

Taxonomy of the genus *Chamaesyce* S.F. Gray (Euphorbiaceae) in the Iberian Peninsula and the Balearic Islands

CARLES BENEDÍ & JERONI JAUME ORELL

Resum

BENEDÍ, C. & J.J. ORELL (1992). Taxonomia del gènere *Chamaesyce* S.F. Gray (Euphorbiaceae) a la Península Ibèrica i Illes Balears. Collect. Bot. (Barcelona) 21: 9-55.

Es realitza un estudi taxonòmic dels 10 tàxons (nou específics) del gènere *Chamaesyce* S.F. Gray (Euphorbiaceae) presents a la Península Ibèrica i les Illes Balears. Per a cada tàxon es valoren els caràcters d'interès taxonòmic i s'indica el nom correcte, la sinonímia, descripció, corologia i ecologia. Es confirma la presència de *Chamaesyce humifusa* (Willd.) Prokh. a la Península Ibèrica i se cita *Chamaesyce humistrata* (Gray) Small com a novetat per a Europa.

Mots clau: Euphorbiaceae, *Chamaesyce*, Taxonomia

Abstract

BENEDÍ, C. & J.J. ORELL (1992). Taxonomy of the genus *Chamaesyce* S.F. Gray (Euphorbiaceae) in the Iberian Peninsula and the Balearic Islands. Collect. Bot. (Barcelona) 21: 9-55.

A taxonomic study is undertaken of the ten taxa (nine of them specific) belonging to the genus *Chamaesyce* S.F. Gray (Euphorbiaceae) which are present in the Iberian Peninsula and the Balearic Islands and a dichotomic key is provided. The taxonomic characteristics of each taxon are discussed and the correct name, synonyms, description, chorology and ecology are given. The presence of *Chamaesyce humifusa* (Willd.) Prokh. in the Iberian Peninsula is confirmed and *Chamaesyce humistrata* (Gray) Small is recorded for the first time from Europe.

Keywords: Euphorbiaceae, *Chamaesyce*, Taxonomy

INTRODUCTION

The genus *Chamaesyce* S.F. Gray comprises close to 250 species with a cosmopolitan distribution (WILLIS, 1973) and is part of the subtribe *Euphorbiinae* Hurusawa (WEBSTER, 1975). The taxonomic history of the genus has been constantly linked to the comprehension and delimitation of the genus *Euphorbia* L. From 1753, when *Euphorbia* was proposed by

CARLES BENEDÍ & JERONI ORELL: Laboratori de Botànica, Facultat de Farmàcia, Universitat de Barcelona, Av. Diagonal 643, 08028 Barcelona, Spain.

Linnaeus, until the present day, the conception of the genus and its taxonomy have been subjected to two clearly differentiated criteria, one of which has sought to split up *Euphorbia* s.l. in the light of its great morphological diversity, while the other has considered the presence and interpretation of the cyathium as a unifying element.

In view of the obvious diversity of the genus defined by Linnaeus, the predominant trend during the first half of the last century was to divide it into a multitude of microgenera by playing down the importance of the cyathium which characterized *Euphorbia* in the Linnean sense. Examples of this first trend are provided by authors such as HAWORTH (1812), who proposed the genera *Anisophyllum*, *Crepidaria*, *Dactylanthes*, *Esula*, *Galarhoeus*, *Medusea* and *Treisia*; GRAY (1821), the creator of *Chamaesyce* and *Characias*; or RAFINESQUE (1837, 1838 & 1840), an author with an extremely analytical tendency who separated as many as twenty-one genera from *Euphorbia* (*Adenorima*, *Agaloma*, *Alkema*, *Allobia*, *Aplarina*, *Dematra*, *Desmone-ma*, *Ditritra*, *Kanopikon*, *Lacanthis*, *Lepadena*, *Lophobios*, *Murtekias*, *Nisomenes*, *Peccana*, *Petaloma*, *Ticuralia*, *Torfasadis*, *Tumalis*, *Vallaris*, *Xamesike*); or again KLOTZSCH (1859) who proposed the genera *Arthrotamnus*, *Diadenaria*, *Dichrophyllum*, *Eumecanthus*, *Euphorbias-trum*, *Hexadenia*, *Leptopus*, *Sterigmanthe*, *Tithymalopsis* and *Trichosterigma*, most of which were taken from the Linnean Euphorbias.

From the middle of the 19th century until well into the 20th, the prevailing criterion in the generic concep of *Euphorbia* was one of unification. Thus, BOISSIER (1862) in the first synthesis of the genus, drawn up for Candolle's *Prodromus*, ordered close to 700 species of *Euphorbia* s.l. into 27 sections. This concep of the genus was followed by BENTHAM (1880), PAX (1891) and PAX & HOFFMAN (1930), who classified some 1600 species belonging to *Euphorbia* into 9 sections and 47 subsections.

Certain present-day authors (PROKHANOV, 1949; TUTIN & R. SMITH, 1968; CARTER & R. SMITH, 1988) consider *Chamaesyce* a subgenus of *Euphorbia*. However the criteria for considering *Chamaesyce* as an independent genus on the basis of the taxonomic application of new anatomical, caryological, carpological, phytodermological, physiological, phytochemical, micromorphological and palynological knowledge (cf. HURUSAWA, 1954; CROIZAT, 1972; KOUTNIK, 1984, 1985; RAJU & RAO, 1977; RAO & PRASAD, 1987) is gradually prevailing.

DELIMITATION OF THE GENUS

From olden times, it has been possible on the basis of morphological characters to differentiate between the species of *Chamaesyce*, either with the rank of independent genera (*Chamaesyce* S.F. Gray, *Anisophyllum* Haw., *Xamesike* Rafin.) or at subgenus level below *Euphorbia* (subgen. *Chamaesyce* Rafin.) or as a section (sect. *Anisophyllum* Roeper). We compile hereunder new data which give support to the classification of *Chamaesyce* as an independent genus from *Euphorbia*.

HAWORTH (1812), ROEPPER (1824) and BOISSIER (1862) characterized *Chamaesyce* (at the level of genus, section or subsection) by its opposite leaves, the presence of stipules and the absence of caruncles.

CROIZAT (1936-38), WHEELER (1941a), HURUSAWA (1954) and HUGUET (1978) defined differences in type of growth: monopodial in *Euphorbia*, with a generally erect habit, and sympodial in *Chamaesyce*, with a prostrate habit resulting from the abortion of the apical meristem.

WEBSTER, BROWN & SMITH (1975) and DOWNTON (1975) showed that the species of *Chamaesyce* are C4 plants whereas in *Euphorbia*, as in the rest of Euphorbiaceae, we find only C3 or CAM plants. As a consequence of the C4 metabolism, the leaves of *Chamaesyce* present the Kranz syndrome.

EHLER (1978), BAIGES (1989) and BAIGES & BLANCHÉ (1989) in their micromorphological

and carpological studies established the seminal differences between *Euphorbia* and *Chamaesyce*.

RAJU & RAO (1987) and BENEDÍ & ORELL (1992a) showed that in *Chamaesyce* the predominant stomatal type is anisocytic, while in *Euphorbia* it is anomocytic.

ANTON (1974) and EVANS & KINGHORN (1977) established the biochemical differences between terpenic compounds in *Chamaesyce* and *Euphorbia*.

WEBSTER, RUPERT & KOUTNIK (1982) studied the variation in the number of nuclei in the pollen grains of *Euphorbiaceae*, and concluded that *Chamaesyce* always presents trinucleate pollen grains, while the majority of species belonging to *Euphorbia* present binucleate grains.

From the phylogenetic point of view, KUZMANOV (1964) considered that *Chamaesyce* was probably formed from ancestors of *Euphorbia* subgen. *Agaloma* (Rafin.) House, the shared characters of both being their stipulate leaves, ecarunculate seeds and appendiculate cyathial glands.

MORPHOLOGICAL CHARACTERS

1. Habit and ramification

In *Euphorbia* the type of growth is monopodial, since the epicotyl produces an erect stem, with a more or less obvious vegetative zone (inhibition zone plus innovation zone, according to the terminology of WEBERLING, 1981). This stem, with or without sterile branches, ends in a whorl of pleiochasic bracts, from the axilla of which the branches of the pleiochasic system sprout. Each pleiochasic branch usually develops a system of dichotomous cyathial cymes from each pair of dichasial bracts. Thus the cymose organization of the synflorescence in *Euphorbia* is established at four levels: pleiochasic cyme / dichasial cyme / cyathium / cincinnus of male flowers.

In *Chamaesyce*, the development of the epicotyl is extremely limited since the apical meristem aborts in the first stages, which means that the vegetative phase virtually disappears. HAYDEN (1988) considered that the apical meristem of *Chamaesyce*, rather than aborting, is consumed in the formation of the two epicotyledon leaves, which moreover are deciduous. In any specimen of *Chamaesyce* it is possible to distinguish, at the point where the ramifications start (right on the main axis of the root) an apparent nodule divided into two parts, which presumably correspond to the marks of the epicotyledon leaves. The prostrate habit which characterizes the majority of species belonging to *Chamaesyce* (at least in the autonym section) is the result of sympodial growth arising from the development of the cotyledon buds (WEBSTER, 1967), with a cymoid ramification, according to the terminology of WEBERLING (1981).

ROEPER (1824) already established a parallel between the pleiochasic system of *Euphorbia* subgen. *Esula* Pers. and the radial ramification of *Chamaesyce*, a homology accepted by later authors. However, HAYDEN (1988), in a detailed ontogenetic study of the cotyledon region of *Chamaesyce maculata*, concludes that the likeness between the pleiochasic system of *Euphorbia* and the radial ramification of the epigeal system of *Chamaesyce* is only apparent. In *Chamaesyce* the axillary cotyledon buds produce the two first branches and the later ones sprout from the base of these, and so on, producing a radial ramification, while in *Euphorbia* each pleiochasic radius sprouts from a pleiochasic bract. Thus in *Chamaesyce* the cymose system of the synflorescence comprises only three levels: dichasial branches / cyathia / cinni of male flowers.

Another distinguishing trait of the ramification of *Chamaesyce* is that the two branches of the dichasium develop differently. Alternately in each node, one of the dichasial branches adopts the position of main axis, so displacing the central cyathium of the dichasium.

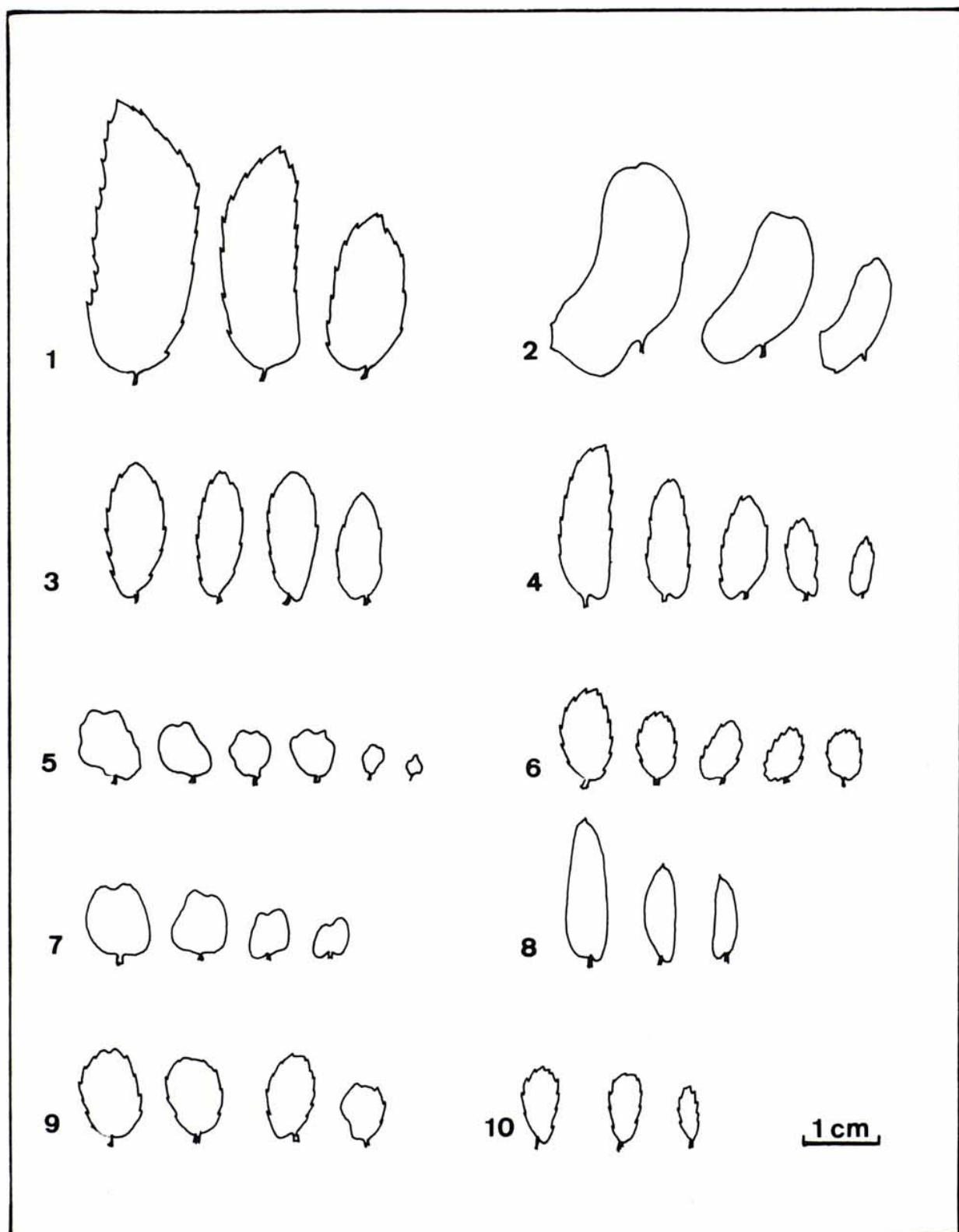


Fig. 1.— Variation in the leaves of *Chamaesyce*: *C. nutans* (1), *C. peplos* (2), *C. humistrata* (3), *C. maculata* (4), *C. vulgaris* subsp. *vulgaris* (5), *C. vulgaris* subsp. *massiliensis* (6), *C. serpens* (7), *C. polygonifolia* (8), *C. prostrata* (9), *C. humifusa* (10).

The species included in section *Chamaesyce* comprise creeping therophytes, while section *Hypericifoliae* comprises scapose therophytes.

Among the observations made, the following are of particular importance.

1. It is usually possible to identify the two opposite cotyledon branches, below which the remaining branches sprout radially lending a rosette-like appearance to the whole.

2. In all the species we have occasionally observed some specimens (the majority in *C. polygonifolia*) in which the only two branches are those of the cotyledons. The total number of branches varies from one species to another, ranging from 1 (when one cotyledon branch does not prosper) in *C. nutans* to 25 in *C. vulgaris*. However it is worth noting that in *C. polygonifolia* one often finds only the two cotyledon branches, that *C. peplis* usually presents four ramifications and that the largest number is found in *C. vulgaris* (up to 25).

3. In *C. nutans* we have noted that in some specimens one of the two cotyledon branches aborts while the other, being erect, is opposite to the root.

4. On the abaxial surface of each node of *C. serpens* one can observe two or three nodules which can put out caulogenous roots, especially on damp ground. For this reason, some descriptions and keys contain allusions to the rooting character of the nodes, and one variety (var. *radicans* Boiss.) has even been described on the basis of this character. When the node puts out caulogenous roots, it also develops a fascicle of cyathial branches of asynchronous growth, so that the stems apparently no longer present a cymoid ramification.

2. Leaves

As already stated, in *Chamaesyce* the pair of leaves from each node is homologous to the two dichasial bracts of the pleiochasial branches. Leaf characters (arrangement, symmetry and presence of stipules) have traditionally been used as a distinguishing trait in separating *Chamaesyce* from *Euphorbia*.

In *Chamaesyce* the leaves are always opposite and are usually distichous, except in some endemic Hawaiian species belonging to section *Sclerophyllae* (Boiss.) Hurusawa where they are decussate.

Terms such as anisophylloous and dissymmetrical, which have frequently been used to refer to the asymmetry of the foliar limb, are somewhat inappropriate.

a. Limb

The limb can vary in size, the longest being found in *C. nutans* (up to 35 mm) and the shortest in *C. vulgaris* (up to 2 mm). We do not confirm the validity of length of leaf as a criterion for separating the two subspecies of *C. vulgaris*, as claimed in *Flora Europaea*.

Shape varies from linear to suborbicular (Fig. 1). The limb is always more or less asymmetrical, the abaxial hemilimb being larger than the adaxial one. Leaf asymmetry attains its highest level in *C. peplis*, where the base of the abaxial hemilimb is prolonged in an obvious auricle giving rise to a falcate shape. The least asymmetrical leaves belong to *C. polygonifolia*, where their shape is linear-oblong.

The leaf margin can be entire, crenate or serrate. The type of margin does not vary except in *C. vulgaris*, where in subspecies *vulgaris* it can be entire or crenate, while in subspecies *massiliensis* it is always serrate.

Indumentum is always absent in *C. humifusa*, *C. peplis*, *C. polygonifolia*, *C. serpens*, and *C. humistrata* while *C. maculata*, *C. prostrata*, *C. nutans* and *C. vulgaris* subsp. *massiliensis* present an indumentum made up of eglandular, multicellular, uniseriate, scabrid trichomes. *C. vulgaris* subsp. *vulgaris* is a special case in that the whole range of variation between

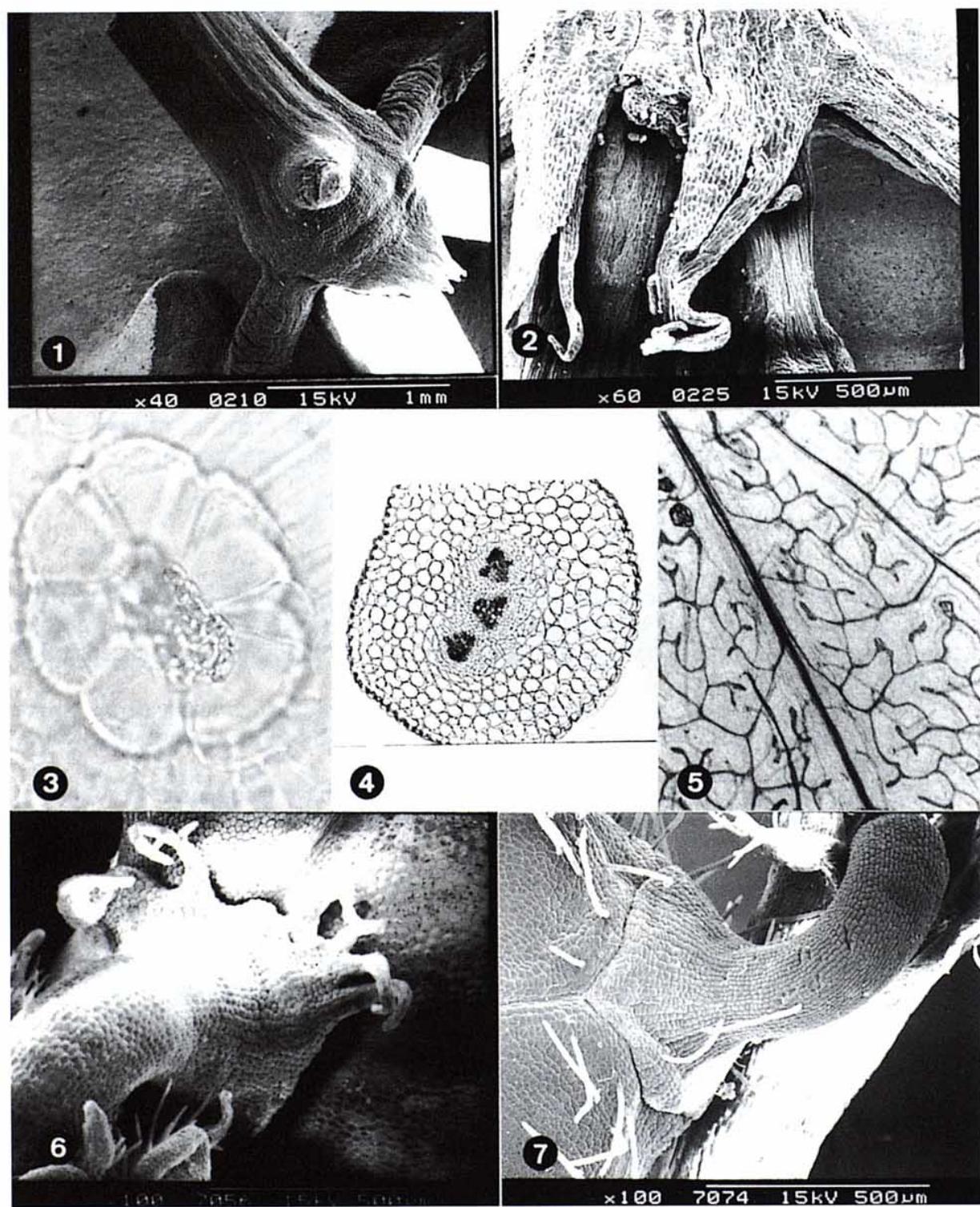


Fig. 3.— Interpetiolar stipules of *C. serpens* (1) and *C. polygonifolia* (2). Cross section of a bundle of *C. serpens* (3). Cross section of the petiole of *C. serpens* (4). Leaf venation of *C. serpens* (5). Hypogynous discs of *C. serpens* (6) and *C. prostrata*.

glabrous or glabrescens and clearly white-hairy leaves is found but the differences have no taxonomic relevance. Leaf hairy-covering can be used to differentiate between *C. humistrata* (pilose stems and glabrous leaves) and *C. maculata* (pilose stems and leaves).

In some taxa (*C. maculata*, *C. nutans*, *C. humistrata* and *C. vulgaris* subsp. *vulgaris*) the presence of a purple spot of variable size and shape in the middle of the leaf limb is observed more or less frequently. In contrast, *C. vulgaris* subsp. *massiliensis*, *C. polygonifolia*, *C. serpens*, *C. prostrata*, *C. peplos* and *C. humifusa* never present spots.

The leaf venation is reticulate, the ends of the veins being distributed over the inside of the intercostal fields. In the case of *C. nutans*, it is immediately apparent that the limb is three-veined at the base.

b. Petiole

The leaves of *Chamaesyce* always present a petiole whose length varies between 0.5 and 3 mm but which is of no taxonomic interest in the group of species under study. The presence of petiolate leaves has been used, along with other characters, to separate *Chamaesyce* from *Euphorbia*. With regard to the latter genus, it should be noted that they are sessile in *E.* subg. *Esula* Pers. but not in *E.* subg. *Cystidospermum* (Prokh.) Prokh.

In order to ascertain the correct denomination of the stipules, we made sections of the petiole which revealed its unifacial structure.

c. Stipules

The presence or absence of stipules is a character which has traditionally been used to separate *Chamaesyce* from *Euphorbia* subg. *Esula*. Other subgenera of *Euphorbia* present glandular stipules (subg. *Poinsettia* (Grah.) House), stipules which are between gland-shaped and subulate (subg. *Eremophyton* (Boiss.) Wheeler), or glandular or absent (subg. *Agaloma* (Rafin.) House). According to CROIZAT (1960) and KHAN (1964), the interpetiolar stipules of *Chamaesyce* correspond to the aborted leaves of the whorl itself.

The following observations are worthy of mention:

1. In *Chamaesyce* the interfoliar stipules are membranous and, with reference to the unifacial structure of the petiole, axillary. In none of the species under study are the stipules deciduous.

2. The stipules are always connate (Fig. 3) except in young shoots, forming a lamina, between deltate and fimbriate, which surrounds the portion of the node situated between the two leaves.

3. In some species (*C. nutans* and *C. prostrata* the two stipules are different on the two node surfaces. Thus in *C. prostrata* they are deltoid-dentate on the adaxial surface and deeply laciniate on the abaxial surface. Occasionally the lamina formed by the connate stipules may be torn by the development of the cyathium, which finally moves away and finished up inserted in the middle zone of the stipule (Fig. 3.2).

4. The shape of the stipules is constant. The only exception is *C. serpens*, in which the stipules are usually deltate and very rarely laciniate (var. *fissistipula* Thell.).

3. Cyathium

Warming (FONT QUER, 1953) gave the pseudanthium of *Euphorbia* and other related genera the name «cyathium», a word of Greek origin which refers to its wine-glass shape.

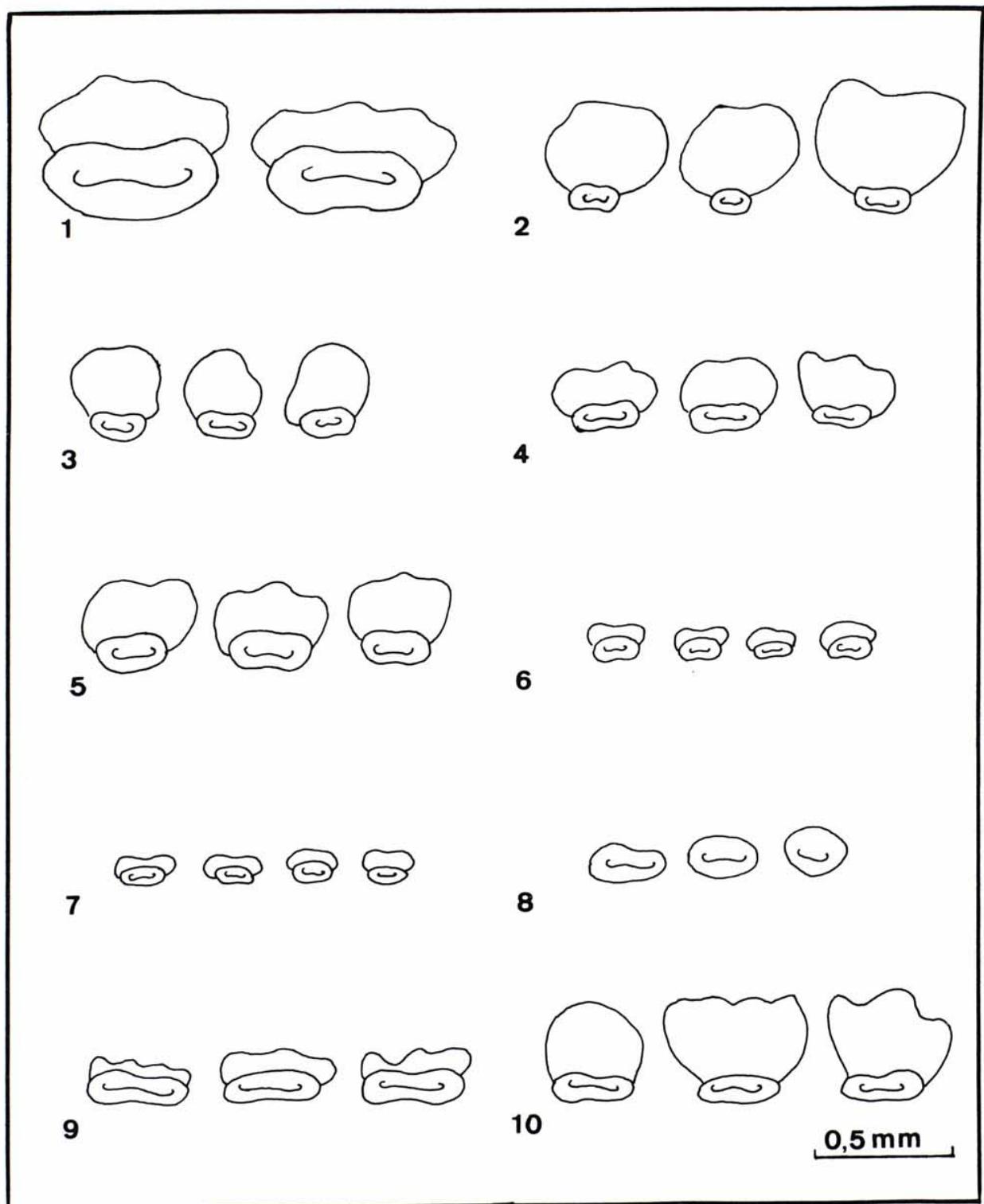


Fig. 2.— Morphology of the nectaries and cyathial appendices of *Chamaesyce*: *C. pepitis* (1), *C. humistrata* (2), *C. nutans* (3), *C. maculata* (4), *C. serpens* (5), *C. humifusa* (6), *C. prostrata* (7), *C. polygonifolia* (8), *C. vulgaris* subsp. *vulgaris* (9), *C. vulgaris* subsp. *massiliensis* (10).

LINNAEUS (1753) considered the cyathium a flower and not an inflorescence, situating *Euphorbia*, curiously enough, in the *Dodecandria* class and not in *Polyandria*. One of the first to question Linnaeus interpretation of the nature of the cyathium was LAMARCK (1788) who expressed doubts about its being a flower. The credit of having defined its true nature belongs to BROWN (1818) who established the cyathium was an inflorescence.

According to CROIZAT (1937) and WEBERLING (1981), in phylogenetic terms the cyathium evolved from a primitive hermaphrodite inflorescence with unisexual flowers. These authors postulate moreover the polyphyletic origin of the cyathium.

In *Chamaesyce* the cyathia are either situated at the ends of the branches of the dichasial or pleiochasial system or else solitary cyathia are located between them, forming dense clusters of axillary or terminal cymes. The outermost part (exocyathium) is formed by the union of the five bracts of the male inflorescence. In the inner part of the exocyathium there are four to five groups consisting of variable numbers of male flowers grouped together in cincinni and separated by partial intracyathial septa which can be either laminar or plumose.

In the species under study, the exocyathium is always campanulate and can be glabrous or pilose according to the indumentum of the stem.

a. Nectaries

The nectaries are inserted in the edge of the exocyathium. In European species they are usually four in number, whereas in other species, including some endemic Hawaiian species, there can be five or even six. Though in the light of the current interpretation of the nature of the cyathium, the cyathial nectaries should be classified as extrafloral, according to FHAN's (1953) typology, they should be considered perigonial since the cyathium is a pseudanthium.

In *Chamaesyce* the nectaries usually present a laminar expansion (Figs. 4.2 and 4.4) known as the appendix, which is often described as petaloid on account of the contrast between its colour (white to greyish) and that of the nectary (chestnut to reddish). Their shape (Fig. 2) ranges from oblate to circular, and that of the appendices from obtrapeziform to suborbicular, with an entire, crenate or lobulate margin.

The following observations are of particular interest:

1. The surface of the nectaries is more or less concave, with obvious perforations in the central zone (Fig. 4.4) which are probably related to nectar secretion. We have not seen these perforations described in the literature consulted.

2. *C. polygonifolia* is the only species with non-appendiculate nectaries which moreover are stipitate.

3. In *C. vulgaris* the relationship between the lengths of the nectary and appendix respectively may be used to characterize the two subspecies we recognize.

b. Flowers

In the cyathium, the male flowers are grouped together in 4 or 5 cincinni around the central female flower, the whole structure corresponding to a cymoid organization. The female flower has a hypogynous disc and the stigmas are bifid.

The following observations are of special note:

1. We noted that the species under study can present 4 or 5 cymes of male flowers indistinctly, in a proportion of about 50 % each.

2. In *C. peplis* and *C. polygonifolia*, the cincinni are many-flowered. In *C. nutans* they are reduced to 2 stamens each and in the remaining species studied each cyme has been reduced to a single stamen (Table 1).

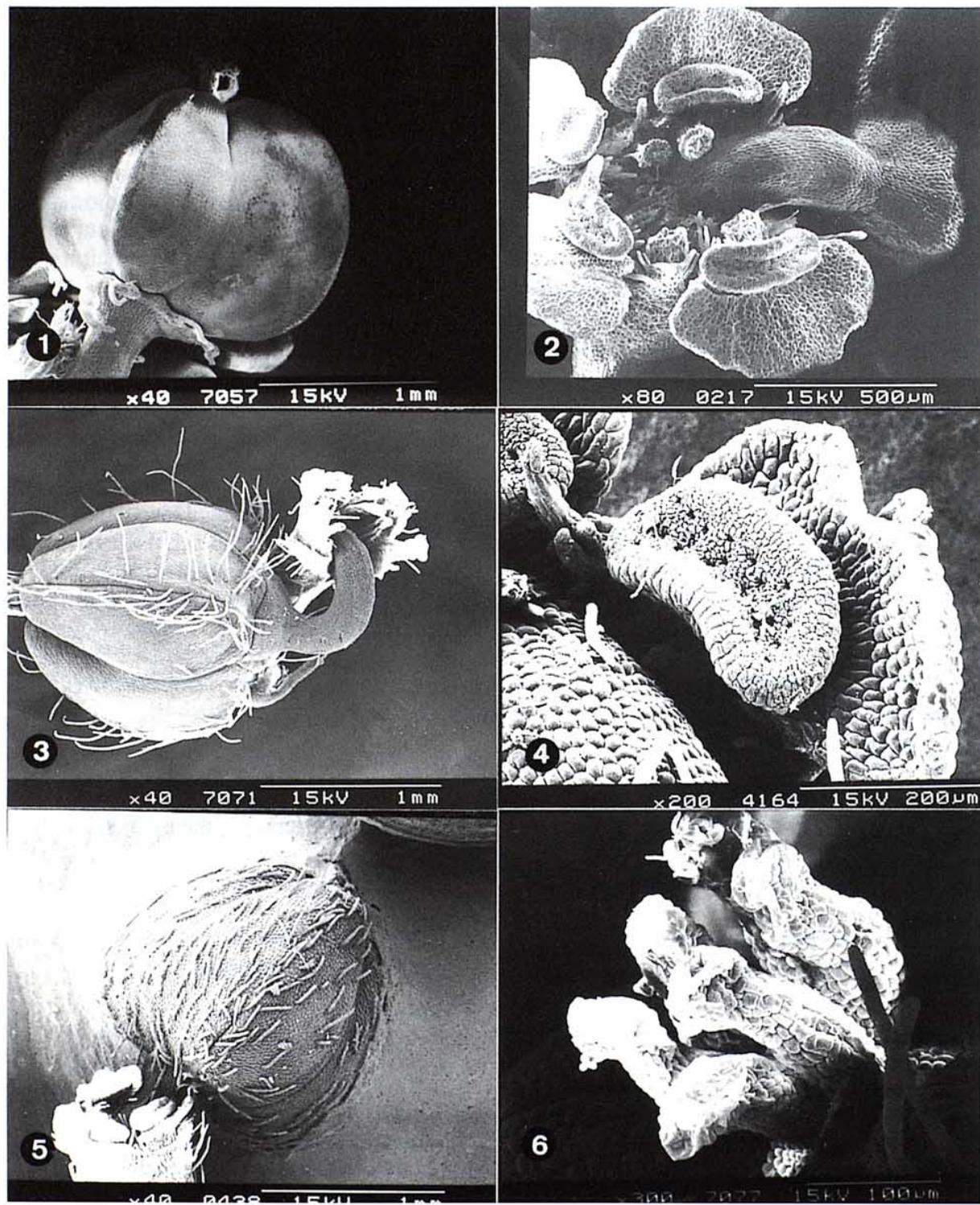


Fig. 4.— Capsules of *C. serpens* (1), *C. prosstrata* (3) and *C. maculata* (5). Nectaries and appendages of *C. serpens* (2) and *C. maculata* (4). Stigmata of *C. prostrata* (6).

Table 1.—Percentages of the number of cincinni in the species studied; one asterisk (*) indicates cincinni reduced to a single stamen, and two asterisks (**) indicate cincinni usually reduced to two stamens.

	4 cincinni (%)	5 cincinni (%)
<i>C. humifusa</i>	45 (*)	55 (*)
<i>C. humistrata</i>	55 (*)	45 (*)
<i>C. maculata</i>	47 (*)	53 (*)
<i>C. nutans</i>	56 (**)	44 (**)
<i>C. peplis</i>	58	42
<i>C. polygonifolia</i>	45	55
<i>C. prostrata</i>	54 (*)	46 (*)
<i>C. serpens</i>	52 (*)	48 (*)
<i>C. vulgaris</i>	52 (*)	48 (*)

3. The cincinnus present a plumous basal bract (incorrectly termed bracteola) which is more or less visible.

4. Pollen

The pollen of *Chamaesyce* is tricolporate, prolate or subprolate, with long tapering colpae, and with perforated exine (KOUTNIK, 1984), falling within the type «*Euphorbia helioscopia*» according to LÓPEZ & DÍEZ (1985); according to the typology of EL-GHAZALI (1989) it belongs to the type of «*Euphorbia cuneata*». WEBSTER, RUPERT & KOUTNIK (1982), who have analyzed the taxonomic meaning of the number of nuclei in the pollen grains of the tribe *Euphorbieae*, conclude that *Chamaesyce* presents trinucleate pollen grains, while in *Euphorbia* they are mainly binucleate.

According to the data of LÓPEZ & DÍEZ (1985, 1987), *Chamaesyce*, like *Euphorbia*, is a stenopalynous genus. We wish to point out, however, that in the species studied by these authors, the pollen of *Chamaesyce* presents an oval endoaperture, whereas in pollen from *Euphorbia* the opening is rectangular.

5. Capsule

The fruit of *Chamaesyce*, like that of *Euphorbia*, is a schizocarp with septicidal and septifragal dehiscence and loculicidal mericarps. The characters of the capsule (indumentum, topography, shape and size) have been traditionally used in the taxonomy of the genus.

The following observations are of particular importance:

1. All the species studied present ovoid, sulcate, or keeled capsules with smooth, rounded, mericarp surfaces.
2. The hypogynous disc can be triangular to polygonal (Figs. 3.6 and 3.7), and occasionally laciniate in *C. peplis* and *C. serpens*. It has no taxonomic significance.
3. The capsules are glabrous (Fig. 4.1) in *C. humifusa*, *C. nutans*, *C. polygonifolia*, *C. peplis* and *C. serpens*. In *C. prostrata* the indumentum is located on the keels (Fig. 3.4) while in *C. vulgaris* (when the specimens are not glabrous) the indumentum is evenly distributed over the entire capsule with more or less patent trichomes. The capsules of *C. maculata* always present a uniform indumentum consisting of applied trichomes (Fig. 4.5). In *C. humistrata* we have observed in young capsules a scattered indumentum of more or less applied trichomes; this indumentum, however, is deciduous, since the mature capsule is totally glabrous.

4. In *C. peplis* and *C. polygonifolia*, the peduncle of the capsule bends over with the result that the mature capsule is located below the stem and leaves.

6. Seeds

The seeds of *Chamaesyce* are ecarunculate, small in size, with a usually mucilaginous episperm and obvious raphe (EHLER & HEIDELBERG, 1976; BAIGES, 1989). ROEPER (1828) used the absence of the caruncle to differentiate *Chamaesyce* (ut *Euphorbia* sect. *Anisophyllum*) from *Euphorbia*.

In the species with a mucilaginous episperm, some tabular cells are observed in the episperm with concentric thickenings containing complex mucilages according to BAIGES & BLANCHÉ (1989). These authors, moreover, consider the seed characters to have taxonomic significance at specific level for the Iberian-Balearic species of *Chamaesyce*.

The following observations are worthy of note:

1. In psammophilous species (*C. peplis* and *C. polygonifolia*) the seeds are pyriform and over 1.5 mm long, while in the remaining taxa studied, their shape is ovoid to subovoid and their length less than 1.5 mm.

2. The false hilum (Fig. 5.1) in the shape of a laminar excrescence is especially manifest in *C. nutans*, *C. peplis* and *C. polygonifolia*. In some cases the false hilum has been confused with a caruncle, as in the extreme case of *C. carunculata* (Waterfall) Shinners, a species endemic to America in which the seeds, in addition to being clearly apiculate, have a highly developed false hilum.

3. Only *C. humistrata* presents a testa covered with small wart-like outgrowths, the testa in the remaining species studied being rugose (*C. maculata*, *C. nutans*, *C. prostrata* and *C. vulgaris*) or smooth (*C. humifusa*, *C. peplis*, *C. polygonifolia* and *C. serpens*).

4. The colour of the seeds varies from grey to chestnut in the majority of species. In *C. nutans* they are blackish-grey-brown.

7. Cytotaxonomy

According to the sources consulted (cf. ORELL, 1991) there is little uniformity in terms of zygotic valency ($2n=12, 14, 18, 20, 22, 24, 28, 42$). The basic number also varies from one species to the other. PERRY (1943) defined it as $x=7$; later LÖVE & LÖVE (1961) reported that it can be $x=6, 7, 10?, 11$. DATTA (1967) added the basic number of $x=9$ for *C. prostrata* and MULLIGAN & LINDS (1978) added $x=13$ for *C. polygonifolia*. BENEDÍ & ORELL (1991) pointed out class 1A asymmetry, in terms of Stebbins typology, for *C. peplis*, *C. prostrata* and *C. vulgaris*.

8. Phenology

The species studied flower and bear fruit in summer and autumn. After germination, the cotyledon branches are already fertile and quickly produce mature capsules, and it is for this reason that we have taken into account the period of flowering and fructification. In some species (*C. prostrata*, *C. serpens* and *C. vulgaris*) we have observed that they can produce seeds in 3-4 weeks and that several biological cycles can be completed in a single year.

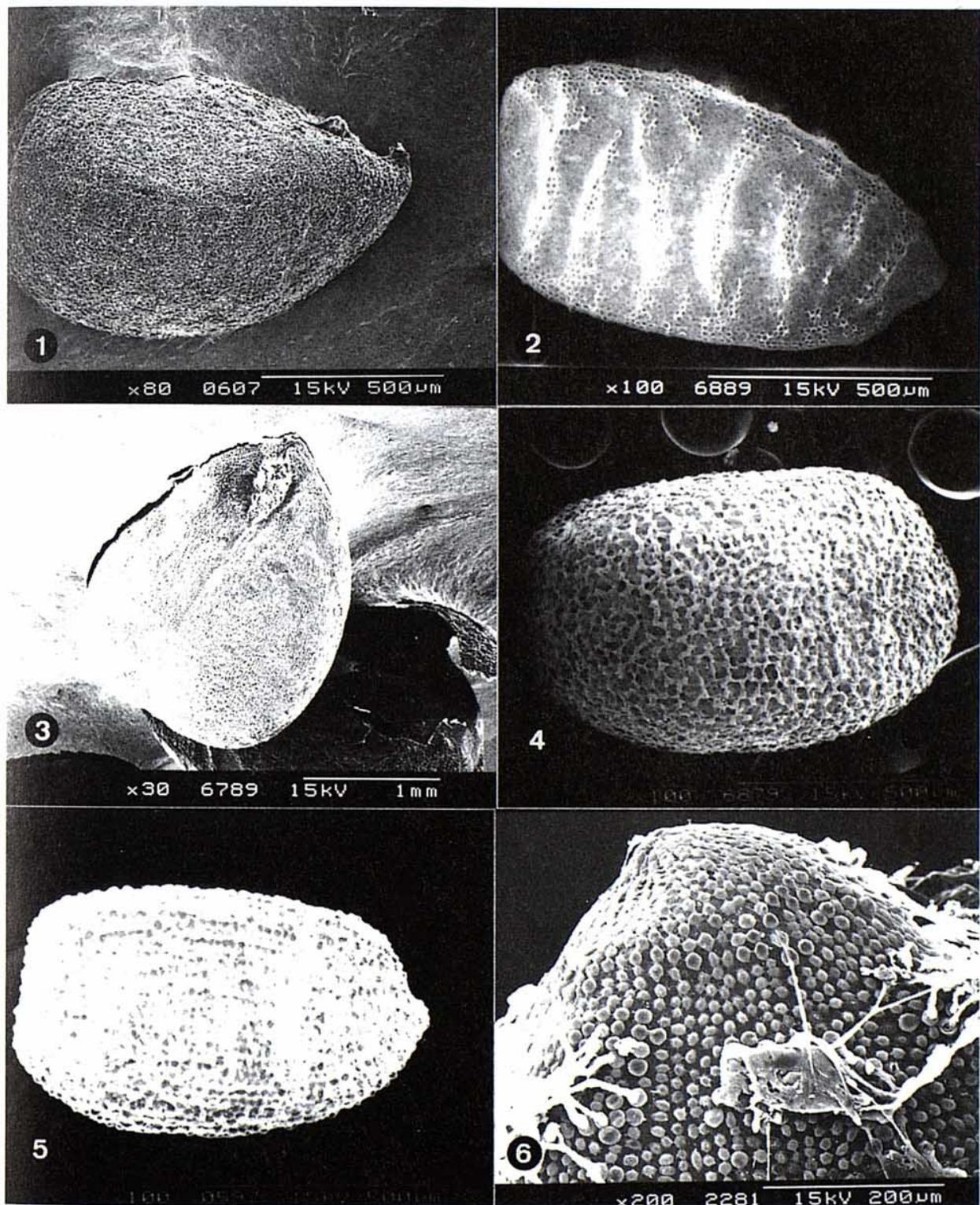


Fig. 5.— Seeds of *C. humifusa* (1), *C. prostrata* (2), *C. peplis* (3), *C. serpens* (4), *C. humistrata* (5), and *C. vulgaris* (6).

9. Biogeography

The majority of the species of *Chamaesyce* present in the geographical area under consideration are American neophytes (*C. humifusa*, *C. humistrata*, *C. nutans*, *C. polygonifolia*, *C. prostrata* and *C. serpens*) specific to anthropized environments and with a marked invasive character. *C. humifusa* is the only species native to Asia, while *C. peplis* and *C. vulgaris* are autochthonous Mediterranean species, though some authors consider *C. vulgaris* an archeophyte of Iranian-Turanian origin. The worldwide distribution of each species is given according to the data of OUDEJANS (1990) and the definitions of floristic regions given by TAKHTAJAN (1986) are used. To describe distribution in the area under study, we have resorted to the provincial abbreviations used in *Flora iberica* (CASTROVIEJO & al., 1986). Whenever we only have bibliographical reports for a particular province, this is indicated.

10. Ecology

The majority of the species present in the area under study have a clear ecological liking for anthropized biotopes, particularly areas subject to trampling. *C. peplis* and *C. polygonifolia* are halophilous species belonging to sandy coastal areas. Most of the species present well-defined phytosociological properties and are characteristic of higher syntaxonomical levels, which will be referred to in the description of each taxon.

TAXONOMIC SYNTHESIS

1. Introduction

For the taxonomic synthesis, we checked all the material in the herbaria listed below using the acronyms from «Index Herbariorum» (HOLMGREN & al., 1990): BC, BCC, BCF, GDA, JACA, JAEN, LEB, LOU, MA, MAF, MUB, SALA, SALAF, SEV, VAL and VF. We also examined J. Orell's private herbaria (Herb. Orell) in Sóller. Occasionally other herbariums (AV, BM, FI, G, K, and P) were consulted.

2. Descriptive part

***Chamaesyce* S.F. Gray, Nat. Arr. Brit. Pl. 2: 260 (1821)**

= *Euphorbia* subgen. *Chamaesyce* (S.F. Gray) House, Bull. New York State Mus. 254: 470 (1924)

= *Anisophyllum* Haw., Syn. Pl. Succ.: 159 (1812), nom. illeg., non Jacq. (1763) = *Euphorbia* subgen. *Anisophyllum* (Haw.) Gaucher, Ann. Sci. Nat. Bot., ser. 8, 15: 294 (1902) = *Euphorbia* sect. *Anisophyllum* (Haw.) Webb & Berth., Phyt. Canar. sect. 3: 236 (1847)

= *Xamesike* Rafin., Fl. Tell. 4: 115 (1838)

= *Aclarina* Rafin., New Fl. 4: 99 (1838)

= *Ditritra* Rafin., Sylva Tellur. 115 (1838)

= *Euphorbia* subgen. *Chamaesyce* Rafin. Amer. Month. Mag. 2(2): 119 (1817)

= *Euphorbia* sect. *Anisophyllum* Roeper in Duby, Bot. Gall. 1: 412 (1828)

Type: *Chamaesyce peplis* (L.) Prokh. (= *Euphorbia peplis* L.), designated by MILLSPAUGH (1909: 300).

Plants monoecious, annual or perennial, glabrous or pubescent. Includes procumbent or ascending herbs, rarely shrubs or small shrubs. Main axis formed by a stem that has aborted at the level of the first pair of leaves, giving rise to a sympodial structure with radial axillary branches. Axillary interpetiolar stipules present, membranous, rarely deciduous, connate at least in young leaf nodes, occasionally dimorphous in the same node. Leaves opposite, simple, often petiolate, distichous or rarely decussate, with entire, crenate or serrate margin, more or less asymmetrical at the base. Flowers forming solitary pseudoaxillary cyathia or grouped together in cymes; exocystium glabrous or pilose, campanulate, with four or five (rarely six) nectariferous glands, usually with a petaloid appendix; male flowers achlamydeous, grouped together in four or five few-flowered or many-flowered monochasias; bracts ciliate, plumose or absent. Tricolporate pollen with perforated exine. Solitary female flower, pedicellate, ovary 3-locular; carpels with a single anatropous ovule; styles free or joined at the base, bifid or rarely entire; fruit schizocarpic with a persistent columella and septifragal mericarps. Seed ecarunculate, usually with mucilaginous testa, smooth, rugose or sulcate.

Observations

Though MILLSPAUGH (1909) typified the genus automatically according to the criterion of the American Code, for this typification to be considered correct we will have to await the outcome of proposed amendments 291 and 297 to the International Code of Botanical Nomenclature by MCNEILL (1986) on the subject of typifications carried out under the American Code. We should however point out that if in the forthcoming XV International Botanical Congress in Tokyo either of these proposals were to be accepted, the validity of Millspaugh's typification would not imply any change in nomenclature at infrageneric level. WHEELER (1943) designated as type species *Chamaesyce maritima* S.F. Gray, a superfluous name for *C. peplis* (L.) Prokh.

Unlike other non-European congeners, the species present in the area under study are annual, herbaceous, with distichous (not decussate) leaves, persistent stipules, cyathia with four nectaries, and seeds with mucilaginous episperm.

3. Delimitation of the sections

BOISSIER (1862) proposed dividing *Euphorbia* sect. *Anisophyllum* Roeper (= *Chamaesyce* S.F. Gray) into eight categories without defining their taxonomic rank (§ *Gymnadeniae*, § *Sclerophyllae*, § *Chelonae*, § *Acutae*, § *Elegantes*, § *Hypericifoliae*, § *Chamaesyceae* and § *Pleiadeniae*) and using criteria related to the biotype along with biogeographical ones. Later PAX & HOFFMANN (1931) combined Boissier's eight taxa at subsection level. HURUSAWA (1954), after claiming that *Chamaesyce* is an independent genus from *Euphorbia*, organized it into three sections:

Sect. *Chamaesyce*: including creeping therophytes, with non-coriaceous leaves and cyathia which are either solitary or grouped together in axillary cymes with few cyathia. T: *Chamaesyce vulgaris* Prokh. (= *E. chamaesyce* L.).

Sect. *Hypericifoliae* (Boiss.) Hurusawa, J. Fac. Sci. Univ. Tokyo Bot. 6: 277 (1954): including therophytes or hemicryptophytes with ascending or suberect branches, non-coriaceous leaves and numerous cyathia (10 or more) grouped together in capitate corymbiform and terminal cymes with many cyathia. T: *Chamaesyce hypericifolia* (L.) Millsp. (= *Euphorbia hypericifolia*).

Sect. *Sclerophyllae* (Boiss.) Hurusawa, J. Fac. Sci. Univ. Tokyo Bot. 6: 275 (1954): including pantropical frutescent or subfrutescent chamaephytes with articulate branches and

coriaceous or subcoriaceous leaves. T: *Chamaesyce atoto* (Forst. f.) Croizat (= *Euphorbia atoto* Forst. f., designated by KOUTNIK, 1984: 338).

Recently WEBSTER (1982: 412) added a further section to Hurasawa's synopsis (sect. *Acutae* (Boiss.) Webster) comprising North American strigose hemicryptophytes.

The species present in the Iberian-Balearic area all belong to the autonym section, with the exception of *C. nutans*, which is part of sect. *Hypericifoliae*.

4. Key to the species

1. Glabrous plant 2
- Glabrescens or pilose plant 6
2. Cyathial glands without appendage *C. polygonifolia*
- Cyathial glands with appendage 3
3. Smooth seeds 4
- Seeds irregularly granulose-rugose *C. vulgaris*
4. Seeds over 2.5 mm long; leaves with curved limb and manifest basal auricle; plant of sandy coastal areas *C. peplis*
- Different 5
5. Leaves 3-6 x 3-5 mm, with limb ovate to suborbicular, entire margin, retuse apex; interpetiolar stipules often deltoid; tetrahedral seeds *C. serpens*
- Leaves 4-6 (8.5) x 2-3 (5) mm, with limb oblong to oblanceolate, dentate margin, rounded apex, laciniate stipules; ovoid seeds *C. humifusa*
6. Prostrate, pilose stems, oblong, glabrous leaves; seed coat granular *C. humistrata*
- Different 7
7. Erect or erect-ascending stems; leaves with limb measuring 13-30 (35) x 6-10 (16) mm, clearly three-veined; cyathia grouped together in pseudocorymbiform terminal cymes *C. nutans*
- Different 8
8. Capsule with uniform, applied indumentum *C. maculata*
- Different 9
9. Capsule with indumentum only on the keels *C. prostrata*
- Capsule with indumentum evenly spread *C. vulgaris*

5. Description of species

1. *Chamaesyce humifusa* (Willd. ex Schlecht.) Prokh., Izv. Akad. Nauk SSSR 1927: 195-197.

≡ *Euphorbia humifusa* Willd. ex Schlecht., Enum. Pl. Hort. Berol. Suppl.: 27 (1813) ≡ *Anisophyllum humifusum* (Willd.) Klotzsch & Garcke, Phys. Abh. Akad. Berlin 1859: 21 (1860).

Annual, procumbent, glabrous, ramified from the base into 4-6 (9) branches up to 12 cm long. Leaves opposite, distichous and petiolate; limb 4-6 (8.5) x 2-3 (5) mm, oblong to oblanceolate, no spot, apex obtuse, rounded and serrate, margin serrate, base asymmetrical; petiole 0.5-1.75 mm; stipules 0.5-1.5 x 0.3-0.75 µm, laciniate on both node surfaces. Cyathia

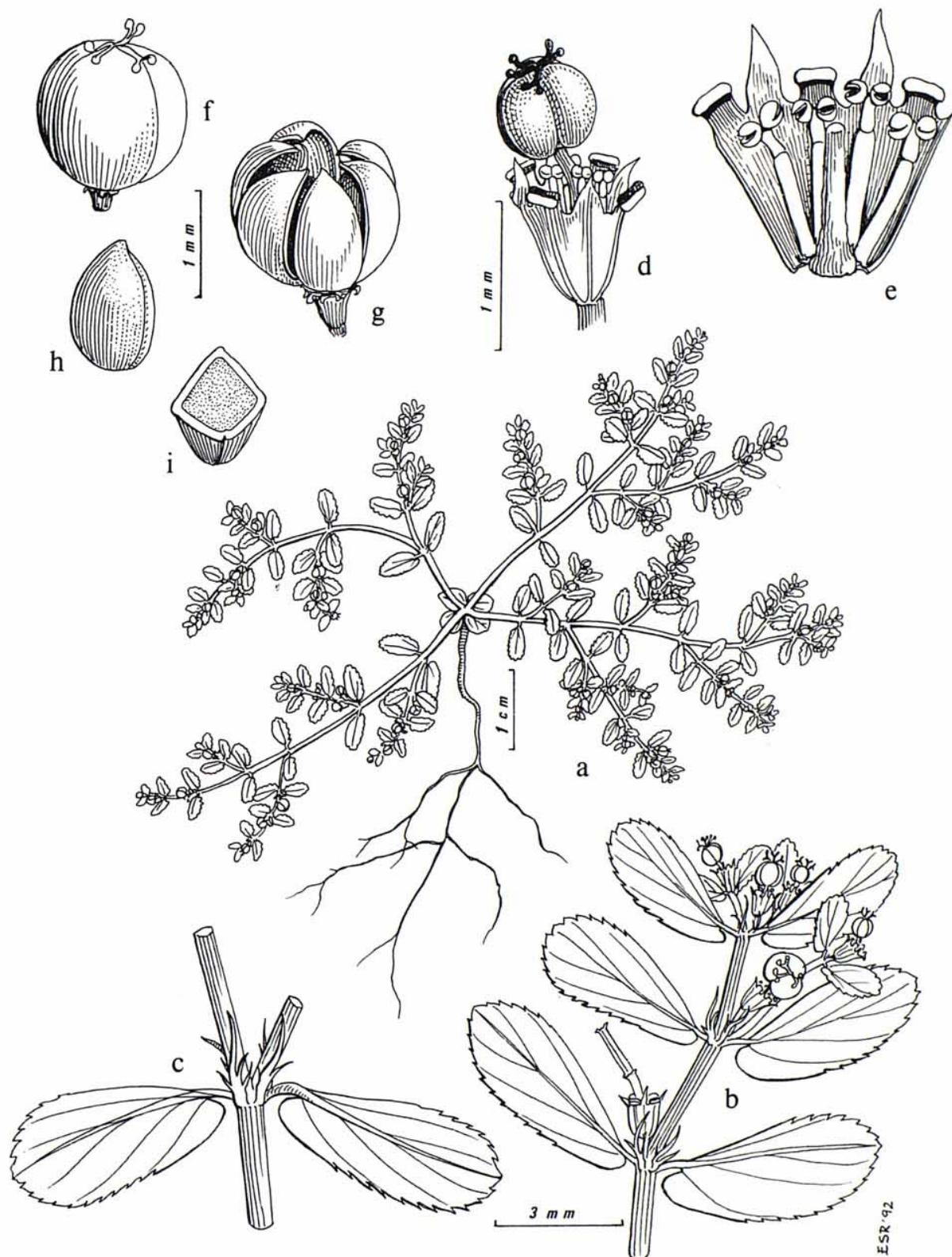


Fig. 6.—Iconography of *C. humifusa*: habit (a), details of the branches (b and c), cyathium (d), details of the nectaries and cyathial appendages (e, f), mature capsule (g), seeds (h, i).

solitary at the bifurcation of the dichasial branches and grouped together in axillary dichasial clusters on the branches of the last order, with 4-5 cymes of male flowers, glabrous exocystium; glands 70-90 x 160-180 µm, oblate to suborbicular, appendix measuring 20-40 x 140-180 µm with entire margin. Capsule 1.2-1.5 x 1.2-1.8 mm, oval, deeply sulcate, glabrous, with keeled mericarps. Seeds 1-1.3 x 0.7-0.8 mm, ovoid, with subquadragular cross section, smooth, apiculate, pale grey to light chestnut brown; episperm mucilaginous. June-November.

Observations

This species has quite often been confused with *C. serpens*, probably because of the doubtful specific status given to the latter species in *Flora Europaea*. They can easily be distinguished by their leaves (cf. Table 2): retuse and entire in *C. serpens*, obtuse and serrate in *C. humifusa*. It could also possibly be confused with the glabrous forms of *C. vulgaris* subsp *vulgaris*, from which it can be differentiated by its smooth seeds and the dentate margin (neither entire nor crenate) of the leaves. It can be distinguished from *C. vulgaris* subsp. *massiliensis* (which also has dentate leaves) by its smooth and not granulate-rugose seeds, and by the presence of indumentum.

Type: described on the basis of specimens from the wild cultivated in the Berlin Botanical Gardens. Lectotype (B-Willd. 9283) designated by R.-SMITH (1982: 579).

Iconography: Fig. 8.

Chromosome number: $2n = 22$ (LÖVE & LÖVE, 1961).

Ecology: behaves as a ruderal species, growing on compacted damp clay soils.

Chorology: holarctic species from south-east Asia, naturalized in the European circumbooreal and Iranian-Turanian regions. In the Iberian Peninsula it is probably in the process of expansion (Fig. 8). Spain: Ca, Ge.

Observations

In *Flora Europaea* the code «Hs» does not appear in the distribution of this species either. GREUTER & al. (1986), in their Med-checklist, consider it present in «Hs» owing to the (mistaken) assumption that *Euphorbia engelmannii* sensu Cadevall & Font Quer corresponds to *Chamaesyce humifusa*. This misinterpretation stems from the fact that, as we have observed from his sheets, Cadevall used the binomen *E. engelmannii* to refer to Catalan specimens of *C. serpens*.

C. humifusa was reported during the last decade from three Spanish provinces (Albacete, Granada and Valencia). Review of the voucher sheets provides proof of the above-mentioned confusion with other congeners (*C. nutans* and *C. serpens*). The sheets on which the report from Albacete (Ab: Alcalá de Júcar) by FIGUEROLA, PERIS & ESTESO (1989) is based in fact correspond to *C. nutans*. The same applies to the sheets supporting the report from Valencia (V: Valle de Cofrente, Jalance) by COSTA & al. (1982), which appears in the catalogue published by MATEO & FIGUEROLA (1981). We also found three sheets from Valencia in the VAL herbarium (VAL 842165, VAL 842169 and VAL 851288) which belong to *C. serpens*. After examining the sheet on which it is based (GDA 14787), we likewise concluded that the report from Granada (Gr: Jerte) by MARÍN CALDERÓN & al. (1984) should also be removed from this species. Recently *C. humifusa* has been reported from Catalonia by Casasayas (1989), a claim repeated by BOLÒS & al. (1990). Casasayas report from Girona (l.c.: Girona, La Devesa, BCC) undoubtedly does belong to *C. humifusa*, as can be demonstrated by summary inspection of the characters of the leaves and seeds. This report, together with our

Table 2.—Distinguishing traits between *C. humifusa*, *C. serpens*, *C. vulgaris* subsp. *vulgaris* and *C. vulgaris* subsp. *massiliensis*.

	<i>C. humifusa</i>	<i>C. serpens</i>	<i>C. vulgaris</i> subsp. <i>vulgaris</i>	<i>C. vulgaris</i> subsp. <i>massiliensis</i>
Indumentum	—	—	— +	+
Leaves (shape)	oblong to oblanceolate	ovate to suborbicular	ovate to obovate	ovate-oblong to oblong
Leaves (shape)	serrate	entire	entire-crenulate	serrate
Leaves (length)	4-6 mm	3-6 mm	2-9 mm	4-8 mm
Leaves (apex)	obtuse to rounded	retuse	obtuse-retuse	obtuse-retuse
Appendage	entire	truncate to (tri) lobulate	entire to (tri) lobulate, less than double the gland	entire to (tri) lobulate, more than double the gland
Stipules	laciniate	deltate (rarely fimbriate)	fimbriate	fimbriate
Seeds (shape)	ovoid	tetrahedral	ovoid to subtetrahedral	ovoid to subtetrahedral
Seeds (testa)	smooth	smooth	rugose-granulate	rugose- granulate

own from Cadiz, constitute for the time being the only authentic evidence for the presence of this neophyte in the Peninsula for at least a century, the last being based on Pérez-Lara's hundred-year-old collection.

Material studied

Austria

In cultis et viis horti botanici Vindobonensis (BC 57576).

Belgium

Bélgica: Jardín botánico (MAF 95625).

France

GIRONDE: Bordeaux, Jard. Bot., 15-XI-1913, Bouchon (BC 57569).

Spain

CÁDIZ: Jerez, in cultis, 9-VIII-1882, Pérez Lara (MAF 23503, MAF 23504). GIRONA: Girona, en la Devesa, ruderal, DG84, 22-VII-1981, T. Casasayas (BCC).

2. *Chamaesyce humistrata* (Engelm. ex Gray) Small, Fl. s.e. U.S.

≡ *Euphorbia humistrata* Engelm. ex Gray, Man., ed. 2 :386 (1856).

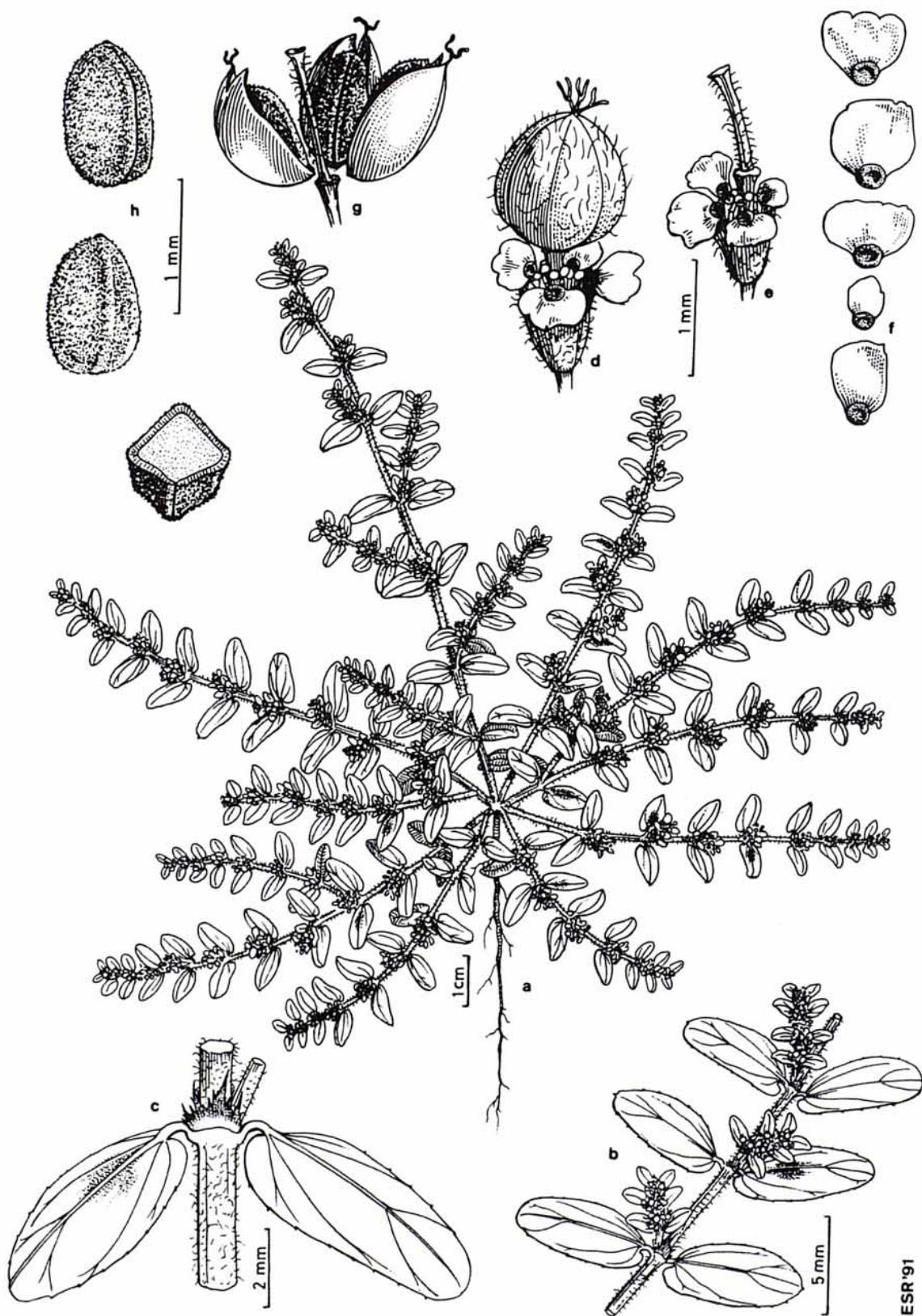


Fig. 7.— Iconography of *C. humistrata*: habit (a), details of the branches (b and c), cyathium with immature capsule (d), details of the nectaries and cyathial appendages (e, f), mature capsule (g), seeds (h).

Annual, procumbent, ramified from the base into up to 7 pilose branches, maximum length 30 cm. Leaves glabrous, opposed, distichous, petiolate; limb 9-12 x 5-6 mm, oblong, often with a diffuse spot on the upper surface, apex obtuse (rarely mucronate), margin serrate; petiole 0.5-1 mm; interfoliar pilose stipules, triangulate-fimbriate on both node surfaces. Cyathia grouped together in dense, conspicuous axillary dichasial clusters; glands 90-110 x 200-300 µm, chestnut-reddish, with appendages twice as large, suborbicular, 200-300 x 300-400 µm, with entire or (tri) lobate margin. Capsule 1.25-1.35 x 1.35-1.65 mm, oval, sulcate, hirsute when young, glabrous in maturity; smooth mericarp surfaces; triangular hypogynous disc, 360-600 µm. Seeds 0.85-1.05 x 0.55-0.70 mm, subtetrahedral, granulate, apiculate, chestnut-coloured; episperm mucilaginous. June-November.

Observations

Previously this species passed unnoticed since it was confused with *C. vulgaris* or *C. maculata*. It is easily distinguished from both by its pilose stems and glabrous leaves, by the cyathia grouped together in dense axillary glomerules and particularly by its granulate seeds. We have observed that the hirsute indumentum of the young ovaries and capsules is deciduous, since mature capsules are entirely glabrous.

Type: «*Habitat in Ontario, New York, Minnesota, Kansas et Mississippi*». Lectotype (MO 149873) designated by WHEELER (1941c: 261) on a specimen from Mississippi; isolectotype in G (!).

Iconography: BRITTON (1970), Fig. 7.

Chromosome number: we have found no count so far in the literature consulted.

Ecology: in the populations studied, this species was living alongside *C. serpens* or *C. maculata*, colonizing sandy-slimy soils in waste places.

Chorology: native to the North American Atlantic region; in Europe it is naturalized in the south of the Iberian Peninsula (Fig. 8). Spain: Gr.

Observations

Ours are the first European reports of this American neophyte which was possibly introduced only recently. In one of the localities (Gr: Cubillas dam) it is abundant and can be considered naturalized (Dr. G. Blanca, pers. comm.).

Material studied

Spain

GRANADA: Caparacena, Embalse del Cubillas, 30SVG4026, 630 m, 13-IX-1974, J. Fernández Casas (MAF 130326); Motril, Cortijo de la Ponata, cultivos nitrificados, 21-VII-1981, López Guadalupe & Marín Calderón (GDA 14785); Caparacena, pr. reservorium dictum «Embalse del Cubillas», ad viam, solo calcareo, 30SVG4026, 630 m, 13-IX-1974, Fernández Casas & Sánchez García (MA 208227); en las márgenes del Patano del Cubillas, 14-IX-1974, Fernández Casas (MA 345661).

United States of America

ILLINOIS: Illinois, 1878, Patterson (G); Waterford, IV-1891, Pepoon (BM) bankes of the Mississippi, near Quawka, Patterson (K). MISSOURI: Sheffield, 22-VIII-1931, Busch (G); Jefferson Country, 30-VII-1986, R.E. Gereau (BM); New Madrid, northwest of Maston, 1-XI-1956, J.A. Steyermark (BM); Jefferson Country, near Mammouth Creek, 1-XI-1986,

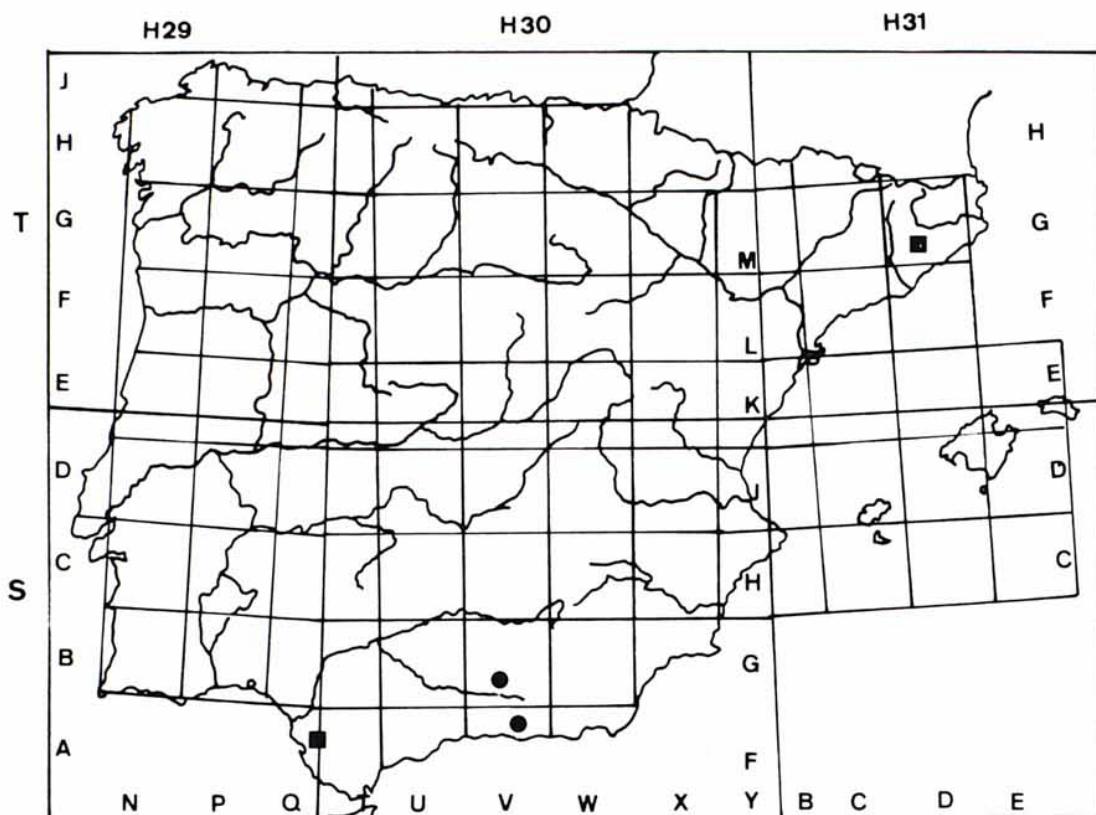


Fig. 8.— Distribution of *C. humifusa* (■) and *C. humistrata* (●) in the area under study.

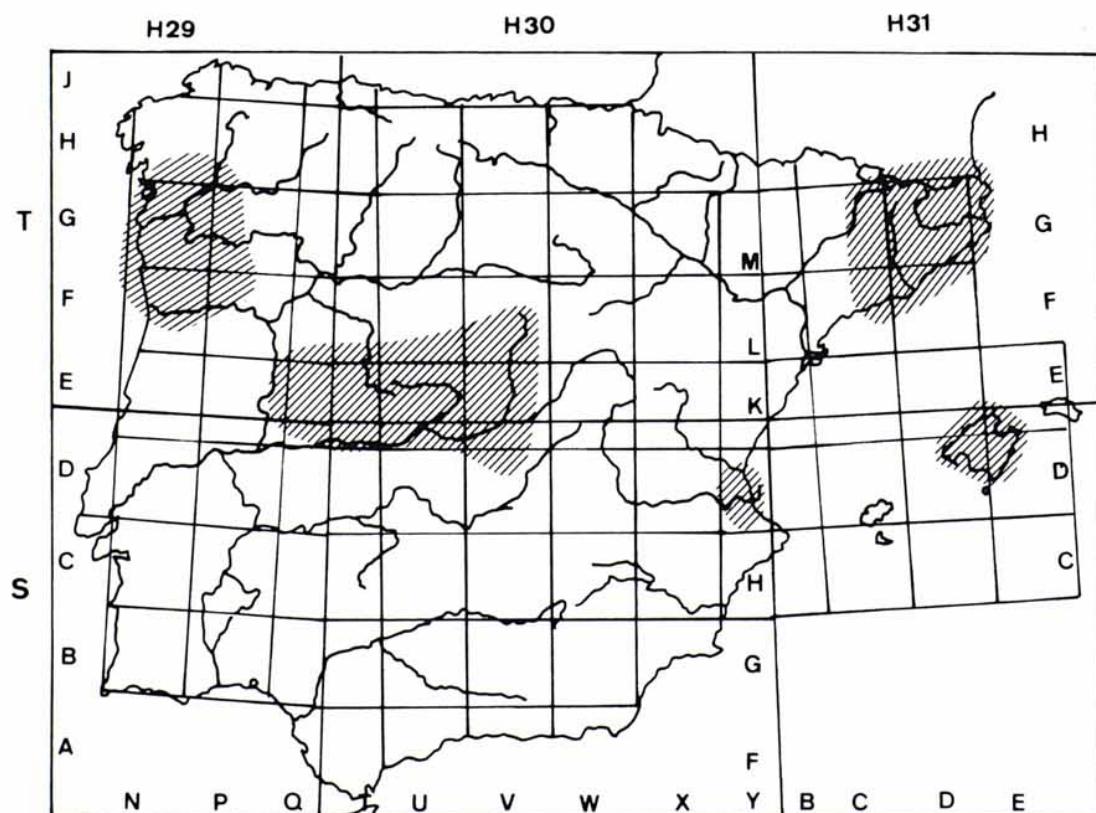


Fig. 9.— Distribution of *C. maculata* in the area under study.

Raven 27387 (BM); Holmes Park, 9-X-1922, F. Bush (K). OKLAHOMA: Neosho river, near Miami, 26-VIII-193, W. Stevens, (G). TENNESSE: Cumberland River, near Nachville, A. Gattingen (BM); Cumberland River, sandy grounds, A. Gattingen (G).

3. *Chamaesyce maculata* (L.) Small, Fl. s. e. U.S. 713 (1903).

- = *Euphorbia maculata* L., Sp. Pl. 455 (1753) = *Anisophyllum maculatum* (L.) Haw., Syn. pl. succ.: 162 (1812) = *Xamesike maculata* (L.) Rafin., Autikon bot.: 97 (1840) = *Tithymalus maculatus* (L.) Beckhaus in Hasse, Fl. Westf.: 787 (1893).
- = *E. supina* Rafin., Amer. Monthly Mag. 2: 119 (1817) = *E. supina* Rafin. ex Boiss. in DC., Prodr. 15(2): 47 (1862) = *Xamesike supina* (Rafin.) Rafin. Autikon bot.: 97 (1840) = *Chamaesyce supina* (Rafin.) Moldenke, J. Jap. Bot. 16: 119 (1939).
- = *E. jovetii* Huguet, Botaniste 54: 153 (1971) = *Chamaesyce jovetii* (Huguet) Holub, Folia Geobot. Phytotax. 8: 176 (1973), holotype in P (!).

Annual, procumbent, ramified from the base into up to eight pilose branches, maximum length 30 cm. Leaves opposite, distichous and petiolate; limb 6-12 x 2-6 mm, asymmetrical, oblong to obovate, rarely incurved, frequently with a well-defined or diffuse spot in the centre of the purple upper surface, orbicular to oblong, apex obtuse, rounded or apiculate, margin serrulate, base only slightly asymmetrical, upper surface glabrous to slightly pilose, lower surface pilose; petiole pilose, 0.5-1.5 mm; interfoliar stipules 1-1.3 x 0.5-1.1 mm, membranous and pilose, fimbriate on both node surfaces. Cyathia solitary at the bifurcation of the dichasial branches or grouped together in axillary dichasial aggregates on the branches of the last order, with 4-5 uniflorous male cymes, pilose exocystathium; glands 140-190 x 65-90 µm, concave-oblate, chestnut-coloured, with appendices twice as large, 300-450 x 130-190 µm, obtrapeziform, pinkish to whitish, with entire, retuse or trilobulate margin; 4-5 male flowers. Capsule 1.1-1.4 x 1.2-1.5 mm, oval, sulcate and keeled, pilose, rarely glabrescent, with adpressed indumentum; smooth mericarp surfaces; hypogynous disc 0.3-0.5 mm, polygonal. Seeds 0.8-1.0 x 0.4-0.5 mm, ovoid, tetragonal, gently transversely sulcate, apiculate, grey to chestnut-reddish; mucilaginous episperm. June-November.

Observations

HUGUET (1971) described *Euphorbia joveitii* from the French Atlantic Pyrenees, including it in his monograph. He considered it a previously undiscovered South American species which had been introduced into France. After checking the type material deposited in the Paris herbarium we have discovered from the lacinate stipules, the capsule with applied indumentum, the ornamentation of the seed and the oblong-obovate leaf limb that it belongs to an exuberant form of *C. maculata* whose leaves lack the purple spot in the middle. In this connection it should also be pointed out that HUGUET (1978) himself admitted the variability of the degree of ramification. It must be stressed, moreover, that the spot on the upper leaf surface of *C. maculata* is a predominant character, but it is neither constant in this species nor exclusive to it.

Type: «*Habitat in America septentrionali*», lectotype (LINN 630, !) designated by CROIZAT (1962). WHEELER (1941) erroneously typified *C. maculata*, concluding that the type of this species corresponded to *C. nutans* (Lag.) Small, and that therefore *C. maculata* was the priority name for designating the Lagasca's plant. This would mean applying the binomen *Chamaesyce supina* (Rafin.) Small (= *Euphorbia supina* Rafin.) to what we presently call *C. maculata*. The error was detected and corrected by Croizat. However, it has come to our notice that some present-day floras (cf. HITCHCOCK & CRONQUIST, 1973; R.- SMITH, 1982; MALAGARRIGA, 1978) continue to reproduce the error.

Iconography: PIGNATTI (1982), VALDÉS & al. (1987).

Chromosome number: $2n=42$ (QUEIROS, 1975; BENEDÍ & ORELL, 1992).

Ecology: this species is found in ruderal communities which colonize intensely trampled soils and sandy-slimy ground, often living side by side with other congeners (*C. prostrata*, *C. vulgaris*, *C. humistrata*). From the phytosociological point of view, it is characteristic of the alliance *Euphorbion prostratae* Rivas Martínez 1976. 40-500 m.

Chorology: A native to North America, naturalized in the Mediterranean, Eurosiberian, Capense, Australian, Iranian-Turanian, and east Asian regions. In the Iberian Peninsula its distribution is mainly concentrated in the northern half (Fig. 9). It is in the process of expansion, as is shown by recent reports from Valencia (CRESPO & GÜEMES, 1991) and Majorca (BENEDÍ & ORELL, 1991). Spain: B, Cc, Ca, Ge, M, PM (Mll), Po, To, V. Portugal: Mi.

Material studied

Belgium

LIMBOURG: Zelem, 1-IX-1979, H. Rabijns (SALAF 1131, MAF 107711).

France

HAUTE-CORSE: Moltifao, 270 m, 18-IX-1979, R. Descartes (SEV 77097, MAF 107713); Asco, márgenes carretera, 270 m, 18-IX-1979, R. Deschartes (SALAF 1129). HAUT-RHIN: au NE de Petit-Landau, 14-VIII-1972, V. Rastetter (SEV 22492); Habsheim (culto ex semina), V. Rastetter (SEV 77096); Habsheim, 2-IX-1977, V. Rastetter (MAF 107712). PYRÉNÉS-ATLANTIQUES: Bayonne, Le Boucau, playa con alcornoques, XP2222, 13-VII-1979, P. Montserrat & L. Villar (JACA 205879). VAR: Le Canet-des-Maures, lieux xablonneux humides, 4-IX-1972, B. de Retz (SEV 22491, MAF 98814). VILLE-DE-PARIS: Paris, ruderal, 15-X-1935, C. Guinet (BCF).

Portugal:

DOURO LITORAL: Baia, pr. de Aregos, 19-X-1978, Rozeira, Serra & Bernardino (LOU 12562). MINHO: Viana do Castelo, 20-XI-1961, Bento Rainha (MA 65950); Barcelos, caminho de ferro, 40 m, 30-XI-1961, Bento Rainha (MA 250879); V.N. de Cerveira, 12-XI-1947, M. da Silva (MA 250878).

Romania:

CARAS-SEVERIN: Banatus, 90 m, 1-VIII-1968, I. Todor & I. Gergel (MAF 75436).

Spain:

BALEARES: Mallorca, Santa Maria, 21-IX-1990, J. Orell & J.J. Orell (BCF 35978). BARCELONA: Noia, Capellades, baixador dels FFCC, vora de la via del tren, 31SCF99, 250 m, 2-XI-1989, C. Benedí (BCF 35974); Sant Pol de Mar, junto a la vía férrea, 12-X-1975, J. Molero (BCF 35999); Pedralbes, 7-VIII-1965, K. Banch (BC 596276); Delta del Llobregat, estany de l'Illa, 23-X-1979, O. de Bolòs (BC 630703); Montjuïc, Clot de la Fuiarda, 11-IX-1952, A. de Bolòs (BC 119026); Mollet, estación FFCC, 18-VIII-1940, A. de Bolòs (BC 97867); Bages, Catlluç, 230 m, 1-XI-1947, Codina (BC 108360); Colonia Gomis, 20-VIII-1942, A. Marçet (BC 93277); Manlleu, 450 m, 28-VIII-1925, Sennen & Gonzalo (BC 57575); Bages, Monistrol de Montserrat, 135 m, 25-VIII-1924, J. Nuet, Badia & J.M. Panareda (BC 655788); Manlleu, voie ferrée, 500 m, 28-VIII-1925, Sennen & Gonzalo (MA 471561). CÁCERES: Moraleja, 1-IX-1983, E. Rico (MAF 123556); Guijo de Coria, embalse de Borbollón, suelos arenosos-limosos, 22-IX-1981, M. Laredo & A. Valdés (SALAF 2406); Navalmoral de la Mata, estación del ferrocarril, 8-VI-1981, E. Rico (SALAF 1132); Moraleja, 1-IX-1983, E. Rico (SALA 32513, LOU 7449, BCF 35998); estación de F.C. de Navalmoral de la Mata, 8-VII-1981, E. Rico (SALA 23546); Guijo de Coria, embalse de Borbollón, suelos arenosos-limosos, 22-XI-1981, Valdés Franzi (MA 250474). CÁDIZ: Laguna de Janda, 8-XI-1978, E.F. Galiano, J. Rivera & B. Valdés (SEV 57593, GDA 13919, SALA 22234); El Matorral, Los Barrios, 90 m,

23-X-1982, B. Moleswoth (SEV 90188). GERONA: Sant Miquel de Fluvia, marges del riu Fluvia, indrets nitròfils, 31SDG69, 200 m, 8-XI-1989, C. Benedí (BCF 35976). MADRID: El Escorial, pastos, 12-VIII-1987, J. Izco (MAF 127247). PONTEVEDRA: Cementerio de la Parda, 13-VIII-1986, F.J. Panda (LOU 07777). TOLEDO: Oropesa y Corchuela, pantano de Rosarito, medios temporalmente inundados, 11-IX-1985, Ruiz Téllez (SALAF 11242).

4. *Chamaesyce peplis* (L.) Prokh., Obz. moloch. Sr. Azii 1933: 15 (1933).

= *Euphorbia peplis* L., Sp. Pl. 455 (1753) = *Tithymalus peplis* (L.) Scop., Fl. Carn. ed.2, 1: 340 (1772) = *Anisophyllum peplis* (L.) Haw., Syn. pl. succ. 159 (1812) = *Chamaesyce maritima* S.F. Gray, Nat. arr. brit. pl. II: 260 (1821), nom illeg. = *Tithymalus auriculatus* Lam., Fl. Fr. 3: 102 (1779).

Annual, procumbent, glabrous, glaucous, somewhat fleshy, ramified from the base, frequently into 4-5 branches up to 35 cm long. Leaves opposed, distichous and petiolate; limb 7-12(16) x 3-6(9) mm, falcate, no spot, apex obtuse, rounded to retuse, margin entire, with the basal auricle occasionally serrate, base markedly asymmetrical because of the fact that half the abaxial limb is prolonged into a conspicuous auricle; petiole 1-3 mm; interfoliar stipules 2.25-3.5 x 2.1-3 mm, non-ciliate, deeply laciniate on both node surfaces. Cyathia solitary at the bifurcation of the dichasial branches and grouped together in axillary dichasial clusters on the branches of the last order, multiflorous, with 4-5 cymes of male flowers, glabrous exocytium; glands 90-100 x 450-520 µm, oblate-reniform, reddish in colour, with appendices of the same size or smaller, 75-85 x 450-520 µm, greyish-white, with entire or irregularly lobed margin. Capsule 3-4 x 4-5 (6) mm, oval, deeply sulcate, glabrous, with keeled mericarps; hypogynous disc measuring 1-2 mm, polygonal to triangular, with laciniate corners. Seeds (2.5)3 x (1.6) 2 mm, pyriform, not tetrahedral, with subcircular cross section, smooth, apiculate, pale grey in colour; mucilaginous episperm. April-December.

Type: «*Habitat in Narbonae, Hispaniae maritimis*»; Lectotype (LINN 630/18, !), designated by R.- SMITH (1982: 579).

Iconography: COSTE (1903), BONAFE (1979), PIGNATTI (1982), VALDÉS & al. (1987).

Chromosome number: 2n=24 (BENEDÍ & ORELL, 1992).

Ecology: halophile plant proper to subnitrophilous communities of sandy coastal areas. In phytosociological terms it is characteristic of the alliance *Euphorbion peplidis*. 0-5 m.

Chorology: native to the Mediterranean region, naturalized on the Pacific coast of North America. Distributed throughout the coastal area of the Iberian Peninsula and Balearic Islands (Fig. 10). On the Cantabrian coast it seems rare since we have only seen specimens from Vizcaya, though we are aware of the report from Santander made by LORIENTE (1974). Spain: A, Al, B, Bi, C, Ca, Cs, Ge, Gr, H, Ma, Mu, PM (Ib, Mll, Mn), Po, S, T, V; Portugal: Ag, BL, E, R.

Material studied

France

HAUTE-CORSE: entre Alèria i Bастia, platjes de Moriani, 13-VIII-1990, C. Benedí (BCF 35957). PYRÉNÉES-ORIENTALES: Port-Vendres, plage, 5-VI-1875, Chassagne (MAF 58399); Port-Vendres, 5-VI-1875, Chassagne (BCF).

Portugal

ALGARVE: Torralta, praia, 27-9-1969, T. Pereira (LISU 69238); Alvor, XI-1915, F. Mender (LISU 24194). BEIRA LITORAL: Buarcos, XI-1881 (LISU 23936); Praia da Torre, IV-1883, A.R. da Cunha (BC 136171); Beira, litoral, 1 m, 9-VIII-1947, Figueira da Foz (BC 105349); Figueira da Foz, 23-VIII-1949, J. Matos (MA 250902); Praia da Torre, IV-1888, A.R. da Cunha

(MA 250901). ESTREMADURA: Almada, praia de Santo Antonio de Caparica, VIII-1953, T. Pereira (LISU 56517); Pederneira, Nazare, IX-1889, A.R. da Cunha (LISU 23934). RIBATEJO: Setúbal, laguna de Santo Andre, 13-IX-1984, M. Luceño (SALA 44181).

Morocco

MELILLA: Melilla, 27-IX-1933, H. Mauricio (MAF 23835). TEMARA SKHIRAT: E. Harhoura, a 10 Km de Rabat, sables maritimes, 1-X-1983, J. Lewalle (SALAF 14194).

Spain

ALICANTE: Tabarca, 24-IX-1968, M. Caldúch (VF 9923); costa de Alicante, arenas, 18-XII-1940, S. Rivas Goday (MAF 85078); Cabo de la huerta, 10-06-1952, Rigual (BC 601123); Cabo de las Huertas, 11-VI-1952, A. Rigual (MA 370700); Peñón de Calpe, 6-VII-1955, A. Rigual (MA 370692). ALMERÍA: Carboneras, playas y rocas, 30SWF9996, 5 m, 10-XI-1982, D. Gómez & G. Montserrat (JACA 217482; Palomares, *Salsolo kali-Cakiletum aegyptiacae*, sobre arenas nitrificadas, 2-XI-1984, M. Costa & al. (SEV 121082, LEB 31364, GDA 18772, VF 14159, VF 1409, MAF 126307, MGC 20804, SALA 41081); finca de la Marina del Pino, playa, 13-XI-1966, S. Silvestre (SEV 2348); El Alquián, arenas marítimos, 8-VIII-1977, B. Cabezudo (SEV 27345); El Alquián, sandy ground by sea, 5-VI-1967, P.W. Ball, A.O. Chater, I.K. Ferguson & B. Valdés (SEV 2349); Cala Cortada, en el límite con Murcia, arenas marítimas, 12-VIII-1974, Ginés López (MAF 95696, GDA 7084); Roquetas, playas nitrificadas, IX-1959, Losa & Rivas Goday (MAF 90447); Carboneras, XI-1969, Fernández Casas (MA 409266). BALEARES: Ibiza: Islas Torretas, pr. Ibiza, 22-XI-1973, H. Kuhbier & G. Finschow (SEV 23658); Ibiza, platja d'Ibiza, 1 m, 27-VII-1920, Gross (BC 99440); Cabrera, Sa platjola de ses Cases, 3-V-1947, P. Ferrer (MA 74655). Mallorca: Mallorca, Can Pastilla, arenal, 24-VII-1951, Palau Ferrer (BCF); Can Pastilla, arenas marítimos, 24-VII-1951, P. Ferrer (MAF 23824); Pollença Ca'n Cuarassa, 15-VIII-1990, J.J. Orell (BCF 35958); Coll de'n Rabassa, 3 m, 10-VIII-1917, Bianor (BC 57536). Menorca: Ciutadella, Cala Bosc, playa, 13-IX-1971, P. Montserrat (JACA 699371); Cala Tirant, dunes, 25-VIII-1988, C. Benedí (BCF 35079); cala Mesquida, 2 m, VIII-1912, Font i Quer (BC 57533); Puerto de Mahón, 23-VII-1898, Pons i Guerau (MA 74664). BARCELONA: Prat de Llobregat, VII-1948, Marcos (MAF 23830); Prat de Llobregat, 6-IX-193, F. Sennen (MAF 23829); Prat de Llobregat, dunes, 6-IX-1935, F. Sennen (MAF 58756); Can Tunis, arenas marítimas, 14-VII-1917, E.H. del Villar (MAF 58400); Garraf, platjes, 2-VIII-1948, Gabarda (BCF 34767); Malgrat, XI-1956, Losa (BCF); Castelldefels, arenas marítimos, IX-1955, T.M. Losa (BCF 36000); Barcelona, IX-1871, E. Vayreda (BC 805453); El Prat, 16-VII-1939, A. de Bolòs (BC 100719). CÁDIZ: entre Chipiona y Sanlúcar, 22-IX-1967, B. Valdés (SEV 2347); desembocadura del Guadiaro, en arena del litoral, 14-IX-1988, F. Gómiz (LEB 40852). CASTELLÓN: Sagunto, 21-IX-1946, E. Sierra (BC 106114); Nules, 06.1919, F. Beltrán (MA 74660). GERONA: Platja d'Aro, arenas marítimos, 17-VIII-1944, Font Quer (MAF 23827, BCF); Cadaqués, VII-1866, F. Trèmols (BC 650449); Platja d'Aro, IX-1933, Font i Quer (BC 81398); Platja de Pals, 10-X-1954, A. de Bolòs et al. (BC 130362); Platja de Creixell de mar, riu Galla, 28-X-1948, Batalla, Masclans (BC 104696); Platja Tamarit de Mar, 14-IX-1947, Batalla, Masclans (BC 103875). GRANADA: Calahonda, playa, 10-VI-1974, E. Domínguez & S. Talavera (SEV 43009); Punta Negra, VF86 19-IV-1976, A. Asensi & B. Díez (MGC 3684); entre Almuñécar y Salobreña, VF46, 3-X-1975, A. Asensi & B. Díez (MGC 3053); Cerro Gordo, Almuñécar, playas, VF36, 3-X-1975, A. Asensi & B. Díez (MGC 3051); Motril, 21-VI-1952, H. Roivainen (BC 143626). HUELVA: Isla Cristina, dunas, 26-VII-1978, S. Silvestre (SEV 43400). LA CORUÑA: La Coruña, VIII-1893, Mas Guindal (MAF 64058); Finisterre, playa, 2-VIII-1975, F. J. Fernández Díez (SALA 7682); Muros, playa de Louro, 1-X-1967, R. Alvarez (SALA 3687); Playa del Miño, P. Merino (LOU 01416). MÁLAGA: Málaga, arenas marítimos, 8-XII-1942, Rivas Goday (MAF 85079); Playa de la Misericordia, UF65, 4-XII-1974, A. Asensi & B.D. Garretas (MGC 1770); playa del Campo de Golf, UF65, 16-X-1975, A. Asensi & B. Díez (MGC 3167); La Cala, Mijas, UF55 31-X-1975, A. Asensi & B. Díez (MGC 3154); delta del Guadalhorce, UF66 24-VI-1976, A.

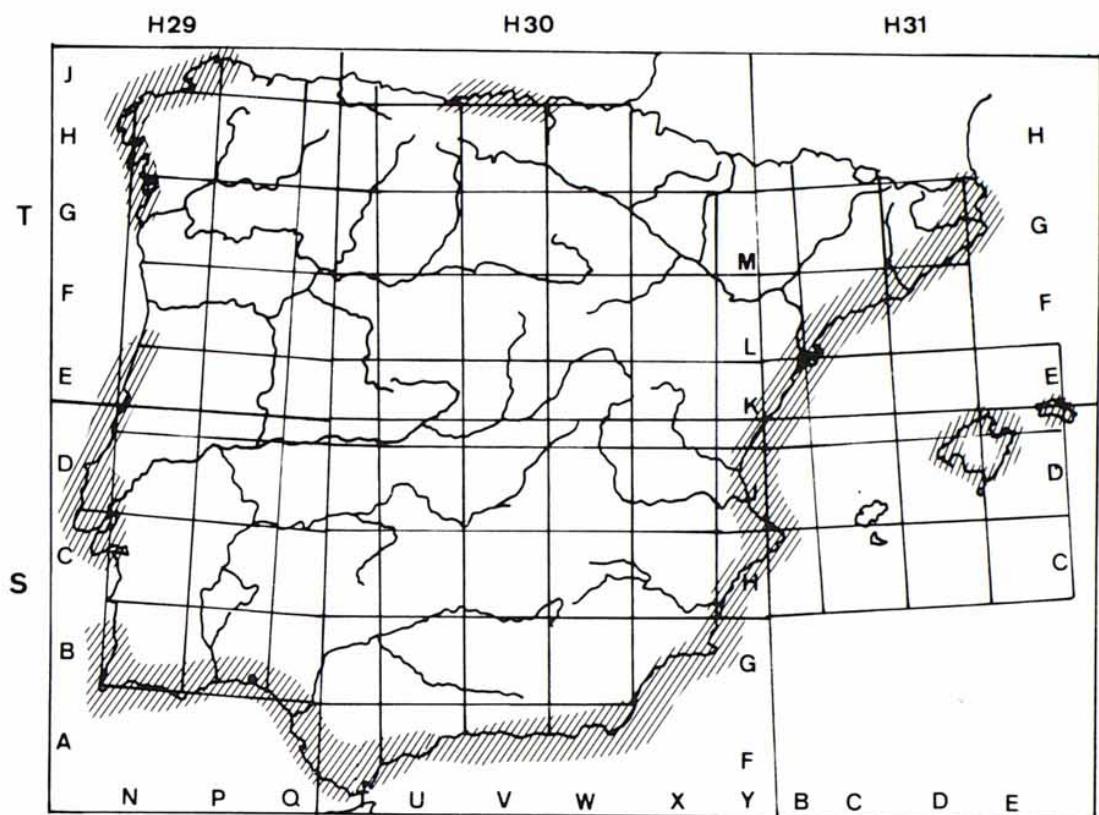


Fig. 10.— Distribution of *C. peplis* in the area under study.

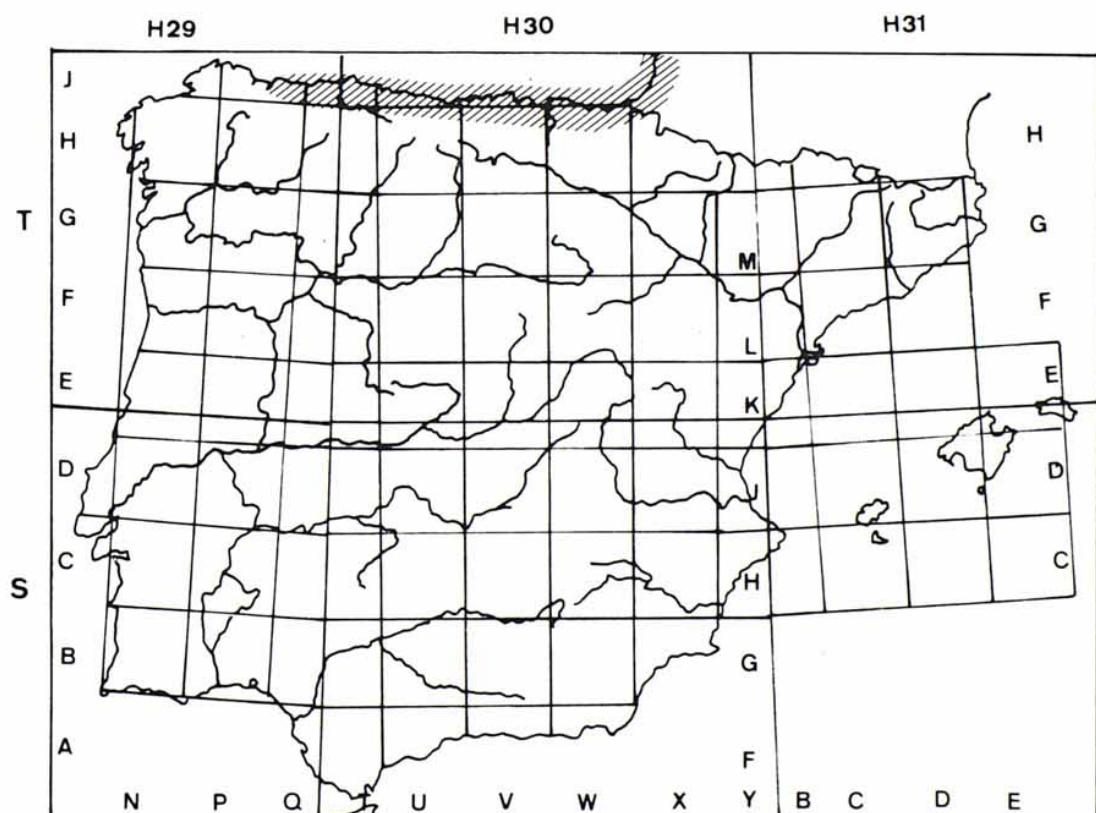


Fig. 11.— Distribution of *C. polygonifolia* in the area under study.

Asensi & B. Díez (MGC 3733); El Palo, X-1830, s.r. (MA 150483). MURCIA: San Javier, La Manga del Mar Menor, 11-VIII-1973, S. Silvestre (SEV 15135); Cartagena, playa de la Ferrosa, 3-V-1903, F.A. Ibáñez (MAF 58401); Cartagena, La Manga, El Bolondo, arenal consolidado y nitrificado, KG9976, 20-XII-1980, F. Alcaraz (MUB 4954); Cartagena, Ibañez (MA 74659); Los Peruchos, arenales, 24-VIII-1902, Jiménez (MA 74658); Mar Menor, 4-IX-1971, J. Fernández-Casas (MA 408836). PONTEVEDRA: Villanueva de Arosa, playa del Terror, 13-VIII-1969, Valdés Bermejo (LEB 2130, VF 5043, GDA 7104, MAF 74092); Isla de Arosa, Rivas Mateos (MAF 23826); Playa de la Lanzada, 2-VIII-1964, Bellot & B. Casaseca (SALA 12011); Playa de la Lanzada, 2-VIII-1964, Bellot & Casaseca (MA 192595); Playa de Melide, Cangas de Morrazo, 21-VIII-1971, S. Castroviejo (MA 196356). TARRAGONA: Delta del Ebro, arenales marítimos, 15-VII-1980, F. Alcaraz (MUB 4400); Segur de Calafell, 2-VIII-1976, E. Rico (SALA 13887); Cambrils, Ruidecañas, 26-VII-1972, R. Folch (BC 631245); Cap Gross, 14-XI-1954, A. de Bolòs (BC 130089); Segur de Calafell, 10-X-1948, Font i Quer (BC 108650). VALENCIA: Cullera, VII-1945, J. Borja (VF 473); Sierra de la Murtra, Brosquil, arenales marítimos, J. Borja, MAF 23825; Albufera de Valencia, arenales marítimos, 3-XI-1935, R. Pascual (MAF 81331); Pinedo, arenales costeros, 30-IX-1984, G. Mateo (VAB 842150); Sagunto, dunas, en comunidades subnitrófilas, YJ4097, 7-VII-1989, M.A. Codoñer & S. Fos (VAB 892317); Gandía, arenales costeros, X-1974, G. Mateo (VAB 74249); Valencia, arenales marítimos, VII-1898, C. Pau (MA 407946). VIZCAYA: Bilbao, sables, 14-VIII-1918, Hno. Elías (MA 74665).

5. *Chamaesyce polygonifolia* (L.) Small, Fl. s. e. U.S. 703 (1903).

≡ *Euphorbia polygonifolia* L., Sp. Pl. 455 (1753).

Annual, procumbent, glabrous, glaucous, sometimes somewhat fleshy, ramified from the base usually into two branches up to 8 cm long. Leaves opposite, distichous and petiolate; limb (7)11-13(16) x 2-4 mm, linear to linear-oblong, no spot, apex from subobtuse to obtuse, apiculate, margin entire, base almost symmetrical; petiole 1.5-2 mm; interfoliar stipules 0.9-2.2 x 1.9-2.2 mm, deeply lacinate on both node surfaces. Cyathia solitary at the bifurcation of the dichasial branches or grouped together in axillary clusters on branches of the last order, pauciflorous, with 4-5 cymes of male flowers, glabrous exocystium; 4 glands per cyathium, more or less stipitate, 240-280 x 135-155 µm, oblate to suborbicular, concave, chestnut coloured, without appendices. Capsule 2.6-3 x 2.5-3 mm, oval, deeply sulcate, glabrous, with keeled mericarps; polygonal hypogynous disc, 0.6-0.9 mm. Seeds 1.9-2.2 x 1.5-1.6 mm, pyriform, not tetrahedral, with subcircular cross section, smooth, slightly apiculate, light grey in colour; mucilaginous episperm. July-November.

Observations

Unlike its congeners, this species usually presents only two branches corresponding to the cotyledon branches and does not develop subsidiary axillary branches. TUTIN & R.-SMITH (1968), in their description of the species in *Flora Europaea*, state that the branches reach a greater length (up to 18 cm) than we have observed (up to 8 cm) in the dozen sheets we examined. We also disagree with these author's findings regarding the triangular shape of the stipules, since we have always found them to be deeply lacinate on both node surfaces.

Type: «*Habitat in Canada et Virginia*».

Iconography: COSTE (1903).

Chromosome number: n=13 (MULLIGAN & LINDSAY, 1978).

Ecology: lives in subnitrophilous communities in sandy coastal areas and can cohabit with *C. peplis*. 0-5 m.

Chorology: native to the Atlantic region of North America, naturalized in Europe from Britanny to the Cantabrian coast (Fig. 11). Though we have not studied material from Vizcaya and Santander, we are aware of the reports made respectively by ASEGINOZALA & al. (1981) and LORIENTE (1974). Spain: Bi, O, S, SS.

Material studied

France

GIRONDE: Gironde, Pointe du Cap Ferret, VIII-1927, Malvesin Fabre (BC 57543); Pointe du Cap Ferrer, s.r. (BC 57543); Lacanau-Océan, sables, 8-VII-1920, Bouchon (BM). PYRÉNÉES-ATLANTIQUES: Adour, emouchure, sables maritimes, 4-VIII-1901, E.J. Neyraud (MAF 23886); Biarritz, dunas, 8-VIII-1961, E.K. Horwood (SEV 24046); Biarritz, sables maritimes, VIII-1980, Luizet (G).

Spain

ASTURIAS: Playa de La Arena, Soto del Barco, 13-VII-1974, S. Rivas Goday & E. Valdés (MAF 93842); Navia, arenosis maritimis, 5-VI-1973, M. Laíz (MA 395734); playa de la Arena, Soto del Barco, arenas marítimas, en *Cakiletea maritimae*, 13-VII-1974, Rivas Goday & Valdés (MA 410909); Playa de la Arena, 13-VII-1974, S. Castroviejo (MA 405936). VIZCAYA: Lekeitio, playa de Carraspio, 13-VIII-1947, E. Guinea (MA 165049).

6. *Chamaesyce prostrata* (Aiton) Small, Fl. s. e. U.S. 713 (1903)

- = *E. prostrata* Aiton, Hort. kew. 2: 139 (1789) = *Tithymalus prostratus* (Aiton) Samp., Anais Fac. Sci. Porto 17:45 (1931).
- *E. chamaesyce* sensu Wheeler non sensu Linnaeus.

Annual, procumbent, ramified from the base into up to ten branches, with the final apex occasionally ascending; branches up to 35 cm long, lower zone generally glabrous and green, upper zone reddish and pilose. Leaves opposite, distichous and petiolate; limb 5.6-9 x 4-6 mm, asymmetrical, from wide and elliptical to oblong, not blotched, obtuse, margin serrulate in the upper half, base only slightly asymmetrical, upper surface glabrous or glabrescent, underside generally pilose, rarely glabrescent; petiole 0.5-1 mm; interfoliar stipules membranous and pilose, deltoid-fimbriate on the lower surface of the leaf node, less obvious on the upper surface. Cyathia solitary at the bifurcation of the dichasial branches of the last order, with 4-5 uniflorous male cymes, pilose exocystium; glands 180-215 x 60-70 µm, oblate, reddish-purple, with appendices of similar size, 200-260 x 50-90 µm, truncate, pinkish-white, with margin entire or irregularly lobulate. Capsule 1.2-1.6 x 1-1.5 mm, oval, sulcate and keeled, with patent trichomes on the keels, mericarp surfaces glabrous and smooth; hypogynous disc 0.2-0.5 mm, polygonal. Seeds 0.9-1.1 x 0.4-0.7 mm, ovoid, tetrahedral, granulate-transversely striate, apiculate, grey in colour; mucilaginous episperm. April-December.

Type: «Nat. of the West Indies. Cult. 1758 by Mr Philip Miller» lectotype (in BM, !) designated by CARTER & R.-SMITH, 1988: 421.

Iconography: BONAFÉ (1979), PIGNATTI (1982), VALDÉS & al. (1985).

Chromosome number: 2n=18 (BENEDÍ & ORELL, 1992).

Ecology: synanthropic species characteristic of soils subjected to frequent trampling, often living alongside *C. maculata*, *C. serpens* and *C. vulgaris*. In phytosociological terms it is characteristic of the alliance *Euphorbion prostratae* Rivas-Martínez 1976. 0-1000 m.

Chorology. Probably native to the Caribbean region, abundantly naturalized throughout the world. Widespread all over the Iberian Peninsula and Balearic Islands (Fig. 12). Spain: A, Ba, B, Bu, Cc, Cs, Co, Ge, Gr, Hu, J, L, M, Ma, Mu, Na, Or, PM (Ib, Mll, Mn), SS, T, V, Va, Z; Portugal: E. The report for Orense is by GÓMEZ (1985).

Material studied

France

PYRÉNÉES-ORIENTALES: Banyuls, gravillons au bord de la route, 30 m, 1-VIII-1981, J. Lambinon & al. (SALAF 9725, SEV 111390); Banyuls, 30 m, 1-VII-1981, J. Lambinon (MAF 123669). VAR: Saint-Laurent du Var, 5 m, 16-VIII-1979, J. Lambinon (MAF 107714); Saint-Laurent du Var, endroit rudéralisé, 16-VIII-1979, H. Rabijns & G. Van Buggenhout (SALAF 1136).

Portugal

ESTREMADURA: Valle de Alcántara, VII-1884, J. Daveau (LISU 23963).

Spain

ALICANTE: Pego, marjal, 4-XII-1983, Mateo & Aguilella (VAB 831058). BADAJOZ: jardines del Parque de la Legión, 18-VII-1985, P. Gómez (MA 428319). BALEARES: Mallorca: Sóller, Ca'n Cremat, 60 m, 20-X-1982, J. Orell (BC 652377); Alcúdia, carretera de Pollença, VIII-1990, J.J. Orell (BCF 35979); Sóller, VIII-1990, J.J. Orell (BCF 35980). BARCELONA: Pineda de Mar, pr. San Farriol, aliseda aclarada con pl. nitrófilas, DG6908, 90 m, 13-XI-1976, P. Montserrat (JACA 185476); Poble Nou, vía férrea, 5-XI-1951, P. Montserrat (JACA 68251); Pineda, playas, 1960-1961, P. Montserrat (JACA 102760); Castelldefels, apeadero, 18-VIII-1968, J. Izco (MAF 82192); Aiguafreda, 1945, Marcos & Gabarda (BCF 34766); Puig Reich, 26-VIII-1941, Font i Quer (BC 93270); Castelldefels, 11-VIII-1941, Font i Quer (BC 93271); Montcada, 1946, A. de Bolòs (BC 100725); Sta. Coloma de Cervelló, 9-VII-1939, A. de Bolòs (BC 100726); Igualada, IX-1915, R. Queralt (BC 57572); El Bruc, Collbató, 420 m, 18-XII-1984, J. Nuet, J.M. Panareda (BC 652377); Castelldefels, 8-X-1968, O. de Bolòs (BC 602269); Manlleu, champs sabloneaux, 10-VIII-1927, Hno. Gonzalo (MA 74565); Igualada, 09-1915 (MA 74567). BURGOS: Bujedo, 11-IX-1921, H. Elías (BC 57574); Bujedo, vía férrea, 11-IX-1921, Hno. Elías (MA 74563). CASTELLÓN: Vall d'Uxó, márgenes caminos, 200 m, 28-XI-1983, G. Mateo (LEB 22773); Les Villes de Benicàssim, 15-X-1959, M. Caldúch (VF 3779); Cotonar, pr. fàbrica del pí, 6-XII-1917, M. Caldúch (VF 3853); Aitana, Sierra de Espadán, 400 m, 7-X-1984, G. Mateo (VAB 842153); Jiraba, 27-X-1986, A. Nebot (VAB 884666); Castelló, port., 30-VII-1954, M. Caldúch (BC 129077). CÓRDOBA: Embalse de Hornachuelos, 2-X-1980, P. Fernández & I. Parras (SEV 105038). GIRONA: Alt Empordà, Garriguella, a 1 km cap a Delfià, rambla d'un riu, 31SEG80, 250 m, 11-XI-1989, J. Molero (BCF 35990); Gironès, Sant Miquel de Fluià, vores del riu Fluià, indrets nitròfils, 31SDG69, 8-XI-1989, C. Benedí (BCF 35984); Alt Empordà, Figueres, entre les pedres a les escales de l'Hospital, 30-VIII-1990, J. Vallès (BCF 35986); Ribes de Freser, 925 m, 6-VIII-1971, J. Vigo (BC 607109); Torruella de Montgrí, 15-XI-1938, L. Pericot (BC 92565); Platja d'Aro, VIII-1915 (BC 105446); Martorell de la Selva, 60 m, 15-VII-1944, Font i Quer (BC 105420); Sarrià de Ter, 2-X-1982, J. Bou & R. M. Manovens (BC 240617); Castelló d'Ampurias, 1-IX-1963, A. de Bolòs (BC 149778). GUIPÚZCOA: Bergara, 10-XI-1979, Loidi (MAF 122536). HUESCA: Jaca, Instituto Pirenaico de Ecología, gravilla, 820 m, 31-VII-1973, P. Montserrat (JACA 405573); confluencia Alcanadre -río Cinca, junto carretera, BG6711, 130 m, 1-X-1968, P. Montserrat (JACA 435668); desvío a Rodellar, 30TYM4064, 500 m, 26-X-1986, J.M. Montserrat (JACA 628986); salida de Barbastro, lugares pisoteados, 4-VII-1989, J.C. Baiges & al. (BCF 35985); Andújar, Cerca de los Villares, 30SVH1311, 210 m, 25-XI-1981, F. Molino & F. Fernández (JAÉN 812564). LÉRIDA: entre Bell-lloc i Lleida, ruderal, 2-IX-1974, A. Boldú (BCF 18476); Lérida, alrededores de

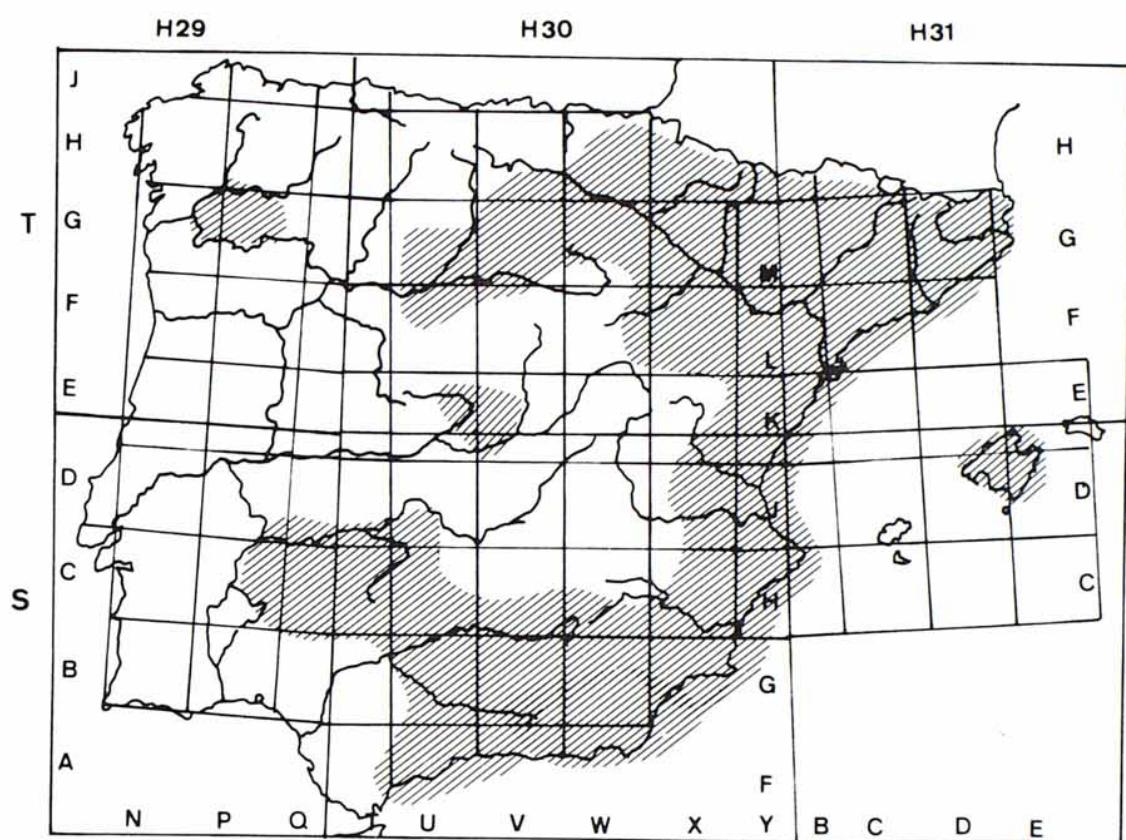


Fig. 12.— Distribution of *C. prostrata* in the area under study.

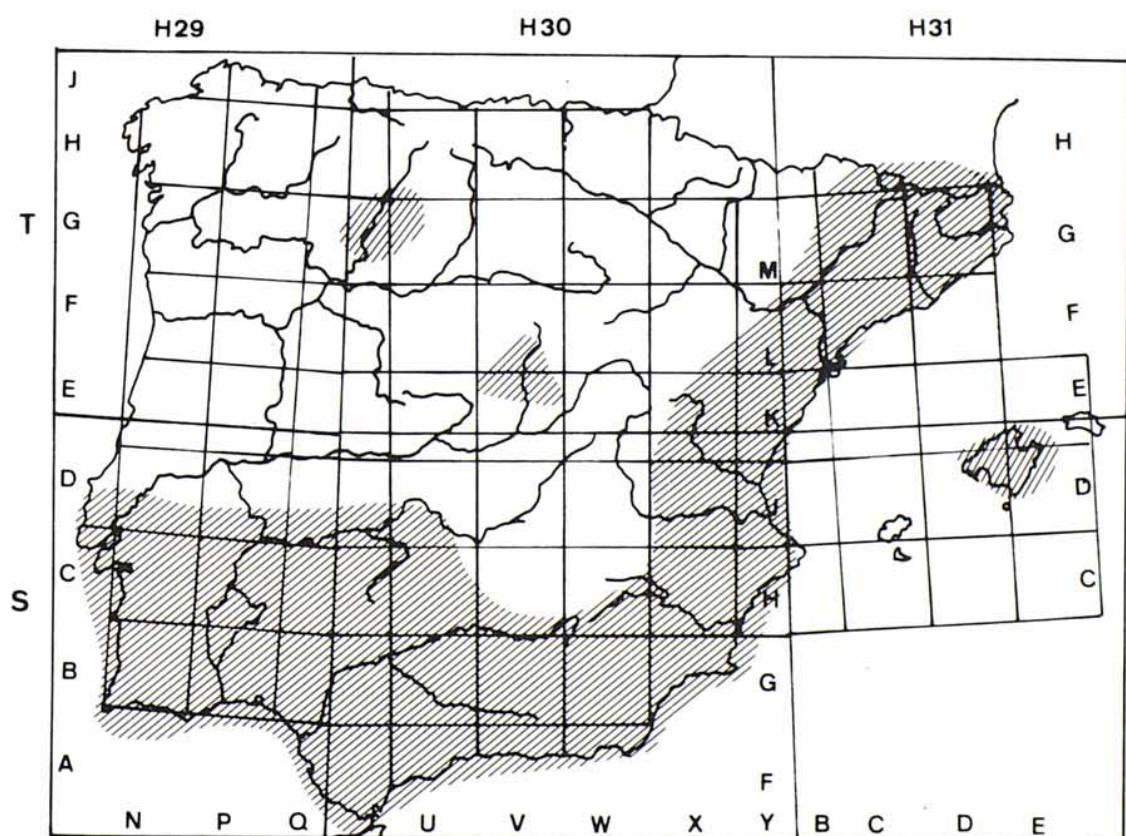


Fig. 13.— Distribution of *C. serpens* in the area under study.

la capital, 6-VIII-1983, E. Rico (SALA 32289); Bell Puig, 3-X-1943, Font i Quer (BC 94240); Mollarusa, 14-VII-1984, A. Majoral (BC 647612). MADRID: Alrededores de la Fac. de Farmacia, 18-XI-1975, M. Ladero (MAF 93227); La Moncloa, ruderal, comunidades nitrófilas de sitios pisoteados, 26-VIII-1973, B. Valdés & G. López (MAF 93157). MÁLAGA: Calahonda, 15-X-1983, S. Holmdahl (MGC 17676). MURCIA: Murcia, Jardín Chino, en zona irrigada, 5-XI-1984, Alcaraz (MUB 12390); Archena, borde de acequias, 20-XI-1985, S. Ribas (MUB 16385). NAVARRA: Pto. del Perdón, jardín, 21-VII-1973, s.r. (JACA 367373). TARRAGONA: entre Scala Dei i Vilella Alta, cunetas, 1-11-1973, Molero (BCF 111465); Cambrils, 23-VII-1972, R. Floch (BC 631240); Ametlla de Mar, 22-XI-1972, R. Folch (BC 631241); St. Jaume dels Domenys, 9-IX-1955, Palau (BC 634403). VALENCIA: Ribarroja del Turia, jardines, 28-XI-1983, J.M. Díaz-Regañón (SEV 95072); Ayora, cultivos de cereales, 16-VIII-1981, J.B. Peris (VF 9041); Jaratuel, cultivos de girasol, 9-VIII-1980, J.B. Peris (VF 9300); Benicarló, pr. vía, 12-X-1956, s.r. (VF 6817); Cortadán, cultivos de cítricos, 16-VIII-1978, D. Sánchez-Mata (MAF 112579); Alfarp, bordes de cultivo, 7-VIII-1979, D. Sánchez Mata (MAF 105250); Burjassot, terrenos arcillosos pisoteados, YJ27, 50 m, 5-VIII-1985, M.B. Crespo (VAB 851900); Lliria, rambla de las Veinticuatro, YJ0688, 200 m, 19-VIII-1986, M.B. Crespo & J. R. Nebot (VAB 861586); Bétera, por la Creu de Fusta, YJ1688, 120 m, 23-VIII-1986, M.B. Crespo & J.R. Nebot (VAB 861492); Castellar, pr. Valencia, caminos, 4-XI-1984, G. Mateo (VAB 842149); Tabernas de Valldigna, 23-XI-83, G. Mateo (VAB 831056); Carcaixent, Casa Bonastre, YJ22, 19-IX-1986, S. Piera (VAB 861347); Denia, 18-IX-1957, A. et O. de Bolòs (BC 140357). VALLADOLID: Aldea, 12-VII-1975, R. Folch, R.M. Masalles (BC 631243). ZARAGOZA: Chodes, ruderal, XL2793, 420 m, 1-VIII-1986, A. Martínez (JACA 316386); Fraga, 29-IX-1957, A. de Bolòs (BC 140860).

7. *Chamaesyce serpens* (Kunth in Humb. & al.) Small, Fl. s. e. U.S. 709 (1903).

- = *Euphorbia serpens* Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 2: 52 (1817).
- = *E. serpens* var. *radicans* Engelm. ex Boiss. in DC., Prodr. 15(2) 30 (1862).
- *E. engelmanii* sensu Cadevall & Font Quer, non sensu Boiss.

Annual, procumbent, glabrous, ramified from the base into up to 16 branches, maximum length 25 cm; leaf nodes either rooting or non-rooting but with conspicuous primordia of adventitious roots at the base of the node. Leaves opposite, distichous, glabrous and petiolate; limb 3-6 x 3-5 mm, ovate to subcircular, never blotched, apex retuse, base only slightly asymmetrical; petiole 0.5-0.75 mm; interfoliar stipules 0.5-1 x 0.7-1 mm, glabrous, frequently white and conspicuous, deltoid, with apex irregularly dentate, rarely laciniate. Cyathia erect, grouped together in axillary dichasial clusters, with 4-5 uniflorous male cymes, glabrous exocyathium; glands 180-200 x 80-110 µm, concave-oblate, reddish purple in colour, with larger appendages, 310-400 x 100-150 µm, pinkish-white, with truncate or trilobulate margin. Capsule 1.3-1.8 x 1.4-1.8 mm, oval, sulcate and glabrous, with keeled mericarps; hypogynous disc 0.4-1 mm, triangular-laciniate to polygonal. Seeds 1-1.2 x 0.5-0.7 mm, tetrahedral not ovoid, smooth, greyish-pink to light grey-brown in colour; mucilaginous episperm. April-December.

Observations

The fascicle of cyathial branches of asynchronous growth frequently observed between the two dichasial branches would in principle imply a change in the cymoid ramification. This is a consequence of events which take place in the nodes of *C. serpens*. On the lower surface of the adult stems, in the basal zone of the node (below the stipules), two or three apparent nodules appear which can sprout caulogenous roots, especially on damp soils. This is why many

descriptions of *C. serpens* contain references to the rooting character of the nodes, a criterion which is even used to characterize the variety *radicans* Boiss. (attributed erroneously to Sennen & Pau and Thellung). When roots appear, the fascicle of dychasial branches mentioned above emerges from each rooting node.

R.-SMITH & TUTIN (1978) in their European review of *Euphorbia*, attributed uncertain taxonomic status to *C. serpens* (ut *Euphorbia*), considering it akin to *C. humifusa* (id.). In our opinion, *C. serpens* is a true species which must be distinguished not only from *C. humifusa* but also from glabrous specimens of *C. vulgaris*, with which it could also possibly be confused. In Table 2 we summarize the distinguishing traits of the three species (assuming that we are dealing with glabrous specimens of *C. vulgaris* subsp. *vulgaris*).

HUGUET (1978), in his review of prostrate Euphorbias in France considered the «very laciniate and multifid» hypogynous disc characteristic of *C. serpens* and he uses this character as discriminating in the specific key. In this connection we wish to point out that, according to our observations, the shape of the hypogynous disc is triangular, though it has convex or concave sides and, when concave, laciniate corners. In Iberian and Balearic specimens convex sides are more frequent. In view of what HUGUET (l.c.) says, we assume, though with some reservations, that the opposite is probably the case in France. On the other hand, the interpetiolar stipules can be clearly connate and form a triangular sheet, with an apex that is either dentate or in the shape of a lamina split down the middle and with both halves laciniate. We have observed that specimens with laciniate stipules always have a triangular-laciniate hypogynous disc, while if the stipules are deltoid, the hypogynous disc is usually triangular-entire, or more or less laciniate. Thus it is impossible to establish a clear correlation between the two characters. This variability has been commented upon recently by JAUZEIN (1989) as a result of the publication of *C. serpens* as a novelty for Corsica. For these forms with a laciniate hypogynous disc and stipules, THELLUNG (1917) created var. *fissistipula*, which JAUZEIN (l.c.) recognizes; CABRERA (1953), on the other hand, attributes these forms to var. *montevidensis*.

THELLUNG (l.c.) claims that *C. serpens* can be perennial, precisely because of the presence of rooting forms. We would observe, however, that it is relatively frequent for annual plants characteristic of damp places to present caulogenous roots without this implying any modification of their biological cycle.

Type: «*Crescit in umbrosis Cumanae prope Bordones et Punta Araya, Bonpland 407*», lectotype in P (!), designated by R.-SMITH (1982: 580).

Iconography: PIGNATTI (1982 ut *E. englemanii* Boiss.).

Chromosome number: $2n = 22$ (BENEDÍ & ORELL, 1992).

Ecology: wayside communities subject to trampling, frequently cohabits with *C. prostrata* and *C. vulgaris*. 10-800 m.

Chorology: native to tropical America, abundantly naturalized in temperate regions. In the Iberian Peninsula it is found in the Mediterranean area (Fig. 13). Spain: A, Al, B, Ba, Ca, Cs, Co, Ge, Gr, M, Ma, Mu, PM (Mll), Se, T, V, Z; Portugal: Ag, BA1, E.

Material studied

Portugal

ALGARVE: praia da Rocha, 26-IV-1956, Malato-Beliz (MA 250969). BAIXO ALENTEJO: Sines, 16-V-1962, B. Rainha & P. Silva (SEV 12256). ESTREMADURA: Lisboa, 31-X-1931, Bento Rainha (MA 250968).

Spain

ALICANTE: Maigmó, taludes de regadíos, YH0460, 20-VI-1985, A. de la Torre (MUB 19978). ALMERÍA: Antax, suelo pisoteado, 30SWG92, 100 m, 28-5-1981, J. Guiraom (MUB

5885). BADAJOZ: Puerto Peña, 2-XI-1972, Pérez Chiscano (LEB 2111). BALEARES: Mallorca: Palma, álveo de la Riera, calles exteriores, jardines de la Sagrera, 6-XI-1947, P. Ferrer (MAF 23566); Palma, riera de Palma, 6-IX-1947, Palau Ferrer (BCF 34761); Palma, campos, 1-VII-1947, Palau Ferrer (BCF 34760); Sóller, 15-VIII-1990, J.J. Orell (BCF 35989); Llucmajor, entre les rajoles de la vorera, 13-VIII-1990, J. Vallès (BCF 35952); Port de Sóller, 10-IX-1989, J.J. Orell (BCF 35114); Sóller, carretera del Port de Sóller, 3-VIII-1988, J.J. Orell (BCF 35091); Alcúdia, badia de Pollença, 21-VIII-1990, J.J. Orell (BCF 35940); Palma, 01-VII-1947, P. Palau (MA 74553); Palma, calles exteriores, 1-VII-1947, P. Ferrer (MAF 23991). BARCELONA: Garraf, 31-X-1967, J. Izco (MAF 91177); port de Barcelona, sables, 16-XI-1912, Sennen (MAF 58422); Bonanova, ruderal, 1933, Sennen (MAF 23990); Sampeador, 28-VIII-1927, Hno. Gonzalo (BCF); Barcelona, Penitentes, lugar arenoso, 6-VIII-1941, A. Marcos & Gabarda (BCF); Barcelona, Bonanova, ruderal, 1933, Sennen (BCF 34762); Barcelona, 17-X-1934, Sennen (BCF 34763); Barcelona, Montjuïc, prop del Jardí Botànic, 27-X-1989, C. Benedí (BCF 35953); Besalú, 27-VIII-1965, A. et O. de Bolòs (BC 475780); St. Gervasi, 29-IX-1949, Font i Quer (BC 146335); Bonanova, Sennen (BC 82412); St. Cugat, 25-VII-1955, A. et O. de Bolòs (BC 130827). CÁDIZ: San Roque, El Almendral, VII-1967, D.M.C. Briton-Lee (SEV 81892); San Roque, vivero del Soto Grande, 10-XI-1977, Molleswaten (SEV 36649); entre Los Barrios y Algeciras, Montes de la Torre, 4-VI-1975, D.M.C. Brinton-Lee (SEV 90062). CASTELLÓN: Rafalafena, 29-VII-1970, M. Calduch (VF 6467). CÓRDOBA: Mezquita, Patio de los Naranjos, 90 m, 13-XI-1982, P. Montserrat (JACA 223382). GIRONA: Garriguella, a 1 Km cap a Delfià, rambla desquistosa del riu, 31SEG80, 250 m, 11-XI-1989, J. Molero (BCF 35988); Martorell de la Selva, 60 m, 16-IX-1954, Font i Quer (BC 105421). GRANADA: Motril, playa de Poniente, 20-VIII-1985, J.A. Molina (MAF 123158). MADRID: Puerta de Hierro, in arvis, 700 m, VII-1978, A. Ceballos & Fernández Casas (MA 250590). MÁLAGA: Antequera, 800 m, 6-X-1978, B. Molesworth (SEV 105021); Benamargosa, cultivos nitrificados, 30SVF9575, 27-IX-1981, Aroza & al. (GDA 14787). MURCIA: Sierra de Espuña, Ceña de Hierro, suelos nitrogenados, XG3583, 200 m, 31-X-1985, A. Robledo (MUB 15375); Aljucer, Camino Baden, en cultivos, XH6204, 20-VIII-1979, F. Alcaraz (MUB 401); Fortuna, lugar pisoteado, XH6427, 3-4-1982, F. Alcaraz (MUB 7114); Santiago de la Ribera, bordes de acequia, 13-VII-1983, A. Carreras (MUB 12278); Murcia, suelos arenosos o arcillosos, 21-VI-1985, D. Ferrer (MUB 13196). SEVILLA: Aznalcázar, río Guadiamar, 18-XII-1974, B. Cabezudo & B. Valdés (SEV 20534). TARRAGONA: Baix Ebre, pr. Tortosa, 15-VII-1988, J.C. Baiges (BCF 35951); Roquetes, 4-VI-1988, J.C. Baiges (BCF 35997); Tortosa, 28-VII-1982, Ll. de Torres (BC 646585). VALENCIA: Nogente, 400 m, 1-XI-84, G. Mateo & R. Figuerola (VAB 842165); Sueca, arrozales, YJ34, 18-IX-1984, G. Mateo & al. (VAB 842169); base del Monte Picayo por Puzol, YJ39, 100 m, 1-VI-1985, O. Bolòs & al. (VAB 851288); Bétera, por la Creu de Fusta, YJ1688, 120 m, 23-VIII-1986, M.B. Crespo & J.T. Nebot (VAB 86654); Puzol, 30SYJ3188, 10 m, 18-V-1987, M.B. Crespo & M.L. Manso (VAB 871891); El Palmar, terrenos húmedos transitados, 3-XI-1987, G. Mateo (VAB); Burjassot, terrenos pisoteados, YJ27, 50 m, 8-VIII-1985, M.B. Crespo (VAB 851902); Roca-fort, en Polycarpion, YJ27, 50 m, 17-VIII-1986, M.B. Crespo (VAB 86644); Burjassot, 50 m, 27-IX-1986, M.B. Crespo (MA 398903). ZAMORA: Vadillo de la Criareña, 31-VII-1984, X. Giráldez (SALA 48349).

8. *Chamaesyce vulgaris* Prokh., Tr. Kuibysh. Not. Sada 1: 8 (1941)

≡ *Euphorbia chamaesyce* L., Sp. Pl. 455 (1753) ≡ *Anisophyllum chamaesyce* (L.) Haw., Syn. pl. succ. 160 (1812) ≡ *Chamaesyce chamaesyce* (L.) Hurusawa, Journ. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 6: 283 (1954), comb. inadmisa ≡ *Xamesike vulgaris* Rafin., Fl. Tellur. 4: 15 (1838) nom. superf.

Annual, procumbent, ramified from the base into as many as 25 branches, maximum length 30 cm. Leaves opposite, distichous and petiolate; limb 2-9 x 1.5-8 mm, ovate to obovate, occasionally with one or several purple spots on the upper surface, apex obtuse to retuse, margin entire, crenate or serrate; petiole 0.5-1 mm; interfoliar stipules laciniate on both node surfaces. Cyathia solitary at the bifurcation of the dichasial branches and grouped together in axillary dichasial clusters on the branches of the last order, with 4-5 uniflorous male cymes; glands 125-150 x 250-500 µm, concave-oblate, chestnut coloured, with appendages 100-375 x 450-740 µm, with truncate, crenate or lobulate margin. Capsule 1.4-1.7 x 1.5-1.8 mm, oval, sulcate, glabrous, glabrescent or hirsute; smooth mericarp surfaces; hypogynous disc 0.5-0.6 mm, polygonal. Seeds 1-1.5 x 0.6-0.9 mm., ovoid-subtetrahedral, irregularly granulose-transversely rugose, apiculate, grey to chestnut in colour. May-December.

Type: «*Habitat in Europa australis, Siberia*». Lectotype LINN 630/15 (!), designated by KHAN (1964: 150).

Ecology: belongs to nitrophilous ruderal communities of trampled biotopes. In phytosociological terms it is characteristic of *Euphorbion prostratae* Rivas Martínez 1976. 25-1000 m. We recognize two subspecies:

7a. *C. vulgaris* subsp. *vulgaris*

- = *Euphorbia canescens* L., Sp. Pl. ed. 2, 1: 652 (1762) = *Tithymalus canescens* (L.) Moench., Methodus: 666 (1794) = *Chamaesyce canescens* (L.) Prokh., Conspl. Syst. Tithym. As. Med.: 19 (1933): 19 = *Anisophyllum canescens* (L.) Gandoer, Fl. Eur. 20: 144-145 (1980) = *E. chamaesyce* var. *canescens* (L.) Boiss. in DC., Prodr. 15(2): 35 (1862).
- = *Tithymalus nummularius* Lam., Fl. Fr. 3: 101 (1779).
- = *Euphorbia chamaesyce* var. *glabra* Roeper, Enum. Euphorb. Germ. Pannon. 58 (1824) = *E. chamaesyce* f. *glabra* (Roeper) Thell. in Asch. & Graebn., Syn. Mitteleur. Fl. 7: 455 (1916) = *Chamaesyce canescens* subsp. *glabra* (Roeper) Sojak, Cas. Nár. Muz (Prague) 140 (3-4): 169 (1972).
- = *Euphorbia chamaesyce* var. *gabriuscula* Lange in Willk. & Lange., Prodr. Fl. Hisp. 3: 489 (1877).
- = *Euphorbia chamaesyce* var. *pilosa* Guss., Fl. sic. Prodr. 1: 539 (1827) = *E. chamaesyce* f. *pilosa* (Guss.) Thell. in Asch. & Graebn., Syn. Mitteleur. Fl. 7: 455 (1916).
- = *Euphorbia chamaesyce* var. *hirsuta* Sennen, sched. Pl. d'Esp. n.º 3787 (1919).
- *Euphorbia canescens* var. *microphylla* Sennen & Elias in Sennen, sched. Pl. d'Espagne 4299 (1921), *sine descriptio*.
- *Euphorbia chamaesyce* var. *pseudoglabra* Rivas Goday, *in sched.* (MAF 85070).
- *Euphorbia chamaesyce* var. *rotifera* Palau, *in sched.* (MA 74630).

Plants glabrous, glabrescent or pilose. Leaves 2-9 x 1.5-8 mm, with limb ovate, oblong, suborbicular or obovate, with margin entire or crenate, somewhat thickened, never serrate, occasionally with a purple spot on the upper surface or with several (3-4) aligned on the midvein. Glands of the cyathium 150 x 425-500 µm, with appendages 100-240 x 450-625 µm, with margin entire, crenate or (tri)lobulate, not more than double the size of the gland.

Observations

The name *Euphorbia chamaesyce* var. *chamaesyce* has traditionally been applied to the glabrous or glabrescent specimens, while the pilose specimens were included in the trinomen *Euphorbia chamaesyce* var. *canescens*. After analyzing the variability of the indumentum of this saxon, we conclude that the differences in indumentum are not taxonomically significant.

Moreover our attention is drawn by the fact that in the references consulted, we find no trace of the presence of the spot on the leaf limb, a relatively frequent character, as stated in the description. Finally we wish to refute two statements made in *Flora Europaea*: the appendix is not always smaller than the gland (though it is less than double the size of the latter) nor is it always entire, since it can be entire, crenate or even (tri)lobulate.

Iconography: VALDÉS & al. (1987).

Chromosome number: $2n = 14$ (BENEDÍ & ORELL, 1991).

Chorology: probably native to the Iranian-Turanian region, believed to have been naturalized at an early date in the Mediterranean region. More recently it has been introduced into South America and Indonesia and Malaysia. In the Iberian Peninsula and the Balearic Islands it is widespread (Fig. 14). Though we have not seen specimens from Tarragona and Teruel, we are aware of the report from Teruel made by MATEO (1990). Spain: A, Ab, Al, B, Ba, Bi, Bu, Cc, Ca, CR, Cs, Co, Cu, Ge, Gr, H, Hu, J, L, Lo, M, Ma, Mu, PM (Mll, Mn), Sa, Se, Sg, So, T, Te, To, V, Z, Za; Portugal: AA1, E, R.

Material studied

France

HAUTE-CORSE: Moltifao, 270 m, 18-IX-1979, R. Deschartres (SEV 77043); Ponte-Leccia, route d'Asco, 270 m, 18-IX-1979, R. Deschartres (MAF 107709); inter Algaiola and Calvi, 10-VII-1917, G. Küenthal (BC 57565); route d'Asco, 270 m, 18-XI-1979, R. Deschartres (SALAF 1122). HÉRAULT: Béziers, 27-VIII-1892, Sennen, BC-Sennen. LOT-ET-GARONE: Agen, 4-VI-1906, Ch. Duffour (BC 57564); VAR: Flassans-sur-Issole, 250 m, 20-VIII-1976, P. Martin (SEV 77106, MAF 107708, SALAF 1121).

Portugal

ALGARVE: Loulé, VIII-1888, J. Fernández (MA 74611); ALTO ALENTEJO: Elvas, suelos cultivados, 210 m, 12-VII-1979, J.A. Guerra (SEV 77104); Elvas, 210 m, 12-VI-1979, J.A. Guerra (MAF 107707); Elvas, 6-VI-1955, F. Freire (BCF 34765); Elvas, 270 m, 12-VII-1979, J.A. Guerra (SALAF 1120); De Beja a Albornoa, VII-1884, J. Daveau (LISU 23956); Elvas, Vila Fernando, márgenes albufera, 16-VII-1972, J.A. Guerra (MA 250807); Elvas, hered. da Ovelheira, 18-VII-1969, M. Beliz & J.A. Guerra (MA 250808); Elvas, her. da Gramicha, 6-VI-1955, F. Freire (MA 250806). BEIRA BAIXA: Coviliha, VI-1881, A.R. da Cunha (LISU 23958). ESTREMADURA: Villa Velha, VI-1881, A.R. da Cunha (LISU 23959); Alhandra, III-1888, A.R. da Cunha (LISU 23946); Valle de Alcantara, VII-1884, J. Daveau (LISU 23948); Lisboa, V-1890, A.R. da Cunha (MA 250805); alrededores de Rabicha, V-1890, A.R. da Cunha (BC 136169). RIBATEJO: Santarem, Malagueiro, IX-1888, A.R. da Cunha (LISU 23954); margen del río Tejo, Pego Abrantes, IX-1887, A.R. da Cunha (LISU 23955); Santarem, IX-1888, A.R. da Cunha (LISU 23945); Ribatejo, Almeirim, 26-VII-1954, M. Silva (BC 136169).

Spain

ALBACETE: entre Osa de Montiel y Ruidera, impureza de campo de cultivo, 30SWJ11, 4-VIII-87, E. Esteso & C. Bucedo (VF 14636); Socovos, cultivos, 15-VII-1988, P. Sánchez & Alcaraz (MUB 26137); Socovos, La Carrasquilla, 10-VII-1985, P. Sánchez (MUB 16878). ALICANTE: de Pego a Oliva, terrenys compactats, YJ50, 50 m, 13-VIII-1986, M.B. Crespo & J.R. Nebot (VAB); La Carraqueta, 1000 m, 18-VII-1962, A. Rigual (MA 370795). ALMERÍA: María-Topares, IX-1963, Losa & Rivas Goday (MAF 90510). BADAJOZ: Granja, huertos, 21-VIII-1951, V. Moreno Márquez (SEV 2322, MAF 23449); Finca Cabeza Redonda, tierras de barbecho, 2-VIII-1985, A. Galán (MAF 121371); La Haba, comunidades de barbecho, 10-VIII-1985, A. Galán & I. Casas (MAF 121440); Embalse de Puerto Peña, zonas viarias, 2-X-1972, Pérez Chiscano (MAF 83606); El Pantojal, s.f., Rivas Mateos (MAF 23500); Mérida,

17-VII-1891, A. Lomax (MA 74622). BALEARES: Mallorca: Palma de Mallorca, sitios incultos, 5-IX-1947, Palau Ferrer (BCF 34764); Valldemossa, 5-XII-1981, J. Orell (BCF 35098); Sóller, 15-X-1956, J. Orell (BCF 35100); Palma de Mallorca, 6-VI-1953, J. Orell (BCF 35101); alrededores de Palma, sitios incultos del llano, 5-IX-1947, P. Ferrer (MAF 23497); alrededores de Palma, suelo nitrificado, 5-IX-1947, P. Ferrer (MAF 82289); alrededores de Palma, 5-IX-1947, P. Palau (MA 344245). Menorca: Mahón, Barrancs Vells, 25-X-1887, A. Pons y Guerau (MA 74626). BARCELONA: El Bessó, prado, 27-X-1972, Molero, BCF; Barcelona, camp a la Diagonal, 25-VII-1953, A. & O. de Bolòs (BC 124199); Manresa, V-1909, Font Quer (BC 57561). BURGOS: Miranda, campos, 450 M, IX-1927, M. Losa (BCF, MA 466261). CÁCERES: Puerto del Rey, 6-IX-1969, S. Rivas Goday, J. Borja & M. Ladero (VF 2707, MAF 74048, GDA 8053); El Gordo, pr. Valdecañas, sur sols limono-argileux, 30STK9914, 4-VIII-1981, M. Ladero (MAF 128077, SALAF 13990, LOU 8113); alrededores de Cáceres, 29-VI-1940, S. Rivas Goday (MAF 85070); Guadalupe, bordes de caminos nitrificados, 6-VIII-1969, M. Ladero (MAF 80499); Cercas del Calvario, Carrascalejo, barbechos subnitrófilos, 21-IX-1969, M. Ladero (MAF 80498); Sa de la Pa. de Cáceres, Rivas Mateos (MAF 23501); Navalmoral de la Mata, emplazamientos nitrificados, 6-VI-1985, Ruiz Téllez (SALAF 10904); El Gordo, cola del pantano de Valdecañas, zonas temporalmente encharcadas, 11-IX-1985, Ruiz Téllez (SALAF 11254); Peraleda de la Mata, márgenes del Pantano de Valdecañas, 11-IX-1985, Ruiz Tellez (SALAF 11249); Logrosan, 30-VIII-1984, E. Rico (SALA 43731). CÁDIZ: entre Benacoaz y Ubrique, calizas, 13-VII-1978, J.A. Devesa, J. Rivera & B. Valdés (SEV 43676); pr. Jerez, in incultis, 9-VIII-1882, Pérez-Lara (MAF 23504); Olvera, 14-VI-1951, C. López & S. Grau, 15-IV-1987 (MA). CASTELLÓN: Benicàssim, 23-IX-1960, M. Caldúch (VF 3766); castillo de Vilabella, 7-X-1956, M. Caldúch (VF 6831); Cueva Santa, 29-VIII-1919, C. Pau (MA 74638). CIUDAD REAL: La Solana, 25-VIII-1933, González Albo (MA 74620). CÓRDOBA: Facultad de Veterinaria, 12-III-1979, E. Domínguez & J. Valera (SEV 43563); Arroyo del Caño, cerca de la desembocadura, 26-VIII-1981, M. Arenas (SEV 107092); Comarca de los Pedroches-Dos Torres: camino de Dos Torres a Sta. Eufemia, UH36, 25-IX-1976, J.A. Devesa (SEV 33001); comarca de Los Pedroches, Pozoblanco, Cortijo de Muñoz, tierra parda sobre granito, UH34, 31-VIII-1976, J.A. Devesa (SEV 32998); Comarca de los Pedroches, Cardeña, sauce seco del a. de Martín Gonzalo, UH82, 6-VIII-1976, J.A. Devesa (SEV 33000); Comarca de los Pedroches, Villanueva de Córdoba, Cortijo de Fco. Herruzo, 6-IX-1976, J.A. Devesa (SEV 32999); Comarca de los Pedroches, Belalcázar, UH07, 22-X-1976, J.A. Devesa (SEV 32922); poblado de «Rivero de Posadas», carretera de Córdoba-Posadas, 2-X-1980, P. Fernández & I. Porras (SEV 107093); carretera vieja Córdoba-Sevilla, Km 40, 9-X-1980, P. Fernández & I. Porras (SEV 105039). CUENCA: Alcázar del Rey, 17-VII-1974, G. López (MA 408723). GIRONA: S'Agaró, VI-1876, E. Vayreda (MAF 23498); La Bisbal, vinyes, 1-VIII-1974, Molero (BCF 111495); Alt Empordà, Garriguella, a 1 Km. cap a Delfià, rambla del riu, 31SEG80, 250 m, 11-XI-1980, J. Molero (BCF 35992); Maçanet de la Selva, 21-VII-1950, A. & O. de Bolòs (BC 110082); Platja d'Aro, 8-VII-1945, Font Quer (BC 105422); Cadaqués, Port Lligat, IX-1869, F. Trémols (BC 650451). GRANADA: Pantano de Cubillas, campos de cultivo, 12-IX-1981, J. Hurtado (GDA 13339); Ugijar, rambla del río Válor, suelo margoso (VE 9590), 550 m, 15-IX-1978, J. Molero Mesa (GDA 9486); estación de Calicasas, 14-VII-1974, Fernández-Casas (MA 422204). GUADALAJARA: Estremera, 22-VII-1973, Izco (MA 405939). HUELVA: Sierra de Aracena, Higuera de la Sierra, 7-VIII-1979, J. Rivera (SEV 47086, VF 5669, SALA 22261); Sierra de Aracena, entre Aroche y Rosal de la Frontera, río Chanza, 25-X-1979, J. Rivera & B. Cabezudo (SEV 47084, MGC 9749); Huelva, VII-1965, A. Sánchez Jurado (MAF 67852); entre Aroche y Rosal de la Frontera, 17-VIII-1979, J. Rivera (MGC 9746). HUESCA: Enate, parcelas del PFE, junto al río Cinca, BG7063, 340 m, 23-X-1957, P. Montserrat (JACA 145657); La Puebla de Castro, junto presa S. J. de Barasona, lugar pisoteado junto a la carretera, BG7666, 380 m, 3-VII-1979, G. & P. Montserrat (JACA 138079); Calasanz, cultivos, BG8356, 660 m, 25-VIII-1988, J.V. Fernández (JACA 458088);

Candasnos, en los rastrojos, 23-IX-1977, J. Molero (BCF 34770). JAÉN: Quiebrajano, 800 m, 20-VIII-1977, C. Fernández (JAEN 772161); Jaén, terreno de cultivo, VG38, 500 m, 11-VIII-1974, C. Fernández (JAEN 2117); de Peal a Huesa, VG88, X-1987, F. Molino & C. Fernández (JAEN 791736); de Canena a Vílchez, 400 m, 22-VI-1979, C. Fernández (JAEN 791069); Uva del Arzobispo, WH02, 600 m, 14-VII-1979, C. Fernández (JAEN 791440); La Carolina, Nava Martina, VH44, 990 m, 3-VII-1981, C. Fernández (JAEN 812076); La Iruela, el Cantalar, calizas, 30SWH0802, 800 m, 9-VIII-1981, C. Fernández & F. Molino (JAEN 812436); Úbeda, VIII-1918, C. Vicioso (MA 74624); Segura de la Sierra, 16-VIII-1985, C. Soriano (MA 456673). LA RIOJA: Recajo, 29-VIII-1921, Hno. Elías (MA 74621). LERIDA: Seo d'Urgell, pr. Adrall, lecho pedregoso seco, piedras de pizarra, 600 m, 22-VII-1969, S. Silvestre & B. Valdés (SEV 8070); El Cogull, 30-VII-1974, A. Boldú (BCF 18384); Juncosa, 7-IX-1974, A. Boldú (BCF 18475). LUGO: Segueiros, P. Merino (LOU 01415). MADRID: Valdemoro, zonas viarias pisadas, 24-IX-1967, J. Izco, M. Ladero & D. Jiménez (VF 2135, VF 2134, MAF 103365, MAF 69357, SALAF 3238); carretera a Fuenlabrada, 6-IX-1940, S. Rivas Goday & F. Bellot (MAF 85069); Torrelaguna, comunidades otoñales de barbecho, 17-VIII-1985, I. Casas & A. Galan (MAF 122088); Aranjuez, s.r. (MAF 23505); Madrid, 1799, Clemente (MA 174140); Aranjuez, 14-XI-1851, J. Lange (MA 74644). MÁLAGA: Málaga, s.r. (MAF 23502); Cártama, Naranjal, UF56, 27-IX-1982, Garretas & Asensi (MGC 13783, MGC 13782); Villanueva del Rosario, UF79, 1-VIII-1982, B.D. Garretas & A. Asensi (MGC 12739); Villanueva del Trabuco, UF89, 1-VII-1982, B.D. Garretas & A. Asensi (MGC 12745); Peñón del Cuervo, UF86, 4-VII-1975, A. Asensi & B. Díez (MGC 2983). MURCIA: Puente de Hijar, cultivos abandonados, 14-VII-1988, P. Sánchez & Alcaraz (MUB 26126); Benijáin, X-1852, A. Guirao (MA 150488); Cartagena, Algameca Chica, 20-VII-1902, F. Jiménez (MA 74623). SALAMANCA: Guijuelo, 17-X-1987, E. Rico & J. Serradilla (SALA 47955); Cabaloira-Sotoserrano, 25-IX-1979, F.J. Fernández Díez (SALA 18727); La Fregeneda, 19-IX-1977, F. Amich (SALA 16352); Aldealengua, 4-IX-1975, E. Rico (SALA 7547); Santa Olalla de Yeltes, 8-IX-1976, E. Rico (SALA 9358); Ciudad Rodrigo, 3-VII-1976, E. Rico (SALA 9357); Santa Olalla, 9-IX-1972, B. Casaseca & F.J. Fernández Díaz (MA 196334). SEGOVIA: Torrecilla del Pinar, 26-IX-1983, T. Romero (SALA 36998); Sebulcor, 31-VIII-1983, T. Romero (SALA 36997); Villaseca, 17-IX-1983, T. Romero (SALA 36996); Villaseca, 15-IX-1983, T. Romero (LOU 07438). SEVILLA: Las Pajanosas, cultivos de garbanzos, 22-VI-1968, S. Silvestre (SEV 43562); Dos Hermanas, 3-VI-1975, S. Talavera & B. Valdés (SEV 52555). SORIA: Berlanga a Morales, WL09, 880 m, 30-VII-87, G. Mateo (VAB 870677). TOLEDO: Chozas de Canales, rastrojera, 11-VII-1982, S. Laorga (MAF 109554); Cabañas de Yepes, en viñedos, 22-IX-1981, S. Laorga (MAF 109556); El Viso de San Juan, campo de cultivo abandonado, 23-IX-1981, S. Laorga (MAF 109555); Villacañas-Quero, 9-VII-1944, S. Rivas Goday & A. Monasterio (MAF 82359); Calera y Chozas, 20-VII-1985, Ruiz Téllez (SALAF 11232); Calzada de Oropesa, emplazamientos nitrófilos, 11-IX-1985, Ruiz Téllez (SALAF 11240); Algodor, 15-VIII-1926 (MA 74619); Los Yébenes, Quintos de Mora, 21-VII-1986, F. Gómez Manzaneque (MA 349664). VALENCIA: Bicop, VII-1915, C. Vicioso (MA 74639). VIZCAYA: Bilbao, 19-VIII-1894, B. Vicioso (MA 74640). ZAMORA: Fermoselle, 9-VII-1981, Sánchez Rodríguez (SALA 38574); Vadillo de la Guareña, 31-VII-1984, X. Giráldez (SALA 48349). ZARAGOZA: Osera, junto a la carretera, 1-VII-1956, Sandwith & P. Montserrat (JACA 6756); Calatayud, 26-VII-1907, B. & C. Vicioso (MA 74641).

7b. *C. vulgaris* subsp. *massiliensis* (DC.) Benedí & J.J. Orell, Collect. Bot. (Barcelona) 22: 00 (1992)

≡ *Euphorbia massiliensis* DC. in Lam. & DC. Fl. Franç. ed. 3,5: 357 (1815) ≡ *E. chamaesyce* var. *massiliensis* (DC.) Thell. in Asch. & Graebn., Syn. 7: 455 (1916) ≡ *Chamaesyce*

canescens subsp. *massiliensis* (DC.) Sojak, Cas. Nár. Muz (Prague) 140 (3-4): 169 (1972) = *Chamaesyce massiliensis* (DC.) Galushko, Novosti Sist. Vyssh. Rast. 11: 299 (1974).

Plants pilose. Leaves 4-8 x 3-6 mm, with limb ovate-oblong to oblong, margin not thickened, clearly serrate, neither entire nor crenate, no spot. Cyathium glands 125-175 x 250-375 µm, with appendages 250-375 x 500-750 µm, margin entire or (tri)lobulate, more than double the size of the gland.

Observations:

Various authors (BRIQUET, 1935; VINDT, 1953; VALDÉS, 1987) considered as decisive those characters related to the relative size of the appendix compared with the gland and leaf margin. The seed characters (size, ornamentation) are of no use in separating the two subspecies. In Table 2, we list the differential characters which separate the two taxa.

Type: «Habitat in Massilia», lectotype in G-DC (!), designated by BENEDÍ & ORELL (1992)

Iconography: VALDÉS & al. (1987)

Chorology: Circummediterranean taxon, which in the Iberian Peninsula is localized in southeastern Andalusia. We are aware of the report from Córdoba made by PUJADAS & HERNÁNDEZ (1986) Spain: Ca, Co, Se.

Material studied

Crete

Pyrgiotissa, 3-VII-1942, K. H. Rechinger (G); Ornanti, 7-VI-1913, Haradjian (G).

Croatia

DALMATIA: Split, 30-VIII-1934, H. Feure (G); Spalato, 15-VII-1870, Pichler (G).

France

ALPES-MARITIMES: Nice, 1832, Boissier (G). VAR: Draguignan, VI-1910, L. Girod (G).

Hungary

Ripas Danubii, ad parvum Sivinitza (?), 21-VIII-1870, Borbás (BC 57569).

Iran

Ostan, Kazwin, 1-VIII-1956, F. Schmid (G).

Israel

Soho, railway station, near Jerusalem, ruderal, VI-1931, Zohary & Amdursky (MAF 58352).

Italy

ABRUZZO: Pescara, 1866, Kuntze (FI). ISTRIA: Lussinpiccolo, 7-IX-1934, G. Lusina (FI). EMILIA: di Madena a S. Faustino, 1-VI-1882, A. Fiori (FI). LAZIO: Tivoli, 12-VII-1906, Vaccari (FI). LIGURIA: Diana, 31-VII-1888, L. Ferrar (FI); Celle, 30-VIII-1900, Messana (FI). LOMBARDIA: Ozzano, 8-VII-1898, Parlatore (FI). TOSCANA: Livorno, 8-VIII-1890, Rosetti (FI); Sancti Ellero, 7-IX-1949, Sommier (FI). VENEZIA: pr. Verona, 8-VIII-1897, Rigo (FI); Brandolo, pr. Chioggia, 19-VII-1896, A. Fiori (FI). SICILIA: Caccamo, S. Rocco, IX-1889, Guzzino (FI); Terranova, 29-V-1873, Sommier (FI); Altavilla, 29-VIII-1880, Pichler (FI).

Lebanon

pr. Beirut, Postian, VII-1845 (FI).

Spain

CÁDIZ: Villamartín, embalse, 17-XI-1974, J.C. Escudero (SEV 43677). SEVILLA: El Torbiscal, cultivos de algodón, 2-XI-1978, E.F. Galiano, J. Rivera & B. Valdés (SEV 57108); entre el

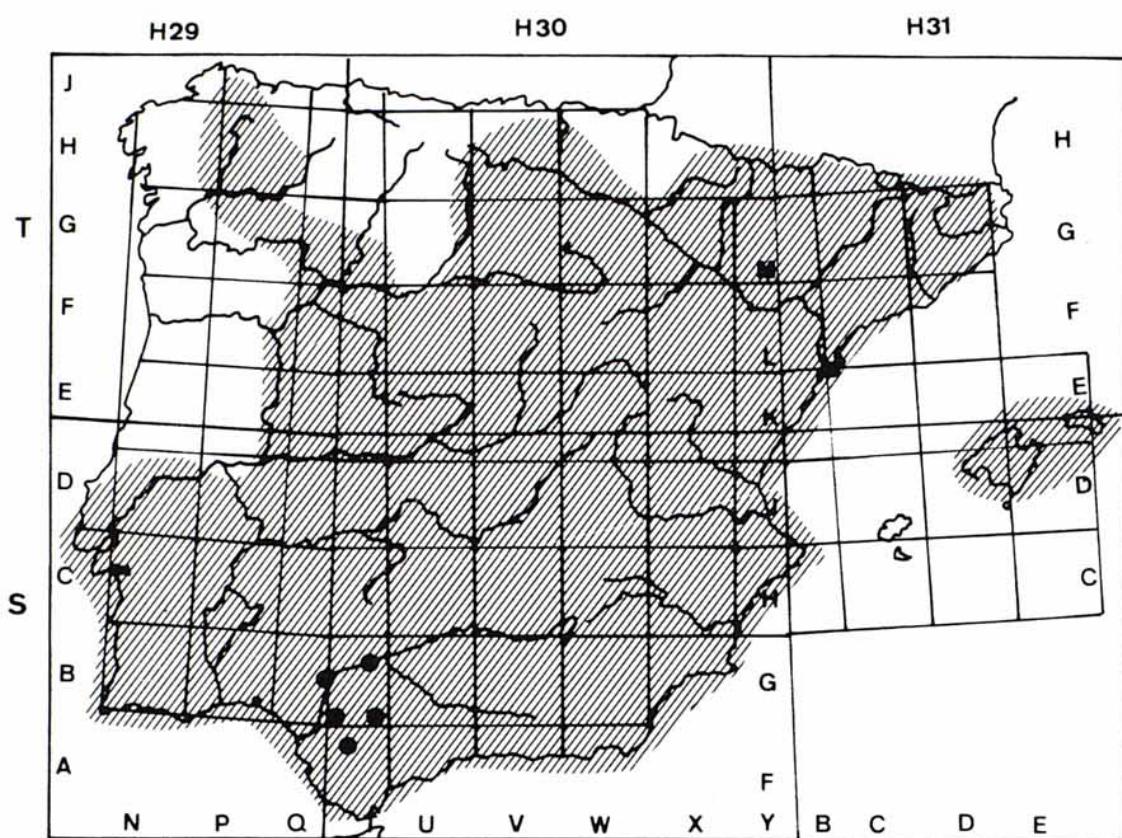


Fig. 14.— Distribution of *C. vulgaris* subsp. *vulgaris* and *C. vulgaris* subsp. *massiliensis* (●) in the area under study.

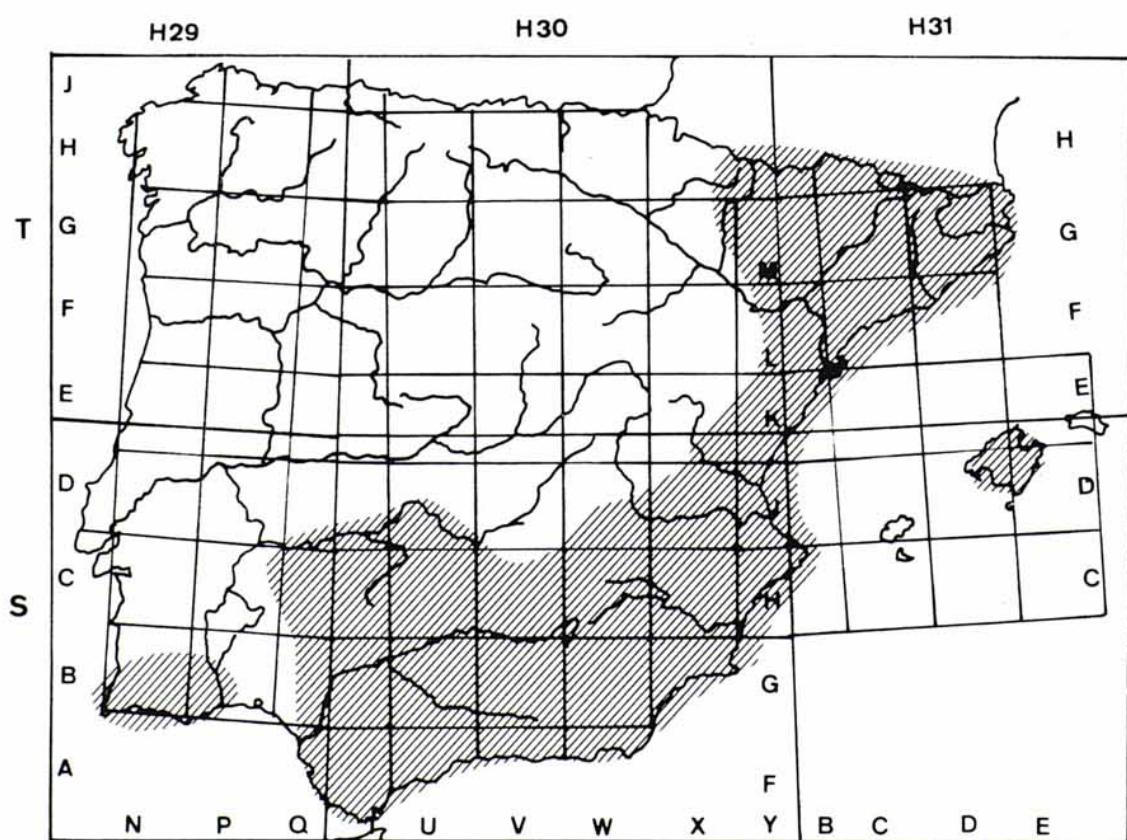


Fig. 15.— Distribution of *C. nutans* in the area under study.

Cruce de las Cabezas y Villamartín, 12-VII-1976, S. Talavera & B. Valdés (SEV 25722); Peñaflor, 6-IX-1975, S. Talavera & B. Valdés (SEV 43661); Morón, paso de la Nena, cultivos de *Medicago sativa*, 11-XI-1973, S. Silvestre & B. Valdés (SEV 43660); Sevilla, campos incultos, VI-1964, J. Borja (MAF 70050).

Turkey

Tunceli, Ovacik, 25-VII-1979, S. Yildirimli (G 262988).

9. *Chamaesyce nutans* (Lag.) Small, Fl. s. e. U.S. 712 (1903).

- ≡ *Euphorbia nutans* Lag. Gen. Sp. Pl.: 17 (1816) ≡ *Tithymalus nutans* (Lag.) Samp., Anais Fac. Sci. Porto 17: 5 (1931).
- = *Euphorbia preslii* Guss., Fl. Sic. Prodr. 1: 539 (1827) ≡ *Chamaesyce preslii* (Guss.) Arthur, Torreya 11: 260 (1911).
- = *Euphorbia preslii* var. *glaberrima* Boiss. in DC., Prodr. 15: 23 (1862) ≡ *E. nutans* subsp. *glaberrima* (Boiss.) Thell. in Ascherson & Graebner, Syn. Mitteleur. Fl. 6: 431 (1917).
- *Euphorbia maculata* sensu Wheeler, non sensu Lagasca.

Annual, ascending, usually ramified from the base into as many as six branches, rarely erect and unicaulous; branches up to 40 (55) cm long, pilose at least at the base and apex. Leaves opposite, distichous and petiolate; limb 13-30 (35) x 6-10 (16) mm, asymmetrical-oblong, frequently with a diffuse purple spot on the upper side, clearly three-veined at the base of the lower side, glabrescent to sparsely pilose, apex subacute to obtuse, margin serrate as far as the base of the abaxial surface and half way up the adaxial surface, base only slightly asymmetrical, generally long and ciliate; petiole pilose, 1-1.5 mm; interfolial stipules 0.5-1.5 x 0.2-1 µm, membranous, pilose, deltoid-dentate on one surface and deeply laciniate on the one that is inserted in the cyathium. Cyathia grouped together in terminal corymbiform dichasia, with male flowers grouped together in 4-5 cymes with two flowers, glabrous exocyathium; glands 125-175 x 75-100 µm, circular to oblate, greenish in colour, with larger appendices, 300-480 x 180-260 µm, suborbicular, rarely truncate, white-pink. Capsule 1.8-2.5 x 1.8-2.5 mm, oval sulcate and glabrous, with keeled mericarps, hypogynous disc 0.3-0.4 µm, polygonal. Seeds 1.1-1.3 x 0.7-0.9 mm, subovoid to subtetrahedral, apiculate, rugose, blackish-grey-brown; episperm mucilaginous. April-December.

Observations

Among the Iberian and Balearic specimens reviewed, those which present scattered pilosity, especially at the base and apex of the branches, are predominant. Glabrous specimens (var. *glaberrima* Boiss.) are rarer, though in our opinion they do not deserve to be separated taxonomically.

Type: «*H. in N.H.*» (habitat in Nova Hispania), without designation, not localized.

Iconography: VALDÉS (1987)

Ecology: waste places. 60-900 m.

Chorology: native to the Caribbean region, naturalized in the Macaronesian, Mediterranean and Iranian-Turanian regions.

Material studied

Portugal

ALGARVE: Quarteira (LISU 64914); Portimao, colinas de Arge, 23-VIII-1972, Malato Beliz (MA 250889).

Spain

ALBACETE: Alcalá del Júcar, 6-XI-1980, J.B. Peris (VF 9322). ALICANTE: Polop, barranco de Chiles, 8-VIII-1958, A. Rigual (MA 370703); Polop, 150 m, 23-V-1977, E. Valdés Bermejo (MA 405929). ALMERÍA: Instinción-María, 8-X-1960, Losa & Rivas Goday (MAF 90446). BADAJOZ: Valdebotoa, río Gévora, tierras pedregosas y arenosas, 10-VIII-1975, P. Gómez Hernández (MA 276093). BALEARES: Mallorca, Santa María, 15-VIII-1990, J. Orell & J.J. Orell (BCF 35964). BARCELONA: Palau-solità, 8-VIII-1938, Garcias Font (BCF 34759); Capellades, via del tren, 330 m, 6-IX-1969, R.M. Masalles et al. (BC 633893); Palau-solità, vía férrea, 28-VIII-1938, Ll. Garcías Font (BC 90394). CÁDIZ: Torreguadiaro, 8-IX-80, B. Molesworth (SEV 71237); Benamahoma, huertas, suelo básico, 6-XI-1981, B. Valdés (SEV 77789, LEB 21504, VF 5574, MAF 109209, MGC 10485, SALAF 6354, GDA 15156, MUB 12565, SALAF 6354, SALA 25751). CASTELLÓN: Algar-Vall d'Uxó, 180 m, J. Alcover (VAB); Bco. de San Julián, por Altura, YK1313, 350 m, 10-VI-1986, M.B. Crespo & J.R. Nebot (VAB 861489); Caudiel, arvense, en campos de cerezos, 30SYK0724, 600 m, 5-IX-1987, M.B. Crespo & M.L. Manso (VAB 879568); Almagro, cerca de Segorbe, 25-X-1888, C. Pau (BC 649272); Segorbe, X-1914, C. Pau (BC 57548); Segorbe, 350 m, XI-1886, C. Pau (MA 74571). CÓRDOBA: Carretera vieja de Córdoba-Sevilla, Río Bembezar, 29-X-1980, P. Fernández & I. Parras (SEV 105027); río Bembezar, carretera Córdoba-Sevilla, 24-VI-1981, I. Fernández, P. Parras & J. Varela (SEV 105028); Alcolea, carretera del embalse de Guadalmellato, 19-VII-1979, M. Arenas (MA 250492). GIRONA: Ribas, 2-IX-1949, Gabarda (BCF 34758); a 1 Km de Garriguella, cap a Delfià, rambla esquistosa d'una riera, 31SEG80, 250 m, 11-XI-1989, J. Molero (BCF 35963); La Sellera, J. Codina (BC 57545); St. Miquel de Fluvià, 1-IX-1922, Agustín (BC 57544); Armanteras, VII-1907, M. Llenas (BC 57546); Martorell de la Selva, 60 m, 16-IX-1945, Font Quer (BC 105413); St. Pere Pescador, 2-VII-1922, E. Gross (BC 99422); Esparraguera, VIII-1963, A. de Bolòs (BC 596685); Olot, F. de Bolòs (BC 145695); Figueras, márgenes del río Menol, 24-X-1955, Font Quer & al. (BC 135526); Pasteral, 9-IX-1921, E. Gros (BC 99425); S. Miquel de Fluvià, bords et lit du Fluvià, 12-XI-1922, F. Agustín (MA 74570). GRANADA: Vélez de Benaudalla, pr. cortijo de la Bernardilla, campos de cultivo, 4-X-1979, Ladero, Molero, Martínez Parras & Raya (SEV 55505); Lanjarón, entrada del pueblo, ruderale, VF5686, 700 m, 6-X-1978, J. Molero Mesa (GDA 6962); Yátor, entre Yátor y Cadiar, campo de maíz, VF8690, 900 m, 15-IX-1978, J. Molero Mesa (GDA 6963); Vélez de Benaudalla, cortijo de la Bernardilla, campos de cultivo, 4-X-1979, Ladero & al. (GDA 5907, LOU 7119 MA 250491); Padul, pr. Acequia de los Quinientos, caminos, 30SVF4596, 725 m, 18-X-1987, López Nieto (GDA 22117); entre Jete y Otivar, ruderale nitrófila, 21-VII-1981, López Guadalupe & Marín Calderón (GDA 14788); El Capricho, cultivos nitrificados, 10-X-1982, Marín Calderón (GDA 14789); las Alpujarras, entrada de Lanjarón, VF5686, 700 m, 6-X-1978, J. Molero Mesa & J.M. Martínez Parras (GDA 5823); Vélez de Benaudalla, campos de cultivo, 4-X-1979, M. Ladero & al. (MUB 1894); Fuente Vaqueros, 14-VII-1974, J. Fernández-Casas (MA 409839). HUESCA: Bielsa, Urdiceto, VI-1954, Casas (BCF 35995). JAÉN: Alcaudete, Río San Juan, 30SVG1155, 700 m, X-1987, C. Fernández (JAEN 742196). LÉRIDA: Alt Urgell: entre coll de Nargó i Organyà, talussos i vores de camins, CG6171, 450 m, 24-XI-1985, C. Benedí & J. Molero & A.M. Romo (BCF); Conca de Tremp, a 4 Km. de Puigcercós en direcció a Selles, rambles pedregosas del Noguera Pallaresa, sorres humides, CG26, 16-IX-1986, J. Molero (BCF, BCF 35994); Inagris, IX-1890, J. Cadevall (BC 638228); Puig Gros, campos, 23-IX-1982, A. Boldú (BC 608355); Mollerusa, 25-VII-1924, Font Quer (BC 99423); Bell Puig, 3-X-1943, Font Quer (BC 94239); Ibars, 25-VII-1924, Font i Quer (BC 99424); Vilanova de la Barca, riu Segre, 27-VI-1953, A. de Bolòs (BC 124223). MADRID: Los Molinos, X-1923, A. Aterido & L. Aterido (MA 145080). MÁLAGA: R. Guadiaro, pr. Gaucín, 170 m, 6-IX-1976, N. Molesworth (SEV 36648); El Gaucín, río Guadiaro, B.M. Allen (SEV 89397); Sierra de Aguas, Vega de Guadalhorce, huertas, 15-IX-1971, G. López (MAF 89159); Coín, río Pereilas, UF45, 12-IX-1977, B.D. Garretas & A. Asensi (MGC 4186); desembocadura del Guadalhorce, UF65,

08-IX-1975, B.D. Garretas (MGC 3067); Algarrobo, 2-XI-1982, B.D. Garretas (MGC 12785); Torre del Mar, cultivos de regadío, VF07, 11-X-1982, B.D. Garretas & A. Asensi (MGC 13617); Frigiliana, 2-XI-1979, B.D. Garretas (MGC 6863); Cártama, sables humides, 9-VIII-1888, Lange (MA 74572); Jimera de Líbar, VIII-1983, A. Aparicio & J. Rowe (MA 469092). MURCIA: Archena, borde de acequia, VIII-1989, S. Ríos (MUB 29182); Salmerón, Moratalla, margen de arrozal, 320 m, 22-VIII-1980, F. Alcaraz & T. Lozano (MUB 1628); Calasparra, márgenes de arrozal, 350 m, 24-IX-1980, F. Alcaraz & T. Lozano (MUB 1653); El Reguerón, huerta, 23-XI-1986, S. Catroviejo & al. (MA 394743). SEVILLA: culta ex semina, loco dicto Coripe (SEV 50882); entre Coripe y Algodonales, 2-IX-1977, N. Cabezudo & al. (SEV 31310, MA 405869). TARRAGONA: Cabacés, Molí Vall, herbazal húmedo, 15-IX-1974, Molero (BCF 111494); Baix Ebre, Benifallet, pr. de acequia, 23-IX-1982, Ll. de Torres (BC 646586); Montblanc, Torrella (BC 607320). VALENCIA: Río Arriba, Jalance, 10-XI-1979, J.B. Peris (VF 9357); Jarafuel, VIII-1980, J.B. Peris (VF 7660); Tabernes de Valldigna, campos de huerta, IX-1964, J. Borja (MAF 103371); Tabernes de Valldigna, VII-1964, J. Borja (MAF 70059, MA 192550); Bétera, YJ1985, 100 m, 19-IX-1986, M.B. Crespo (VAB 861562); Carcassent, casa Bonastre, YJ22, 100 m, 19-IX-1986, S. Piera (VAB 861348); Jalance, IX-1979, J.B. Peris (VAL 5795); Denia, via férrea, 17-IV-1957, A. et O. de Bolòs (BC 140199); Tabernas de Valldigna, VII-1964, J. Borja (MA 192550).

SPECIES TO BE EXCLUDED

Chamaesyce engelmanii (Boiss.) Sojak, Cas, Nár. Muz (Prague) 140 (3-4); 169 (1972)
 = *Euphorbia engelmanii* Boiss., Cent. Euph. 15 (1860) = *C. engelmanii* (Boiss.) Malagarriga,
 Pl. Sennen. 2: 3 (1974).

Observations

This is a South American species of uncertain European naturalization (cf. TUTIN & R.-SMITH, 1968). CADEVALL & FONT QUER (1933) quoted it in their «Flora de Catalunya» confusing it with *C. serpens*. This interpretation was followed by other Catalan botanists such as Palau (in schedulis BC, BCF et MAF) in his Majorcan reports or, more recently, MALAGARRIGA (1978) and BAIGES ESPADALER & BLANCHÉ (1992). This error was commented upon and corrected by A. & O. DE BOLÒS (1950). Among other differences, it should be noted that *C. serpens* is a glabrous plant, whereas *C. engelmanii* presents lateral indumentum on the stems. In Europe, *C. engelmanii* has been reported from Italy by FIORI & PAOLETTI (1901) but PIGNATTI (1982) expresses scepticism about its presence in that country. In the Med-checklist by GREUTER & al. (1986), *C. engelmanii* is considered (in our opinion erroneously) as a synonym of *C. humifusa* which, like *C. serpens*, is glabrous. On the supposed presence of this species in the Balearic Islands, see the comments in BENEDÍ & ORELL (1991).

Literature cited

- ANTON, R. (1974). Étude chimiotaxonomique sur le genre *Euphorbia* (Euphorbiaceae). Thèse Université Louis Pasteur, Strasbourg.
- ASEGINOLAZA, C., D. GÓMEZ, X. LIZAUR, G. MONTSERRAT, G. MORANTE, M.R. SALAVERRIA, P.M. URIBE-ECHEBARRIA & J.A. ALEJANDRE (1981). Catálogo florístico de Alava, Vizcaya y Guipúzcoa. Vitria. Gobierno Vasco. Gráficas Santamaría, Vitoria.

- BAIGES, J.C. (1989). Estudi morfològic, anatòmic i de la dispersió de les granes de les espècies Ibèrico-Baleàriques del gènere *Euphorbia* L. Tesi de llicenciatura Facultad de Farmàcia. Universitat de Barcelona, Barcelona.
- BAIGES, J.C. & C. BLANCHÉ (1989). Morfología de las granas de las especies Ibero-baleares del género *Euphorbia* (Euphorbiaceae), I. Subgen. *Chamaesyce* Rafin. Actes Simposi Internacional de Botànica Pius Font i Quer. Vol. II (Fanerogamia): 89-94. Inst. d'Est. Ilerdencs, Lleida.
- BAIGES, J.C., X. ESPADALER & C. BLANCHÉ (1992). Seed dispersal in W Mediterranean *Euphorbia* species. Bot. Chron. 10: 697-705.
- BENEDÍ, C. & J.J. ORELL (1991). Notas corológicas baleáricas de *Chamaesyce* S.F. Gray. Collect. Bot. (Barcelona) 20: 261-262.
- BENEDÍ, C. & J.J. ORELL (1992a). Contribución al estudio fitodermológico de *Chamaesyce* S.F. Gray (Euphorbiaceae). Collect. Bot. (Barcelona) 22 (in press.).
- BENEDÍ, C. & J.J. ORELL (1992b). Nomenclatura de *Euphorbia chamaesyce* L. dentro del género *Chamaesyce* S.F. Gray (Euphorbiaceae). Collect. Bot. (Barcelona) 22 (in press.).
- BENEDÍ, C. & J.J. ORELL (1992c). Rapports, «In G. Kamari (ed.) Mediterranean chromosome numbers reports. 2» Flora Mediterranea 2 (in press.).
- BENTHAM, G. & J.D. HOOKER (1880). Genera Plantarum. Londini.
- BIESBOER, D.D. & P.G. MAHLBERG (1981). Laticifer starch grain morphology and laticifer evolution in *Euphorbia* (Euphorbiaceae). Nord. J. Bot. 1(3): 447-457.
- BOISSIER, P.É. (1862). *Euphorbieae*. In: Prodromus Systematis Naturalis Regni Vegetabilis A.P. de Coudolle, 15(2): 3-188. Masson, París.
- BOLÓS, A. DE & O. DE BOLÓS (1950). Vegetación de las comarcas barcelonesas. Instituto de Estudios Mediterráneos, Barcelona.
- BOLÓS, O. DE, J. VIGO, R.M. MASALLES & J.M. NINOT (1990). Flora manual dels Països Catalans. Ed. Pòrtic, Barcelona.
- BONAFÉ, F.B. (1979). Flora de Mallorca. Ed. Moll, Mallorca.
- BRIQUET, J. (1935). *Euphorbia* L. In: Prodrome de la flore corse. 2: 71-102. Paul Lechevalier, Paris.
- BRITTON, N. & H.A. BROWN (1970). Illustrated Flora of the Northern United States and Canada. Dover Publications, New York.
- BROWN, R. (1818). Observations on the natural family of plants called *Compositae*. Trans. Linn. Soc. London 12: 75-142.
- CABRERA, A.L. (1953). Manual de la flora de los alrededores de Buenos Aires. Ed. ACME, Buenos Aires.
- CADEVALL, J. & P. FONT QUER (1933). Flora de Catalunya. Institut d'Estudis Catalans, Barcelona.
- CARTER, S. & A.R. SMITH (1988). *Euphorbiaceae* (Part 2). In R.M. Polmill (ed.), Flora of Tropical East Africa. Balkema, Rotterdam, Brookfield.
- CASASAYAS, T. (1989). Flora al-loctona catalana. Tesi doctoral. Universitat de Barcelona, Barcelona.
- COSTA, M., J.B. PERIS & R. FIGUEROLA (1982). Notas corológicas levantinas II. Lazaroa 4: 373-374.
- COSTE, A.H. (1903). Flore descriptive et illustrée de la France, de la Corse et des contrées limitrophes. Albert Blanchard, París.
- CRESPO, M.B. & J. GÜEMES (1991). *Euphorbia maculata* L. en la provincia de Valencia y otras consideraciones sobre las especies valencianas del subgen. *Chamaesyce* Rafin. (Euphorbiaceae). Collect. Bot. (Barcelona) 20: 253-254.
- CROIZAT, L. (1936-38). *Chamaesyce*. In Degener, O. (ed.), Flora Hawaïensis. 5. Honolulú.
- CROIZAT, L. (1937). On the classification of *Euphorbia* II. How should the cyathium be interpreted? Bull. Torrey Bot. Club 64: 523-536.
- CROIZAT, L. (1960). Typification of *Euphorbia maculata* L. a restatement and a conclusion. Webbia 27(1): 187-205.
- CROIZAT, L. (1972). An introduction to the subgeneric classification of *Euphorbia* L. with stress on the south African and Malagasy species III. Webbia. 27(1): 9-12.
- DATTA, N. (1967). Reports «In LÖVE, A. (ed.), IOPB chromosome number reports XII» Taxon 16: 341-350.
- DOWNTON, W.J.S. (1975). The occurrence of C4 photosynthesis among plants. Photosynthetica 9: 96-105.
- EHLER, N. (1975). Mikromorphologie der Samenoberflächen der Gattung *Euphorbia*. Pl. Syst. Evol. 126: 189-207.
- EL-GHAZALI (1989). Pollen and orbicule morphology of some *Euphorbia* species. Grana 28: 243-259.
- EVANS, F.J. & A.D. KINGHORN (1977). A comparative phytochemical study of the diterpenes of some species of the genera *Euphorbia* and *Elaeophorbia* (Euphorbiaceae). Bot. J. Linn. Soc. 74: 23-25.

- FHAN, A. (1953). The topography of the nectary in the flowers and its phylogenetical trend. *Phytomorphology* 3: 424-426.
- FIORI, A. & G. PAOLETTI (1901). *Flora analitica d'Italia*. Padova.
- FIGUEROLA, R., J.B. PERIS & F. ESTESO (1989). Notes florísticas i corològiques, 231-266. *Collect. Bot. (Barcelona)* 17(2): 295-297.
- FONT QUER, P. (1953). *Diccionario de botánica*. Ed. Labor, Barcelona.
- GÓMEZ VIGIDE, F. (1985). Algunas aportaciones al estudio de la flora gallega. *Anales Jard. Bot. Madrid* 41: 367-380.
- GRAY, S.F. (1821). *A Natural Arrangement of British Plants*. 2. Baldwin, Cradok & Joy, London.
- GREUTER, W., BURDET, H.M. & G. LOUS (1986). Med-checklist 3. *Editions des Conservatoire et Jardin Botaniques de la Ville de Genève*, Genève.
- HAWORTH, A.H. (1812). *Synopsis plantarum succulentarum, cum descriptionibus locis*. London.
- HAYDEN, W.J. (1988). Ontogeny of the cotyledonary region of *Chamaesyce maculata* (*Euphorbiaceae*). *Amer. J. Bot.* 75 (11):1701-1713.
- HITCHCOCK, C.L. & A. CRONQUIST (1973). *Flora of the Pacific Northwest*. University of Washington Press, Washington.
- HOLMGREN, P.X., N.H. OLMGREM & L.C. BARNETT (1990). *Index herbariorum. Part 1. The herbaria of the world*, ed. 8. *Regnum Veg.* 120.
- HUGUET, P. (1971). Une nouvelle espèce d'Euphorbes prostrées: *E. jovetii*. *Botaniste* 54: 153-155.
- HUGUET, P. (1978). *Euphorbes prostrées de France*. Librairie Scientifique et Technique, Paris.
- HURUSAWA, I. (1954). Eine nochmalige Durchsicht des herkömmlichen Systems der Euphorbiaceen in weiteren Sinne. *J. Fac. Sci. Univ. Tokyo* 6(6): 224-243.
- JAUZEIN, P. (1989). *Euphorbia serpens* H.B.K. en France. *Monde pl.* 434: 13-16.
- KHAN, M.S. (1964). Taxonomic revision of *Euphorbia* in Turkey. *Notes Roy. Bot. Gard. Edinburgh*. 25(2): 71-161.
- KOUTNIK, D.L. (1984a). *Chamaesyce* (*Euphorbiaceae*): a newly recognized genus in southern Africa. *S. Afr. J. Bot.* 3(4): 262-264.
- KOUTNIK, D.L. (1984b). A Taxonomic revision of the Hawaiian species of the genus *Chamaesyce* (*Euphorbiaceae*). *Allertonia* 4: 331-387.
- KOUTNIK, D.L. (1985). New combinations in Hawaiian *Chamaesyce* (*Euphorbiaceae*). *Brittonia* 37(4): 397-399.
- KUZMANOV, B. (1964). On the origin of *Euphorbia* subg. *Esula* in Europa (*Euphorbiaceae*). *Blumea* 12 (2): 369-379.
- LAMARCK, J.-B.A.P. (1788). *Encyclopédie méthodique*. Vol. 2. París.
- LINNAEUS, L. (1753). *Species plantarum*, I. Laurentii Salvii, Holmiae.
- LOPEZ, C. & M.J. DÍEZ (1985). Contribución al atlas palinológico de Andalucía occidental. III. *Euphorbiaceae*. *Lagascalia* 13(2): 275-291.
- LÓPEZ, C. & M.J. DÍEZ (1987). *Atlas polínico de Andalucía Occidental*. Universidad de Sevilla, Sevilla.
- LORIENTE, F. (1974). Datos sobre la flora de la costa de Santander. *Anales Inst. Bot. Cavanilles* 31(1): 139-153.
- LÖVE, A. & D. LÖVE (1961). Chromosome number of central and northwest european plant species. *Opera Bot.*, 5: 243-244.
- MARÍN CALDERÓN G. & *et al.* (1984). Algunas plantas interesantes que viven bajo los cultivos subtropicales de la provincia de Granada. *Anales Jard. Bot. Madrid* 40(2): 470-471.
- MALAGARRIGA T. (1971). *Flora de la Provincia de Tarragona*. La Salle de Bonanova, Barcelona.
- MALAGARRIGA T. (1978). *Sinopsis de la flora Ibérica*. La Salle de Bonanova, Barcelona.
- MATEO, G. (1990). *Catálogo florístico de la provincia de Teruel*. Instituto de Estudios Turolenses, Teruel.
- MATEO, G. & R. FIGUEROLA (1981). *Flora analítica de la provincia de Valencia*. Institució Valenciana d'Estudis i Investigació, Valencia.
- MCNEILL, J. (1986). Proposals on lectotypification and the report of the omissit on lectotipification. *Taxon* 35: 867-880.
- MILLSPAUGH, C.F. (1909). *Praenunciae Bahamensis II*. *Bull. Mus. Natl. Hist. Nat. Bot.* 2: 289-321.
- MULLIGAN, G.A. & D.R. LINDSAY (1978). *Euphorbia* subgenus *Chamaesyce* in Canada. *Natural. Can.* 105: 37-40.
- ORELL, J.J. (1991). *Taxonomía del género Chamaesyce S.F. Gray (Euphorbiaceae) en la Península Ibérica e Islas Baleares*. Tesis de licenciatura, Facultat de Farmàcia. Universitat de Barcelona, Barcelona.

- OUDEJANS, R.C.H.M. (1990). World catalogue of species name published in the tribe *Euphorbieae* (Euphorbiaceae) with their geographical distribution. Utrecht.
- PAX, F. (1891). Euphorbiaceae. In A. Engler & K. Prantl, Die natürlichen Pflanzenfamilien 2(5): 1-119. Leipzig.
- PAX, F. & K. HOFFMANN (1930). Euphorbiaceae. In A. Engler & K. Prantl., Die natürlichen Pflanzenfamilien 2(19): 11-23. Leipzig.
- PERRY, B.A. (1943a). Chromosome number relationships in the genus *Euphorbia*. Chron. Bot. 7: 413-414.
- PERRY, B.A. (1943b). Chromosome number and phylogenetic relationships in the Euphorbiaceae. Amer. J. Bot. 30: 527-543.
- PIGNATTI, S. (1982). Flora d'Italia. Edagricole, Roma.
- PROKHANOV, Y.I. (1949). *Euphorbia* L. In Shishkin, B.K. & E.G. Bobrov (eds.) Flora of the USSR 14: 233-378.
- PUJADAS, A. & J.E. HERNÁNDEZ (1986). Contribución al conocimiento de la flora arvense y ruderal de la provincia de Córdoba. Lagascalia 14(2): 203-225.
- QUEIROS, M. (1975). Contribuição para o conhecimento citotaxonomico das Spermatophyta de Portugal XI. Euphorbiaceae. Bol. Soc. Brot. 49(2): 143-161.
- RADCLIFFE-SMITH, A. (1982). *Euphorbia* L. In P. Davis, Flora of Turkey and the East Aegean Island. 7: 571-630. Edinburgh University Press, Edinburgh.
- RAFINESQUE, C.S. (1817). Second decade of undescribed American plants. Amer. Monthly Mag. 2: 119-120.
- RAFINESQUE, C.S. (1838). *Sylva Telluriana*. Philadelphia.
- RAFINESQUE, C.S. (1840). *Autikon Botanikon*. Philadelphia.
- RAJU, V.S. & P.N. RAO (1977). Certain new combinations in the genus *Chamaesyce* S.F. Gray. Phytologia 37(5): 453-454.
- RAJU, V.S. & P.N. RAO (1987). The taxonomic use of the basic stomatal type in the generic delimitation of *Chamaesyce* (Euphorbiaceae). Feddes Repert. 98: 137-142.
- RAO, K.S. & M.N.V. PRASAD (1987). Nomenclatural notes on *Chamaesyce* of the Indian subcontinent (Euphorbiaceae). Taxon 36(4): 761-762.
- RAO, K.S. & M.N.V. PRASAD (1988). Typology of latex starch grains of certain Euphorbiaceae and their possible significance in systematics. Pl. Syst. Evol. 160: 189-193.
- ROEPER, J. (1824). Enumeratio Euphoriarum quae in Germania et Pannonia cognoscuntur. Gottingae.
- ROEPER, J. (1828). *Euphorbia* L. In: J.E. Duby, Augustum Pyrami de Candolle Botanicum gallicum, ed. 1. Paris.
- THELLUNG, A. (1917). *Euphorbia* L. In: P.F.A. Ascherson, & K.O.P.P. Graebner, Synopsis der mitteleuropäischen Flora 7: 423-479. Leipzig.
- TUTIN, T.G. & A.R. SMITH (1968). *Euphorbia* L. In: T.G. Tutin, & al. (eds.), Flora Europaea 2: 213-226. Cambridge University Press., Cambridge.
- VALDÉS, B. (1987). *Euphorbia* L. In: B. Valdés, & al., Flora vascular de Andalucía Occidental. Ed. Ketrés, Barcelona.
- VINDT, J. (1960). Monographie des Euphorbiacees du Maroc. Part I. Révision et systématique. Trav. Inst. sci. Chérif. sér. bot. 2: 1-219.
- WEBERLING, F. (1981). Morphology of flowers and inflorescences. Cambridge University Press., Cambridge.
- WEBSTER, G.L. (1975). Conspectus of a new classification of the Euphorbiaceae. Taxon 24: 593-601.
- WEBSTER, G.L. (1967). The genera of Euphorbiaceae in the Southeastern United States. J. Arnold. Arb. 48:303-403.
- WEBSTER, G.L., E.L. RUPERT & D. KOUTNIK (1982). Systematic significance of pollen nuclear number in Euphorbiaceae. Amer. J. Bot. 69: 407-15.
- WEBSTER, G.L., W.V. BROWN & B.N. SMITH (1975). Systematics of photosynthetic carbon fixation pathways in *Euphorbia*. Taxon 24: 27-33.
- WHEELER, L.C. (1941a). *Euphorbia* subgenus *Chamaesyce* in Canada and the United States exclusive of Southern Florida. Rhodora 43: 97-154.
- WHEELER, L.C. (1941b). *Euphorbia* subgenus *Chamaesyce* in Canada and the United States exclusive of Southern Florida. Rhodora 43: 168-205.
- WHEELER, L.C. (1941c). *Euphorbia* subgenus *Chamaesyce* in Canada and the United States exclusive of Southern Florida. Rhodora 43: 654-668.

- WHEELER, L.C. (1943). The genera of living *Euphorbieae*. Amer. Midl. Nat. 3: 456-503.
WILLIS, J.C. (1973). A dictionary of the flowering plants and Ferns, ed. 8. Cambridge University Press., Cambridge.

(Received 13 july 1992, accepted 21 july 1992)