranthaceae	Africa	perennial	Alternanthera caracasana Kunth											
Euphorbiaceae	Trop. America		Chamaesyce serpens (Kunth in Humb. & al.) Small											
Asteraceae	Trop. America	perennial	Conyza canadensis (L.) Cronq.											
Euphorbiaceae	Iranian-Turanian region	annual	Chamaesyce canescens L.											
Asteraceae	Cent. & south America	annual/biennia	Aster squamatus (Sprengel) Hieron.											
Poaceae	Mediterran	annual	Eragrostis barrelieri Daveau											
Asteraceae	-	-	Conyza sp.											
Caryophyllaceae	-	annual/perenn	Spergularia rubra (L.) J C. Presl.											
Cyperaceae	-	perennial	Cyperus esculentus L.											
Plantaginaceae	Europe	annual/perenn	Plantago coronopus L.											
Asteraceae	Europe	annual	Sonchus oleraceus L.											
Amaranthaceae	Temp. south America	perennial	Amaranthus muricatus (Moq.) Gillies ex Hicken											

Table 1. Analytical table of communities. The following relevés were taken to the analyses: 1 - 3, Gutte, 1989: tab.5/2-4; 4 - 8, Oberdofrer, 1983: tab.3/3,5,6,11,12; 9, Nyakbawa, 1988: p. 305; 10 - 19, carni, 1995: tab. 1/1-10; 20 - 29, Schulte, 1993: tab 2/1-10; 30 - 32, Oberdorfer, 1975:

INDONESIA BRAZIL MADEIRA CANARY ISLANDS SPAIN AND PORTUGAL

12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
12	9	10	8	14	11	9	11	10	5	12	10	8	8	9	6	11	3	10	8	9	9	9	11	7	9	10	10	9	12	9	6	4	4	8
4	4	4	4	4	3	4	4	2	2	2	2	2	2	2	2	3	1	1	1	1	1	1	3	1	2	1	1	1	2	1	2	2	3	1
1		+		+	+		+	r	+	r	+	1	+		r	r	+	+		1		1			+		+		+					+
				2	1	+	2				r	+	+	+						+															
		1	+	+		+		r							+	+						+		1		+		+		+				
	+			+	1	+			r	r	+	+		r					+	+		1	1				+		+					
								r		r	+							+	+			1	2	1	3		+							
+	+	+	+	+			+	1	1	+	1	+	+	2	+	+																		
2	2	2	2	1	1	1	1	+	+	+	1	+	+	+	+	+	+																	
+	1	+		+	+	1																												
+		+	+				2																											
					+																													
+	+				+	+	+																											
+			+	+	+		+																											
		+		+	+	1	+																											
								r		r	r		r	r		1																		
				+																														
+				+	+	+																												
+		+					+																											
										+	1	r	+																					
										+			r		+	r																		
+																																		
								r		r		r																						
								r			r			r																				
								+		+					+																			
			+																															
				+																														
	+																																	
		+	2																															
								r								r																		
								+							+																			
																		+	2	1	2	3		+	+	+		1						
																		+	2	2	2	1		1	+			+				2		
																		+	1		1		1			2	2	1						
																		+	+	+	2	2													
																								1	+	1	1								
																			1	+	+	+								+	2	2	3		
																															+	+	1	
																			1		2	2												
																				+	1	+												
																		+	1															
																							+	1										
																			1		+													
																				+			1											
																							+	+										
																							+	+										
																									2				+					

tab. 2/5,6,13; 33 - 34, Lohmeyer et al., 1970: tab. 9/3,4; 35 - 36, Lohmeyer, 1975: tab 8/160,165; 37, Rivas-Martinez, 1976: p. 60; 38 - 42, Ortiz et al. 1990: tab2/2,3,13-15, 43 - 46, Ariza et al., 1986: tab. 4/1-4

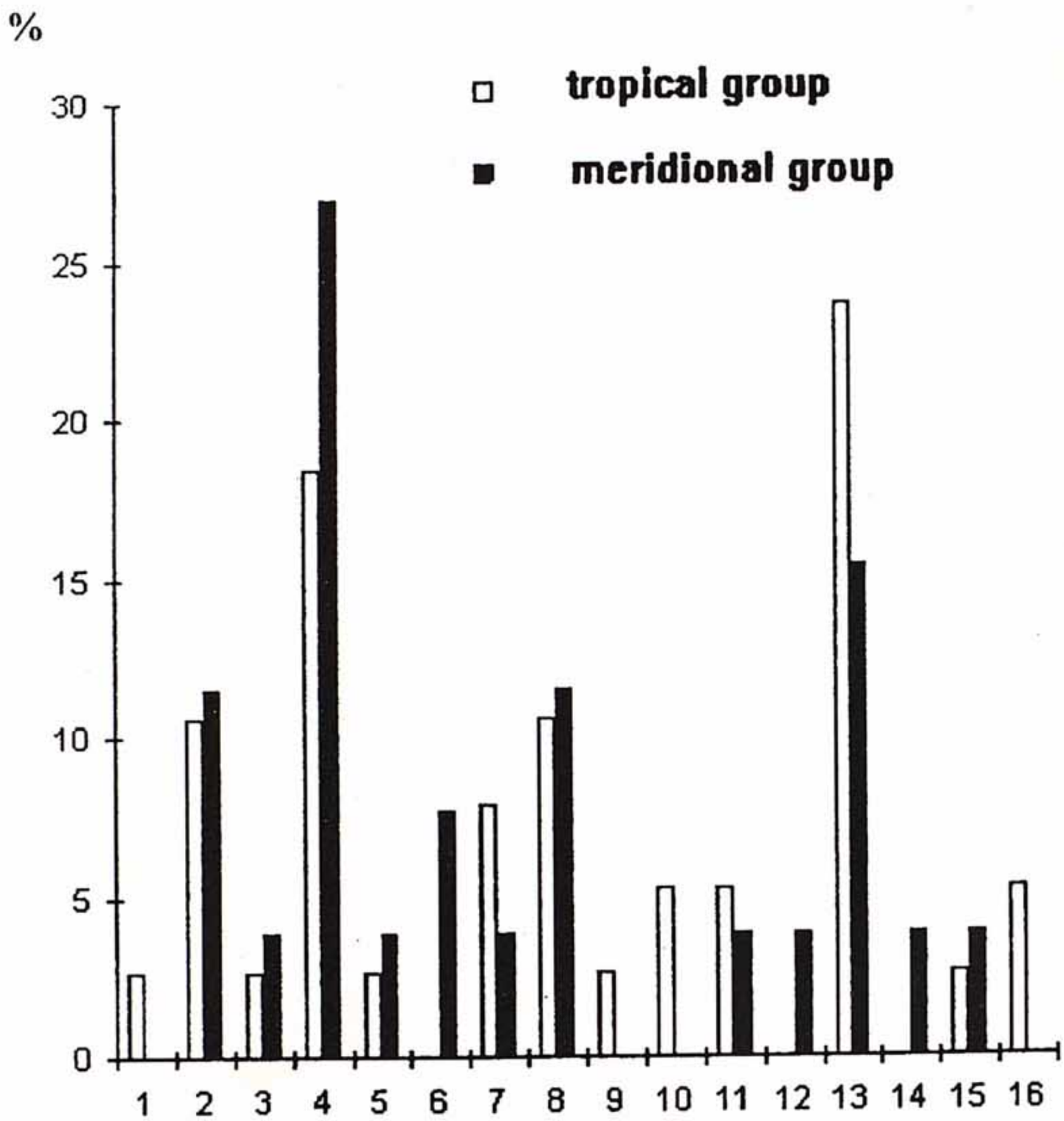

Fig. 3. Information about the families presented in the relevés. 1, Acanthaceae; 2, Amaranthaceae; 3, Apiaceae; 4, Asteraceae; 5, Brassicaceae; 6, Caryophyllaceae; 7, Cyperaceae; 8, Euphorbiaceae; 9, Fabaceae; 10, Malvaceae; 11, Oxalidaceae; 12, Plantaginaceae; 13, Poaceae; 14, Polygonaceae; 15, Portulacacae; 16, Rubiaceae.

temperature being over 23°C. There are no dry seasons. The only exceptions are Brazil and Hawaii with a short dry season, since they are located already in the subtropical region.

The second group appears in the meridional region:

Polycarpo-Althernantheretum Oberd. 1965 from Canary Islands and Madeira (LOHMEYER & al., 1970; LOHMEYER, 1975; OBERDOFER, 1965, 1975); *Poa annua-Polycarpon* Trittgesellschaft from Carary Islands (LOHMEYER, 1975); *Gnaphalio luteo-albi-Polycarpetum tetraphylli* Ortiz 1990 from Portugal (ORTIZ, 1990); *Euphorbietum chamaesyco-prostratae* Rivas MartÌnez 1976 from Spain (RIVAS-MARTÍNEZ, 1976); *Schismo-Filagiletum conteste* O. Bolos (1948)1975 from Spain (ARIZA & al., 1986).

This group is present on the Iberian peninsula and on the Canary Islands and in Madeira. This region is drier and less hot in its climatic sense. The rainfall does not

exceed 600 mm p. a. and the average year temperature is about 20°C. What is characteristic for this climate is the summer hydric stress (high temperature and low rainfall in summer). This enable the development of the species from the tropics, since their competitor plants are eliminated. This type of vegetation reaches its maximum of development in the late summer (RIVAS-MARTÍNEZ, 1976).

In the diagramme presenting the ordination (fig. 2), on the abscissa, there is a gradient of the communities from the tropical regions towards the meridional group (climatic gradient).

The second axis (ordinate) reflects the geographical division. This axis shows that *Eragrostio-Euphorbietum* from Brazil differs from all other communities.

In the figure 3 the percentage of the families in the relevés is shown. The main difference between the two groups is a higher percentage of *Poaceae* and *Cyperaceae* in the tropical region.

In the list made by COLLINS & JONES (1986) the C4 pathway plant species are classified mainly within the *Amaranthacaea, Chenopodiaceae, Cyperaceae* and *Gramineae*. In our opinion the species from the families (*Poaceae* and *Cyperaceae*) that posses the C4 pathway syndrome find better conditions for their growth in the hot tropical climate than in the meridional one.

On the other hand, the percentage of the species classified within *Asteraceae* and *Caryophyllaceae* is higher in the second group. This is logical since *Caryophyllaceae* are mainly distributed in the holoarctic region (EHRENDORFER, 1983) and the share of the species classified within *Asteraceae* is the smallest in the flora of tropical lowlands (WAGENITZ,1979). Other differences are not discussed, since they are small and their presence can coincide.

References

ARIZA, A. F., G. M. BELMONTE, J. M. F. PARRAS & M. P. LORCA (1986.) Notas fitosociologicas sombre el sureste de la Peninsula Iberica, I. *Coll. Bot.* **16(2)**: 415-423.

BENEDI, C. & J. J. ORELL (1992). Taxonomy of the genus Chamaesyce S. F. Gray (Euphorbiaceae) in the Iberian penninsula and the Balearic Islands. *Colect. Bot.* **21:** 9-22.

CARNI, A. (1995). Les associations nitrophiles et rudérales dans lévert Java (Indonésie). *Coll. Phytosociol.* **25**: 565-572.

COLLINS, S. L. & M. B. JONES (1986). The influence of climatic factors on the distribution of C4 species in Europe. *Vegetatio* **64 (2,3)**: 121-129.

EHRENDORFER, F. (1983) Geobotanik in E. STRASSBURGER (begr.) *Lehrbuch der Botanik für Hochschülen*. Gustav Fischer, Stuttgart, New York.

GUTTE, P. (1989). Ein Beitrag zurt Kenntnis von Flora und Vegetation der Stadt Santa Clara in Cuba. Wiss. Ztschr. Friedrich-Schiller-Univ. Jena, *Naturwiss.* R. **38(2)**: 297-314

LOHMEYER, W. & W. TRAUTMANN (1970). *Zur Kenntnis der Vegetation der Kanarischen Insel La Palma*. Schriftenrh. *Vegetkde* **5**: 209-236.

LOHMEYER, W. (1975) Über einige antropogene nitrophile Unkrautgesellschaften der Insel Gran Canaria. Schriftenrh. *Vegetkde* **7**: 111-138.

MAAREL VAN DER, E: (1979). Transformation of cover-abundance values in phytosociology and its effect on community similarity. *Vegetation* **39**: 97-114.

NYAKBWA, M. (1988). Associations nouvelles de l'ecosystem urbain de Kisangani (Haut-Zaire). *Ann. Sc. Econom.* **17**: 294-310.

OBERDORFER, E. (1965). Pflanzensoziologische Studien auf Teneriffa und Gomera (Kanarische Inseln). *Beitr. natur. Forsch. SW-Deutschl.* **24(1)**: 47-104.

—— (1975). Bemerkungen zur Vegetation Madeiras. *Anal. Inst. Bot. Cavanilles* **32(2)**: 1315-1332.

—— (1983). Einige Bemerkungen zu Vegetationsstrukturen im östlichen Nordamerika, in Oahu (Hawaii) und Mitteljapan. Andrias 2: 53-63.

ORTIZ S. & J. RODRÍGUEZ-OUBINA (1990). Contribucion al conocimiento de la alianza *Polycarpon tetraphylli* en Portugal. *Bot. Complutensis* **16:** 71-79.

PODANI, J. (1993). *SYN-TAX-pc. Version 5.0.* Budapest.

RIVAS-MARTÍNEZ, S. (1976). De plantis hispaniae. Notule systematicae, chorologicae et ecologicae, II. Acta Bot. Malacitana 2: 59-64.

SCHULTE, W. & E. TEIXEIRA (1993). Zur Flora und Vegetation Zentralbrasilinischer Städte. *Phytocoenologia* **21**: 471-492.

TRPIN, D. (1995). Euphorbia prostrata v Sloveniji: 28, in N. JOGAN (ed.). *Simpozij Flora in vegetacija Slovenije. Zbornik povzetkov referatov.* Ljubljana.

WAGENITZ, G. (1979). Compositae I: Allgemeiner Teil, Eupatorium-Achillea, in G. Hegi, Illustrirte Flora von Mitteleuropa VI/3. Paul Parey, Berlin, Hamburg.

WALTER, H. & H. LIETH (1960.) *Klimadiagramm.* Weltatlas. Jena.

Address of the author:

Dr. A. Carni, Institute of Biology, Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Gosposka 13, 1000 Ljubljana, Slovenia.