14. Systematic descriptions and keys

Anthemis L., Sp. Pl.: 893 (1753). – Type (Hichcock & Green 1929): *A. arvensis* L.

Note. – Britton & Brown (1913) typified *Anthemis* by *A. maritima* L., but Green (in Hichcock & Green 1929) designated *A. arvensis* L. as the type. Since the two species in question are presently arranged in different sections, the infrageneric nomenclature of the genus depends on the choice of type.

The typifications of Linnaean generic names made by Britton and co-workers under the *American code* (Arthur & al. 1907) have been defined as mechanical or arbitrary. Therefore, they may be ignored under Art. 10.5 of the *Code*, even when they ante-date choices made by other authors. The Committee on Lectotypification that reported to the Berlin Congress (McNeill 1986) doubted justification of that rule. In the case of *Anthemis*, Britton & Brown's (1913) choice of *A. maritima* was not really mechanical or arbitrary, because they omitted the first two species listed by Linnaeus (1753), *A. cota* and *A. altissima* (nowadays treated as synonymous), which are characterised by dorsoventrally compressed achenes, and settled on the third, *A. maritima*, with achenes that are rhombic in cross-section.

At the Berlin Congress in 1987, a Subcommittee on Lectotypification of Linnaean Generic Names of the Committee on Lectotypification was established (McNeill 1987, Nicolson 1988), to produce specific proposals aimed at avoiding nomenclatural disruptions in the current usage of Linnaean generic names (and also of names of infrageneric entities) that would be caused by the consistent adoption of either the Britton & Brown (1913) choices or those of Hichcock & Green (1929). The Subcommittee produced a list of 72 Linnaean generic names to be conserved with specific types (Jarvis 1992), which were (with two exceptions, *Cacalia* and *Briza*) recommended for conservation by the Committee for Spermatophyta (Brummitt 1995). Unfortunately, the potential disruption to nomenclature caused by the conflicting type designations of Britton & Brown (1913) and Green (in Hichcock & Green 1929) was not considered to be serious enough to justify inclusion of *Anthemis* on that list (Jarvis 1992: 554).

The typification of *Anthemis* by *A. arvensis* L. proposed by Hitchcock & Green (1929) was accepted by Fedorov (1961) and Fernandes (1975b, 1976). Consequently, in both revisions the section containing annuals related to *A. arvensis* was named *A.* sect. *Anthemis*. The perennial representatives of *A.* subg. *Anthemis* were treated as a separate section, named *A.* sect. *Rumata* Fed. (Fedorov 1961), with type *A. saportana* Alb., or *A.* sect. *Hiorthia* (DC.) R. Fernandes (Fernandes 1975b, 1976), with *A.* sect. *Rumata* in synonymy.

Typification of *Anthemis* by *A. maritima* L. as proposed by Britton & Brown (1913) was accepted by Bremer & Humphries (1993), and made its way also into the list of Linnaean generic names compiled by Jarvis & al. (1993) and the list of generic names in current use by Greuter & al. (1993). Bremer & Humphries (1993: 132) argue that Linnaeus adopted the generic name *Anthemis* from Micheli (1729) who included *A. maritima* but not *A. arvensis* in the enumeration of species and that, therefore, the typification made by Britton & Brown (1913) is "more correct". This argument, however, is irrelevant since both species are included in *Species plantarum* (Linnaeus 1753), and both fit the generic description in *Genera plantarum* (Linnaeus 1754). Ac-

ceptance of the typification proposed by Britton & Brown (1913) would result in the section of annual representatives hitherto treated as *A.* sect. *Anthemis* to be named *A.* sect. *Erianthemis* Griseb., based on *A. tomentosa* L., thus disrupting sectional nomenclature in this large genus; whereas the later choice, by Hichcock & Green (1929), maintains usage of the infrageneric categories established by Fernandes (1975b, 1976). Fortunately, for the sake of nomenclatural stability, the *Code* still authorises the supersession of Britton & Brown typifications (*Code* Art. 10.5 and Ex. 6).

Annuals, biennials, or short- to long-lived perennial herbs and subshrubs. Stems procumbent, ascending-erect or erect, with several capitula in a cymose synflorescence, sometimes arising from a rootstock formed by the lignified bases of primary and subsequent annual shoots and simple to few-branched. Leaves alternate, usually evenly distributed along the stem, glabrous or sparsely hairy to sericeous or tomentose, with medifixed hairs and interspersed sessile glands, sometimes succulent, usually elliptical to ovate or obovate in outline, sessile to petiolate, usually 1-3-pinnatipartite to -pinnatisect; ultimate segments usually triangular to narrowly elliptical or linear, mucronate or more rarely blunt. Capitula solitary, radiate, heterogamous, gynomonoecious or functionally hermaphrodite (or discoid, homogamous and hermaphrodite), solitary at the end of slender to strongly inflated peduncles. Involucre hemispherical or obconical, attenuate to strongly umbonate at maturity. Involucral bracts in 3-5 imbricate rows, glabrous or sparsely to densely hairy, with pale to brown or black membranous margins. Receptacle flat or hemispherical to ovoid-conical or narrowly conical, usually paleate at least in the upper half. Pales subulate, narrowly elliptical to narrowly obovate, membranous, persistent to readily caducous at maturity; apex usually formed by the protruding midrib, sometimes not reached by the midrib, concolourous or tinged with yellow, brown or black. Ray florets (when present) white or yellow, female or sterile; the tubular part usually dorso-ventrally flattened, sometimes becoming spongy and inflated at maturity; limb usually 3-lobed apically. Disc florets yellow or tinged with red, hermaphrodite, fertile; the proximal part (tube) either remaining slender at maturity or becoming spongy and inflated; circular to tetragonal in cross-section, not saccate basally nor capping the ovary or the mature achene; the distal part (limb) funnel-shaped and apically 5-lobed. Achenes of ray florets (when present and fertile) 9-11 ribbed, round to triangular or dorso-ventrally flattened and transversely rhombic in cross-section; ribs inconspicuous or conspicuous, smooth or tuberculate, usually beset with mucilage cells; apical plate bordered by a marginal ridge or an adaxial auricle. Achenes of disc florets homomorphic or heteromorphic, stout and subcylindrical to obconical or more slender and narrowly obconical to fusiform, 8-22 ribbed, round, quadrangular, or transversely rhombic in cross-section; ribs rather inconspicuous or distinct, smooth or tuberculate, usually beset with mucilage cells; furrows between the ribs usually with sessile, biseriate glands; corona absent, or forming a rounded rim, or an adaxially protracted, sometimes ± membranous auricle.

Basic chromosome number. – $x = 9$

Key to the N African species

1. Short- to long-lived perennials (sometimes flowering already in the first year) with annual shoots arising from a woody stock formed of the bases of the primary shoots and subsequent annual shoots; stems simple or few-branched, with single to several capitula; peduncles not inflated at maturity; achenes quadrangular-rhombic or round in cross-section ..... 2.
– Annuals with procumbent, ascending-erect or erect stems and with usually several capitula in cymose synflorescences; peduncles not or moderately to strongly inflated at maturity; achenes dorso-ventrally compressed or round in cross-section ..... 9.
2. Capitula discoid (very rarely with minute ray florets hidden by the inner involucral bracts) ..... 21β. *A. pedunculata* var. *discoidea*
– Capitula radiate ..... 3.
3. Leaves conspicuously succulent ..... 20. *A. maritima*
– Leaves not succulent ..... 4.
4. Leaves densely sericeous-hairy; achenes quadrangular-rhombic in cross-section, very inconspicuously ribbed, smooth ..... 19a. *A. cretica* subsp. *columnae*
– Leaves glabrous or moderately to densely tomentose; achenes round or rarely quadrangular-rhombic in cross-section, usually conspicuously ribbed; ribs usually moderately to strongly tuberculate, rarely smooth ..... 5.
5. Involucral bracts with pale membranous margins; tips of pales usually stramineous ..... 21b. *A. pedunculata* subsp. *clausonis*
– At least outer and middle involucral bracts with light to dark brown membranous margins ..... 6.
6. Capitula (6-)20-30(-38) mm in diameter; involucres (5-)9-13(-14) mm in diameter; inner involucral bracts (3.1-)3.4-5.3(-6.0) mm long; ray florets (5.9-)7.6-12.9(-15.7) mm long; disc florets (1.3-)1.6-2.1(-2.6) mm long; pales (2.6-)2.9-4.3(-4.6) mm long; achenes (1.3-)1.6-2.1(-2.6) mm long, moderately to strongly tuberculate ..... 21. *A. pedunculata*
– Capitula (30-)35-47(-55) mm in diameter; involucres usually (10-)14-22 mm in diameter; inner involucral bracts (4.5-)5.4-7.5(-8.2) mm long; ray florets (11.0-)11.8-18.8(-25.5) mm long; disc florets 3.1-3.8(-4.2) mm long; pales (3.7-)4.1-5.5(-5.8) mm long; achenes (1.8-)2.0-2.9(-3.1) mm long, smooth or moderately tuberculate ..... 7.
7. Pales narrowly elliptical to narrowly obovate, apically tricuspidate or abruptly tapering; inner involucral bracts narrowly obovate or obovate, with broad brown and marginally pale membranous margins ..... 22a. *A. punctata* subsp. *punctata*
– Pales narrowly elliptical to nearly subulate, apically tapering gradually; inner involucral bracts narrowly elliptical, with narrow brown membranous margins ..... 8.
8. Achenes with an adaxial corona (Djurdjura) ..... 22b. *A. punctata* subsp. *kabylica*
– Achenes without corona (NW Morocco) ..... 18. *A. abylaea*
9. Ray florets yellow ..... 10.
– Ray florets white or absent ..... 15.
10. Achenes smooth ..... 11.
– Achenes tuberculate ..... 12.

11. Achenes with strongly elongate mucilage cells forming continuous slime ribbons on the ridges of ribs ..... 8. *A. gharbensis*
– Achenes with isodiametric or only slightly elongate mucilage cells that never form continuous slime ribbons on the ridges of ribs ..... 10. *A. tenuisecta*
12. Pales with tips formed by the protruding midribs ..... 13.
– Pales acuminate to blunt, their midrib never reaching the apex ..... 14.
13. Limb of ray florets shorter than 7 mm; leaves usually densely tomentose; ultimate leaf segments broadly elliptical to nearly circular in outline ..... 7. *A. chrysantha*
– Limb of ray florets longer than 7 mm; leaves usually sparsely hairy; ultimate leaf segments elliptical ..... 6. *A. boveana*
14. Stems erect; leaves petiolate; inner involucral bracts 2.8-4.3 mm long; pales 3.2-3.7 mm long; disc florets 2.8-3.5 mm long; achenes of ray florets 1.6-2.3 mm long, those of disc florets 1.4-1.9 mm long ..... 9. *A. maroccana*
– Stems prostrate; leaves sessile; inner involucral bracts (2.2-)2.4-3.2 mm long; pales 2.1-3.4 mm long; disc florets 2.1-2.7 mm long; achenes of ray florets 1.2-1.7 mm long, those of the disc florets 1.0-1.6 mm long ..... 10. *A. tenuisecta*
15. Achenes dorso-ventrally compressed ..... 25. *A. austriaca*
– Achenes round or tetragonous, but not dorso-ventrally compressed ..... 16.
16. Pales subulate ..... 17.
– Pales narrowly linear to elliptical or obovate, but not subulate ..... 18.
17. Achenes readily falling off at maturity, conspicuously tuberculate; receptacles paleate only in the upper half ..... 23. *A. cotula*
– Achenes persistent at maturity, smooth or inconspicuously tuberculate; receptacles paleate throughout ..... 24. *A. pseudocotula*
18. Pales caducous at maturity ..... 19.
– Pales persistent at maturity ..... 22.
19. Involucral bracts glabrous, with very wide, brown membranous margins ..... 3. *A. monilicostata*
– Involucral bracts sparsely to densely hairy, with rather narrow, pale or brown membranous margins ..... 20.
20. Achenes of disc florets heteromorphic; the peripheral ones rather stout, with smooth ribs, persistent at maturity; the central ones more slender, slightly tuberculate, readily falling off at maturity ..... 2. *A. mauritiana*
– Achenes of disc florets homomorphic, slender, with tuberculate ribs; peripheral ones sometimes persistent at maturity ..... 21.
21. Achenes > 1.5 mm long ..... 4. *A. stiparum*
– Achenes < 1.5 mm long ..... 5. *A. zaianica*
22. Leaves 1-2 pinnatipartite to 1-2-pinnatisect; stems prostrate; achenes tuberculate ... 23.
– Leaves 2-3-pinnatipartite to 2-3-pinnatisect; stems erect or prostrate; achenes smooth or tuberculate ..... 25.
23. Basal part of disc florets longer than the distal part, inconspicuously inflated; tip of pales somewhat hooded, tinged with yellow, midrib never protruding as a mucro ... 24.
– Basal part of disc florets shorter than or as long as its distal part, conspicuously inflated; apex of pales mucronate by the protruding midrib ..... 11. *A. confusa*
24. Capitula discoid or with minute ray florets ..... 14. *A. kruegeriana*
– Capitula radiate ..... 13. *A. glareosa*

25. Achenes smooth ..... 26.
– At least achenes of peripheral disc florets tuberculate ..... 28.
26. Peduncles becoming strongly inflated at maturity; involucre not umbonate at maturity.. ..... 1. *A. arvensis*
– Peduncles remaining slender at maturity; involucre attenuate or moderately to strongly umbonate at maturity ..... 27.
27. Capitula radiate; ray florets longer than 8 mm; involucre not or only slightly umbonate; pales apically truncate or tricuspidate ..... 16. *A. taubertii*
– Capitula discoid or with minute (c. 4 mm long) ray florets; involucre strongly umbonate; pales tapering gradually to an erose or simple tip ..... 12. *A. cyrenaica*
28. Peduncles becoming strongly inflated at maturity; stems and leaves glabrous or hairy; ultimate leaf segments blunt, acuminate or mucronate .... 15α. *A. secundiramea* var. *secundiramea*
– Peduncles remaining slender at maturity; stems and leaves hairy; ultimate leaf segments acuminate or mucronate ..... 29.
29. Stems with prostrate, squarrose branches; leaves moderately succulent; involucral bracts with pale membranous margins (coasts of N and NE Tunisia) .... 15β. *A. secundiramea* var. *cossyrensis*
– Stems erect to ascending with ascending branches; leaves not succulent; involucral bracts with brown membranous margins (E Algeria, N Tunisia) ..... 17. *A. ubensis*

Clé des espèces de l'Afrique du Nord

1. Plantes pérennes (fleuressant parfois la première année déjà), à tiges annuelles provenant d'une souche ligneuse formée par les bases des tiges des années précédentes; pédoncules non enflés à la maturité; akènes rhombiques ou circulaires en section transversale ..... 2.
– Plantes annuelles à tiges couchées, ascendantes ou dressées; capitules disposés en cymes; pédoncules parfois enflés à la maturité; akènes comprimées radialement ou circulaires en section transversale ..... 9.
2. Capitules discoïdes (très rarement à fleurs rayonnantes minuscules, cachées par les bractées intérieures de l'involucre) ..... 21β. *A. pedunculata* var. *discoidea*
– Capitules radiés ..... 3.
3. Feuilles distinctement succulentes ..... 20. *A. maritima*
– Feuilles non succulentes ..... 4.
4. Feuilles densément soyeuses; akènes quadrangulaires-rhombiques en section transversale, très indistinctement côtées, lisses ..... 19a. *A. cretica* subsp. *columnae*
– Feuilles glabres ou éparsment à densément tomenteuses; akènes circulaires ou rarement quadrangulaires-rhombiques en section transversale, en général distinctement côtées; côtes souvent légèrement à fortement tuberculeuses, rarement lisses ..... 5.
5. Bractées de l'involucres à bord scarieux pâle; paillettes du réceptacle en général unicolores ..... 21b. *A. pedunculata* subsp. *clausonis*
– Au moins les bractées extérieures et moyennes de l'involucre à bord scarieux brun clair ou foncé; paillettes du réceptacle souvent à pointe brune ou noire ..... 6.

6. Capitules de (6-)20-30(-38) mm de diamètre; involucres de (5-)9-13(-14) mm de diamètre; bractées intérieures de l'involucre longues de (3.1-)3.4-5.3(-6.0) mm; fleurs du rayon longues de (5.9-)7.6-12.9(-15.7) mm; celles du disque de (1.3-)1.6-2.1(-2.6) mm; paillettes du réceptacle longues de (2.6-)2.9-4.3(-4.6) mm; akènes de (1.3-)1.6-2.1(-2.6) mm de longueur, légèrement à fortement tuberculées ..... 21. *A. pedunculata*
- Capitules de (30-)35-47(-55) mm de diamètre; involucres normalement de (10-)14-22 mm de diamètre; bractées intérieures de l'involucre longues de (4.5-)5.4-7.5(-8.2) mm; fleurs du rayon longues de (11.0-)11.8-18.8(-25.5) mm; celles du disque de 3.1-3.8(-4.2) mm; paillettes du réceptacle longues de (3.7-)4.1-5.5(-5.8) mm; akènes de (1.8-)2.0-2.9(-3.1) mm de longueur, lisses ou légèrement tuberculées ..... 7.
7. Paillettes du réceptacle étroitement elliptiques à étroitement obovées, tricuspidées ou brusquement acuminées au sommet; bractées intérieures de l'involucre étroitement obovées ou obovées, à marge scarieuse brunâtre bordée de blanc ..... 22a. *A. punctata* subsp. *punctata*
- Paillettes du réceptacle étroitement elliptiques à presque subulées, graduellement acuminées; bractées intérieures de l'involucre étroitement elliptiques, à marge scarieuse brunâtre ..... 8.
8. Akènes munis d'une couronne sur le côté adaxial (Djurdjura) ..... 22b. *A. punctata* subsp. *kabylica*
- Akènes dépourvues de couronne (NO du Maroc) ..... 18. *A. abylaea*
9. Fleurs du rayon jaunes ..... 10.
- Fleurs du rayon blanches, ou absentes ..... 15.
10. Akènes lisses ..... 11.
- Akènes tuberculeuses ..... 12.
11. Akènes à cellules mucilagineuses fortement allongées et formant des rubans continus de mucilage sur les côtes ..... 8. *A. gharbensis*
- Akènes à cellules mucilagineuses isodiamétriques ou légèrement allongées, mais ne formant pas de rubans continus de mucilage sur les côtes ..... 10. *A. tenuisecta*
12. Paillettes du réceptacle mucronées par la nervure central saillante ..... 13.
- Pailettes du réceptacle acuminées ou obtuses, la pointe n'atteignant jamais la nervure centrale ..... 14.
13. Fleurs du rayon à ligules de moins de 7 mm de longueur; feuilles normalement densément tomenteuse, à pinnules ultimes largement elliptiques à pourtour presque circulaire ..... 7. *A. chrysantha*
- Fleurs du rayon à ligules dépassant 7 mm; feuilles normalement éparsement tomenteuse, à pinnules ultimes elliptiques ..... 6. *A. boveana*
14. Tiges dressées; feuilles pétiolées; bractées intérieures de l'involucre longues de 2.8-4.3 mm; paillettes du réceptacle longues de 3.2-3.7 mm; fleurs centrales longues de 2.8-3.5 mm; akènes des fleurs du rayon de 1.6-2.3 mm, celles des fleurs centrales de 1.4-1.9 mm de long ..... 9. *A. maroccana*
- Tiges prostrées; feuilles sessiles; bractées intérieures de l'involucre longues de (2.2-)2.4-3.2 mm; paillettes du réceptacle longues de 2.1-3.4 mm; fleurs centrales longues de 2.1-2.7 mm; akènes des fleurs du rayon de 1.2-1.7 mm, celles des fleures centrales de 1.0-1.6 mm de long ..... 10. *A. tenuisecta*

15. Akènes comprimées radialement ..... 25. *A. austriaca*
– Akènes circulaires ou tétragonales en section transversale, jamais radialement comprimées ..... 16.
16. Paillettes du réceptacle subulées ..... 17.
– Paillettes du réceptacle étroitement elliptiques ou obovées, jamais subulées ..... 18.
17. Akènes souvent caduques à la maturité, distinctement tuberculeuses; réceptacle muni de paillettes seulement dans sa moitié supérieure ..... 23. *A. cotula*
– Akènes persistant à la maturité, lisses ou légèrement tuberculeuses; réceptacle muni de paillettes depuis la base ..... 24. *A. pseudocotula*
18. Paillettes du réceptacle précocément caduques à la maturité ..... 19.
– Paillettes du réceptacle persistant à la maturité ..... 22.
19. Bractées de l'involucre glabres, bordées d'une marge scarieuse brunâtre, très large .... 3. *A. monilicostata*
– Bractées de l'involucre éparsement ou densément tomenteuses, bordées d'une marge scarieuse blanchâtre ou brunâtre, assez étroite ..... 20.
20. Akènes des fleurs centrales hétéromorphes; les périphériques assez trapues, à côtes lisses, persistant à la maturité; les centrales plus sveltes, légèrement tuberculées, souvent caduques à la maturité ..... 2. *A. mauritiana*
– Akènes des fleurs centrales homomorphes, trapues, à côtes tuberculeuses; les périphériques parfois persistant à la maturité ..... 21.
21. Akènes de > 1.5 mm de long ..... 4. *A. stiparum*
– Akènes de < 1.5 mm de long ..... 5. *A. zaianica*
22. Feuilles 1-2-pennatipartites ou 1-2-pennatiséquées; tiges prostrées; akènes tuberculées ..... 23.
– Feuilles 2-3-pennatipartites ou 2-3-pennatiséquées; tiges dressées ou prostrées; akènes lisses ou tuberculées ..... 25.
23. Fleurs du disque à partie basale plus longue que la partie distale; partie basale indistinctement boursouflée à la maturité; paillettes du réceptacle acuminées ou obtuses, à sommet jaunâtre jamais atteint par la nervure centrale ..... 24.
– Fleurs du disque à partie basale plus courte ou de même longueur que la partie distale; partie basale distinctement boursouflée à la maturité; paillettes du réceptacle mucronées par la nervure centrale saillante ..... 11. *A. confusa*
24. Capitules discoïdes ou munis de fleurs du rayon minuscules ..... 14. *A. kruegeriana*
– Capitules radiés ..... 13. *A. glareosa*
25. Akènes lisses ..... 26.
– Au moins les akènes des fleurs périphériques du disque tuberculées ..... 28.
26. Pédoncules distinctement enflés à la maturité; involucres non ombiliqués à la maturité ..... 1. *A. arvensis*
– Pédoncules non enflés à la maturité; involucres parfois légèrement à fortement ombiliqués à la maturité ..... 27.
27. Capitules radiés; fleurs du rayon dépassant 8 mm; involucres tout au plus légèrement ombiliqués; paillettes du réceptacle brusquement tronquées à tricuspidées .... 16. *A. taubertii*
– Capitules discoïdes ou munis des fleurs du rayon minuscules (tout au plus de 4 mm de long); involucres fortement ombiliqués; paillettes du réceptacle graduellement acuminées, érodées ou mucronées au sommet ..... 12. *A. cyrenaica*

28. Pédoncules fortement enflés à la maturité; tiges prostrées, à branches divariquées; tiges et feuilles glabres ou tomenteuses; feuilles à pinnules ultimes obtuses, acuminées ou mucronées ..... 15α. *A. secundiramea* var. *secundiramea*
– Pédoncules non enflés à la maturité; tiges prostrées, dressées ou ascendantes, à branches divariquées ou ascendantes; tiges et feuilles tomenteuses; feuilles à pinnules ultimes acuminées ou mucronées ..... 29.
29. Tiges prostrées, à branches divariquées; feuilles légèrement succulentes; bractées de l'involucre à marge blanchâtre (côte méditerranéenne du N et NE de la Tunisie) .... 15β. *A. secundiramea* var. *cossyrensis*
– Tiges dressées ou ascendantes, à branches ascendantes; feuilles non succulentes; bractées de l'involucre à marge brunâtre (E de l'Algérie, N de la Tunisie) ..... 17. *A. ubensis*

I. ***Anthemis*** L. subg. ***Anthemis***
– *Anthemis* subg. *Euanthemis* Rouy, Fl. Fr. 8: 231 (1903), nom. inval. [Art. 21.3].
– *Anthemis* subg. *Alethanthemis* Briquet, Annuaire Cons. Jard. Bot. Genève 19: 261 (1916), nom. inval. [Art. 22.2].

Annuals, biennials or short- to long-lived perennial herbs and subshrubs. Receptacles hemispherical or conical to narrowly conical, paleate throughout or only in the upper half. Pales subulate or narrowly elliptical to narrowly obovate, persistent or readily caducous at maturity. Basal part of disc florets becoming spongy and inflated at maturity, sometimes remaining slender. Achenes not dorso-ventrally compressed, obovoidal to obconical or obpyramidal, circular or quadrangular in cross-section, smooth or with c. 10 more or less distinct, smooth or tuberculate ribs; epicarpic cells usually filled with crystal sand.

Basic chromosome number. – $x = 9$
Ploidy levels. – $2x$, $4x$, $6x$, $8x$.

A. ***Anthemis*** L. sect. ***Anthemis*** ≡ *A.* [unranked] *Leianthae* Boiss., Fl. Orient. 3: 279 (1875). – Type: *A. arvensis* L.
= *Anthemis* sect. *Erianthemis* Griseb., Spicil. Fl. Rumel. 2: 205 (1845). – Type: *A. tomentosa* L.
– *Chamaemelum* auct. [non Mill., Gard. Dict. Abr., ed. 4: [315] (1754)]: All., Fl. Pedem.: 184 (1785); Cass. in Cuvier, Dict. Sci. Nat. 29: 179 (1823).
– *Anthemis* sect. *Euanthemis* DC., Prodr. 6: 7 (1838), nom. inval. [Art. 21.3].
– *Lyonnetia* [unranked] *Annuae* DC., Prodr. 6: 14 (1838), nom. inval. [Art. 22.2].

Annuals, very rarely biennials or short-lived perennial herbs. Stems procumbent, ascending-erect or erect, with usually several capitula in cymose capitulescences. Peduncles remaining slender or becoming moderately to strongly inflated at maturity. Capitula radiate or discoid. Receptacles hemispherical or conical to extremely elongate and narrowly conical, paleate throughout. Ray florets usually female. Pales narrowly elliptical to nearly

subulate or narrowly obovate, persistent or readily caducous at maturity; apex formed by the protruding midrib or never reached by the midrib and somewhat hooded, usually stramineous or tinged with yellow, only rarely tinged with brown or black. Achenes of disc florets homomorphic to conspicuously heteromorphic, those of the peripheral ones often conspicuously stouter than those of the central ones, circular in cross-section, with more or less distinct, smooth to tuberculate ribs. Sclerenchymatic tissue in the mesocarp sometimes reduced and pericarp thin and translucent.

Basic chromosome number. – $x = 9$.
Ploidy levels. – $2x$, $3x$.

In the delimitation proposed by Yavin (1972), the section comprises c. 60 species distributed throughout the range of the genus.

a. ***Anthemis*** L. ser. ***Anthemis*** ≡ *A.* [unranked] *Arvenses* Rchb. f. in Reichenbach & Reichenbach, Icon. Fl. Germ. 16: 60 (1854) [Art. 22.5].
– *Anthemis* ser. *Arvenses* Fedorov in Komarov, Fl. SSSR 26: 35 (1961), nom. inval. [Art. 36.1, 33.1].

Usually annual, very rarely [*A. arvensis* subsp. *sphacelata* (C. Presl) R. Fernandes] biennial or short-lived perennial herbs. Stems procumbent to ascending, usually much-branched. Leaves obovate to narrowly obovate, 1-3-pinnatipartite; ultimate segments usually elliptical to narrowly elliptical, mucronate. Peduncles becoming inflated or remaining slender at maturity. Capitula radiate. Involucre hemispherical, not umbonate at maturity. Involucral bracts moderately to densely hairy, with comparatively wide pale to brown membranous margins; the outer ones triangular, the inner ones apically rounded. Ray florets white, female. Receptacle elongate and conical at maturity. Pales elliptical to obovate in outline, usually abruptly acuminate or even dentate apically, persistent at maturity. Disc florets yellow, sometimes tinged with purple, hermaphrodite; the basal part usually spongy and inflated at maturity. Achenes of disc florets moderately to strongly heteromorphic, usually subcylindrical to obconical, smooth, those of the peripheral ones often persistent on receptacles, those of the central ones readily falling off at maturity; ribs distinct, rounded, somewhat spongy, formed by the intensive growth of mesocarpic parenchyma, alternating with ribs of the mesocarpic sclerenchyma cylinder; corona a spongy rim or an adaxially protracted auricle.

Basic chromosome number. – $x = 9$.
Ploidy levels. – $2x$, $3x$.

Taxonomy. – *Anthemis* ser. *Anthemis* is a well circumscribed taxon. Its monophyletic nature is demonstrated by the occurrence of anatomically highly specialised achenes, in which the external ribs alternate with the ribs of the mesocarpic sclerenchyma cylinder, while in all other members of *A.* sect. *Anthemis* the external ribs coincide with those of the mesocarpic sclerenchyma cylinder. This peculiar achene anatomy (see Fig. 28) is not lim-

ited to the closely related species *A. arvensis* L. and *A. ruthenica* M. Bieb., but was also found in *A. auriculata* Boiss. from SE Europe and Turkey, which therefore is treated as a member of *A.* ser. *Anthemis,* not of *A.* ser. *Tomentosae* Yavin as suggested by Yavin (1972). All four remaining members of *A.* ser. *Tomentosae,* recently revised by Georgiou (1990), were found to have the normal type of pericarp arrangement.

Conversely, achene anatomy justifies the exclusion of *Anthemis ubensis* from *A.* ser. *Anthemis.* This species was considered to be closely related to *A. arvensis* by Pomel (1874-1875) when he described it, and by Quézel & Santa (1963) who proposed the combination *A. arvensis* var. *ubensis.* However, as *A. ubensis* has a normal type of pericarp arrangement, its close relationship with *A. arvensis* is unlikely. Its inclusion in *A.* ser. *Secundirameae* is proposed here.

1. ***Anthemis arvensis*** L., Sp. Pl.: 894 (1753) ≡ *Chamaemelum arvense* (L.) Hoffmanns. & Link, Fl. Port. 1: 347 (1820). – Ind. loc.:"Habitat in Europae, praesertim Sueciae agris." – Lectotype (Fernandes 1975a: 1472): Herb. Linn. No. 1016.15 (LINN, microfiche!).

Annual, biennial to short-lived perennial herbs. Rhizome up to 4 mm in diameter. Flowering stems ascending to erect, (5-)10-30(-80) cm long, basally lignified, usually repeatedly branched, sparsely to densely sericeous. Lower cauline leaves (7-)15-35(-75) mm long and (4-)8-16(-27) mm wide, petiolate; petiole up to 45 mm long, basally with up to 4 pairs of minute teeth; blade 1-2(-3)-pinnatisect, sparsely to densely hairy with medifixed hairs and interspersed glands; ultimate segments triangular to narrowly elliptical or linear, (0.4-)1.5-4.0(-4.7) mm long and 0.2-0.8(-1.0) mm wide, mucronate. Peduncles up to 150 mm long, remaining slender or becoming strongly inflated at maturity. Capitula up to 40 mm in diameter, heterogamous. Involucre 6-13 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, triangular to narrowly elliptical or narrowly obovate in outline, acute to obtuse, sparsely to densely hairy with long medifixed hairs, bordered with pale to light brown, membranous margins. Receptacle hemispherical to conical, paleate throughout. Ray florets 6-17 per capitulum, white or rarely tinged with pink, female, 5-15 mm long. Pales subulate to narrowly elliptical or narrowly obovate, membranous, persistent at maturity, acuminate to mucronate. Disc florets yellow, sometimes tinged with purple, hermaphrodite, 2-4 mm long; the proximal part usually spongy and inflated at maturity, sometimes remaining slender; distal part funnel-shaped and 5-lobed. Achenes stout and subcylindrical to obconical, 1.3-2.3 mm long and up to 1.8 mm in diameter, 10-ribbed; ribs usually obtuse, smooth, separated by narrow and deep furrows; corona absent or a rounded rim.

Variation and taxonomy. – *Anthemis arvensis* is a morphologically extremely variable species distributed throughout Europe, N Africa and SW Asia where it usually grows as an archeophytic weed in corn fields and disturbed habitats. According to Rivera Nuñez & Obón de Castro (1996) who reported on macroremains of *Compositae* in Europe, N Africa, and the Near East, achenes of *A. arvensis* were found in a Spanish excavation site dating back to the Bronze age, and the species is commonly found in archaeological sites



Fig. 25. *Anthemis arvensis* subsp. *incrassata:* general habit *(Vogt 10061 & Oberprieler 4509).* – Scale bar = 10 cm.

of the Medieval period and later throughout Europe. It has been introduced into N and S America, Australia and New Zealand, S Africa, and E Asia. According to Fernandes (1975a, 1976), four subspecies can be distinguished. *A. arvensis* subsp. *arvensis* is found throughout the range of the species; subsp. *incrassata,* which differs from the typical subspecies by its inflated peduncles and strongly elongate, conical receptacles, is restricted to the Mediterranean region; subsp. *cyllenea* (Halácsy) R. Fernandes, endemic to Greece, is characterised by smaller overall size, smaller capitula, and more rigid pales; subsp. *sphacellata* (C. Presl) R. Fernandes from S Italy and Sicily differs by its biennial to perennial habit and more slender achenes. A fifth subspecies, *A. arvensis* subsp. *acrochordona* Briq. & Cavill., which is considered to differ from all other subspecies by its achenes with veruccose instead of smooth ribs, was accepted by Pignatti (1982) and listed for Sardinia, Corsica, and the Riviera coast, but treated by Fernandes (1975a, 1976) as a synonym of subsp. *incrassata.*

According to Benedí i Gonzáles (1987), on the Iberian peninsula *Anthemis arvensis* is represented by subsp. *arvensis* and subsp. *incrassata* which inhabit distinct areas. *A. arvensis* subsp. *arvensis* is confined to the N and W parts of the Iberian peninsula which are under atlantic and subatlantic climatic influence, subsp. *incrassata* is found in the more Mediterranean influenced parts of the Peninsula in S and E Spain and the Balearic Islands. In North Africa, only the latter subspecies is found.

1a. ***Anthemis arvensis*** subsp. ***incrassata*** (Loisel.) Nyman, Consp.: 361 (1879) ≡ *A. incrassata* Loisel., Not. Fl. France: 129 (1810) ≡ *A. arvensis* var. *incrassata* (Loisel.) Boiss., Voy. Bot. Espagne 2: 310 (1840) ≡ *A. arvensis* f. *incrassata* (Loisel.) J. Gay in Gussone, Fl. Sic. Syn. 2(2): 870 (1844). – Ind. loc.: "... aux environs d'Arles et à l'embouchure du Rhône, dans les endroits stériles et pierreux, où elle a été découverte par MM. Artaud et Requien ..." – Type: not designated.

= *Anthemis tuberculata* var. *laevis* Emb. & Maire in Bull. Soc. Hist. Nat. Afrique N. 20: 186 (1929) ≡ *A. pedunculata* var. *laevis* (Emb. & Maire) Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934). – Ind. loc.: "Hab. in quercetis, abietis et cedretis Atlantis Rifani occidentalis, solo calcareo nec non siliceo, ad alt. 1200-2000 m, junio florens: in monte Tissouka, prope Bab Tarigouen, Bab Amegas, etc." – Lectotype (designated here): [Morocco] "In Atlante rifano: Bab Tarigouen, in querceto togae", 1300-1400 m, 17 Jun 1928 (MPU-AfN!, isolectotype: P!).

Note. – Fernandes (1983) assumed on the basis of Maire's description of *A. tuberculata* var. *laevis* ("Achaenia laevia, apice obtusissime marginata; paleae obovato-oblongae sub apice dentato-lacerae") that this variety does not belong to *A. tuberculata* (= *A. pedunculata*). Examination of the original material confirms that the lectotype and one of the other syntype collections ([Morocco] "In Atlante rifano: in abietetis montis Tissouka, solo calcareo", 1800 m, 14 Jun 1928 [MPU-AfN!]) belong to *A. arvensis* subsp. *incrassata.* The last syntype ([Morocco] "In Atlante rifano: Bab Amegas, in querceto togae, solo arenaceo", 1400-1600 m, 17 Jun 1928 [MPU-AfN!]) is *A. pedunculata* var. *pedunculata.* Since the achene characters and the shape of pales given in Maire's description are typical of *A. arvensis,* the name of Maire's variety is lectotypified here by one of the *arvensis* elements. The duplicates in Paris and Montpellier once formed a

single specimen, which was cut apart (lectotype) or dismembered (specimen from Tissouka) after the transfer of Maire's herbarium from Alger to Montpellier, one part being passed on to Paris.

– *Anthemis bourgeaui* auct. [non Boiss. & Reuter 1852]: Sennen & Mauricio, Cat. Fl. Rif Oriental: 60 (1933).

Annual, rarely single-stemmed, usually branched from immediately above the ground and then few- to many-stemmed. Stems rarely erect, usually procumbent to ascending-erect, (1-)6-22(-30) cm tall, basally 1-3 mm in diameter, unbranched and with a single capitulum or branched in the upper half and with up to 6 capitula, light to dark green, basally usually tinged with dark red, sulcate, sparsely to densely appressed hairy with symmetrical or asymmetrical medifixed hairs. Basal and lower cauline leaves (10-)15-45 (-75) mm long and (4-)6-16(-27) mm wide, rarely obovate to narrowly obovate, usually narrowly elliptical in outline, petiolate; petiole (3-)6-23(-45) mm long; base with up to 5-6 pairs of entire or trifurcate teeth; blade 2-3-pinnatipartite to -pinnatisect, with (2-)3-4 pairs of ovate to elliptical lobes; ultimate segments narrowly triangular or linear to narrowly elliptical, 1.1-2.4(-3.7) mm long and 0.35-0.75(-1.0) mm wide, mucronate, sparsely to densely hairy with long, medifixed hairs, sparsely glandular. Upper cauline leaves (8-)15-27(-31) mm long and (3-)6-13(-16) mm wide, linear with entire or dentate margin, or elliptical to obovate in outline, sessile or with a 1-9(-15) mm long petiole; blade pinnatifid to 2-3-pinnatipartite or 2-3-pinnatisect with 1-3 pairs of primary lobes; ultimate segments (0.4-)1.0-2.7(-4.7) mm long and (0.2-)0.4-0.8 mm wide, narrowly triangular, linear or narrowly elliptical, glandular-punctate; base usually with 1-3 pairs of teeth. Peduncles (5-)15-65(-150) mm long and (0.4-)0.8-1.5(-1.8) mm in diameter, becoming conspicuously inflated at maturity and (1.2-)1.5-2.4(3.0) mm in diameter, hollow, sulcate, densely sericeous with long, straight, medifixed hairs. Capitula (10-)16-28(-35) mm in diameter, heterogamous. Involucre (6-)8-13 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, with a conspicuous, green, median strip, and rather wide, pale to light brown, membranous margins, abaxially hairy with long, symmetrically to asymmetrically medifixed hairs; the outermost triangular-ovate to narrowly triangular-elliptical, 2.5-3.6(-4.4) mm long and (0.5-)0.8-1.4 mm wide, acute, laterally with up to 0.4 mm wide, apically with up to 0.6 mm wide membranous margins; the middle ones obovate to narrowly elliptical-obovate, 3.2-4.3(-4.8) mm long and (0.8-)1.2-1.9(-2.2) mm wide, obtuse, apically sometimes lacerate at maturity, with laterally up to 1.0 mm wide,



Fig. 26. *Anthemis arvensis* subsp. *incrassata:* leaf spectrum *(Vogt 10061 & Oberprieler 4509).* – Scale bar = 5 cm.

apically up to 1.0 mm wide membranous margins, hairy only in the distal half; the innermost obovate to narrowly elliptical-obovate, (3.2-)3.6-4.7(-5.0) mm long and (1.1-)1.3-2.0 (-2.2) mm wide, obtuse, apically sometimes lacerate at maturity, laterally with up to 1.0 mm wide, apically with up to 2.3 mm wide membranous margins, hairy only in the distal half. Receptacle conical to broadly conical at anthesis (1.2-4.0 in diam., 1.1-6.0 mm high), conical to broadly conical at maturity (1.7-4.5 in diam., 2.0-7.5 mm high), paleate throughout. Ray florets (6-)9-14(-17) per capitulum, white, female, 5.5-15.0 mm long, limb elliptical to narrowly elliptical [index 1.5-3.1], 4.0-14.0 mm long and 2.5-4.0 mm wide, apically 3-lobed; tube sparsely glandular, 1.5-2.5 mm long and 0.5-0.8 mm wide. Pales usually narrowly obovate to narrowly elliptical-obovate, sometimes narrowly linear [index 3.4-6.6], (2.6-)2.9-3.9(-4.6) mm long, flat to somewhat convex, membranous, apically usually dentate, with a rather rigid midvein forming an up to 1.0 mm long mucro, persistent at maturity. Disc florets yellow, sometimes tinged with red at maturity, hermaphrodite, sparsely glandular, 2.2-3.1 mm long, the lower part strongly inflated at maturity, spongy and tetragonous, 0.8-1.7 mm long and 0.7-0.9 mm wide; apically 5-lobed; lobes triangular, 0.3-0.5 mm long and 0.3-0.4 mm wide, with a 0.1-0.25 mm long dorsal appendages. Achenes of ray florets 1.4-1.9 mm long and 0.5-0.8 mm in diameter, fusiform, with an apical, 0.1-0.2 mm long auricle, adaxially bent, 8-11-ribbed, ridges rather inconspicuous, smooth, with mucilage cells, furrows glandular. Achenes of disc florets strongly heteromorphic; the peripheral ones (1.3-)1.5-2.1 mm long and 0.8-1.6(-1.8) mm in diameter, stout and subcylindrical to broadly obconical, persistent at maturity, c. 10-ribbed; ribs very broad and rounded, smooth, furrows very narrow, apically and basally overgrown by the ribs, with sparse mucilage cells; corona a rounded rim; the inner ones comparatively more slender than the peripheral ones, 1.3-1.8 mm long and 0.6-0.8 mm in diameter, obconical-obovoidal, subtetragonal in cross-section, readily falling off at maturity, 10-ribbed, ribs less thickened than in peripheral ones, smooth; corona a rounded rim.

Chromosome number. – $n = 9$, $2n = 18$, 27 (see discussion in chapter 10).

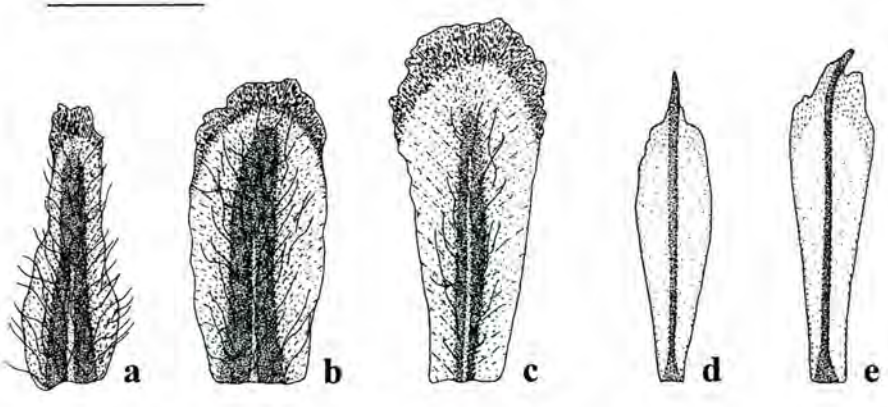


Fig. 27. *Anthemis arvensis* subsp. *incrassata:* (a-c) involucral bracts *(Vogt 9642 & Oberprieler 4078),* (d-e) pales (d, *Vogt 9642 & Oberprieler 4078;* e, *Vogt 9650 & Oberprieler 4086*). – Scale bar = 2 mm.

Distribution and habitat. – *Anthemis arvensis* subsp. *incrassata* is confined to S Europe, SW Asia and NW Africa. According to Meusel & Jäger (1992), the subspecies also occurs sporadically N of the Alps. In N Africa, *A. arvensis* subsp. *incrassata* shows a continuous distribution area only in the extreme NW of Morocco where it is restricted to the Tangier peninsula and the adjacent W and C parts of the Rif mountains. Some isolated collections (made by M. Gandoger and, therefore, object to some uncertainty) come from the Melilla peninsula and the Islas Chafarinas off the NE Moroccan coast. Humphries & al. (1978, sub *A. arvensis*) report on the chromosome number of plants from the Cirque de Jaffar in the High Atlas mountains, but since I have not seen the corresponding voucher specimen, the occurrence of *A. arvensis* in the High Atlas mountains remains questionable. The same is true for indications of *A. arvensis* from the surroundings of Algiers (Algeria) by Quézel & Santa (1963) and Battandier & Trabut (1888-1890), and from gardens in Sousse, Aïn Sebaa, and Gabès (Tunisia) by Pottier-Alapetite (1981). In the case of Quézel & Santa (1963), the indications at least partly ("K3: basse Seybouse") relate to their *"A. arvensis* var. *ubensis"* [comb. inval.], which is here considered to represent an independent species not closely related to *A. arvensis*.

In the limestone mountain ranges of the E part of the Tangier peninsula (Dorsale calcaire) in NW Morocco, *Anthemis arvensis* subsp. *incrassata* was observed in roadside

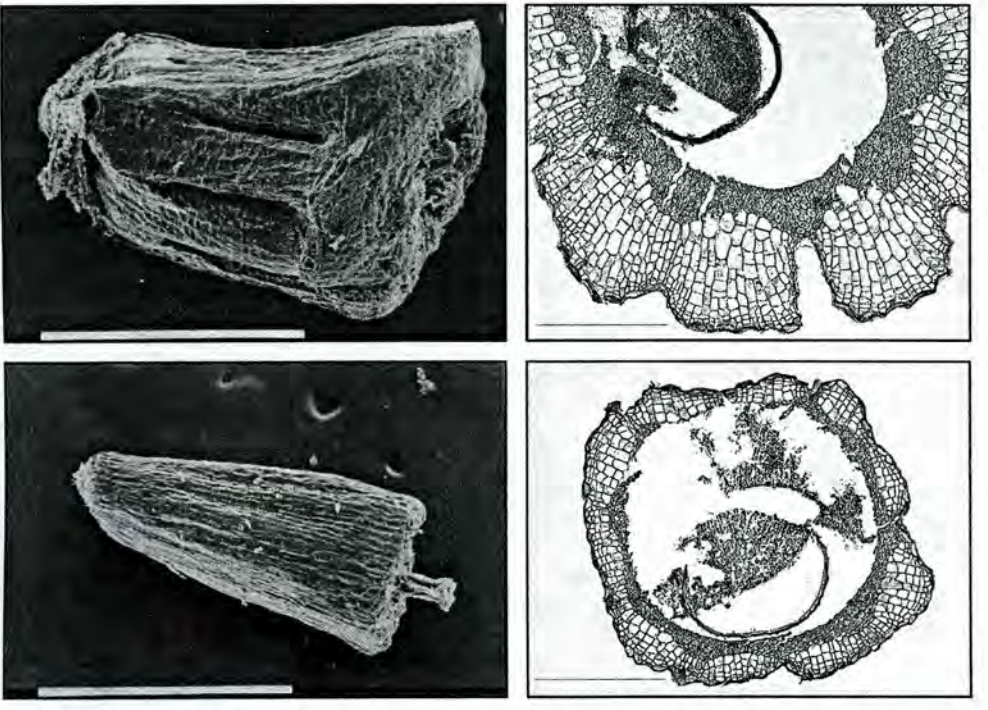


Fig. 28. Micrographs of achenes of *Anthemis arvensis* subsp. *incrassata (Mejías & Silvestre 359/93)*. Upper row: achene of peripheral disc floret; lower row: achene of central disc floret. – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

habitats and arable fields between 300 m and 1200 m, growing together with annuals or biennials like *Pallenis spinosa* (L.) Cass. subsp. *spinosa, Biscutella didyma* L., *Erodium salzmannii* Delile, *Euphorbia segetalis* L., *Galactites tomentosa* Moench, *Galium verrucosum* Huds., *Geranium molle* L., *Hedypnois cretica* (L.) Dum.-Cours., *Medicago polymorpha* L., *Asteriscus aquaticus* (L.) Less., *Reichardia picroides* (L.) Roth, *Scandix pecten-veneris* L., *Senecio leucanthemifolius* var. *major* Ball, *Silene colorata* Poir., and *Urtica membranacea* Poir. In the W and C Rif mountains, where the species ascends to 1900 m, it is often found growing as a weed in fields of *Cannabis sativa* L., in mountain pastures, and on grassy clearings in *Cedrus atlantica* and *Abies maroccana* forests.

Variation and taxonomy. – *Anthemis arvensis* subsp. *incrassata* is easily recognised by its peduncles that become strongly inflated at maturity, the conical receptacles, and especially by the extremely stout, subcylindrical achenes of its peripheral disc florets with their broad and smooth ribs, the narrow furrows between the ribs, and the corona formed by a rounded rim. The subspecies is characterised by an extreme phenotypic plasticity, especially relating to length of stems and to the degree of branching, which are strongly influenced by the availability of water. While in dry habitats unbranched, monocephalous plants with stems not exceeding 1-5 cm may sometimes be observed, plants growing under more humid conditions show a vigorous development and have comparatively long and strongly branched stems.

Specimens seen. – [Spain, Melilla] Maroc, ins. Zafarines, Apr 1908, *Gandoger* (G). – [Morocco, Al Hoceima] Atlas Rifain, Targuist, à Bab-Izugar, sol schisteux, 1230 m, [34°58′N, 4°20′W], 20 Jun 1933, *Sennen & Mauricio* (BC-Sennen 819900). Rif central: Djebel Tidirhine, surroundings of forest house "Bab-Chiker" c. 5 km above Tetla Ketama on track to Djebel Tidirhine, fields of Cannabis sativa, 1550 m, 34°53′N, 4°35′W, 20 Jun 1992, *Vogt 9592 & Oberprieler 4028* (B; G; Herb. Oberprieler; Herb. Vogt). Rif, Mont Tidighin, [34°52′N, 4°28′ W], 21 Jun 1934, *Sennen & Mauricio* (MPU-AfN). – [Chaouèn] Chefchaouen, Targha, ascenso por la rambla, sembrados, y en altura, pizarras, 35°22′N, 5°02′W, 3-270 m, 7 Apr 1995, *Caruz & al. 5033/95* (SEV). Chefchaouen, Targha, ascenso por la rambla, sembrados, y en altura, pizarras, 3-270 m, 35°22′N, 5°02′W, 7 Apr 1995, *Caruz & al. 4942/95* (SEV). Chafchaouene, Djebel Tassaot, calizas, pinsapar, 35°17′N, 5°07′W, 1550 m, 22 Jul 1995, *Mateos & al. 6920/95* (SEV). Rif occidental: Djebel Tassaot, 7 km above Talembote on track to Djebel Tassaot, cultivated fields on limestone, 1195 m, 35°17′N, 5°08′W, 25 Jun 1992, *Vogt 9650 & Oberprieler 4086* (Herb. Oberprieler). Western Rif mountains, Oued Laou, limestone cliffs near the village Tagzout Bani Hassan, 5.3 km NE of reservoir of Oued Laou, 1.2 km NE of the bridge over Oued Laou along the road between Chafchaouene and El-Tleta-de-Oued-Laou, 350 m, 35°16′N, 5°15′W, 22 Apr 1993, *Vogt 10066 & Oberprieler 4514* (B). Chefchaouen, Talembote, Jbel Tazaut, meadows in the *Abies pinsapo* forest, 35°16′N, 5°07′W, 1550 m, 2 Jul 1993, *Mejías & Silvestre 338/93* (SEV). Chefchaouene, Talembote, carril al Djebel Tassaot, calizas, maizal, 35°15′N, 5°11′W, 600 m, 22 Jul 1995, *Mateos & al. 6961/95* (SEV). Chefchaouene, Talembote, carril al Djebel Tassaot, calizas, maizal, 35°15′N, 5°11′W, 600 m, 22 Jul 1995, *Mateos & al. 6960/95* (SEV). Rif occidental: Djebel Tassaot, 14 km above Talembote on track to Djebel Tassaot, limestone, forest of *Abies maroccana*, 1600 m, 35°15′N, 5°05′W, 25 Jun 1992, *Vogt 9642 & Oberprieler 4078* (B; Herb. Oberprieler; Herb. Vogt). Western Rif mountains, Chefchaouene, camping site above the town, 730 m, 35°10′N, 5°15′W, 30 May 1993, *Vogt 12037* (B; G; K; Herb. Oberprieler; Herb. Vogt). Rif occidental: Djebel Talamssantane, 14 km NE Bab Taza on track to Djebel Talamssantane, around and above forest-house, forests of *Abies maroccana* and *Cedrus atlantica*, S-facing limestone cliffs, 1765-1900 m,

35°09'N, 5°12'W, 26 Jun 1992, *Vogt 9673 & Oberprieler 4110* (B; G; Herb. Oberprieler; Herb. Vogt). In Atlante rifano: in abietis montis Tissouka, solo calcareo, 1800 m, [35°07'N, 5°10' W], 14 Jun 1928, *Maire* (MPU-AfN; P). - In Atlante rifano: Bab Tarigouen, in querceto togae, 1300-1400 m, [35°07'N, 5°10'W], 17 Jun 1928, *Maire* (MPU-AfN; P). Rif occidental: Djebel Talamssantane, 10 km NE Bab Taza on track to Djebel Talamssantane, mixed forest of *Quercus rotundifolia* and *Quercus alpestris*, limestone rocks, 1420 m, 35°06'N, 5°11'W, 26 Jun 1992, *Vogt 9652 & Oberprieler 4088* (B; Herb. Oberprieler; Herb. Vogt). Chefchaouen, Valle de Ametrasse, cerca de Cherafat, calizas, 35°06'N, 5°06'W, 900-1350 m, 2 May 1995, *Mateos & al. 5870/95* (SEV). Chefchaouen, Bab Berret, Jbel Tizirane, open areas on mixed *Quercus* and *Cedrus* forest, 35°02'N, 4°55'W, 1300 m.s.m., 3 Jul 1993, *Mejías & Silvestre 359/93* (SEV). Rif occidental: 13 km W Bab Berret on road P 39 between Ketama and Chefchaouene, ponds and surrounding arable fields, 1450 m, 35°01'N, 4°59'W, 25 Jun 1992, *Vogt 9632 & Oberprieler 4068* (B; Herb. Oberprieler; Herb. Vogt). Tetuan - Xauen, Kleine Talsperre südwestlich des Jebel Tisirene, [35°01'N, 4°59' W], 31 Aug 1977, *Krach 1161* (MSB). – [Nador] Rif: Monts de Kebdana, [35°00'N, 2°40'W], 20 Jun 1934, *Sennen & Mauricio* (MPU-AfN). Maroc, Cabo Tres Forcas, Apr 1908, *Gandoger* (G). – [Ouezzane] Oezzan, 6.1909, *Gandoger* (G). – [Tetouan] Tanger Peninsula, road 8303 from Souk-Tleta-Taghramet to Ceuta (Sebta), limestone rocks above Souk-Tleta-Taghramet and around the quarry not far from the summit of the pass, 450-500 m, 35°48'N, 5°27'W, 17 Apr 1993, *Vogt 9854 & Oberprieler 4302* (B; Herb. Oberprieler; Herb. Vogt). Tanger peninsula, Monts de Beni Hosmar S Tetouan, road from Tetouan / Toretta to transmitting installation on Djebel Bou Zeïtoune, limestone cliffs, 1200 m, 35°30'N, 5°21'W, 30 May 1993, *Vogt 12038* (Herb. Vogt; Herb. Oberprieler). Tanger Peninsula, Monts de Beni Hosmar S Tetouan, limestone cliffs above Tetouan / Toretta along the road to transmitting installation on Djebel Bou Zaïtoune, 300 m, 35°30'N, 5°20'W, 21 Apr 1993, *Vogt 10055 & Oberprieler 4503* (B; Herb. Oberprieler; Herb. Vogt). Tanger Peninsula, Monts de Beni Hosmar S Tetouan, track from Tetouan / Toretta to transmitting installation on Djebel Bou Zaïtoune, limestone cliffs, 1200 m, 35°30'N, 5°21'W, 21 Apr 1993, *Vogt 10001 & Oberprieler 4449* (B; Herb. Oberprieler). Tanger Peninsula, Monts de Beni Hosmar S Tetouan, road from Tetouan / Toretta to transmitting installation on Djebel Bou Zaïtoune, above *Pinus* plantation, limestone cliffs, 600-750 m, 35°30'N, 5°20'W, 21 Apr 1993, *Vogt 10050 & Oberprieler 4498* (B). Tanger Peninsula, road P28 between Tetouan and Chefchaouene near the reservoir 14 km S Tetouan, roadside, 35°27'N, 5°23'W, 22 Apr 1993, *Vogt 10061 & Oberprieler 4509* (B; G; Herb. Oberprieler; Herb. Vogt). – [Not located] E Barbarie Vahl, Planta distincta, *Gouan* (K). - Prairie humide à Ouka-el-Melaïb, 1330 m, 4 Jul 1961, *Sauvage* (MPU-Sauvage).

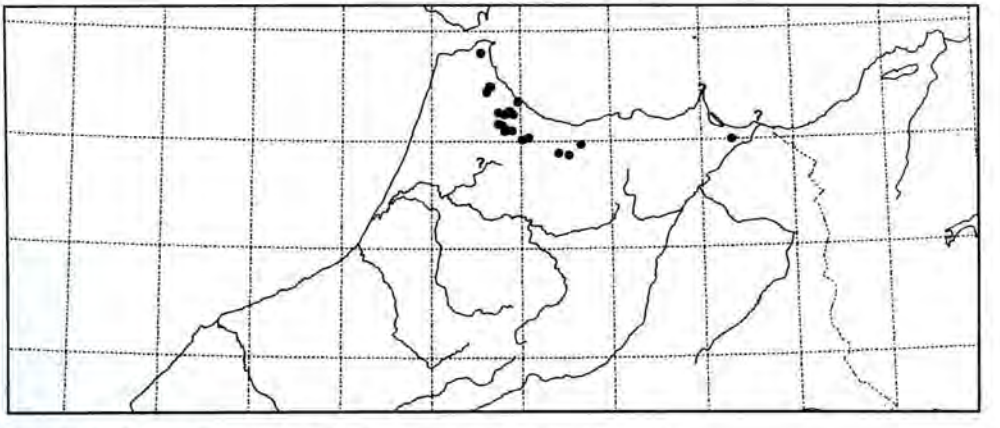


Fig. 29. N African distribution of *Anthemis arvensis* subsp. *incrassata*.

b. ***Anthemis*** ser. ***Bourgaeinianae*** Yavin in Israel J. Bot. 21: 176 (1972). – Type: *Anthemis bourgaei* Boiss. & Reuter.

Annuals. Stems procumbent to ascending-erect. Leaves obovate to narrowly obovate, 2-3-pinnatipartite; ultimate segments elliptical to linear in outline, mucronate. Peduncles remaining slender at maturity, sometimes becoming slightly inflated. Capitula radiate. Involucre hemispherical, not umbonate at maturity. Involucral bracts moderately to densely hairy, sometimes glabrous (*A. monilicostata* Pomel), with narrow to rather broad light to dark brown, membranous margins; the outer ones triangular, the inner ones obtuse to acuminate. Ray florets white, female. Receptacle hemispherical to conical at maturity. Pales narrowly elliptical in outline, sometimes nearly subulate, caducous at maturity. Disc florets yellow, hermaphrodite; the basal part usually spongy and inflated at maturity. Achenes of disc florets homomorphic or moderately to strongly heteromorphic, subcylindrical or obconical to narrowly obconical, usually readily falling off at maturity, sometimes those of peripheral disc florets persistent; ribs distinct, smooth or tuberculate, coinciding with ribs of the mesocarpic sclerenchyma cylinder (sclerenchyma cylinder of achenes of central disc florets often reduced and pericarp rather thin and translucent); corona absent or an adaxially protracted auricle.

Basic chromosome number. – $x = 9$.
Ploidy level. – $2x$.

Taxonomy. – The SW Spanish endemic *Anthemis bourgaei,* after which the series is named, is rather poorly known since only few herbarium specimens dating from the 19th century exist. For a long time, *A. bourgaei* was considered to be related to *A. cotula,* especially because of its annual habit and its strongly tuberculate achenes. Fernandes (1976) lists the species along with *A. cotula, A. pseudocotula,* and *A. lithuanica* under *A.* sect. *Maruta.* Talavera (in Valdés & al. 1982) considers *A. bourgaei* as an annual segregate of *A. tuberculata* (= *A. pedunculata*), a species that usually grows as a perennial herb but may sometimes flower already in the first year. Benedí i González (1987), on the other hand, found no evidence for Talavera's suggestion and followed Yavin (1972), who treated the species in *A.* sect. *Anthemis.*

Members of *Anthemis* sect. *Bourgaeinianae* are characterised by pales that fall off very easily, while those of other *Anthemis* species tend to persist on the receptacle even after dissemination of the achenes.

2. ***Anthemis mauritiana*** Maire & Sennen in Bull. Soc. Hist. Nat. Afrique N. 24: 217 (1933) ≡ *A. mauritii* Maire & Sennen in Sennen, Diagn. Nouv. Pl. Espagne Maroc 1928-1935: 157, 234 (1936), nom. illeg. – Ind. loc.: "Hab. in arenis maritimis ad promontorium Tres Forcas ad septentrionem urbis Melilla (Sennen)." – Lectotype (designated here): [Morocco] "Peninsula de Cabo Tres Forcas à Casablanca", 12 Jun 1931, *Sennen & Mauricio* (MPU-AfN!; isolectotype: BC-Sennen 819907!).

– *Anthemis mauritii* Sennen ex Pau in Cavanillesia 5: 176 (1932), nom. nudum.

Annual, rarely single-stemmed, usually branched from immediately above the ground and then few- to many-stemmed. Stems procumbent to ascending-erect, rarely erect, (3-)15-35(-47) cm tall, basally 0.5-3.0(-4.5) mm in diameter, usually branched in the upper half, with (1-)2-11(-25) capitula, dull green, basally sometimes tinged with red, sulcate, sparsely to densely appressed tomentose. Basal and lower cauline leaves (13-)16-33(-56) mm long and (4-)7-14(-25) mm wide, obovate to narrowly obovate or elliptical to narrowly elliptical in outline, petiolate; petiole (3-)6-16(-35) mm long; base without teeth, rarely with 1-3 pairs of teeth; blade 2-3-pinnatipartite to -pinnatisect with 2-3 pairs of elliptical to obovate primary lobes; ultimate segments linear or elliptical to obovate, (0.6-)0.9-1.7(-2.4) mm long and 0.4-1.4 mm wide, densely hairy, glandular-punctate. Upper cauline leaves (5-)8-20(-35) mm long and 1-12(-20) mm wide, linear with entire or dentate margin, or elliptical to obovate in outline with 1-7(-10) mm long petiole and 1-2-pinnatipartite to pinnatisect lamina with 1-3 pairs of primary lobes; ultimate segments 0.7-3.3 mm long and (0.4-)0.7-1.6 mm wide, linear or elliptical, sometimes triangular, glandular-punctate; base usually with 1-3 pairs of teeth. Peduncles (5-)15-40(-60) mm long and 0.5-1.2 mm in diameter, remaining slender or becoming only slightly incrassate at maturity, sulcate, densely ± appressed tomentose. Capitula (14-)18-27(-35) mm in diameter, heterogamous. Involucre (5-)7-11 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, abaxially densely appressed tomentose, with a green longitudinal strip; the outermost triangular-elliptical to narrowly triangular-elliptical,



Fig. 30. *Anthemis mauritiana* subsp. *mauritiana:* general habit (3 Jul 1934, *Sennen & Mauricio*). – Scale bar = 10 cm.

(1.2-)2.0-3.0 mm long and 0.6-1.3 mm wide, acute, with rather narrow (0.1-0.3 mm), laterally pale, apically pale or brown, membranous margins; the middle ones elliptical-obovate to narrowly elliptical-obovate, (2.9-)3.2-4.2(-4.6) mm long and 1.1-1.4 (-1.6) mm wide, acute to obtuse, laterally with 0.1-0.5 mm wide pale, apically with 0.3-0.9 mm wide brown, membranous margins; the innermost elliptical-obovate, usually narrowly so, (2.8-)3.3-4.4(-4.8) mm long and 1.0-1.6 mm wide, acute to obtuse, laterally with 0.2-0.6 mm wide pale, apically with 0.2-1.0 mm wide brown, rarely pale, membranous margins, usually appressed tomentose only in the distal half. Receptacle globose to cylindrical at anthesis (1.8-2.2 in diam., 2.2-2.4 mm high), cylindrical to ovate at maturity (3.0-3.5 in diam., c. 3.5 mm high), paleate throughout. Ray florets 7-13 per capitulum, white, female, (6.2-)8.0-11.7(-14.7) mm long; limb elliptical to narrowly elliptical [index (1.4-)1.7-2.4 (-2.7)], (4.7-)6.3-9.6(-12.4) mm long and (2.5-)3.1-4.6(-5.5) mm wide, apically 3-lobed; tube sparsely glandular, (1.0-)1.6-2.2(-2.5) mm long and (0.3-)0.5-0.9 mm wide. Pales narrowly linear to nearly subulate, (2.6-)2.9-3.8(-4.4) mm long; the peripheral ones 0.3-0.7 mm wide and apically hairy; the central ones 0.2-0.4 mm wide, tapering basally into a 0.2-0.3 mm wide point, flat to somewhat convex, membranous, glandular, caducous at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 2.3-3.0 mm long; the basal part moderately inflated, spongy and subtetragonous at maturity, 1.0-1.6 mm long and 0.5-0.7 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular, with a 0.1-0.25 mm long dorsal appendage. Achenes of ray florets 1.4-2.0 mm long and 0.5-0.6 mm in diameter, fusiform to obovoidal, contracted below an apical, ± dentate, c. 0.1 mm long auricle formed by the slightly protruding ribs, adaxially bent, 9-11-ribbed; ribs abaxially more conspicuous than adaxially, smooth to slightly tuberculate, with rectangular or elongate mucilage cells; furrows with glands. Achenes of disc florets strongly heteromorphic; the peripheral ones 1.4-2.0 mm long and 0.8-1.1 mm in diameter, stout and subcylindrical to broadly obconical, persistent at maturity, 10-ribbed; ribs broad and rounded, smooth to slightly tuberculate with a row of ± elongate mucilage cells; furrows with yellow glands; corona absent or, due to the apically protruding ribs, a crenulate rim; the central ones more slender than the peripheral ones, 1.1-1.8 mm long and 0.5-0.7 mm in diameter, narrowly obconical-obovoidal, readily falling off at maturity, 10-ribbed; ribs narrower and less rounded than in peripheral achenes, smooth to slightly tuberculate with a row of ± elongate mucilage cells; pericarp rather thin and translucent in the furrows, with glands; corona absent or a crenulate rim.

Chromosome number. – $n = 9$; $2n = 18$.

Distribution and habitat. – *Anthemis mauritiana* is endemic to the Mediterranean coast of NE Morocco, between the Melilla peninsula and the frontier with Algeria (Fig. 32). Some specimens also come from the extreme NW corner of Algeria. The species grows in sandy habitats near the sea, on adjacent stony slopes, and on dunes along near-by rivers and wadis.

Variation and taxonomy. – In view of its annual habit, caducous pales, and peduncles remaining slender at maturity, *Anthemis mauritiana* is clearly a member of *Anthemis* ser. *Bourgaeinianae*. It differs from *A. monilicostata* by its strongly heteromorphic achenes

with smaller and less protruding mucilage cells, and its moderately to strongly hairy involucral bracts with comparatively narrow, pale to light brown, membranous margins. The narrowly elliptical to nearly subulate pales observed in *A. mauritiana* distinguish the species from its allies *A. monilicostata* and *A. stiparum* subsp. *stiparum*. From *A. stiparum* subsp. *sabulicola*, which it approaches morphologically by the shape of its pales, it differs by its more vigorous growth and strongly heteromorphic, smooth achenes. The latter distinguish it also from the SW Spanish endemic *A. bourgaei*, which is characterised by strongly tuberculate achenes.

Anthemis mauritiana shows considerable variation in leaf dissection. Specimens from the W part of its distribution area (Melilla Peninsula) tend to have less strongly dissected leaves; the basal and lower cauline leaves are usually 1-2-pinnatipartite to -pinnatisect, the upper cauline leaves usually pinnatipartite to pinnatisect, the uppermost ones entire. Plants from the maritime sands of the coast between Saidia in Algeria and Ras-el-Ma in Morocco, in the E part of the species' distribution area, have more strongly dissected leaves: the basal and lower cauline leaves are usually 2-3-pinnatipartite to -pinnatisect, and the upper cauline leaves usually 2-pinnatisect to 2-pinnatipartite. Variation in leaf dissection is paralleled to some extent by the length of ray florets, which is (6.2-)6.9-9.5(-10.5) mm in plants from the Mellila Peninsula but (6.7-)8.8-12.1(-14.7) mm in plants from around Ras-el-Ma and Saidia. Mainly based on the differences in leaf dissection, Maire (1938) acknowledged plants from around Saidia as an independent variety placed under *A. pedunculata*, but which the characteristic heteromorphic achenes of disc florets along with the caducous pales identify as belonging to *A. mauritiana*. A study of PMC meiosis in plants of the Saidia and Ras-el-Ma populations revealed no disturbances. Bivalent formation was regular and does not support the idea of a hybrid origin of *A. mauritiana* the vigorous growth of the plants and the occurrence of teeth at the base of the leaves – typically lacking in plants from the Melilla Peninsula and in the other members of *A.* ser. *Bourgaeinianae* – might suggest. By consequence, the Saidia and Ras-el-Ma populations are treated here as a subspecies of *A. mauritiana*.

Key to subspecies

1. Basal and lower cauline leaves 1-2-pinnatipartite to -pinnatisect, upper cauline leaves pinnatipartite to pinnatisect, the uppermost ones often entire; capitula (14-)17-22 mm in diameter, ray florets (6.2-)6.9-9.5(-10.5) mm long ... 2a. *A. mauritiana* subsp. *mauritiana*
– Basal and lower cauline leaves 2-3-pinnatipartite to -pinnatisect, upper cauline leaves 2-pinnatipartite to -pinnatisect, even the uppermost ones at least dentate or pinnatifid; capitula (19-)21-29(-35) mm in diameter; ray florets (6.7-)8.8-12.1(-14.7) mm long ..... 2b. *A. mauritiana* subsp. *faurei*

2a. ***Anthemis mauritiana*** Maire & Sennen subsp. ***mauritiana***

Exs.: Sennen, Pl. Esp. 1934: n° 9409 (sub *"Anthemis mauritii"*); Duffour, Soc. Franç. 1934: n° 7198 (sub *"A. mauritii"*); Behr, Pl. Rar. Nov.: n° 46-1939 (sub *"A. mauritii"*).

Stems (2-)8-20(-25) cm tall, basally (0.5-)0.9-1.9(-3.0) mm in diameter, usually with 1-8(-15) capitula. Basal and lower cauline leaves (13-)20-33(-43) mm long and (4-)8-16 mm wide, obovate to narrowly obovate or elliptical to narrowly elliptical in outline, petiolate; petiole (3-)7-17(-23) mm long; base usually without teeth; blade 1-2-pinnatipartite to -pinnatisect; ultimate segments broadly elliptical to elliptical-obovate, (0.8-)1.1-1.7(-2.0) mm long and (0.7-)0.9-1.2(-1.4) mm wide, apically blunt to inconspicuously mucronate. Upper cauline leaves (5-)8-17(-20) mm long and (1-)3-9 mm wide, obovate to spatulate with entire or dentate margins, or elliptical to obovate in outline with up to 4-8(-10) mm long petiole and pinnatifid to pinnatipartite lamina; base usually without teeth; ultimate segments (0.7-)1.0-2.1(-3.3) mm long and 0.7-1.3(-1.6) mm wide, broadly elliptical to broadly obovate, sometimes triangular. Capitula (14-)17-22 mm in diameter. Involucre (5-)7-9(-10) mm in diameter. Involucral bracts in 3 rows; the outermost (2.0-)2.3-3.0 mm long and (0.6-)0.8-1.3 mm wide, with laterally 0.1-0.2 mm wide, apically 0.1-0.4 mm wide membranous margins; the middle ones (2.9-)3.2-4.0(-4.3) mm long and 1.1-1.5 mm wide, with laterally 0.1-0.3 mm wide, apically 0.3-0.6 mm wide membranous margins; the innermost (2.8-)3.3-4.1 mm long and (0.9-)1.1-1.4(-1.6) mm wide, with laterally 0.2-0.3 mm wide, apically 0.2-0.7 mm wide membranous margins. Ray florets 7-13 per capitulum, (6.2-)6.9-9.5(-10.5) mm long; limb elliptical [index 1.6-2.1], (4.7-)5.4-7.7(-8.5) mm long and 2.8-4.0(-4.4) mm wide; tube (1.0-)1.4-2.0 mm long and 0.6-0.9 mm wide. Pales (2.6-)2.8-3.4(-3.6) mm long; the peripheral ones 0.3-0.6 mm wide; the central ones 0.2-0.4 mm wide.

Chromosome number. – Unknown; pollen dimensions are intermediate between values typical for diploids and those for tetraploids (see chapter 11).

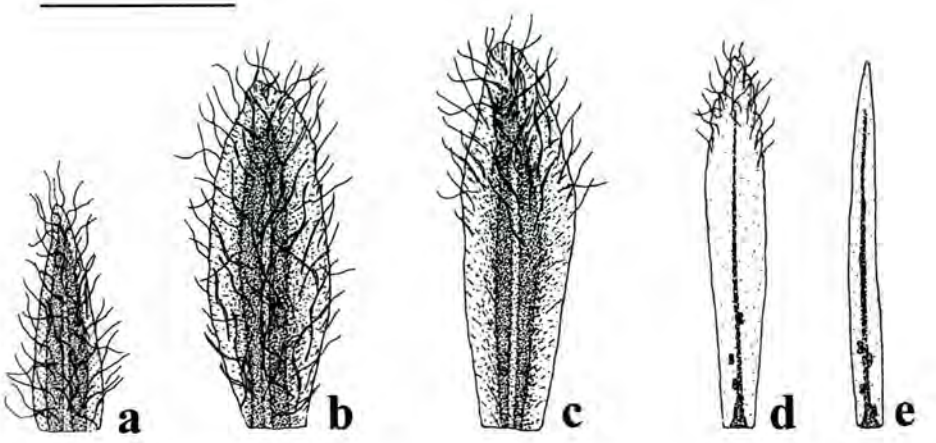


Fig. 31. *Anthemis mauritiana* subsp. *mauritiana:* (a-c) involucral bracts, (d) outer pale, (e) inner pale (3 Jul 1934, *Sennen & Mauricio*). – Scale bar = 2 mm.

Distribution and habitat. – Restricted to the W and N coasts of the Melilla Peninsula in NE Morocco, where it is found growing in maritime habitats like dunes and sandy pine groves near the sea (Fig. 32).

Specimens seen. – [Morocco, Nador] Târia-n-Tît, Dchar Rana, 35°23′36″N, 3°00′40″W, 5-15 m, playas y roquedos marítimos, 7 Jun 1993, *Molero 3022/5 & al.* (SEV). Península de Cabo Tres Forcas á Casablanca, [35°24′N, 3°01′W], 12 Jun 1931, *Sennen & Mauricio* (MPU-AfN; BC-Sennen 819907). Ismoar, sables de la côte (Beni-Sicar), [35°18′N, 3°03′W], 3 Jun 1934, *Sennen & Mauricio, n° 9409* (MPU-AfN; BC 80959; BC-Sennen 819943; MA 127288; G). Ismoar; sables de la côte (Beni-Sicar), Endemisme marocain sténotype, [35°18′N, 3°03′W], 3 Jun 1934, *Sennen & Mauricio, n° 7198* (MPU-AfN; G; MA 470216; BC 123303; BC 83033; BC-Sennen 819908). Rif: Yazanen, [35°17′N, 3°06′W], 1932, *Sennen* (MPU-AfN; P). Costa entre l'azzanene y Sidi Messaoud, 35°17′06″N, 3°04′21″W, 5-40 m, roquedos calizos del litoral, campos salinizados y playes, 5 May 1994, *Montserrat 4601/5 & al.* (SEV). Rif oriental, Yazananen, [35°15′N, 3°07′W], Apr 1932, *Sennen & Mauricio, n° 46-1939* (B; G). Yazanen, Hidum, Sammar, dunes, [35°15′N, 3°07′W], 4. May 1932, *Sennen & Mauricio, n° 8430* (MPU-AfN; MA 1272287, 161486, 127289, B; G; BC 136270; BC-Sennen 819909). – [Cultivated] c. Melilla, culta ex Semino in H.B. Montj, *Sennen* (BC 79398).

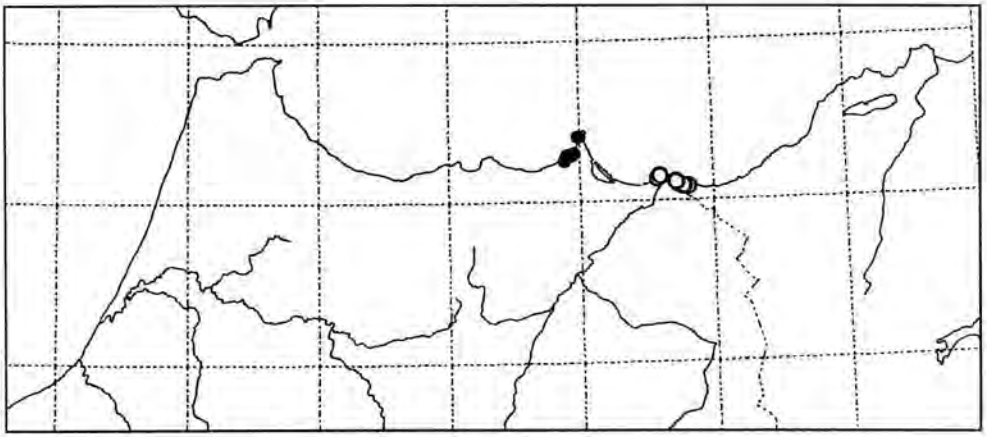


Fig. 32. Total distribution of *Anthemis mauritiana* (● subsp. *mauritiana*, ○ subsp. *faurei*).

2b. ***Anthemis mauritiana*** subsp. ***faurei*** (Maire) Oberprieler, **comb. nov.** ≡ *A. pedunculata* var. *faurei* Maire in Bull. Soc. Hist. Nat. Afrique N. 29: 423 (1938). – Ind. loc.: "Sables du littoral des confins algéro-marocains méditerranéens: Port-Say! (Emberger, A. Faure); Sa'dia! et au N de Berkane! (A. Faure)." – Lectotype (designated here): [Morocco] "Plage de Saïdia, lieux sablonneux", 9 May 1937, *Faure* (MPU-AfN!; isolectotypes: P!, MPU-AfN!).

– *Anthemis sabulicola* auct. [non Pomel 1874]: Sennen, Pl. Esp. 1932, n° 8431; Sennen & Mauricio, Cat. Fl. Rif Oriental: 59 (1933).

Exs.: Sennen, Pl. Esp. 1932: n° 8431 (sub *"Anthemis sabulicola"*).

Stems (10-)15-33(-47) cm tall, basally (0.8-)1.0-2.8(-4.5) mm in diameter, usually with 2-12(-25) capitula. Basal and lower cauline leaves (19-)24-41(-56) mm long and

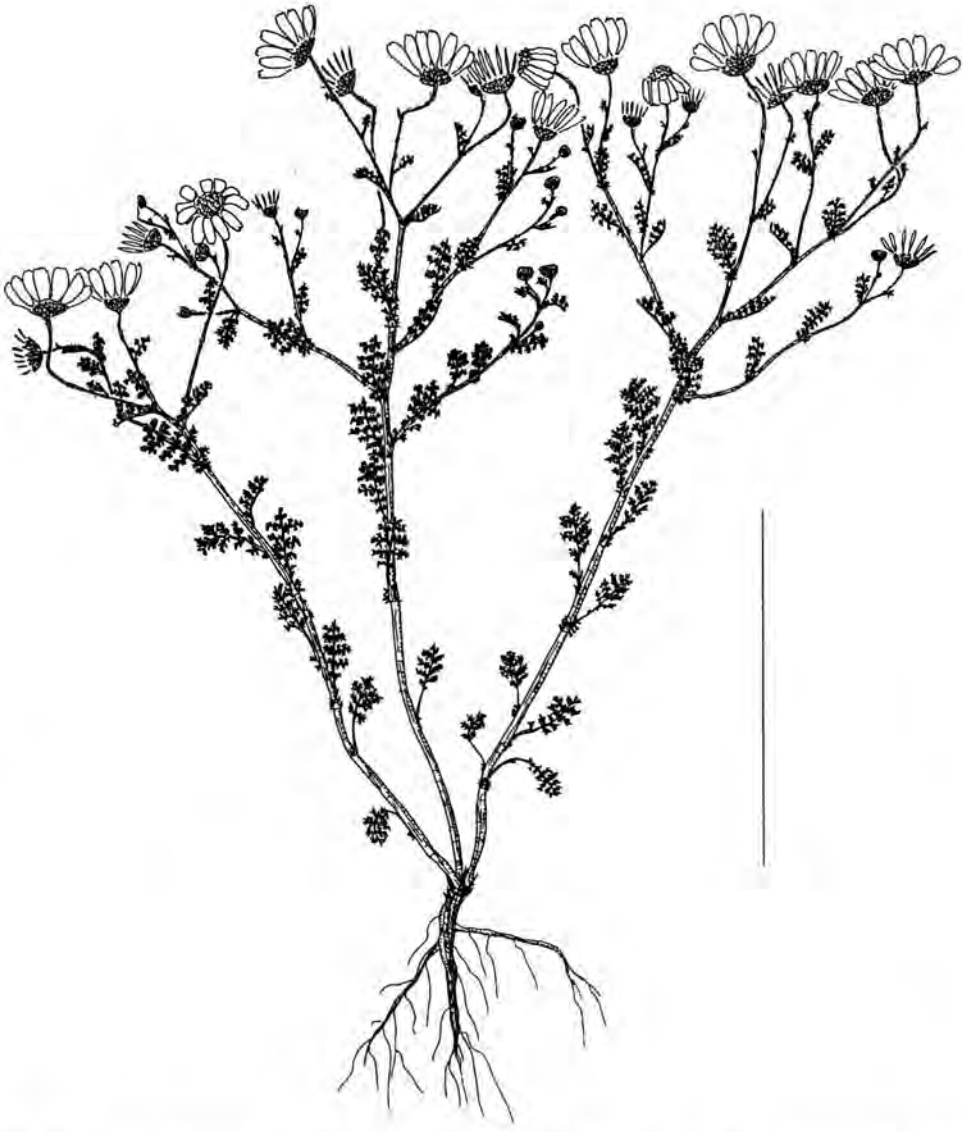


Fig. 33. *Anthemis mauritiana* subsp. *faurei:* general habit *(Vogt 10872 & Oberprieler 5320).* – Scale bar = 10 cm.

(7-)9-18(-25) mm wide, obovate to narrowly obovate or elliptical to narrowly elliptical in outline, petiolate; petiole 9-20(-35) mm long; base with or without teeth; blade 2-3-pinnatipartite to -pinnatisect; ultimate segments elliptical to elliptical-obovate, (0.8-)1.0-1.5 (-2.4) mm long and (0.4-)0.6-0.9(-1.0) mm wide, usually conspicuously mucronate. Upper cauline leaves (8-)11-25(-35) mm long and (2-)5-13(-20) mm wide, elliptical to obovate in outline, sessile or with up to 4-10 mm long petiole, 1-2-pinnatifid to -pinnatipartite lamina; base with or without teeth; ultimate segments (0.7-)0.9-1.3(-1.6) mm long and (0.4-)0.6-0.9 mm wide, elliptical to broadly elliptical or obovate. Capitula (19-)21-29(-35) mm in diameter. Involucre 9-11 mm in diameter. Involucral bracts in 3 rows; the outermost (1.2-)1.9-3.0 mm long and 0.9-1.3 mm wide, with laterally 0.1-0.2 mm wide, apically 0.1-0.3 mm wide membranous margins; the middle ones (3.3-)3.5-4.4(-4.6) mm long and 1.2-1.6 mm wide, with laterally 0.2-0.5 mm wide, apically 0.4-0.9 mm wide membranous margins; the innermost (3.1-)3.6-4.8 mm long and (1.0-)1.1-1.5(-1.6) mm wide, with laterally 0.2-0.6 mm wide, apically 0.4-1.0 mm wide membranous margins. Ray florets (9-)10-13 per capitulum, (6.7-)8.8-12.1(-14.7) mm long; limb elliptical to narrowly elliptical [index (1.4-)1.8-2.5(-2.7)], (4.8-)6.9-10.0(-12.4) mm long and (2.5-)3.3-4.7(-5.5) mm wide; tube (1.5-)1.8-2.2(-2.5) mm long and 0.6-0.8(-0.9) mm wide. Pales (2.7-)3.1-4.0(-4.4) mm long; the peripheral ones 0.3-0.7 mm wide; the central ones 0.2-0.4 mm wide.

Chromosome number. – $n = 9$ (see discussion in chapter 10).



Fig. 34. *Anthemis mauritiana* subsp. *faurei:* leaf spectrum *(Vogt 10872 & Oberprieler 5320).* – Scale bar = 4 cm.

Distribution and habitat. – *Anthemis mauritiana* subsp. *faurei* is restricted to the NE corner of Morocco, where it grows along the Mediterranean coast between the Ras-el-Ma (= Cabo del Agua) and the Algerian frontier, with some localities also on the adjacent Algerian territory (Fig. 32). In the surroundings of the mouth of Oued Moulouya c. 10 km W of Saidia (NE Morocco) it was found to grow in large numbers in dune habitats together with *Aeluropus littoralis* (Gouan) Parl., *Anacyclus* × *valentinus* L., *Arthrocnemum macrostachyum* (Moric.) Moris, *Brachypodium distachyon* (L.) P. Beauv., *Bromus rigidus* Roth, *Catapodium hemipoa* (Delile ex Spreng.) Laínz, *Centaurea sonchifolia* L., *Cynodon dactylon* (L.) Pers., *Delphinium ambiguum* L. (= *D. halteratum* Sm.), *Ephedra fragilis* Desf., *Erodium laciniatum* (Cav.) Willd., *Frankenia laevis* L., *Hedypnois cretica* (L.) Dum.-Cours., *Lagurus ovatus* L., *Linaria munbyana* Boiss. & Reuter, *Lobularia libyca* (Viv.) Webb & Berth., *Loeflingia hispanica* L., *Lolium rigidum* Gaud., *Medicago littoralis* Rohde ex Loisel., *Asteriscus aquaticus* (L.) Less., *Ononis variegata* L., *O. antennata* subsp. *massesylia* (Pomel) Şirj., *Parapholis incurva* (L.) C. E. Hubb., *Paronychia argentea* Lam., *Plantago albicans* L., *Polypogon maritimus* Willd.,

Reichardia tingitana (L.) Roth, *Rostraria pumila* (Desf.) Tzvel., *Salsola kali* L., *Schismus barbatus* (L.) Thell., *Senecio leucanthemifolius* Poir. var. *leucanthemifolius*, *Silene colorata* Poir., *S. ramosissima* Desf., and *Sonchus oleraceus* L.

Specimens seen. – [Morocco, Nador] Cabo de Agua, [35°09′N, 2°25′W], Apr 1908, *Gandoger* (G). Mediterranean coast NW Oujda, Ras-el-Ma, surroundings of lighthouse at Ras Kebdana, maritime sands, 40 m, [35°09′N, 2°25′W], 5 May 1993, *Vogt 10927 & Oberprieler 5375* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). Rif: Cabo del Agua, [35°08′N, 2°26′W], 1932, *Sennen* (MPU-AfN). Kebdana, Cabo de Agua, dunes, [35°08′N, 2°26′W], 25 May 1932, *Sennen & Mauricio, n° 8431* (G; P; BC 136273; BC-Sennen 819946; MA 127295). Cabo de Agua, [35°09′N, 2°25′W], 12 Apr 1929, *Font i Quer* (BC 808318, 808319). – [Oujda] Mediterranean coast W of Saidia, surroundings of the mouth of Oued Moulouya c. 10 km W Saidia, dunes c. 1 km inland, 10 m, [35°07′N, 2°18′W], 5 May 1993, *Vogt 10872 & Oberprieler 5320* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). Berkane, au bord de la mer, Sables maritimes, [35°06′N, 2°17′W], 6 May 1929, *Faure* (MPU-AfN). Between Saidia and Ras el Ma, coastal sand dunes planted with Eucaliptus, 35°05′N, 2°15′W, 3 m, 29 May 1993, *Valdés 429/93 & al.* (SEV). Plage de Saïda, Lieux sablonneux, [35°05′ N, 2°14′W], 9 May 1937, *Faure* (MPU-AfN; P). Env. de Berkane, sables maritimes à Saïdia - Port Say (frontière algérienne), 17 Apr 1928, *Wilczek & al. 956* (G). – [Algeria, Tlemcen] Beni-Snassen, Port Say, [35°05′N, 2°12′W], 17 Apr 1928, *Emberger* (MPU-AfN). Plage de Port-Say, Lieux sablonneux, [35°05′N, 2°12′W], 9 May 1937, *Faure* (MPU-AfN). Sables maritimes à Port Say, [35°05′N, 2°12′W], 17 Apr 1928, *Wilczek & al. 941* (K).

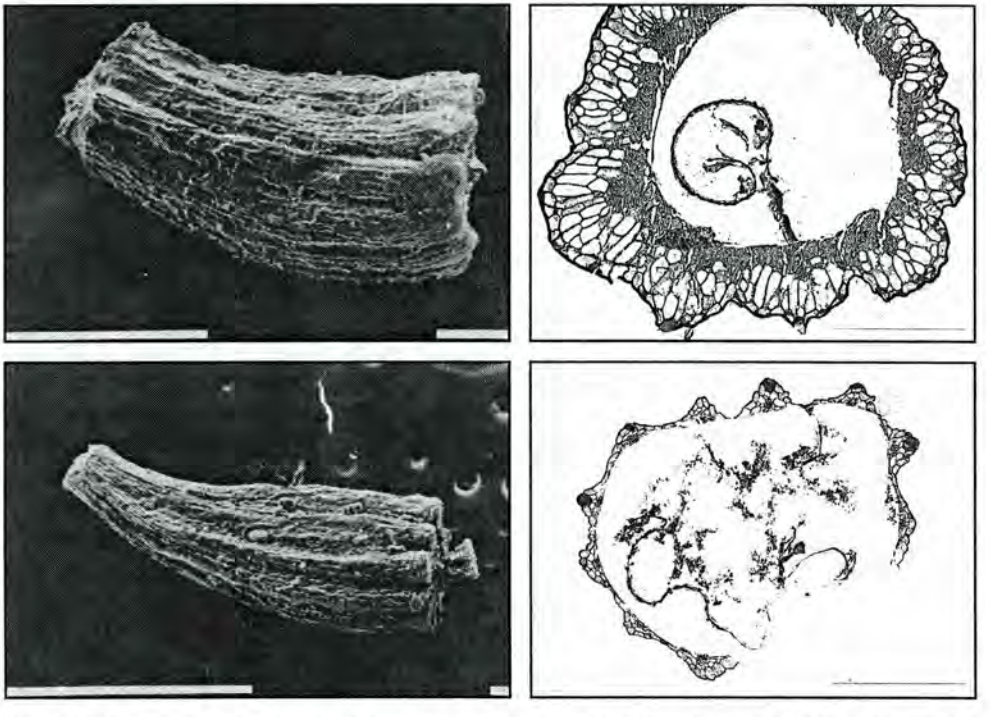


Fig. 35. Micrographs of achenes of *Anthemis mauritiana* subsp. *faurei* (*Vogt 10872 & Oberprieler 5320*). Upper row: Achenes of peripheral disc florets; lower row: achenes of central disc florets. – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

3. ***Anthemis monilicostata*** Pomel, Nouv. Mat. Fl. Atl.: 48 (1874). – Ind. loc.: "Lieux pierreux des hautes steppes: Ousseugh." – Lectotype (designated here): [Algeria] "Ousseugh", May 1862, *Pomel* (MPU-AfN!; isolectotype: P!).
– *Anthemis fugax* J. Gay, in sched. Balansa, Pl. Algérie, 1852, no. 699, nom. nud.; Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934), pro syn.

Exs.: Balansa, Pl. Algérie 1852: n°699 (sub *"Anthemis fugax"*).

Annual, single-stemmed or branched immediately above the ground or in the lower part. Stems erect to ascending, 5-20 cm tall, basally 1-1.5 mm in diameter, usually unbranched and bearing single capitula, green, in the lower half sometimes tinged with red, sulcate, sparsely to moderately appressed tomentose in the lower half, moderately to densely appressed tomentose in the upper half. Basal and lower cauline leaves often withered at anthesis, 8-30 mm long, 5-11 mm wide, elliptical to obovate in outline, usually petiolate; petiole 4-5 mm long, 0.6-0.8 mm wide, broadened towards the base and with 0-3 pairs of c. 0.5-4 mm long teeth; blade c.4-6 mm long, 1(-2)-pinnatisect; ultimate segments



Fig. 36. *Anthemis monilicostata:* general habit (20 Mar 1872, *Warion*). – Scale bar = 5 cm.

linear to narrowly elliptical, 1.2-3.0 mm long and 0.3-0.6 mm wide, sparsely to densely hairy, glandular-punctate, mucronate. Middle cauline leaves 10-23 mm long, 3-12 mm wide, elliptical to obovate in outline, inconspicuously petiolate; rhachis 0.5-0.8 mm wide, broadened towards the base, with 0-2 pairs of c. 2 mm long teeth; blade 1-2-pinnatisect, ultimate segments linear to narrowly elliptical, 1.4-3.0 mm long and 0.4-0.6(-0.8) mm wide, sparsely to densely hairy, glandular-punctate, mucronate. Upper cauline leaves 6-15 mm long, 2-7 mm wide, linear to elliptical in outline, entire or dentate or 1(-2)-pinnatisect; rhachis 0.4-1.0 mm wide, ultimate segments linear to narrowly elliptical, 1.5-2.3 mm long and 0.3-0.7 mm wide, glandular-punctate, mucronate. Peduncles (10-)40-90 mm long, slender or only slightly inflated at maturity, sulcate, densely appressed tomentose. Capitula 10-31 mm in diameter, heterogamous. Involucre 5-13 mm in diameter, hemispherical. Involucral bracts in (3-)4 rows, green, with broad, membranous, chestnut-coloured margins; the outer ones glabrous or sometimes basally sparsely hairy, acute, the inner ones usually glabrous, blunt; the outermost broadly triangular to ovate, 1.9-3.2 mm long, 1.2-1.8 mm wide, with laterally 0.4-0.8 mm wide, apically 0.6-1.3 mm wide membranous margins; the middle ones triangular to elliptical, 2.8-4.4 mm long, 1.3-2.5 mm wide, with laterally 0.4-1.1 mm wide, apically 0.6-1.5 mm wide membranous margins; the innermost elliptical to obovate, 3.8-5.4 mm long, 1.6-2.7 mm wide, with laterally 0.2-1.1 mm wide, apically 0.9-2.0 mm wide membranous margins. Receptacle hemispherical at anthesis; conical at maturity, 2-5 mm long and 2-4 mm in diameter, paleate throughout. Ray florets 9-13 per capitulum, white, female; limb elliptical to narrowly elliptical, 5-14 mm long, 2.0-4.5 mm wide, apically 3-lobed; tube 1.2-1.8 mm long, 0.5-1.0 mm wide, with some glands. Pales 3.2-4.1 mm long, 0.6-1.0 mm wide, narrowly linear to narrowly obovate, flat to shallowly convex, membranous, with chestnut-tinged, obtuse to acute tips, basally narrowed into a c. 0.2 mm wide point, caducous at maturity. Disc florets yellow, 2.6-3.1 (-3.5) mm long, hermaphrodite, with sparse glands; the basal part inflated, spongy and subtetragonous at maturity, 0.9-1.6 mm long and 0.7-1.1 mm wide; the distal part funnel-shaped, apically 0.6-0.9(-1.1) mm in diameter, 5-lobed; lobes triangular, 0.3-0.8 mm long, 0.3-0.5 mm wide, with a 0.1-0.25 mm long apical appendage. Achenes of ray florets 1.9-2.5(-2.8) mm long, 0.6-0.9(-1.3) mm in diameter, fusiform-subcylindrical, slightly adaxially bent, 10-ribbed; ribs densely covered with large, conspicuously protruding mucilage cells; furrows between the ribs with few yellow glands. Achenes of disc florets homomorphic, 1.8-2.3 mm long, (0.4-)0.6-1.0 mm in diameter, obovoid-obconical, slightly adaxi-

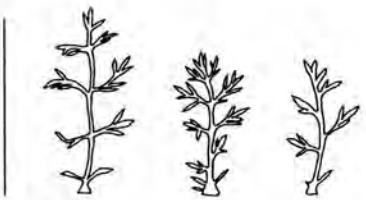


Fig. 37. *Anthemis monilicostata:* leaf spectrum (20 Mar 1872, *Warion*). – Scale bar = 2 cm.

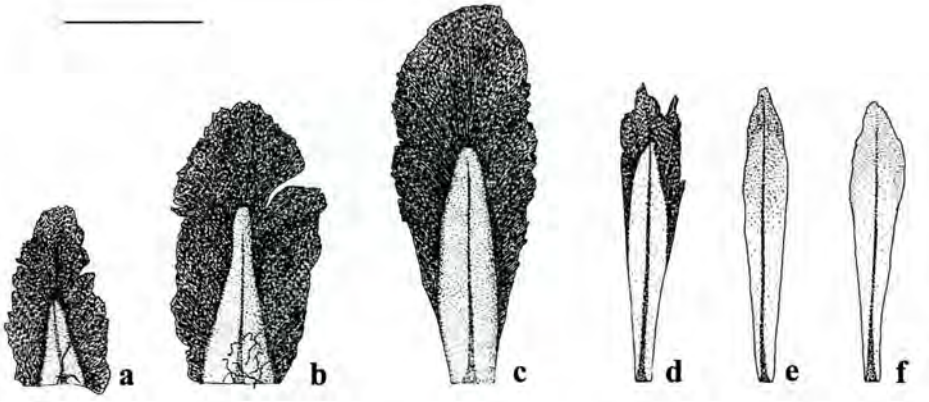


Fig. 38. *Anthemis monilicostata:* (a-c) involucral bracts (20 Mar 1872, *Warion*), (d) outer pale (20 Mar 1872, *Warion*); (e-f) inner pales (e, Khalfallah, *Herb. Battandier;* f, 27 May 1852, *Cosson*). – Scale bar = 2 mm.

ally bent, 10-ribbed; ribs rather narrow and smooth, apically forming a very short, toothed corona and bearing large, conspicuously protruding mucilage cells; furrows rather wide and flat, with yellow glands.

Chromosome number. – Unknown. Pollen dimensions are intermediate between values typical for diploids and those for tetraploids (see chapter 11).

Distribution and habitat. – Endemic to the W Algerian (and E Moroccan) *Stipa tenacissima* steppe of the High Plains. Indications from the C Moroccan Zaïan highlands (Oulmès, Djebel Tougroulmès) by Jahandiez & Maire (1934) relate to *A. zaianica*.

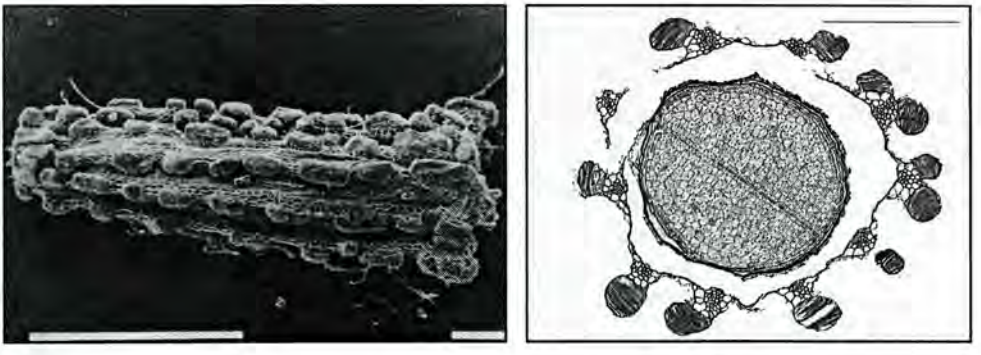


Fig. 39. Micrographs of achenes of *Anthemis monilicostata* (left, 20 Mar 1872, *Warion;* right, *Balansa n°699*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Variation and taxonomy. – *Anthemis monilicostata* is one of the most distinctive N African species of the genus. It is characterised by completely glabrous involucral bracts with extremely broad, chestnut-coloured membranous margins and rather slender, narrowly obovoidal, homomorphic achenes with extremely large and conspicuously protruding mucilage cells on the ribs and much reduced sclerenchymatic tissue in the mesocarp. Within *A.* ser. *Bourgaeinianae,* to which the species clearly belongs due to its caducous pales, it shows the closest relationships with *A. stiparum* subsp. *stiparum,* which differs by its hairy involucral bracts with narrow membranous margins and its achenes with comparatively small mucilage cells. One specimen *(Bertram 439)* holds an intermediate position between *A. monilicostata* and *A. stiparum* subsp. *stiparum* because of its hairy involucral bracts with broad, dark-brown membranous margins; it may indicate that the two species interbreed where they meet in nature.

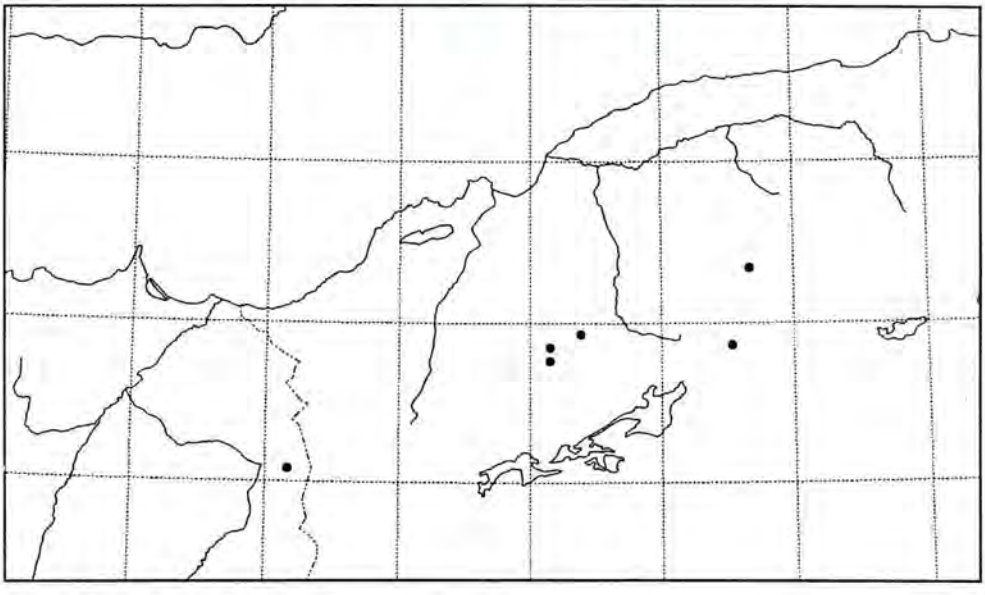


Fig. 40. Total distribution of *Anthemis monilicostata.*

Specimens seen. – [Morocco, Oujda] Ferhaat Guelier el Aoud, [34°5′N, 1°50′W], 1899, *Joly* (MPU-AfN). – [Algeria, Saïda] Coteaux rocailleux près de la cascade de l'Oued Tifrit (29 kilom. à l'Est de Saïda), [34°56′N, 0°23′E], 3 Mar 1872, *Warion* (P). Bois du haut plateau immédiatement au-dessus du Lieu Saïda, [34°51′N, 0°09′E], 27 May 1852, *Cosson* (P; K). - des hauts plateaux au-dessous de Zaïda, [34°51′N, 0°09′E], *Herb. Mouillefarine* (MPU-AfN). Bois du Haut-plateau immédiatement au-dessus du [...] Saïda, [34°51′N, 0°09′E], 29 May 1852, *Cosson* (K). Hauts plateaux, près Saïda, [34°51′N, 0°09′E], 21 May 1852, *Balansa, n° 699* (MPU-AfN; GOET; P; G). Coteaux rocailleux à Saïda, [34°51′N, 0°09′E], 20 Mar 1872, *Warion* (P; G; K). Aïn-el-Hadjar, Khalfallah, [34°46′N, 0°09′E], *Herb. Battandier* (MPU-AfN). – [Tiaret] Aïn Dzarite, Lerson, [35°20′N, 1°40′E], 6 Apr 1899, *Herb. Joly* (MPU-AfN). El-Ousseugh (Hauts Plateaux), [34°52′N, 1°32′E], May 1862, *Pomel* (MPU-AfN; P). – [Cultivated] Cult. e sem. prope Saïda lectis in hort. Burdigal., May 1855, *Durieu de Maisonneuve* (P).

Specimen intermediate between A. monilicostata *and* A. stiparum *subsp.* stiparum. – [Algeria, Saidia] Aïn el Hadjar, 1150 m, [34°46'N, 0°09'E], *Bertram 439* (B).

4. ***Anthemis stiparum*** Pomel, Nouv. Mat. Fl. Atl.: 48 (1874) ≡ *A. tuberculata* [unranked] *stiparum* (Pomel) Battand., Fl. Algérie, Suppl. Phan.: 53 (1910) ≡ *Anthemis monilicostata* subsp. *stiparum* (Pomel) Maire in Bull. Soc. Hist. Nat. Afrique N. 30: 283 (1939). – Ind. loc.: "Lieux pierreux des hautes steppes: Itima, Rassoul, Ousseugh." – Lectotype (designated here): [Algeria] "Itima", 28 May 1860, *Pomel* (MPU-AfN!; isolectotype: P!).

Annual, single-stemmed or branched from immediately above the ground. Root 0.6-4.5 mm in diameter. Stems procumbent to ascending-erect or erect, 3-30 cm long, basally 0.5-2.6 mm in diameter, usually branched in the upper half, with 1-12 capitula, basally sometimes tinged with red, sulcate, sparsely to densely hairy. Basal and lower cauline leaves 6-36 mm long and 3-13 mm wide, obovate to narrowly obovate or elliptical to narrowly elliptical in outline, petiolate; petiole 3-19 mm long, basally usually without teeth, rarely with 1-2 pairs of teeth; blade (1-)2-3-pinnatipartite with 2-3 pairs of elliptical to obovate primary lobes; ultimate segments broadly elliptical to narrowly elliptical or linear, 1.0-4.1 mm long and 0.3-1.3 mm wide, mucronate, sparsely to densely hairy, glandular-punctate. Upper cauline leaves 5-25 mm long and 1-11 mm wide, linear with entire or dentate margins, or elliptical to obovate in outline, sometimes sessile, usually with up to 16 mm long petiole; blade 1-2(-3)-pinnatipartite with 1-2 pairs of primary lobes; ultimate segments 1.0-3.0 mm long and 0.3-1.1 mm wide, linear or elliptical, sometimes triangular; base usually without, sometimes with 1-2 pairs of teeth. Peduncles 5-120 mm long and 0.5-2.0 mm in diameter, remaining slender or becoming only slightly incrassate at maturity, sulcate, sparsely to densely hairy. Capitula 12-32 mm in diameter, heterogamous. Involucre 7-13 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, abaxially sparsely to densely hairy, with a green, longitudinal strip and pale to light or dark brown, membranous margins; the outermost triangular or ovate to narrowly triangular or narrowly ovate, 1.9-4.0 mm long and 0.8-1.3 mm wide, acute, with laterally 0.1-0.4 mm wide, apically 0.4-1.2 wide membranous margins; the middle ones narrowly elliptical to narrowly elliptical-ovate, 3.0-5.1 mm long and 1.0-1.6 mm wide, acute, with laterally 0.2-0.4 mm wide, apically 0.4-1.5 mm wide membranous margins; the innermost narrowly elliptical to narrowly obovate, 2.9-5.5 mm long and 0.7-1.9 mm wide, acute to obtuse, with laterally 0.1-0.5 mm wide, apically 0.4-1.7 mm wide membranous margins, usually appressed tomentose only in the distal half. Receptacle hemispherical at anthesis (c. 2 mm in diam., c. 1 mm high), hemispherical to conical at maturity (2.5-3.5 mm in diam., 2.0-4.5 mm high), paleate throughout. Ray florets 6-15 per capitulum, white, female, 6.0-13.5 mm long; limb narrowly elliptical or elliptical to obovate, 4.5-11.5 mm long and 2.3-4.9 mm wide, apically 3-lobed; tube sparsely glandular, 1.1-2.4 mm long and 0.5-0.9 mm wide. Pales narrowly elliptical or narrowly linear-lanceolate to nearly subulate, 2.3-4.5 mm long and 0.3-1.2 mm wide, apically acute, tapering basally into a 0.1-0.2 mm wide point, flat to somewhat convex, membranous, glandular, caducous at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 2.1-3.4 mm long; the basal part becoming inflated,

spongy and subtetragonous at maturity, 0.9-1.7 mm long and 0.6-1.0 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular with an up to 0.1 mm long dorsal appendage. Achenes of ray florets 1.8-2.5 mm long and 0.6-0.9 mm in diameter, fusiform to obovoidal, contracted below an apical, ± dentate, up to 0.1 mm long corona formed by the slightly protruding ribs, adaxially bent, 8-10-ribbed; ribs abaxially more conspicuous than adaxially, slightly tuberculate to tuberculate, each rib with 1-2 rows of ± rectangular



Fig. 41. *Anthemis stiparum* subsp. *stiparum:* general habit (May 1862, *Pomel*). – Scale bar = 5 cm.

mucilage cells; furrows with glands. Achenes of disc florets slightly to moderately heteromorphic; the peripheral ones 1.5-2.2 mm long and 0.7-1.1 mm in diameter, obconical to obovoidal, sometimes persistent at maturity, sometimes readily caducous, 10-ribbed; ribs broad and rounded, slightly tuberculate to conspicuously tuberculate, with 2-3 rows of ± isodiametrical mucilage cells; furrows with yellow glands; corona absent or a 0.1-0.6 mm long crenulate auricle; the central ones slightly more slender than the marginal ones, 1.5-2.35 mm long and 0.6-1.0 mm in diameter, obconical-obovoidal to narrowly obconical-obovoidal, readily falling off at maturity, 10-ribbed; ribs tuberculate to strongly tuberculate; tubercles in 1-2 rows with ± isodiametrical mucilage cells on the top; pericarp rather thin and translucent in furrows; furrows with glands; corona absent or a 0.1-0.6 mm long crenulate auricle.

Chromosome number. – $2n = 18$ (subsp. *sabulicola;* see discussion in chapter 10).

Distribution and habitat. – *Anthemis stiparum* is endemic to Algeria and E Morocco, where subsp. *stiparum* and subsp. *intermedia* are restricted to the *Stipa tenacissima* steppe of the High Plains between Tell Atlas and Sahara Atlas, and subsp. *sabulicola* is found S of the Sahara Atlas in the even more arid semi-desert habitats at the N fringe of the Algerian Sahara.

Variation and taxonomy. – *Anthemis stiparum* is characterised by readily caducous pales and comparatively long and slender achenes. It differs from *A. monilicostata* by its hairy involucral bracts with narrow, pale to light brown, membranous margins and its achenes with comparatively small mucilage cells; from *A. mauritiana* by its homomorphic to only moderately heteromorphic and tuberculate achenes; and from *A. zaianica* by its achenes which are usually longer than 1.5 mm. A considerable amount of morphological variation, especially relating to length and shape of ray florets and shape of pales, is en-

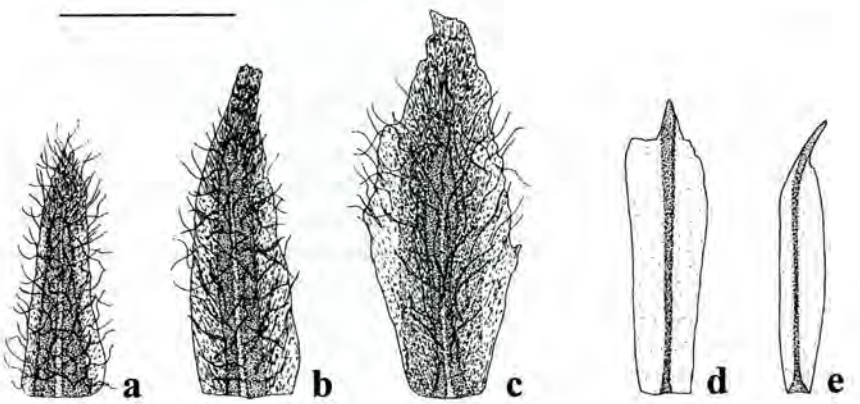


Fig. 42. *Anthemis stiparum* subsp. *stiparum:* (a-c) involucral bracts, (d-e) pales (28 May 1860, *Pomel*). – Scale bar = 2 mm.

countered throughout the vast distributional range of *A. stiparum*, accounted by the recognition of three geographically vicarious subspecies.

Key to subspecies

1. Pales (0.4-)0.5-0.9(-1.2) mm wide, narrowly elliptical to narrowly lanceolate ..... 4a. *A. stiparum* subsp. *stiparum*
– Pales 0.2-0.4(-0.55) mm wide, narrowly linear to subulate ..... 2.
2. Limb of ray florets (7.0-)7.6-9.7(-10.5) mm long, elliptical to narrowly elliptical [index 1.9-3.5]; plants sparsely to densely hairy ..... 4b. *A. stiparum* subsp. *intermedia*
– Limb of ray florets (4.5-)5.1-7.0(-8.5) mm long, elliptical to obovate [index 1.4-2.1]; plants densely white tomentose ..... 4c. *A. stiparum* subsp. *sabulicola*

4a. ***Anthemis stiparum*** Pomel subsp. ***stiparum***

Root 0.7-2.2(-4.5) mm in diameter. Stems usually erect to ascending-erect, sometimes procumbent, (6-)8-15(-20) cm long, basally (0.4-)0.6-1.3(-2.5) mm in diameter, with 1-4 (-7) capitula, sparsely to densely hairy. Basal and lower cauline leaves (10-)14-28(-36) mm long and 4-10 mm wide; petiole (7-)9-14(-19) mm long; blade (1-)2-pinnatipartite; ultimate segments broadly elliptical to narrowly elliptical or linear, 1.3-2.3(-3.2) mm long and (0.4-)0.6-1.0(-1.2) mm wide, sparsely to densely hairy. Upper cauline leaves (8-)10-20(-25) mm long and 2-10 mm wide, sessile or petiolate; petiole up to 10(-13) mm long; blade 1-2-pinnatipartite; ultimate segments (1.2-)1.3-1.9(-2.3) mm long and 0.5-0.9 mm wide, elliptical to narrowly elliptical or linear. Peduncles (15-)24-48(-63) mm long and (0.5-)0.7-1.3(-1.7) mm in diameter, sparsely to densely hairy. Capitula 17-28(-32) mm in diameter. Involucre (7-)9-11(-13) mm in diameter. Involucral bracts sparsely to densely hairy; the outermost 2.6-3.4 mm long and 0.9-1.3 mm wide, with laterally 0.2-0.4 mm wide, apically 0.4-1.2 mm wide membranous margins; the middle ones (3.0-)3.2-4.3(-4.7) mm long and 1.1-1.5 mm wide, with laterally 0.2-0.5 mm wide, apically 0.5-1.2 mm wide membranous margins; the innermost (3.5-)3.8-5.0 mm long and 1.3-1.9 mm wide, with laterally 0.3-0.5 mm wide, apically 0.5-1.5 mm wide membranous margins. Receptacle conical to ovate-conical at maturity (2.5-3.5 mm in diam., 3.5-4.5 mm high). Ray florets 8-13(-15) per capitulum, (9.2-)9.5-12.0(-13.5) mm long; limb elliptical to narrowly elliptical [index 2.0-3.3], (7.2-)7.4-10.0(-11.5) mm long and (2.5-)3.0-3.8(-4.1) mm wide; tube 1.7-2.0 mm long and 0.8-0.9 mm wide. Pales narrowly elliptical to narrowly lanceolate, (2.9-)3.1-3.9(-4.5) mm long and (0.4-)0.5-0.9(-1.2) mm wide, basally 0.2-0.5 mm wide, apically tapering gradually into a usually concolourous, rarely brown-tinged tip. Disc florets 2.6-3.1(-3.4) mm long; the basal part (0.9-)1.1-1.5(-1.7) mm long and 0.6-0.7 mm wide. Achenes of ray florets 1.7-2.0 mm long and 0.7-0.8 mm in diameter, corona an up to 0.1 mm long auricle. Achenes of the peripheral disc florets c. 2.0 mm long and 0.7-0.8 mm in diameter; corona an adaxially up to 0.6 mm long crenulate auricle. Achenes of central disc florets 1.8-2.0(-2.1) mm long and 0.8-0.9 mm in diameter; corona absent or an up to 0.3(-0.6) mm long crenulate auricle.

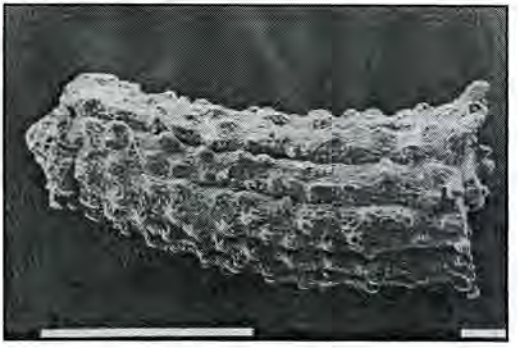


Fig. 43. SEM micrograph of achene of disc floret of *Anthemis stiparum* subsp. *stiparum* (28 May 1860, *Pomel*). – Scale bar = 1 mm.

Chromosome number. – Unknown. Pollen dimensions are intermediate between values typical for diploids and those for tetraploids (see chapter 11).

Distribution and habitat. – Restricted to the *Stipa tenacissima* steppe of the Algerian High Plains between Tell Atlas and Sahara Atlas, with some scattered localities further N in the vicinity of Alger and in the valley of Oued Chélif (Fig. 44).

Variation and taxonomy. – *Anthemis stiparum* subsp. *stiparum* is distinguished from subsp. *intermedia* and subsp. *sabulicola* by its broader pales which are narrowly elliptical to narrowly obovate in outline and may reach a width of more than 0.5 mm. The tip of pales is usually stramineous, but in some populations (e.g. *Podlech 34022*) pales with black tinged tips occur. Other specimens (Bordj bou Areridj, *Letourneux*, May 1882, P; Lambusine, *Letourneux*, 10 Jul 1889, P) resemble *A. pedunculata* by their rather robust habit, very long stems (up to 35 cm), and rather woody stem bases. The readily caducous pales and slender achenes of the central disc florets support inclusion in *A. stiparum*, but may indicate a closer relationship of *A. stiparum* with *A. pedunculata* than the present inclusion of the two species in two different sections of the genus suggests. For fear to compromise the monophyly of *A.* ser. *Bourgaeinianae* and of the whole *A.* sect. *Anthemis*, I have considered the annual habit, the caducous pales, and the slender achenes with a rather thin pericarp as sufficiently important to warrant inclusion of *A. pedunculata* and *A. stiparum* in different sections, until such time as further evidence for their close relationship may come to light. In this context, it is of note that *A. zaianica*, a species closely related to *A. stiparum* and also characterised by readily caducous pales, was found to cluster with *A. pedunculata* rather than with *A. stiparum* in the molecular study (see chapter 13).

Specimens seen. – [Algeria, Alger] Alger: quarties Bon auneil, [36°47′N, 3°02′E], *Herb. Battandier* (MPU-AfN). – [El Asnam] St.Cyprien-du-Attafs, bords du Chelif, [36°15′N, 1°44′E], 15 Jun 1896, *Emberger* (MPU-AfN). – [Laghouat] Sahara Atlas, 42 km SW Aflou an der Straße nach El Bayadh, 1460 m, sandige Fläche, 1°49′E - 33°55′N, 6 Apr 1980, *Podlech 34022* (MSB; G; M; CAI; HUJ). Bordj bou Areridj, [36°05′N, 4°45′E], May 1882, *Letourneux* (P). – [Tiaret] El-Ousseugh (Hauts Plateaux), [34°32′N, 1°32′E], May 1862, *Pomel* (MPU-AfN). Hauts Plateaux près

Itima, [34°32'N, 1°47'E], 28 May 1860, *Pomel* (MPU-AfN; P). – [Not located] In pineto prope Lambusine, 10 Jul 1889, *Letourneux* (P).

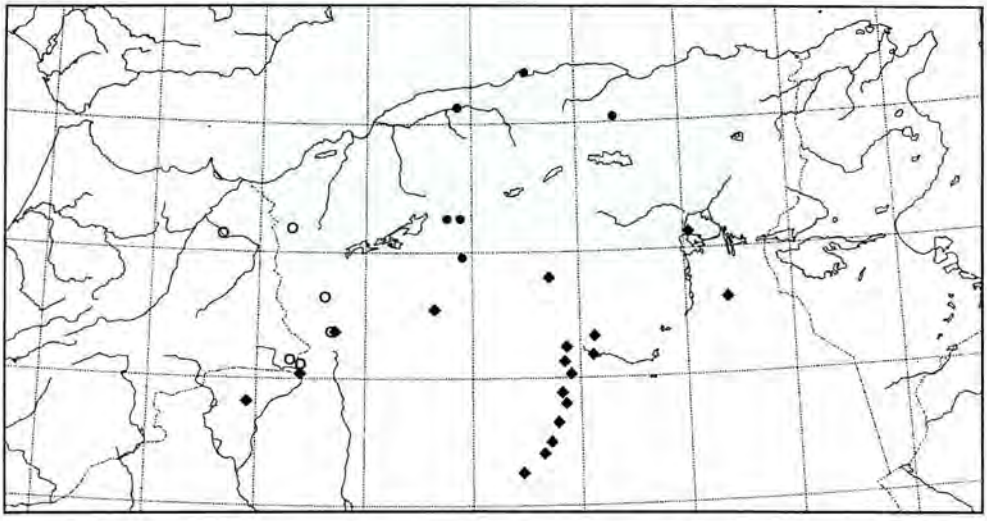


Fig. 44. Total distribution of *Anthemis stiparum* (● subsp. *stiparum*, ○ subsp. *intermedia*, ◆ subsp. *sabulicola*).

4b. ***Anthemis stiparum*** subsp. ***intermedia*** Oberprieler, **subsp. nov.** – Holotype: [Algeria] "Terrains argilo-sablonneux de la plaine d'Aïn Ben Khelil, au sud du Chott el Rarbi", 30 Apr 1856, *Kralik* (G!; isotypes: GOET!, K!, MPU-AfN!, P[2x]!).

– *Anthemis tuberculata* auct. [non Boiss. 1838]: Bourgeau, Pl. Algérie 1856, n° 194.

Exs.: Bourgeau, Pl. Algérie 1856: n° 194.

Ab *Anthemide stiparum* subsp. *stiparum* receptaculi squamis anguste linearibus vel subulatis, ab *A. stiparum* subsp. *sabulicola* floribus radii longioribus foliisque laxius tomentosis differt.

Root 0.6-2.1(-4.2) mm in diameter. Stems usually procumbent to ascending-erect, sometimes erect, (7-)10-19(-30) cm long, basally (0.5-)0.7-1.5(-2.6) mm in diameter, with 1-4(-10) capitula, sparsely to densely hairy. Basal and lower cauline leaves (10-)14-23 (-27) mm long and (4-)6-10(-13) mm wide; petiole (5-)7-12(-16) mm long; blade 2-pinnatipartite; ultimate segments elliptical to narrowly elliptical or linear, (1.0-)1.2-2.7(-4.1) mm long and 0.3-0.8(-1.3) mm wide, sparsely to densely hairy. Upper cauline leaves 6-14(-19) mm long and 2-(-9) mm wide; petiole 3-8 mm long; blade 1-2-pinnatipartite; ultimate segments (1.0-)1.2-2.0(-2.8) mm long and 0.3-0.7(-0.9) mm wide, elliptical to narrowly elliptical or linear. Peduncles (20-)37-76(-120) mm long and (0.7-)0.9-1.6(-2.0) mm in diameter, sparsely to densely hairy. Capitula (14-)20-27(-30) mm in diameter. Involucre (7-)9-12 mm in diameter. Involucral bracts sparsely to densely hairy; the outermost (1.9-)2.6-

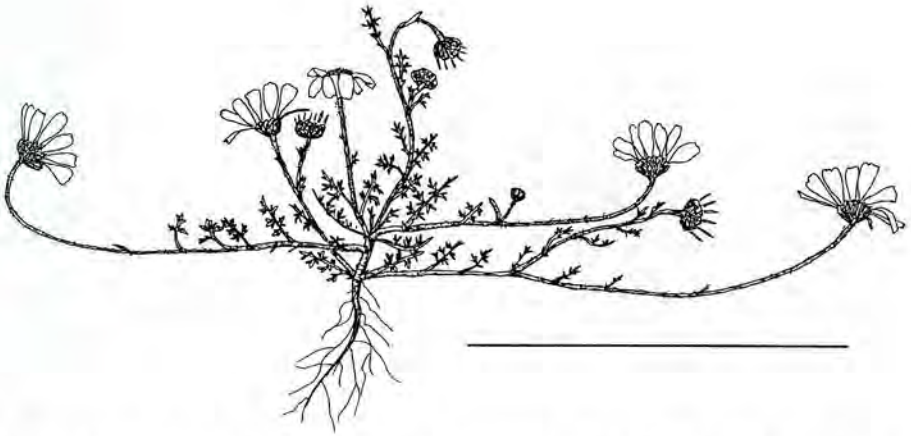


Fig. 45. *Anthemis stiparum* subsp. *intermedia:* general habit (30 Apr 1856, *Kralik*). – Scale bar = 10 cm.

3.8(-4.0) mm long and 0.9-1.2 mm wide, laterally with 0.1-0.3 mm wide, apically with 0.4-1.0 mm wide membranous margins; the middle ones (3.2-)3.4-4.7(-5.1) mm long and 1.0-1.4(-1.6) mm wide, with laterally 0.2-0.4 mm wide, apically 0.4-1.5 mm wide membranous margins; the innermost 3.4-4.8(-5.5) mm long and 1.0-1.5(-1.7) mm wide, with laterally 0.1-0.5 mm wide, apically 0.5-1.7 mm wide membranous margins. Receptacle hemispherical to conical at maturity (2.5-3.5 mm in diam., 2.5-3.5 mm high). Ray florets 6-12 (-15) per capitulum, 9.3-12.5 mm long; limb elliptical to narrowly elliptical [index 1.9-3.5], (7.0-)7.6-9.7(-10.5) mm long and (2.3-)2.9-4.1(-4.9) mm wide; tube 1.4-2.0(-2.4) mm long and 0.5-0.9 mm wide. Pales narrowly linear-lanceolate to nearly subulate, (2.3-)2.7-3.3(-3.6) mm long and 0.2-0.4(-0.6) mm wide, apically acute, tapering basally into a 0.15-0.25 mm wide point. Disc florets 2.4-3.0(-3.2) mm long; the basal part 0.9-1.5(-1.7) mm long and 0.6-0.9 mm wide. Achenes of ray florets c. 1.9-2.1 mm long and c. 0.6 mm in diameter. Achenes of the peripheral disc florets (1.7-)1.8-2.1(-2.2) mm long and 0.8-0.9



Fig. 46. *Anthemis stiparum* subsp. *intermedia:* leaf spectrum (23 May 1933, *Maire*). – Scale bar = 3 cm.

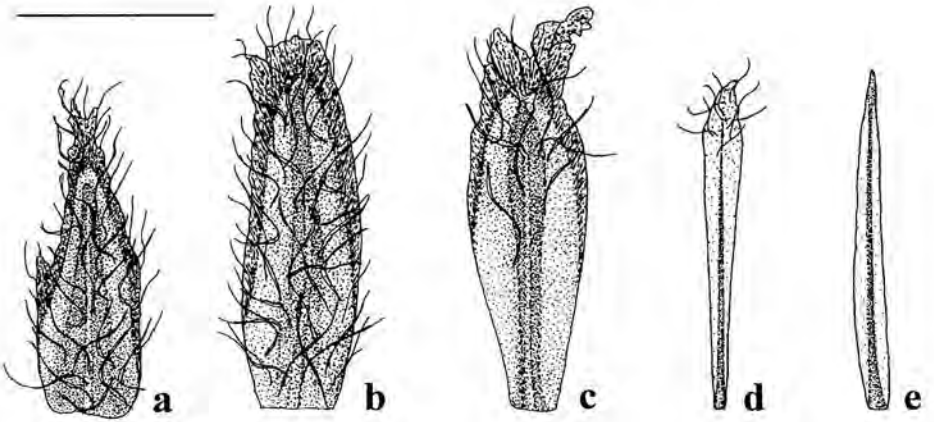


Fig. 47. *Anthemis stiparum* subsp. *intermedia:* (a-c) involucral bracts, (d-e) pales (23 May 1933, *Maire*). – Scale bar = 2 mm.

(-1.0) mm in diameter; corona a (0.1-)0.2-0.5(-0.6) mm long crenulate auricle. Achenes of central disc florets (1.5-)1.6-2.0(-2.3) mm long and 0.7-0.9 mm in diameter; corona absent or an up to 0.5 mm long crenulate auricle.

Chromosome number. – Unknown. Pollen dimensions (see chapter 11) suggest a diploid number.

Distribution and habitat. – Restricted to the E Moroccan and W Algerian High Plains, at altitudes between 900 m and 1300 m (Fig. 44).

Variation and taxonomy. – *Anthemis stiparum* subsp. *intermedia* holds an intermediate position between subsp. *stiparum,* which it morphologically approaches by its long ray florets, and subsp. *sabulicola* with which it shares the comparatively narrow pales. The NE Moroccan populations of this subspecies are characterised by rather narrowly elliptical ultimate leaf segments. This feature is also found in the closely related *A. zaianica* from C Morocco, which is easily distinguished by its shorter achenes.

Specimens seen. – [Morocco, Oujda] Narguechoum, Montagne au S. de Taourirt, garigue du verrant E. 900-1000 m, [34°17′N, 2°43′W], 13 Apr 1928, *Wilczek & al. 754* (K). Env. de Taourirt: versant N. du M. Narguechoum, rocailles, 1000-1300 m, [34°17′N, 2°43′W], 13 Apr 1928, *Wilczek & al. 796* (G). – [Figuig] Oued el Khéroua, in arenosis, [32°18′N, 1°25′W], Apr 1913, *Pitard 3474* (P). El Ardja, in arenosis deserti, [32°14′N, 1°13′W], Mar 1913, *Pitard 3475* (K; P). – [Algeria, Saïda] Sud Ornais: Aïn Sefra, lieux sablonneux, humides, près la [...], [32°45′N, 0°36′W], Mar 1922, *d'Alleizette* (P). Aïn-Sefra, [32°45′N, 0°36′W], *Couderc* (P). Terrains argilo-sablonneux de la plaine d'Aïn Ben Khelil, au sud du Chott el Barbi, [33°18′N, 0°47′W], 30 Apr 1856, *Kralik, n° 194* (MPU-AfN; GOET; G; K; P). Aïn Sefra, [32°45′N, 0°36′W], 7 May 1856,



Fig. 48. SEM micrograph of achene of disc floret of *Anthemis stiparum* subsp. *intermedia (Kralik n° 194).* – Scale bar = 1 mm.

Cosson (MPU-AfN; P). Bedeau (H. Pl. Oranais), 1920, *d'Alleizette* (P). – [Tlemcen] In stipeto tenacissimae inter El-Aricha et Magoura, solo calcareo, 1200 m, [34°23'N, 1°25'W], 23 May 1933, *Maire* (MPU-AfN; P).

4c. ***Anthemis stiparum*** subsp. ***sabulicola*** (Pomel) Oberprieler, **stat. nov.** ≡ *A. sabulicola* Pomel, Nouv. Mat. Fl. Atl.: 49 (1874) ≡ *A. stiparum* var. *sabulicola* (Pomel) Battand. in Battandier & Trabut, Fl. Algérie: 455 (1889) ≡ *A. tuberculata* [unranked] *sabulicola* (Pomel) Battand., Fl. Algérie, Suppl. Phan.: 53 (1910). – Ind. loc.: "Sables sahariens: Metlili, Brezina." – Lectotype (designated here): [Algeria] "Metlili", *Pomel* (MPU-AfN!).

= *Anthemis monilicostata* var. *sublaevis* Maire in Bull. Soc. Hist. Nat. Afrique N. 30: 349 (1939). – Ind. loc.: "Sahara septentrional: Grand Erg occidental à Mehardzi (Volkonsky)." – Holotype: [Algeria] "Sahara: Grand Erg occidental à Mehardzi", 7 Apr 1938, *Volkonsky* (MPU-AfN!).

Exs.: Chevallier, Pl. Sah. Alger.: n° 317.

Stems (3-)6-14(-20) cm long, basally (0.6-)0.8-1.4(-1.8) mm in diameter, with 1-7(-12) capitula, densely hairy. Basal and lower cauline leaves (6-)10-21(-28) mm long and (3-)4-8(-10) mm wide; petiole (3-)5-11(-15) mm long; blade 2-3-pinnatipartite; ultimate segments broadly elliptical to narrowly elliptical, (1.0-)1.2-1.8(-2.3) mm long and 0.5-1.1 mm wide, densely hairy. Upper cauline leaves (5-)7-16(-25) mm long and 1-9(-11) mm wide; petiole 2-9(-16) mm long; blade 1-2(-3)-pinnatipartite; ultimate segments (1.3-)1.5-2.2 (-3.0) mm long and 0.5-1.1 mm wide, linear or elliptical, sometimes triangular. Peduncles (5-)15-45(-80) mm long and 0.7-1.4 mm in diameter, densely hairy. Capitula (12-)15-20 (-25) mm in diameter. Involucre 7-11 mm in diameter. Involucral bracts densely appressed hairy; the outermost 2.2-3.1(-3.6) mm long and 0.8-1.3 mm wide, laterally with 0.1-0.3 mm wide membranous margins; the middle ones (3.0-)3.3-4.0(-4.3) mm long and 1.0-1.4 mm wide, with laterally 0.2-0.4 mm wide, apically 0.4-1.0 mm wide membranous margins;

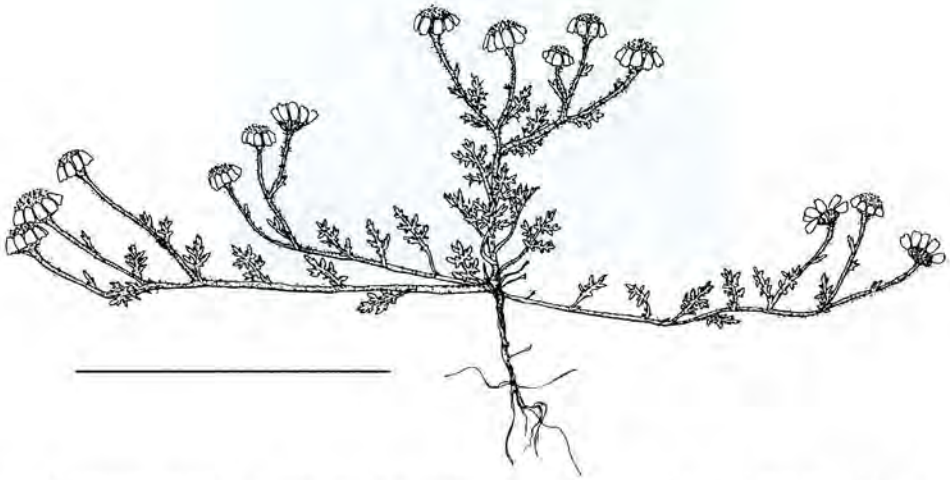


Fig. 49. *Anthemis stiparum* subsp. *sabulicola:* general habit *(Podlech 35468).* – Scale bar = 10 cm.

the innermost (2.9-)3.1-4.0(-4.7) mm long and 0.7-1.6 mm wide, with laterally 0.1-0.3 mm wide, apically 0.4-0.8 mm wide membranous margins. Receptacle hemispherical at anthesis (c. 2 mm in diam., c. 1 mm high), conical to ovate-conical at maturity (2.5-3.5 mm in diam., 2.0-3.5 mm high). Ray florets 7-12 per capitulum, (6.0-)6.5-8.3(-9.7) mm long; limb elliptical to obovate [index 1.4-2.1], (4.5-)5.1-7.0(-8.5) mm long and (2.7-)3.2-4.0 mm wide; tube 1.1-2.0 mm long and 0.6-0.9 mm wide. Pales narrowly linear-lanceolate to nearly subulate, 2.7-3.3(-3.9) mm long and 0.3-0.45(-0.55) mm wide, apically acute, basally 0.1-0.2 mm wide. Disc florets 2.1-3.0 mm long; the basal part 1.0-1.5 mm long and 0.6-1.0 mm wide. Achenes of ray florets 1.8-2.2(-2.5) mm long and 0.65-0.8(-0.9) mm in diameter, with a c. 0.1 mm long auricle. Achenes of the peripheral disc florets (1.5-)1.6-1.9(-2.2) mm long and 0.7-0.9(-1.1) mm in diameter; corona absent or a 0.1-0.2(-0.3) mm long crenulate auricle. Achenes of central disc florets (1.7-)1.8-2.2(-2.35) mm long and (0.6-)0.7-0.8(-1.0) mm in diameter; corona absent or a 0.1-0.3 mm long crenulate auricle.

Chromosome number. – $2n = 18$ (discussion see Chapter 10).



Fig. 50. *Anthemis stiparum* subsp. *sabulicola:* leaf spectrum *(Podlech 35529).* – Scale bar = 3 cm.

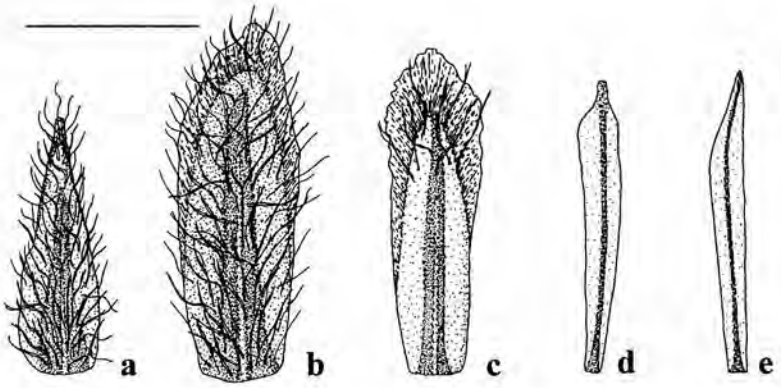


Fig. 51. *Anthemis stiparum* subsp. *sabulicola:* (a-c) involucral bracts, (d-e) pales (Brézina, *Pomel*). – Scale bar = 2 mm.

Distribution and habitat. – Endemic to the N fringe of the Algerian Sahara (Fig. 44). It replaces the other two subspecies of *A. stiparum* S of the Sahara Atlas mountain range and is the representative of the genus that penetrates farthest into the semi-desert and desert habitats of the Sahara.

Variation and taxonomy. – *Anthemis stiparum* subsp. *sabulicola* is the most distinctive among the subspecies of *A. stiparum.* It is easily recognised by its densely hairy leaves with rather short ultimate segments, its comparatively short ray florets with usually circular to elliptical limbs, and its narrowly elliptical to subulate, readily caducous pales. In its dense indumentum, *A. stiparum* subsp. *sabulicola* superficially resembles inland populations of *A. confusa* from the Chott el Jerid area in C Tunisia, which differs markedly by its pales which persist at maturity, are elliptical to obovate in outline, and taper into an abruptly acuminate to tricuspidate tip. The dense indumentum is a consequent adaptation to the arid habitat shared by both species rather than an indication of close phylogenetic relationship.

Specimens seen. – [Algeria, Béchar] Sud Ornais: Colomb Béchar, [31°38′N, 2°12′W], Apr 1914, *Humbert* (MPU-AfN). – [Biskra] Mguebra dans l'Oued R'ir, [34°16′N, 6°04′E], 9 Apr 1858, *Cosson* (P). El Erg, parties graveleuses entre les dunes près Berr es Cof [Beresof SE El Oued], 1 Mar 1875, *Largeau 90* (P). – [Laghouat] Oued en Nsa près El Farch, dans le Mzab, [32°40′N, 4°15′E], 19 May 1858, *Cosson* (P). Metaïguen, [33°36′N, 3°24′E], *Pomel* (MPU-AfN). Kef Zegga (Oued Mzab), [32°30′N, 3°42′E], 10 May 1858, *Herb. de la Perraudière* (MPU-AfN). Bounoura, Ghardaïa: in depressis arenosis, humidis, [32°30′N, 3°43′E], Apr 1899, *Chevallier, n° 317* (MPU-AfN; B; G; P). Zelfana, 55 km ESE von Ghardaia, 360 m, kiesige Flächen, 4°13′E, 32°22′N, 30 Mar 1981, *Podlech 35571* (MSB; M). Mzab: Metlili, [32°16′N, 3°40′E], *Pomel* (MPU-AfN). Metlili, dans le Mzab, [32°16′N, 3°40′E], 11 May 1858, *Cosson* (P). 60 km SSE Ghardaia an der Straße nach El Golea, ca. 400 m, sandige Fläche, 3°47′E, 32°04′N, 28 Mar 1981, *Podlech 35529* (MSB; M). In arenosis ad Puteum album (Haci-el-Abiodh) inter Ghadaia et El-Goléa, [31°46′N, 3°37′E], 18 Feb 1928, *Maire 656* (MPU-AfN). Hassi-Fahl, 115 km S Ghardaia an der Straße nach El Golea, 360 m, Sandflächen um einen artesischen Brunnen, 3°41′E, 31°36′N, 11 Mar

1981, *Podlech 34623* (MSB; M; G; LIE). 125 km NNE El Golea an der Straße nach Ghardaia, 380 m, steinige Sandfläche, 3°32′E - 31°18′N, 28 Mar 1981, *Podlech 35468* (MSB; M; G; LIE). 82 km NNE El Golea an der Straße nach Ghardaia, 400 m, Sandflächen, 3°24′E, 31°00′N, 28 Mar 1981, *Podlech 35447* (MSB). 50 km NE El Golea an der Straße nach Ghardaia, 410 m, waagrechte Kalkplatten mit Sandeinwehungen, 3°16′E, 30°49′N, 28 Mar 1981, *Podlech 35418 & 35456* (MSB; M; G; LIE). 8 km S El Golea nahe der Straße nach In Salah, 400 m, Sandfläche, 2°53′E, 30°31′N, 26 Mar 1981, *Podlech 35378* (MSB). Hassi el Djuad, Oued Mzab, 7 May 1858, *Cosson* (P). – [Ouargla] dunes du Souf entre El Oued et Touggourt, [33°13′N, 6°45′E], 20 Apr 1912, *d'Alleizette* (G). Dunes du Djebel Ktef dans l'Oued Souf, [33°13′N, 6°45′E], 21 Apr 1858, *Cosson* (P). – [Saïda] Brezina, [33°06′N, 1°16′E], *Herb. Pomel* (MPU-AfN). Brézina, [33°06′N, 1°16′E], *Pomel* (MPU-AfN). Aïn Sefra, [32°45′N, 0°36′W], *Herb. Battandier* (MPU-AfN). – [Not located] Massart [?], *Herb. Battandier* (MPU-AfN). Sud Ornais: oued el Hassi tuhreg[?]; très commun sur gravier, [32°05′N, 1°14′W], 11 Apr 1939, *Bertram* (MPU-AfN). Terrains pierreux des HP, (MPU-AfN). Sahara: Grand Erg occidental à Mehardzi, 7 Apr 1938, *Volkonsky* (MPU-AfN). Sahara: Grand Erg occidental, Drâa el Ahmar, 9 Apr 1938, *Volkonsky* (MPU-AfN).

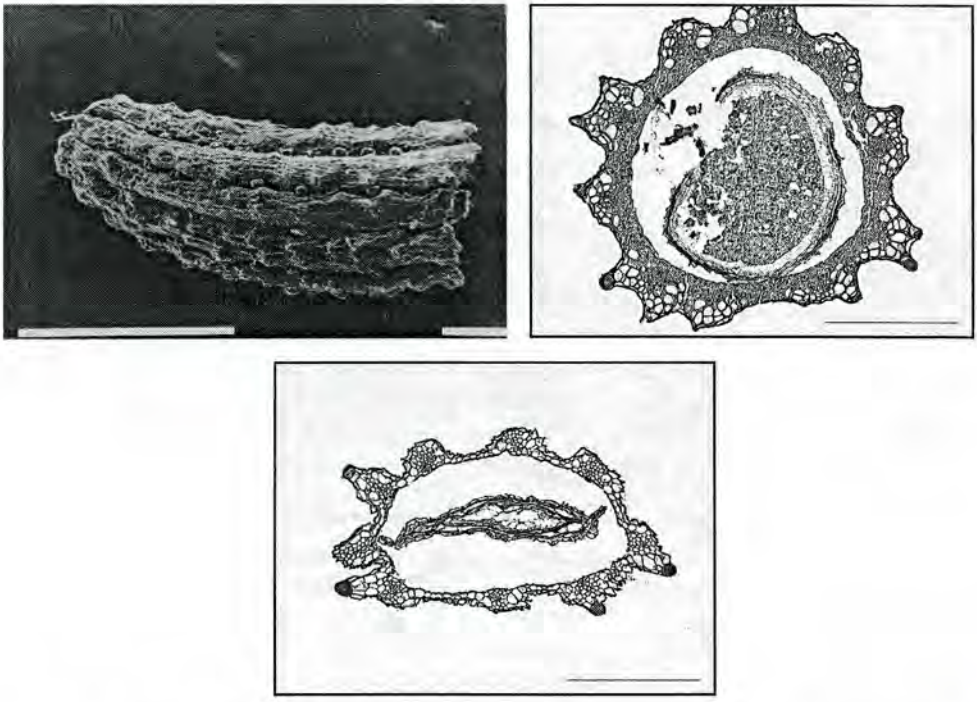


Fig. 52. Micrographs of achenes of *Anthemis stiparum* subsp. *sabulicola*. Upper row: achenes of peripheral disc florets (left, *Podlech 35571;* right, *Podlech 35418*); lower row: achene of central disc floret *(Podlech 35418).* – Scale bars = 1 mm (SEM, top left) and 0.3 mm (LM).

5. ***Anthemis zaianica*** Oberprieler, **spec. nov.** – Holotype: [Morocco] "Zaians: Oulmes au Tougroulmes", 10 May 1927, *Weiller 10227* (MPU-Weiller!).
– *Anthemis monilicostata* auct. [non Pomel 1874]: Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934).

Ab *Anthemide stiparum* achaeniis florum disci brevioribus (ad 1.5 mm longis) differt.

Annual, usually single-stemmed. Stems erect, (5-)10-20 cm tall, basally 0.8-1.8 mm in diameter, usually branched in the upper half, with (1-)2-10(-20) capitula, dull green, basally sometimes tinged with red, sulcate, sparsely to densely appressed tomentose. Basal and lower cauline leaves 10-30 mm long and (4-)7-22 mm wide, broadly to narrowly obovate or elliptical in outline, petiolate; petiole 6-15 mm long, basally usually without teeth, sometimes with 1-2 pairs of teeth; blade 2-pinnatisect with (1-)2 pairs of elliptical primary lobes; ultimate segments linear to filiform, (1.5-)2.2-4.1(-5.0) mm long and 0.3-0.8 mm wide, mucronate, sparsely tomentose, glandular-punctate. Upper cauline leaves 4-20 mm long and 1-15 mm wide, linear with entire or dentate margins, or elliptical in outline with 3-7 mm long petiole and 1-2-pinnatisect lamina with 1-3 pairs of primary lobes; ultimate segments (0.9-)1.5-2.9(-3.3) mm long and 0.2-0.6 mm wide, linear to filiform, sometimes elliptical, sparsely tomentose, glandular-punctate; base usually with 0-2 pairs of

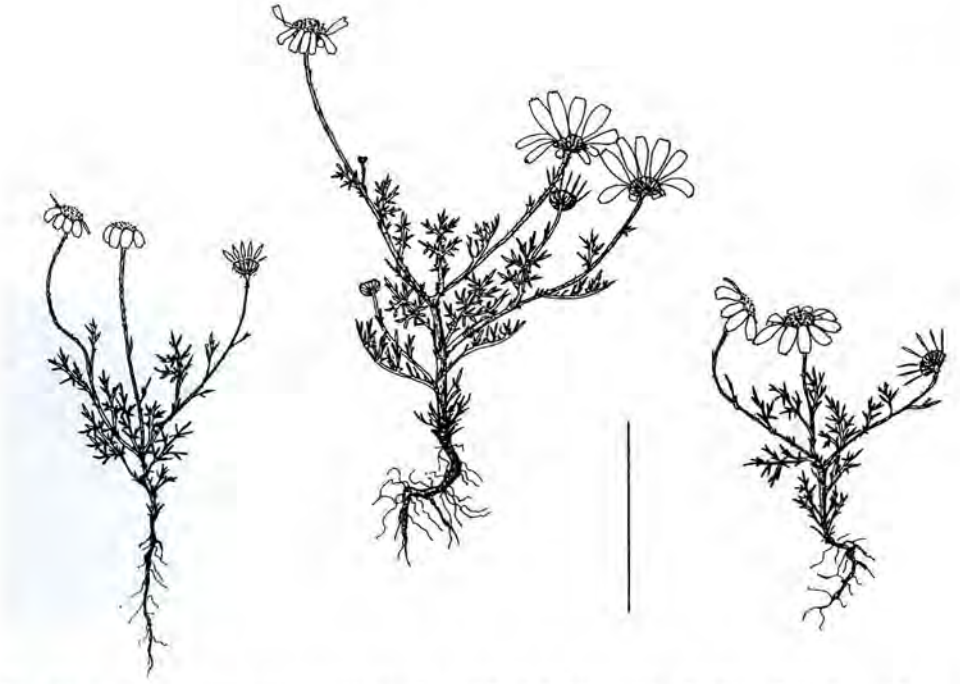


Fig. 53. *Anthemis zaianica:* general habit *(Vogt 14840 & Oberprieler 9149).* – Scale bar = 10 cm.



Fig. 54. *Anthemis zaianica:* leaf spectrum *(Weiller 10227).* – Scale bar = 3 cm.

teeth. Peduncles (11-)26-50(-70) mm long and 0.5-0.8(-1.0) mm in diameter, remaining slender or becoming slightly inflated at maturity, sulcate, densely ± appressed tomentose. Capitula (7-)11-18(-23) mm in diameter, heterogamous. Involucre (5-)7-10 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, abaxially densely appressed tomentose; the outermost narrowly triangular-elliptical, 2.1-2.5 mm long and 0.5-0.8 mm wide, acute, with rather narrow, brown, membranous margins; the middle ones narrowly elliptical, 2.9-3.3 mm long and 0.9-1.1 mm wide, acute to obtuse, laterally with 0.1-0.3 mm wide hyaline, apically with 0.4-0.8 mm wide, usually brown, membranous margins; the innermost narrowly elliptical, 2.5-3.0 mm long and 0.7-0.9 mm wide, acute to obtuse, laterally with 0.1-0.2 mm wide, apically with 0.2-0.9 mm wide brown, sometimes pale membranous margins, usually appressed tomentose only in the distal half. Receptacle globose at anthesis, conical to ovate at maturity (c. 2.5-3.0 in diam., c. 3.0-3.5 mm high), paleate throughout. Ray florets 7-13 per capitulum, white, female, 3.8-8.5 mm long; limb broadly to narrowly elliptical [index 1.2-2.7], 2.9-7.3 mm long and 2.5-3.8 mm wide, apically 3-lobed; tube sparsely glandular, 0.9-1.5 mm long and 0.5-0.85 mm wide. Pales narrowly linear, 2.8-3.4 mm long and 0.3-0.4 mm wide, basally c. 0.3 mm wide, apically tapering gradually into an acute tip formed by the protruding midrib, flat, membranous, glandulose, caducous at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 2.2-2.6 mm long; the basal part becoming moderately inflated, spongy and subtetragonous at maturity, 1.1-1.4 mm long and 0.6-0.8 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular, c. 0.3 mm long and basally 0.3 mm wide, with a 0.1-0.2 mm

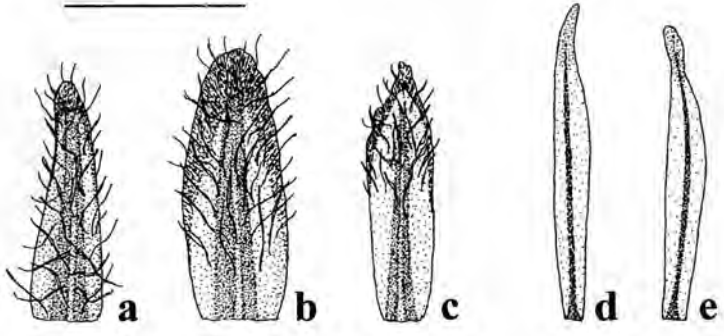


Fig. 55. *Anthemis zaianica:* (a-c) involucral bracts, (d-e) pales *(Weiller 10227).* – Scale bar = 2 mm.

long dorsal appendage. Achenes of ray florets 1.3-1.4 mm long and 0.5-0.6 mm in diameter, cylindrical to obovoid, slightly adaxially bent, 9-10-ribbed; ribs smooth to slightly tuberculate, with rectangular, ± protruding mucilage cells; furrows glandular. Achenes of disc florets moderately heteromorphic; the peripheral ones 1.3-1.5 mm long and 0.7-0.8 mm in diameter, subcylindrical to obconical, persistent at maturity, 10-ribbed; ribs tuberculate with 1-2 rows of ± protruding, isodiametrical to rectangular mucilage cells; furrows with yellow glands; corona absent or (due to the apically protruding ribs) a crenulate rim; the central ones more slender than the marginal ones, 1.2-1.4 mm long and 0.5-0.7 mm in diameter, narrowly obconical-obovoid, readily falling off at maturity, 10-ribbed; ribs smooth to slightly tuberculate with 1-2 rows of ± elongate mucilage cells; pericarp rather thin and translucent and glandular in furrows; corona absent or a crenulate rim.

Chromosome number. – $n = 9$ (see discussion in chapter 10).

Distribution and habitat. – Endemic to the mountains around Oulmès in the Zaïan region (NW Morocco). It is known only from Djebel Tougroulmès where it grows at an altitude of c. 1200-1300 m on grazed and stony mountain slopes dominated by *Thymus zygis* subsp. *gracilis* (Boiss.) R. Morales and accompanied by *Pallenis spinosa* subsp. *aurea* (Willk.) Salzm. ex Nyman, *Atractylis cancellata* L., *Bellis sylvestris* Cyr., *Chamaemelum mixtum* (L.) All., *Echinops spinosus* subsp. *bovei* (Boiss.) Murb., *Glossopappus macrotus* subsp. *hesperius* (Maire) Maire, *Hedypnois rhagadioloides* (L.) F. W. Schmidt, *Mercurialis annua* subsp. *ambigua* (L. fil.) Arcang., *Phagnalon saxatile* (L.) Cass., and *Reichardia picroides* (L.) Roth.

Variation and taxonomy. – *Anthemis zaianica* is described here as a species new to science. By its annual habit and caducous pales it approaches *A. mauritiana, A. monilicostata,* and *A. stiparum* from which it differs by the shorter disc achenes. Additionally, it can be easily distinguished from *A. mauritiana* by its less vigorous growth and homomorphic to moderately heteromorphic, only moderately tuberculate achenes; and from *A. monilicostata* by its hairy involucral bracts with rather narrow membranous margins and its achenes with smaller, never protruding mucilage cells. *A. zaianica* is most similar

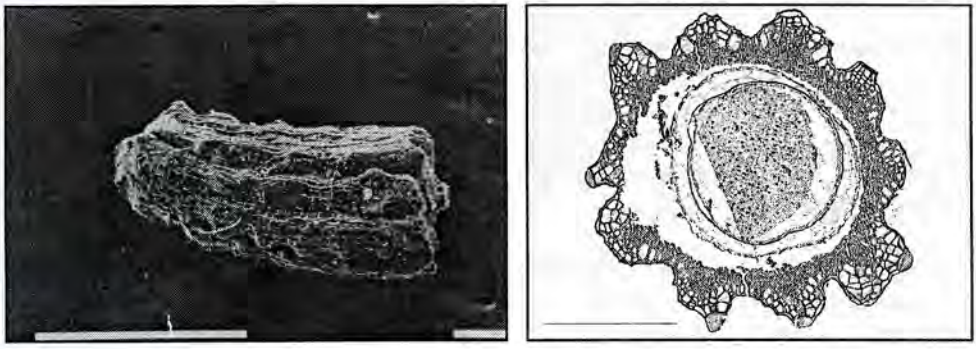


Fig. 56. Micrographs of achenes of *Anthemis zaianica (Weiller 10227).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

to *A. stiparum* subsp. *intermedia* from E Morocco and W Algeria, both taxa being characterised by narrow, long ultimate leaf segments. However, differences in achene dimensions are well marked. Molecular data (see chapter 13) suggest a closer genetic relationship of *A. zaianica* with *A. pedunculata* than with *A. stiparum*. These molecular data, along with the suggested relationship of *A. bourgaei* with *A. tuberculata* (= *A. pedunculata*) by Talavera (in Valdés & al. 1982), and of *A. stiparum* subsp. *stiparum* with the same species (discussed above) are a third hint at a possible close relationship between *A. pedunculata (A.* sect. *Hiorthia)* and *A.* ser. *Bourgaeinianae (A.* sect. *Anthemis).* However, at least for the time being, the monophyly of *A.* ser. *Bourgaeinianae,* based on its annual habit and the caducous pales, is taken for granted, and *A. zaianica* is included in it.

Specimens seen. – [Morocco, Khemisset] Zaïane, Oulmès, Djebel Tougroulmès NE of Oulmès, W- and S-facing slopes of Djebel Tougroulmès, 1310 m, 33°26.339′N, 5°58.561′W, 12 May 1995, *Vogt 14840 & Oberprieler 9149* (B; Herb. Oberprieler; Herb. Vogt). Prairies sèches au Tougroulmès, Oulmès (Zaïan), 1250 m, [33°26′N, 5°59′W], 30 Apr 1927, *Weiller (Herb. Jahandiez n° 102)* (MPU-AfN; G). Zaïans: Oulmes au Tougroulmes, [33°26′N, 5°59′W], 10 May 1927, *Weiller 102.27* (MPU-Weiller).

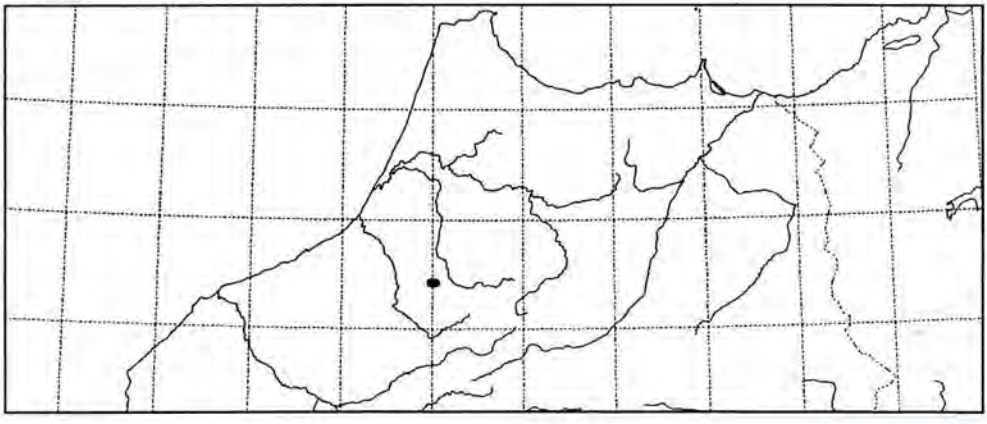


Fig. 57. Total distribution of *Anthemis zaianica.*

c. ***Anthemis*** ser. ***Chrysanthae*** Yavin in Israel J. Bot. 21: 176 (1972). – Type: *A. chrysantha* J. Gay.

Annuals. Stems procumbent to ascending-erect. Leaves obovate to narrowly obovate, 1-2(-3)-pinnatipartite; ultimate segments usually circular to elliptical in outline, mucronate. Peduncles remaining slender at maturity or sometimes becoming moderately inflated. Capitula radiate. Involucre hemispherical, not umbonate at maturity. Involucral bracts moderately to densely hairy, with rather narrow, pale to brown membranous margins; the outer ones triangular, the inner ones obtuse to acuminate. Ray florets yellow, female. Re-

ceptacle usually conical at maturity. Pales elliptical to obovate in outline, persistent at maturity, apically acuminate or truncate to even emarginate; apex formed by the protruding midrib or not reached by the midrib, tinged with yellow and somewhat hooded. Disc florets yellow, hermaphrodite; the basal part spongy and inflated at maturity. Achenes of disc florets homomorphic to moderately heteromorphic, subcylindrical to obconical or obovoidal, usually readily falling off at maturity; ribs distinct, rounded or acutely keeled, smooth or tuberculate, coinciding with ribs of the mesocarpic sclerenchyma cylinder (sclerenchyma cylinder sometimes reduced and pericarp parenchymatous); corona absent or an adaxially protracted auricle.

Basic chromosome number. – $x = 9$.
Ploidy level. – $2x$.

Taxonomy. – *Anthemis* ser. *Chrysanthae* was defined by Yavin (1972) to accommodate *A. chrysantha, A. boveana,* and the Sicilian endemic *A. muricata* Guss. In the present revision, *A. boveana* is dismembered into the four species *(A. boveana, A. gharbensis, A. maroccana,* and *A. tenuisecta). A. muricata* is characterised by discoid capitula, all other species of the series possess yellow ray florets. This character state is considered to represent a synapomorphy for the series. Since *A. muricata* lacks this character and in other features (e.g. its strongly inflated peduncles) shows closer affinity with the species group around *A. secundiramea* than with *A.* ser. *Chrysanthae,* it is here transferred to *A.* ser. *Secundirameae.*

6. ***Anthemis boveana*** J. Gay in Bory & Durieu, Expl. Sci. Algérie: t. 60, f. 2 (1848/1849) ≡ *A. bovei* J. Gay ex Willk. & Lange, Prod. 2: 91 (1870), nom. illeg. – Ind. loc.: none. – Lectotype (designated here): [Algeria] "Lieux stériles de la Falaise de la Batterie espagnole à Oran", 6 May 1842, *D[urieu de] M[aisonneuve]* (P!).
Note. – The name *Anthemis boveana* was validated by an illustration accompanied by detail drawings made by Vaillant (imprint at the bottom of the plate: "Vaillant pinx.^{t} et direx.^{tr}") under the supervision of Gay (Bory & Durieu 1848-1850: 28: "Le savant monographe des Anthémidées, J. Gay, a dirigé l'exécution de la planche 60."), under Art. 44.1, 42.3 and 42.4 of the *Code* (Greuter & al. 1994). The original material consists primarily of specimens collected by Durieu and Bory in Algeria in the years 1840-1842, as borne out by the title of the validating work ("Exploration scientifique de l'Algérie pendant les années 1840, 1841, 1842 [...] par MM. Bory de St-Vincent et Durieu de Maisonneuve [...]"). Of all available elements, the lectotype designated here, especially the lower of two plants on that sheet, shows the highest resemblance with the plant illustrated in the habit drawing.
– *Anthemis boveana* var. *typica* Maire in Bull. Soc. Hist Nat. Afrique N. 14: 151 (1923), nom. inval. [Art. 24.3], p.p.

Exs.: Munby, Pl. Alger. Exs. 1850: n° 3; Balansa, Pl. Algérie 1851: n° 13, & 1852: n° 511; Bourgeau, Pl. Algérie 1856: n° 89; Puel & Maille, Fl. Rég. Algérie 1858: n° 9; Paris, Iter Bor.-Afr.: n° 78; & Frag. Fl. Alger. Exs.: n° 442; Battandier & Trabut, Pl.

Algérie 1887: n° 271; Magnier, Fl. Sel. Exs.: n° 2495; Faure, Pl. Algérie 1907 & 1936; Duffour, Soc. Franç. 1935: n° 7489.

Annual, single-stemmed or branched immediately above the ground and few-stemmed. Stems erect or shortly ascending-erect, (4-)8-25(-40) cm tall, basally 0.5-2.5 mm in diameter, unbranched and with a single capitulum or branched in the upper half and with 2-8(-20) capitula, green, often tinged with red, shallowly sulcate, ± appressed tomentose to glabrescent. Basal and lower cauline leaves (10-)20-40(-50) mm long and (8-)10-20(-25) mm wide, elliptical to obovate in outline; petiole (5-)10-20 mm long; base with 1-3 entire or sometimes dissected teeth; blade 2-3-pinnatipartite to -pinnatisect with 2-3 pairs of primary lobes; ultimate segments elliptical to linear, 1.0-3.5 mm long and 0.4-0.9 mm wide, mucronate, sparsely tomentose, scattered with yellow glands. Upper cauline leaves (5-)10-20(-30) mm long and 1-15(-20) mm wide, linear with entire or dentate margins or elliptical in outline and 1-2-pinnatisect; petiole 3-10 mm long. Peduncles (10-)15-50(-70) mm long, slender or only slightly thickened at maturity, shallowly sulcate, appressed



Fig. 58. *Anthemis boveana:* general habit *(Cosson n° 9).* – Scale bar = 5 cm.

tomentose. Capitula (10-)15-25(-30) in diameter, heterogamous. Involucre (4-)6-11(-12) mm in diameter, hemispherical. Involucral bracts in 3 rows, green, with brown, rarely with pale, membranous margins; the outermost triangular to narrowly triangular-elliptical, (2.7-)2.8-3.5(-3.7) mm long and 1.1-1.3(-1.4) mm wide, appressed tomentose, with laterally 0.05-0.3 mm, apically 0.2-0.9 mm wide membranous margins; the middle ones ovate to elliptical, (3.8-)3.9-4.6(-4.8) mm long and (1.3-)1.4-1.8(-1.9) mm wide, acute to obtuse, in the upper half abaxially appressed tomentose, with laterally 0.1-0.5(-0.9) mm, apically 0.4-1.5 mm wide membranous margins; the innermost elliptical to obovate, 3.9-4.6(-4.9) mm long and 1.3-1.9(-2.2) mm wide, acute, with laterally 0.1-0.3 mm, apically 0.5-0.9 mm wide membranous margins, appressed tomentose in the upper half. Receptacle hemispherical at anthesis, conical to narrowly conical at maturity, paleate throughout. Ray florets (5-)10-14 per capitulum, yellow, female; limb elliptical, 7-14 mm long and 3.5-6.7 mm wide; tube sparsely glandular, 1.5-2.6 mm long and 1.0-1.8 mm wide. Pales obovate-elliptical to narrowly obovate-elliptical, 3.2-3.9 mm long and 0.85-1.45 mm wide, slightly convex, distally bent towards the centre of the capitula, membranous, abruptly tapering to an acute to cuspidate tip. Disc florets yellow, hermaphrodite, sparsely glandular, 2.8-3.6 mm long; the lower part spongy, inflated and subtetragonous at maturity, 1.2-2.2 mm long and 0.7-1.1 mm wide; apically 0.8-1.2 mm in diameter, 5-lobed; lobes triangular with a 0.2-0.3 mm long dorsal appendage. Achenes of ray florets 1.5-1.7 mm long and 0.4-0.7 mm in diameter, subcylindric-obovoidal, 10-ribbed; ribs slightly tuberculate, beset with ± isodiametric mucilage cells; furrows between the ribs with glands. Achenes of peripheral disc florets 1.1-1.4 mm long and 0.6-0.9 mm in diameter, subcylindrical to obconical, 10-ribbed, persistent at maturity; ribs rather broad and flattened, tuberculate with ± isodiametric mucilage cells; furrows between the ribs very narrow, with glands; achenes of central disc florets smaller than peripheral ones, 1.0-1.4 mm long and 0.5-0.8 mm in diameter, obconical to obovoidal, 10-ribbed, readily falling off at maturity.

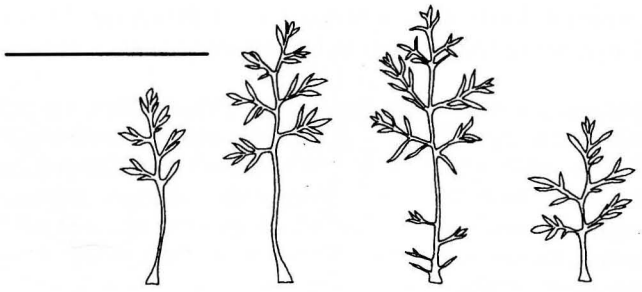


Fig. 59. *Anthemis boveana:* leaf spectrum *(Balansa n° 13).* – Scale bar = 2 cm.

Chromosome number. – Unknown. Pollen measurements (see chapter 11) suggest a diploid number.

Distribution and habitat. – Endemic to NW Algeria where it grows along the Mediterranean coast between Oran (Wilaya Oran) and La Macta (Wilaya Mostaganem) in a distri-

bution area comparable to that of *Anacyclus linearilobus* Boiss. & Reuter. Like *Anthemis chrysantha, A. boveana* is reported to grow in maritime habitats like dunes, stony slopes and cliffs from sea-level up to c. 100 m above sea-level (Fig. 62).

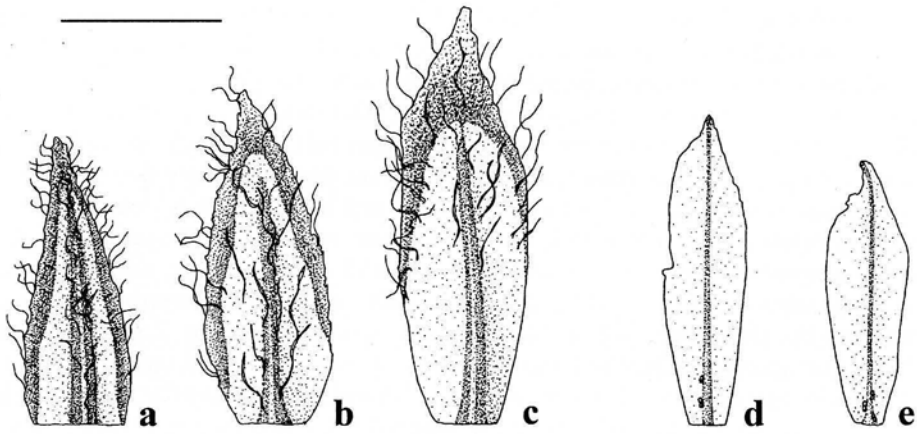


Fig. 60. *Anthemis boveana:* (a-c) involucral bracts (Oran, May 1889, *Herb. Girod*), (d-e) pales (d, *id.;* e, *Balansa n° 13*). – Scale bar = 2 mm.

Variation and taxonomy. – With the present dismemberment of *Anthemis boveana* s.l. into a closely knit group of four allopatric species (see chapter 12), what remains of *A. boveana* is a morphologically clear-cut taxon, which differs neatly from all Moroccan plants formerly assigned to *A. boveana* by its pale tips formed by the protruding midrib. In this feature, *A. boveana* shows some resemblance to the NW Algerian and SW Spanish *A. chrysantha,* from which it differs by its less dense leaf indumentum, its narrower ultimate leaf segments, longer ray florets, and peduncles remaining slender at maturity.

Specimens seen. – [Algeria, Oran] Arzew, Collines, [35°53′N, 0°19′W], Apr 1839, *Bové* (G; P; K). Terrains sablonneux de la route d'Arzeu / 27 Avril environs du blockhauss d'All-Houdja (Telegraphe) 9 Mai / Oran, 1847, [35°53′N, 0°19′W], *Marsilly* (P). Canastel, env. d'Oran, [35°48′N, 0°33′W], Jun 1921, *Alleizette* (MA 127088). Oran, pâturages sablonneux du Cap Canastel, sur sous-sol calcaire, 100 m, [35°48′N, 0°33′W], 23 Apr 1934, *Maire, n° 7489* (B; G; MA 424922). Canastel, près Oran, Pelouses sablonneuses, [35°48′N, 0°33′W], 13 May 1936, *Faure* (G). In pascuis arenoso lapidosis ad promontorium Canastel p. Oran, solo calcareo, 100 m, [35°48′N, 0°33′W], 23 Apr 1934, *Maire* (P). La Macta in arenosis, [35°45′N, 0°10′W], 6 Jun 1918, *Maire* (P). Broussailles avoisinant le pont de la Macta, [35°45′N, 0°10′W], 10 May 1851, *Balansa, n° 13* (GOET; P; G; K). Lieux steriles de la Falaise de la Batterie espagnole à Oran, [35°44′N, 0°35′W], 6 May 1842, *Durieu de Maisonneuve* (P). Oran, sables à la Batterie espagnole, près d'Oran, [35°44′N, 0°35′W], 20 Apr 1882, *Debeaux* (P). Falaises de la Batterie espagnole, env. d'Oran, [35°44′N, 0°35′W], 8 May 1852, *Cosson* (B; P). Oran, in arenosis, [35°44′N, 0°35′W], Apr 1849, *Reuter* (P). in maritimis, Oran, [35°44′N, 0°35′W], Mar 1850, *Munby, n° 3* (P). Oran, falaises et sables maritimes à la Batterie espagnole, [35°44′N, 0°35′W], 4 May 1884, *Debeaux, n° 2495* (G; P; MA

127089). Batterie Espagnole, près d'Oran. Pâturages, au-dessus des falaises, [35°44′N, 0°35′W], 11 Apr 1856, *Cosson (Puel & Maille n° 9)* (P; B; G). In sterilibus, Oran. Aprilis fl., [35°44′N, 0°35′W], Mar/Apr 1850, *Munby, n° 3* (P; K). Oran, Lieux stériles, plane maritime à el Oudja, [35°44′N, 0°35′W], 6 May 1842, *Durieu de Maisonneuve* (P). Oran, in maritimis, [35°44′N, 0°35′W], *Gouget 839* (P). Oran: in collibus maritimis, [35°44′N, 0°35′W], 25 Apr 1865, *Letourneux (Paris n° 78)* (P). - Oran, [35°44′N, 0°35′W], *Durieu* (P). in sterilibus, Oran, [35°42′N,

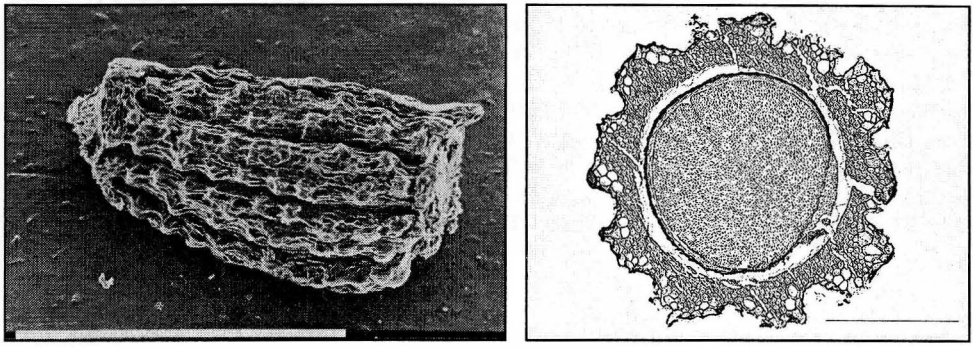


Fig. 61. Micrographs of achenes of *Anthemis boveana* (left, 13 May 1936, *Faure;* right, 9/30 May 1907, *Faure*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

0°38′W], Apr 1844 (K). Pelouses rocailleuses à Gambetta, [35°42′N, 0°38′W], 13 May 1909, *Faure* (G). in arvis maritimis prope Gambetta, [35°42′N, 0°38′W], 24 Apr 1884, *Debeaux* (B). Oran, [35°42′N, 0°38′W], *Kralik* (B). Oran, Champs sabloneux du littoral à Gambetta, [35°42′N, 0°38′W], 30 Apr 1884, *Debeaux* (MA 127028). Oran, terres meubles, [35°42′N, 0°40′W], May 1913, *Herb. d'Alleizette* (MA 127093). Oran, in fruticetis, [35°42′N, 0°38′W], Apr 1849, *Reuter*

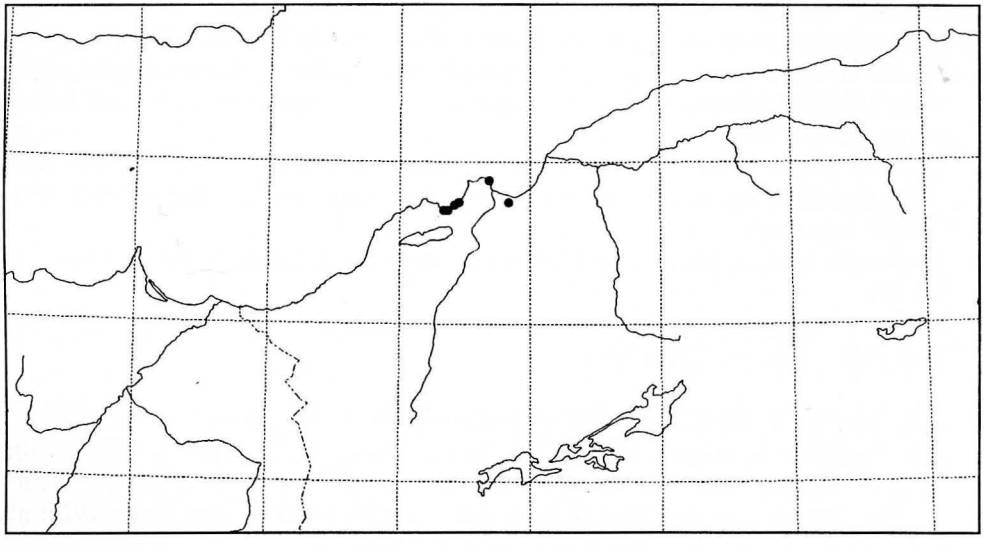


Fig. 62. Total distribution of *Anthemis boveana*.

(G). Collines calc. à Gambetta, [35°42′N, 0°38′W], 26 Apr 1882, *Debeaux* (G). Oran, [35°42′N, 0°38′W], May 1886, *Battandier* (GOET). Oran, fiches du littoral, [35°42′N, 0°38′W], 25 Apr 1884, *Debeaux* (MA 127029). Terrains rocheux au-dessus des falaises, à l'Est d'Oran, [35°42′N, 0°38′W], 6.1861, *Pomel, n° 442* (P; G). Oran, [35°42′N, 0°38′W], Apr 1849, *Reuter* (G). Oran, [35°42′N, 0°38′W], 1909, *Gandoger* (K). Oran, dans les broussailles sablonneuses, [35°42′N, 0°40′W], 20 Apr 1852, *Balansa, n° 511* (MPU-AfN; GOET; P; G; K). Circà Oran, [35°42′N, 0°38′W], 1849, *Boissier & Reuter* (G; P; K). Falaise au-dessus de la Batterie espagnole près Oran, [35°42′N, 0°38′W], 10 Apr 1856, *Bourgeau, n° 89* (GOET; P; G; K). Oran, [35°42′N, 0°38′W], May 1887, *Battandier & Trabut 271* (GOET; P; G). Oran, au Cagneret, Pelouses sèches et rocailleuses, [35°42′N, 0°38′W], 9./30 May 1907, *Faure* (B; G). Oran, au Cagneret, Pelouses sèches et rocailleuses [35°42′N, 0°38′W], 9./30 May 1907, *Faure* (G). Oran, [35°42′N, 0°38′W], May 1889, *Herb. Girod* (G). – [Not located] Bourpan[?], *Gitel* (P). Ruines du port-aux-Poules (Algérie), 7 May 1848 (P). – [Cultivated] Jardin de la faculité de médecine de Paris, provenant de graines (semées le 2 Avril) récoltées par Durieu aux environs d'Oran, 6 Aug 1843, *Durieu* (K). Cult. Hort. Herb. Al. de Bunge (P). Sem. mauritanices (cl. Durieu), 1843 (P).

7. ***Anthemis chrysantha*** J. Gay in Bory & Durieu, Expl. Sci. Algérie: t. 60, f. 1 (1848/1849). – Ind. loc.: none. – Lectotype (designated here): [Algeria] "Très abondant sur les falaises du Château-neuf à Oran", 25 Apr 1842, *D[urieu de] M[aisonneuve]* (P!).

   Note. – Validation circumstances for the name *Anthemis chrysantha* were the same as for *A. boveana* (see above). Of all available elements, the lectotype designated here, especially the plant on the right side of the sheet, shows the highest resemblance with the plant illustrated in the habit drawing. An earlier "lectotypification" by Benedí i González (1987: 223: "in MPU (herb. Maire) (!), isotypi in K (n.v.)") is ineffective because no concrete specimen was mentioned, and none collected by Durieu or Bory (nor indeed any material collected prior to 1850) is present in MPU-AfN.

= *Anthemis chrysantha* var. *intermedia* Faure & Maire in Bull. Soc. Hist. Nat. Afrique N. 30: 349 (1939). – Ind. loc.: "Algérie occidentale: Iles Habibas." – Lectotype (designated here): [Algeria] "Grande Ile Habibas, Pelouses [...]", 3-4 May 1934, *Faure* (P!; isolectotype: MPU-AfN!).

= *Anthemis jimenezii* Pau in Bull. Acad. Int. Géogr. Bot. 16: 76 (1906). – Ind. loc.: "Cartagens ad "Cabo tinoso" loco Azohia."– Lectotype (Benedí i Gonzáles 1987: 223): "in BC" [not seen].

– *Anthemis bovei* auct. [non J. Gay 1848-1849]: Willkomm & Lange, Prodr. Fl. Hispan. 2: 91 (1870).

– *Anthemis chrysantha* var. *eu-chrysantha* Maire in Bull Soc. Hist. Nat. Afrique N. 30: 349 (1939), nom. inval. [Art. 24.3.]

Exs.: Munby, Pl. Alger. Exs. 1850: n° 4; Balansa, Pl. Algérie 1851: n° 12, & 1852: n° 510; Bourgeau, Pl. Algèrie 1856: n° 90; Puel & Maille, Fl. Rég. Algérie 1858: n° 10; Frag. Fl. Alger. Exs.: n° 441; Paris, Iter Bor.-Afr.: n° 77; Warion, Pl. Atl. Sel. 1876: n° 57; Soc. Dauphin.: n° 819; Soc. Cénom. Exs.: n° 2946; Duffour, Soc. Franç. 1923: n° 4482; Lambinon, Soc. Éch. Eur. Médit. 1983: n° 10733.

Annual, sometimes single-stemmed but mostly branched from immediately above the ground and few- to many-stemmed. Stems procumbent to ascending-erect, rarely erect, (5-)10-20(-30) cm tall, basally 1-3(-5) mm in diameter, branched in the upper half, with (1-)3-10(-30) capitula, dull green, basally sometimes tinged with red, sulcate, sparsely to densely appressed tomentose. Basal and lower cauline leaves (10-)15-25(-55) mm long and (4-)7-15(-30) mm wide, elliptical to obovate in outline, petiolate; petiole (5-)7-15(-25) mm long; base without teeth; blade 2(-3)-pinnatipartite to -pinnatisect with 2-3 pairs of primary lobes; ultimate segments linear to broadly elliptical or circular, 0.9-2.3 mm long and 0.8-1.5 mm wide; tips blunt, rarely mucronate, sparsely to densely tomentose, glandular-punctate. Upper cauline leaves (5-)8-20 mm long and 1-10(-15) mm wide, linear with entire margins, or circular to obovate in outline with 3-10 mm long petiole and 1-2-pinnatipartite to -pinnatisect lamina with 1-2 pairs of primary lobes; ultimate segments 1.3-2.8 mm long and 0.5-1.6 mm wide, linear to nearly circular, glandular-punctate. Peduncles (5-)12-26(-35) mm long and 0.6-1.5 mm in diameter, becoming moderately (to

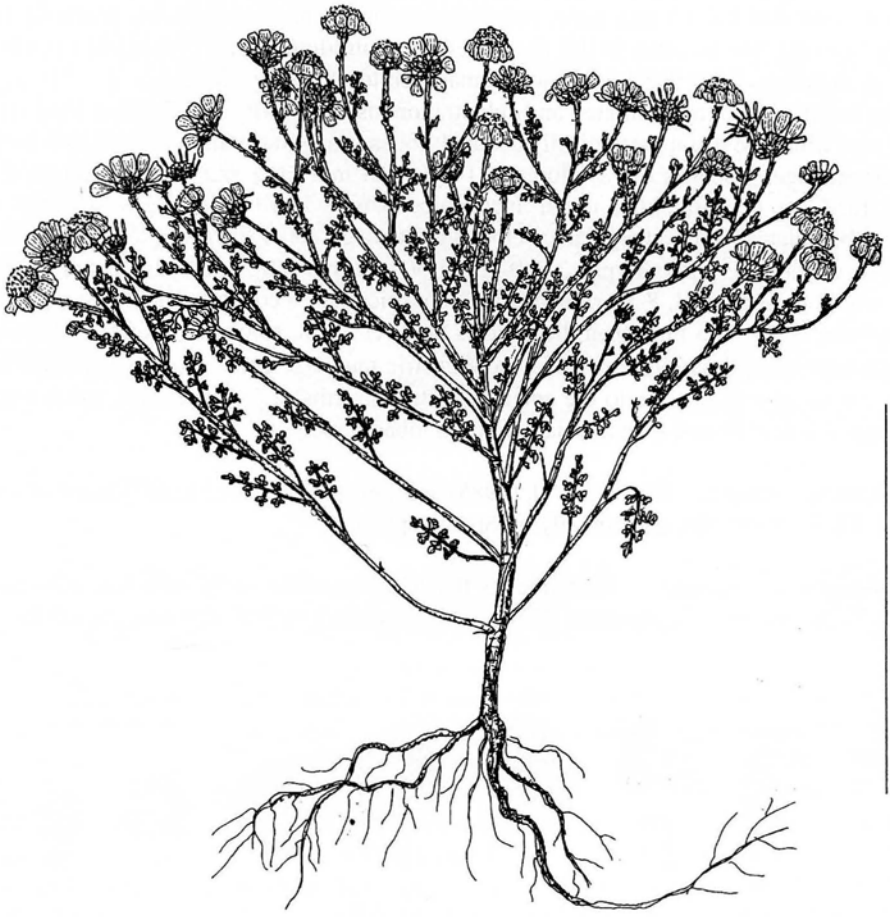


Fig. 63. *Anthemis chrysantha:* general habit *(Dubuis n° 10733).* – Scale bar = 10 cm.

strongly) thickened at maturity and then 1.3-2.1 mm in diameter, sulcate, densely ± appressed tomentose. Capitula 12-20(-24) mm in diameter, heterogamous. Involucre 8-11 mm in diameter, hemispherical, umbonate at maturity. Involucral bracts in 3 rows, rather thick; the outermost triangular-elliptical to narrowly triangular-elliptical, (2.4-)3.0-4.0 (-4.2) mm long and 0.7-1.5 mm wide, acute, densely appressed tomentose, usually devoid of a membranous margins; the middle ones elliptical to narrowly elliptical, (2.9-)3.5-4.3 (-4.5) mm long and 1.0-2.0 mm wide, acute to obtuse, dorsally appressed tomentose, with rather narrow membranous margins; the innermost broadly to narrowly elliptical-obovate, (2.7-)3.2-4.3(-4.7) mm long and 1.5-2.8 mm wide, laterally with rather narrow, pale, membranous margins, apically acute to obtuse with narrow membranous margins, appressed tomentose in the distal half. Receptacle globose at anthesis (c. 2 × 2 mm), elongating and cylindrical to ovate at maturity (c. 2.5 × 3.5-5 mm), paleate throughout. Ray florets 5-11 per capitulum, saturated yellow, female, 3.3-8.8 mm long; limb circular to elliptical, 2.1-7 mm long and 1.3-3.9 mm wide, apically 3-lobed; tube sparsely glandular, 1.2-2.0 mm long and 0.7-1.2 mm wide. Pales obovate to narrowly obovate, (2.7-)2.9-3.5 (-3.8) mm long and 1.1-1.8 mm wide, rather convex and bent, membranous, gradually to abruptly tapering into an acute to (by the somewhat protruding midrib) cuspidate tip, persistent at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 2.5-4.0 mm long; the lower part spongy, inflated and subtetragonous at maturity, 1.2-2.2 mm long and 0.8-1.1 mm wide; the distal part apically 5-lobed; lobes triangular, with a 0.1-0.2 mm long dorsal appendage. Achenes of ray florets 1.1-1.8(-2.0) mm long and 0.6-0.8 mm in diameter, fusiform to obovoidal, rather inconspicuously 8-10-ribbed; ridges smooth to slightly tuberculate, with rectangular or elongate mucilage cells; furrows glandular. Achenes of disc florets ± homomorphic, (1.0-)1.2-1.6(-1.7) mm long and 0.6-1.0 mm in diameter, obovoid-obconical, 8-10-ribbed; ribs inconspicuous to conspicuous, flattened and much broader (0.15-0.35 mm) than the furrows between them, smooth to slightly tuberculate, each with several parallel rows of ± isodiametric mucilage cells; furrows with yellow glands; corona absent, or (due to the apically protruding ribs) a crenulate rim, sometimes with an up to 0.4(-0.6) mm long adaxial, entire to lobed auricle.

Chromosome number. – Blanché & al. (1985) and Benedí i González (1987) found $n = 9$ and $2n = 18$ chromosomes, respectively, in Spanish plants.

Distribution and habitat. – Endemic to the Mediterranean coast between Beni-Saf (Wilaya Tlemcen) and Mostaganem (Wilaya Mostaganem) in NW Algeria, the offshore

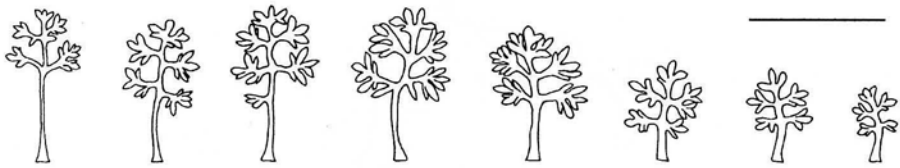


Fig. 64. *Anthemis chrysantha:* leaf spectrum (8 Jun 1852, *Balansa*). – Scale bar = 2 cm.

islands (Iles Habibas), and in the surroundings of Cartagena and Escombreras island (Prov. Murcia) in SE Spain. *Anthemis chrysantha* is reported to grow in maritime habitats like dunes and adjacent rocky slopes and cliffs between sea level and c. 50 m of altitude. Benedí i Gonzalez (1987) indicated Spanish populations to grow preferably in nitrophilous dunal plant communities (Hordeion leporini s.l.).

Variation and taxonomy. – Its golden-yellow ray florets characterise *Anthemis chrysantha* as the lead species of a distinct grouping, *A.* ser. *Chrysanthae*. It differs from the other members of this series by its leaves which are usually densely tomentose and its ultimate leaf segments which are broadly elliptical to circular. With the partly sympatric *A. boveana* it is the only member of *A.* ser. *Chrysanthae* to possess pale tips formed by the protruding midrib. It differs, however, from *A. boveana* by its shorter ray florets and moderately to strongly inflated peduncles.

Plants from the Habibas islands off the Algerian coast were described as *Anthemis chrysantha* var. *intermedia* (Faure & Maire in Maire 1939), considered to hold a morphologically intermediate position between the mainland populations and *A. boveana,* which it would morphologically approach by its larger involucres and longer ray florets. I cannot confirm a discontinuity in capitula dimensions between the Algerian mainland and island populations of *A. chrysantha.* The type specimens of var. *intermedia* well fall within the variational range of the mainland representatives of the species. I therefore treat *A. chrysantha* var. *intermedia* as a synonym of *A. chrysantha.*

Spanish plants of *Anthemis chrysantha* from around Cartagena (Murcia province) were described by Pau (1906) as *A. jimenezii.* Fernandes (1983) compared plants from both areas and found that the leaves were less strongly dissected in the Algerian plants than in the Spanish ones. Additionally, she found the Algerian plants to have smaller capitula, higher receptacles, and achenes with usually more conspicuous ribs and a smaller corona than the Spanish representatives. In view of the small number of specimens studied she felt unable to decide on the taxonomic status of the Spanish plants, but she noted that *A. jimenezii* might possibly deserve recognition as a subspecies of *A. chrysantha.* How-

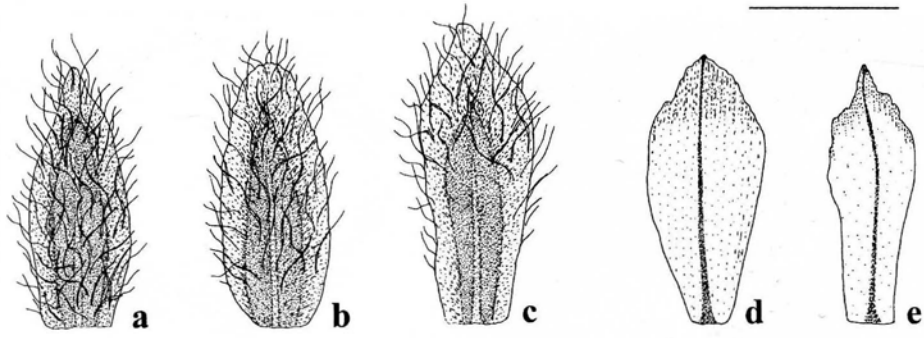


Fig. 65. *Anthemis chrysantha:* (a-c) involucral bracts (24 May 1980, *Dubuis*), (d-e) pales (d, *id.;* e, 5 Jun 1910, *Faure*). – Scale bar = 2 mm.

ever, Benedí i González (1987) did not find any taxonomically relevant differences between plants from the Spanish and Algerian coast and treated *A. jimenezii* as a synonym of *A. chrysantha*. I found that Spanish plants tend to have longer peduncles, larger capitula, and larger achenes than most Algerian representatives of *A. chrysantha*, but still fall within the variational range of the N African populations.

Specimens seen. – [Algeria, Mostaganem] Pointe de la Salamandre, près de Mostaganem, sur les falaises, [35°56′N, 0°03′E], 20 May 1851, *Balansa, n° 12* (MPU-AfN; GOET; P; G; K). Mauritania ad Mostaganem, [35°55′N, 0°05′E], 1845, *Delestio [?]* (P). Mostaganem, [35°55′N, 0°05′E], *Duval* (P). Mostaganem, [35°55′N, 0°05′E], *Herb. Battandier* (MPU-AfN). – [Oran] Bou-Sfer, bord de la mer, entre "Les Andalouses" et la plage de Bou-Sfer, alt. env. 2 m, sables plus ou moins fixés des dunes littorales, [35°45′N, 0°46′W], 24 May 1980, *Dubuis 10733* (MSB; G, MA 378567; RNG; BC 648813; SEV 113012). Arzeu, rochers siliceux maritimes, 10-20 m, [35°53′N, 0°19′W], 22 Apr 1934, *Maire & Weiller, n° 2946* (MPU-AfN; G; BC 88311). Environ d'Arzew, pelouses sablonneuses, [35°53′N, 0°19′W], 22 Apr 1934, *Faure* (MA 127026). Arzeu, in arena maritima, [35°53′N, 0°19′W], 22 Apr 1934, *Maire & Wilczek 844* (B). In pascuis lapidosis maritimis prope Arzeu, solo siliceo, [35°53′N, 0°19′W], 22 Apr 1934, *Maire* (MPU-AfN; P). Khristel, [35°50′N, 0°30′W], 7 May 1891, *Doumergue* (G). Christel, sables maritimes, [35°50′N, 0°30′W], 5 May 1875, *Cosson & Kralik, n° 819* (MPU-AfN; P; K). Cap Falcon, [35°48′N, 0°49′W], 29 Mar 1952, *de Retz 31576* (MPU-AfN). Cap Falcon, sur les falaises, [35°48′N, 0°49′W], 8 Jun 1852, *Balansa, n° 510* (MPU-AfN; GOET; P; G; K). Sables maritimes, Cap Falcon, [35°48′N, 0°49′W], Apr 1921, *d'Alleizette* (MA 127027). Aïn-el-Turck, rochers dominant la plage, [35°46′N, 0°45′W], 20 Jun 1923, *Le Cesve, n° 4482* (MPU-AfN; G). Argiles au pied des falaises à l'Est d'Oran, [35°46′N, 0°33′W], Jun 1861, *Pomel, n° 441* (MPU-AfN; P; K). Aïn-el-Turk, près Oran, Pelouses sablonneuses, [35°44′N, 0°45′W], 5 Jun 1910, *Faure* (G). Batterie Espagnole, près d'Oran, Pâturages au-dessus des falaises, [35°44′N, 0°35′W], 11 Apr 1856, *Cosson, n° 10* (MPU-AfN; B; P; G). Oran (Algérie), [35°44′N, 0°35′W], 16 Apr 1887, *Julien* (G). Terrains sablonneux du littoral, Oran, [35°44′N, 0°35′W], May 1918, *d'Aleizette* (G). Grand Ile Habibas, Pelouses et broussailles, [35°44′N, 1°7′W], 3/4 May 1934, *Faure* (MPU-AfN). - In insula Habiba majore, [35°44′N, 1°7′W], 3 May 1934, *Maire* (MPU-AfN; P). Paturages de la Falaise de la Batterie espagnole à Oran, [35°44′N, 0°35′W], 18 Apr 1842, *Durieu de Maisonneuve* (P). Habibas, [35°44′N, 1°7′W], *Herb. Pomel* (MPU-AfN). Environs d'Oran, Lieux sablonneux, [35°44′N, 0°35′W], 17 May 1932, *Faure* (G). Oran (Algérie), sables maritimes a la batterie espagnole,

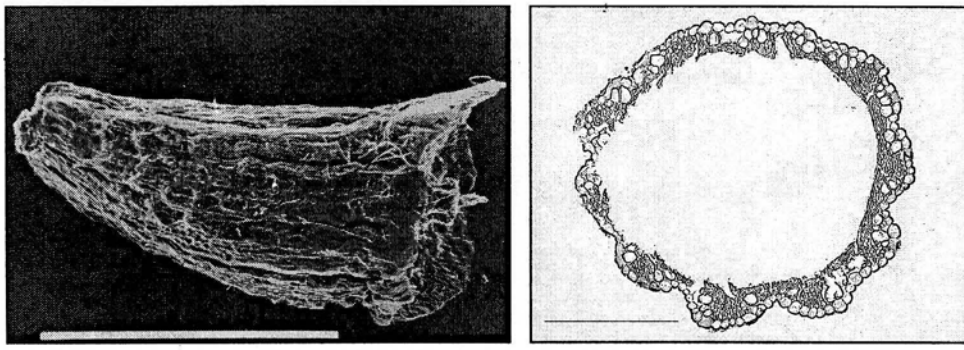


Fig. 66. Micrographs of achenes of *Anthemis chrysantha (Dubuis n° 10733).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

[35°44′N, 0°35′W], 28 Apr 1881, *Debeaux* (P). Sables maritimes à la Batterie espagnole près Oran, [35°44′N, 0°35′W], 19 Apr 1856, *Bourgeau, n° 90* (MPU-AfN; GOET; P; G; K). Oran (Algérie), [35°44′N, 0°35′W], 1845, *Jaubert* (G). Oran, falaises maritimes vers Mers-el-Kebir, [35°44′N, 0°41′W], May 1910, *Weiller* (MPU-Weiller). Grand Ile Habiba, Pelouses, [35°44′N, 1°7′W], 3/4 May 1934, *Faure* (MPU-AfN; P). In arenosis maritimis juxta Christel, ad orientem Oran, [35°44′N, 0°41′W], 5 May 1875, *Warion, n° 57* (B; P; G; K). Falaises de la Batterie espagnole, env. d'Oran, [35°44′N, 0°35′W], 8 May 1852, *Cosson* (B; G). Oran; in arenis maritimis (zona super.) ad Aïn et Turk, Algeria occid., [35°44′N, 0°45′W], 5 May 1930, *Andreanszky* (B; G). Oran, in ruderatis, [35°44′N, 0°35′W], Apr 1849, *Reuter* (G; P). In insulae Habiba majoris rupibus maritimis vulcanicis, [35°44′N, 1°7′W], 3 May 1934, *Maire* (P; BC 88343). Ad littora maris, Oran, [35°43′N, 0°39′W], May 1850, *Munby, n° 4* (MPU-AfN; P; K). bords de la mer, Oran, [35°42′N, 0°38′W], May 1846 & Apr 1847, *Marsilly* (P). Batterie espagnole (Oran), [35°42′N, 0°38′E], 12 Apr 1886, *Battandier & Trabut, n° 159* (GOET; G). Algérie, Chateau neuf à Oran, [35°42′N, 0°38′W], 4 May 1876, *Cosson* (P). Oran, [35°42′N, 0°38′W], 1859, *Pomel* (GOET). Circà Oran, [35°42′N, 0°38′W], 1849, *Boissier & Reuter* (P; G; K). Oran, près de la mer, [35°42′N, 0°38′W], Apr 1839, *Bové* (P; G; K). Oran, audessous des forcifications du Fort-neuf à 150 pieds environ audessus du niveau de la mer, [35°42′N, 0°38′W], 1839, *Dédé* (K). ad rupes maritimis, Oran, [35°42′N, 0°38′W], May 1844 (K). Falaises maritimes, Oran, [35°42′N, 0°38′W], Apr 1911, *d'Alleizette* (BC 29485). Oran, [35°42′N, 0°38′W], *Delile* (K). Oran. Falaise du Chateau neuf, [35°42′N, 0°38′W], 25 Apr 1842, *Durieu* (P). Paturages maritimes à Oran, [35°42′N, 0°38′W], 14 Jun 1842, *Durieu* (P). Très abondant sur les falaises du Château-neuf à Oran, [35°42′N, 0°38′W], 25 Apr 1842, *Durieu de Maisonneuve* (P). Oran, [35°42′N, 0°38′W], *Durieu de Maisonneuve* (P). in maritimis, Oran, [35°42′N, 0°38′W], *Munby, n° 4* (P). Oran (Cap Falcon), [35°42′N, 0°38′W], Apr 1912, *d'Alleizette* (P). Oran, in collibus maritimis, [35°42′N, 0°38′W], 25 Apr 1865, *Letourneux 77* (P). 20 km E of Oran, Kristel to Aïn Franin, 50 m, 35°40'N, 0°30'W, cliff-top vegetation, 16 Apr 1976, *Sutton & Sutton 266* (RNG). 20 km E of Oran, Montagne des Lions, 400 m, 35°40'N, 0°30'W, *Cistus/Teline* dominated vegetation, 15 Apr 1976, *Sutton & Sutton 244* (RNG). Sables maritimes près du Cap Carbon, 7 May 1875, *Cosson* (P). – [Tlemcen] Environs de Beni-Saf, Pelouses rocailleuses,

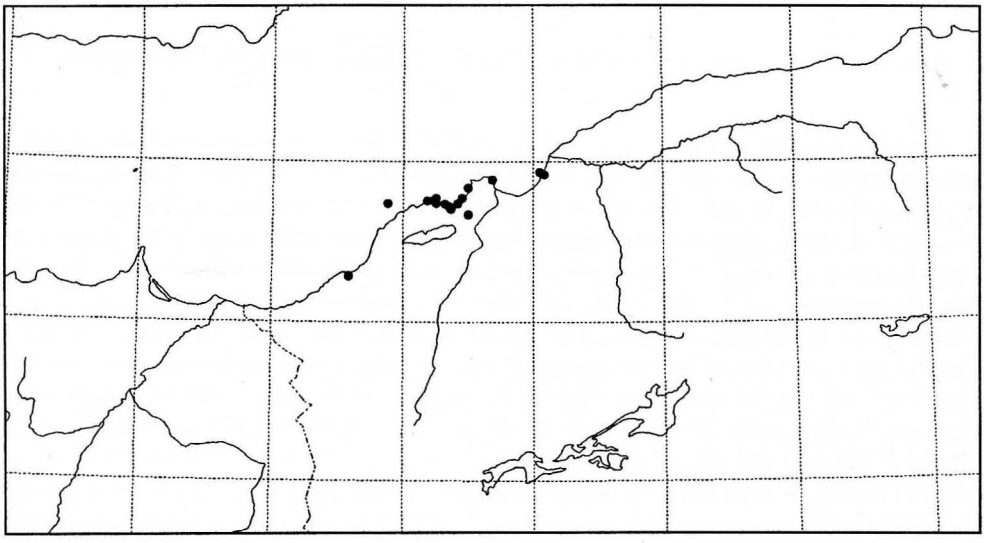


Fig. 67. N African distribution of *Anthemis chrysantha*.

[35°20'N, 1°25'W], 1 May 1934, *Faure* (MA 127091). – [Not located] Ruines du port-aux-Poules, 7 May 1848, *[?]* (P). Tunisie [?], *Vialas* (MPU-AfN). – [Cultivated] Fragmens d'un capitule d'un échantillon unique de Herbier du jardin des plantes de Paris, sur le quel j'ai fait ma description, échantillon trouvé à Arzew par Bravais [m. J. Gay], Apr 1840, *Bravais* (K). H. Par. Sem. mauritani. M. Durieu, *Herb. Schultz Bip.* (P). Semins Mauritan. du DuRieu. H.P. 1843, (P). Sur ma fenêtre, Graines seméns le 22 Avril 1840 (recolées à Oran par M. Dédé.), 30 Aug 1840, *Gay* (K). dont les graines ont été récoltées par Durieu sur les falaises des environs d'Oran). Jardin des plantes, Couches, 17.Jul 1843 (K).

8. ***Anthemis gharbensis*** Oberprieler in Willdenowia 24: 83 (1994). – Holotype: [Morocco] "Rharb, road S 216 between Arbaoua and Moulay Bousselham, c. 3.4 km W of junction with road to Lalla-Rhano and Ksar-el-Kebir, ungrazed field margin", 10 m, 34°51'N, 6°10'W, 24 Apr 1993, *Vogt 10161 & Oberprieler 4609* (B; isotypes: G, K, RAB, RNG, SEV, MA, JE, herb. Oberprieler, herb. Vogt).

= *Anthemis boveana* f. *elongata* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 763 (1934) ≡ *A. boveana* var. *elongata* (Maire) Sauvage in Trav. Inst. Sci. Chérifien, Sér. Bot. 22: 187 (1961). – Ind. loc.: "WN. Forêt de la Mamora (Maire)." – Holotype: [Morocco] "In silva Mamora", 15 Apr 1926, *Maire* (P!).

– *Anthemis boveana* var. *tenuisecta* auct. [non (Ball) Maire 1923]: Maire in Bull. Soc. Hist. Nat. Afrique N. 14: 151 (1923) p.p.; Jahandiez & Maire, Cat. Pl. Maroc: 763 (1934), p.p.

– *Anthemis chrysantha* var. *tenuisecta* auct. [non (Ball) Pau 1930]: Pau in Font Quer, Iter Marocc. 1930: n° 666 (1930).

– *Anthemis boveana* var. *jahandiezii* auct. [non Maire 1923]: Jahandiez & Maire, Cat. Pl. Maroc: 763 (1934), p.p.

Exs.: Font Quer, Iter Marocc. 1930: n° 666 (sub *"Anthemis chrysantha* var. *tenuisecta"*).

Annual, single-stemmed or branched immediately above the ground and then few- to many-stemmed. Stems erect or shortly ascending-erect, (4-)10-45(-60) cm tall, basally (0.4-)1-4(-5) mm in diameter, rarely unbranched and with a single capitulum, usually branched in the upper half and with (2-)5-25(-50) capitula, dull green, in the lower half often tinged red, sulcate, ± appressed tomentose. Basal and lower cauline leaves (10-)20-50(-75) mm long and (3-)5-20(-30) mm wide, elliptical to obovate in outline, petiolate; petiole (5-)7-20(-25) mm long; base entire, rarely with a few short teeth; blade 1-2-pinnatisect with 2-4 pairs of primary lobes; ultimate leaf segments elliptical to ovate, 0.8-2.1 mm long and 0.4-0.7 mm wide, mucronate, sparsely to densely tomentose, glandular-punctate. Upper cauline leaves (5-)10-25(-35) mm long and 1-10(-20) mm wide, linear to elliptical, entire or dentate or 1-2-pinnatisect; petiole 2-10(-13) mm long. Peduncles (7-)20-50(-75) mm long, remaining slender at maturity, sulcate, appressed tomentose. Capitula (8-) 13-22(-25) in diameter, heterogamous. Involucre (4-)8-10(-12) mm in diameter, hemispherical. Involucral bracts in 3 rows, dull green; the outermost narrowly triangular, 1.7-3.4 mm long and 0.6-1.0 mm wide, appressed tomentose; the middle ones narrowly ellipti-

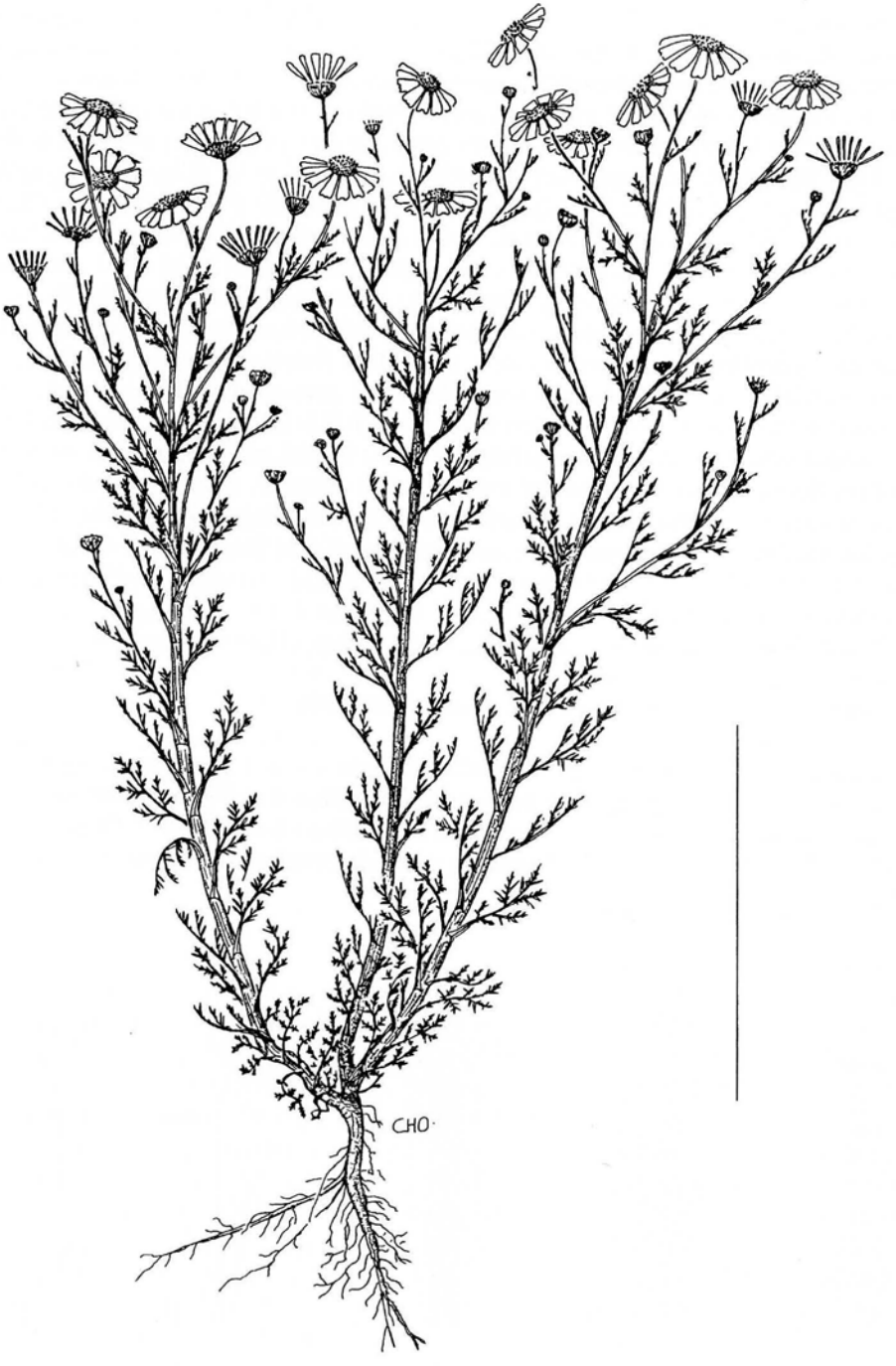


Fig. 68. *Anthemis gharbensis:* general habit *(Vogt 10161 & Oberprieler 4606).* – Scale bar = 10 cm.

cal to narrowly obovate, 2.4-3.9 mm long and 0.8-1.1(-2.0) mm wide, obtuse, appressed tomentose abaxially in the distal half and with 0.1-0.4 mm wide, brown-membranous margins; the innermost narrowly elliptical to narrowly obovate, 3.1-3.8 mm long and 0.8-1.2 mm wide, laterally with 0.1-0.2 mm wide, pale membranous margins, apically obtuse to truncate with 0.4-0.6 mm wide brown-membranous margins, appressed tomentose in the distal half. Receptacle hemispherical at anthesis, ovoid-conical at maturity, paleate throughout. Ray florets (4-)12-14(-17) per capitulum, pale yellow [R.H.S. Colour Chart (Anon. 1966): 3A], female; limb elliptical, (4-)7-12 mm long and (2-)3-4 mm wide; tube sparsely glandular, 1.0-1.8 mm long and 0.5-1.0 mm wide. Pales (2.8-)3.0-3.7 mm long and (0.4-)0.5-0.8 mm wide, narrowly elliptical to linear, slightly convex, distally bent towards the centre of the capitulum, membranous, with yellow, spathulate, truncate to emarginate, sometimes somewhat hooded tips. Disc florets yellow, hermaphrodite, sparsely glandular, 2.2-2.9(-3.3) mm long; the basal part spongy, inflated and subtetragonous at maturity, (0.6-)1.0-1.5 mm long and (0.3-)0.5-1.0 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular with a 0.1-0.2 mm long appendage. Achenes of ray florets 1.4-1.7 mm long and 0.4-0.6 mm in diameter, subcylindric-obovoidal, inconspicuously 8-10-ribbed; ridges smooth with elongate mucilage cells forming uninterrupted, longitudinal rows; furrows with glands. Achenes of disc florets homomorphic, 1.1-1.6 mm long and 0.4-0.7 mm in diameter, obovoid-obconical, smooth, with 10 conspicuous, acutely keeled ribs bearing uninterrupted, longitudinal rows of elongate mucilage cells; furrows with sparse, yellow glands; all achenes readily falling off at maturity.

Chromosome number. – $n = 9$; $2n = 18$ (Oberprieler 1994).

Distribution and habitat. – Endemic to NW Morocco where it grows on sandy inland plains along the Atlantic coast between Tangier and Casablanca (Fig. 71), at 10-200 m above sea level. Most of the specimens were collected in the Rharb lowlands N of Rabat and in the Forêt de la Mamora E of Rabat. According to my observations (Oberprieler 1994), the

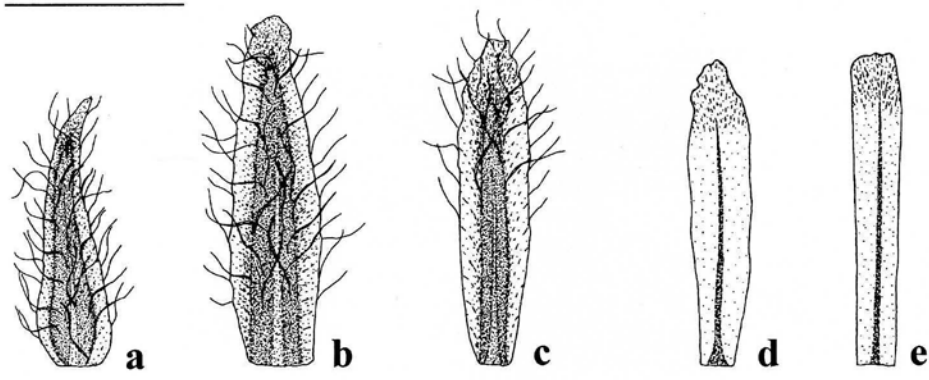


Fig. 69. *Anthemis gharbensis:* (a-c) involucral bracts *(Vogt 10259 & Oberprieler 4707),* (d-e) pales (d, *id.;* e, *Vogt 10161 & Oberprieler 4609).* – Scale bar = 2 mm.

species is usually found along ungrazed field margins in plant communities dominated by weedy annuals and in the understory of *Quercus suber* forests (Forêt de la Mamora).

Variation and taxonomy. – *Anthemis gharbensis,* recently described (Oberprieler 1994), is a showy species with salient features. The sculpturing of its disc achenes is unique not only within *A.* ser. *Chrysanthae* but among N African members of the genus. The 10 acutely keeled ribs are smooth, devoid of tubercles, and bear characteristically formed mucilage cells that are strongly elongate to form continuous slime ribbons on the narrow ridges of the ribs (Fig. 3B, 70). Some plants of *A. tenuisecta* subsp. *tenuisecta* and all those belonging to *A. tenuisecta* subsp. *jahandiezii* also have smooth instead of tuberculate achenes, but their achenes have shallow and rounded ribs that lack the specialised mucilage cells typical for *A. gharbensis*. Mutivariate statistical analysis of morphological characters (see chapter 12) shows *A. tenuisecta* subsp. *jahandiezii* in a somewhat intermediate position between subsp. *tenuisecta* and *A. gharbensis,* which latter it phenetically approaches in its erect habit and comparatively long and pale yellow ray florets. However, since its achenes lack the unique features of *A. gharbensis* and resemble those of the northernmost populations of *A. tenuisecta* subsp. *tenuisecta*, it is included in *A. tenuisceta* rather than in *A. gharbensis*.

As mentioned earlier (Oberprieler 1994), the conspicuous and constant achene features of *A. gharbensis* went unnoticed by Maire (in Jahandiez & Maire 1934) when he first acknowledged plants from the Mamora forest as an aberrant form of *"A. boveana* var. *tenuisecta"*, f. *elongata,* which he distinguished from typical var. *tenuisecta* by its taller, less branched habit and the lighter colour of its ray florets.

Specimens seen. – [Morocco, Casablanca] Casablanca, [33°35′N, 7°33′W], May 1887, *Méllerio* (P). – [Kénitra] ca. 15 km ESE Moulay-Bousselham an der Straße nach Souk-el-Arba-Rharb (S 216), 6°10′W, 34°51′N, 23 Jun 1989, *Podlech 46867* (MSB). Rharb, road S 216 between Arbaoua and Moulay Bousselham, c. 3.4 km W of junction with road to Lalla-Rhano and Ksar-el-Kebir, ungrazed field margin, 10 m, [34°51′N, 6°10′W], 24 Apr 1993, *Vogt 10161 & Oberprieler 4609* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). Mamora: Dar Salem, sables, [34°14′N, 6°19′W], 28 Apr 1924, *Jahandiez 206* (B; MA 127098). Forêt de la Mamora, 5 km NW Sidi-Allal-Bahraoui an der Straße nach Kenitra (P 29), Korkeichenwald, 120 m, 6°33′W,

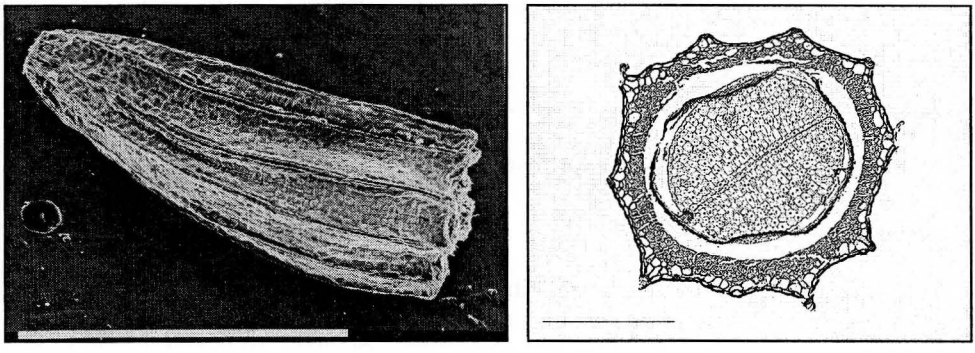


Fig. 70. Micrographs of achenes of disc florets of *Anthemis gharbensis* (left, *Podlech 43489;* right, *Sauvage 3098*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

34°03′N, 2 May 1987, *Bayón & al. 6059* (Herb. Oberprieler; Herb. Vogt). Forêt de la Mamora, 5 km N Sidi-Allal-Bahraoui an der Straße nach Kenitra (P 29), 120 m, Korkeichen-Wald, 6°33′W, 34°03′N, 2 May 1987, *Podlech 43489* (MSB; G). – [Khemisset] Terrains sablonneux de la forêt de Mamora près de Monod, [34°0′N, 6°34′W], 1 Jun 1938, *Herb. Faurel* (MPU-Dubuis). Camp Monod, in aridis, [34°0′N, 6°34′W], Apr 1912, *Pitard 549* (P). Mamora, près Camp Monod, [34°0′N, 6°34′W], Apr 1912, *Mouret (Pitard 516)* (P). Camp Monod, in arenosis, [34°0′N, 6°34′W], May 1912, *Mouret (Pitard 1453)* (P). Forêt de la Mamora, road P 29 between Kenitra and Sidi-Allal-el-Babraui, c. 3.7 km NNW Sidi-Allal-el-Babraui, *Quercus suber* woodland with *Chamerops humilis*, 120 m, [34°3′N, 6°33′W], 27 Apr 1993, *Vogt 10259 & Oberprieler 4707* (B; Herb. Oberprieler; Herb. Vogt). – [Rabat] Forêt de la Mamora, près de Rabat, [34°10′N, 6°10′W], Apr 1926, *Braun-Blanquet* (MPU-Braun-Blanquet). Marocco occ., prope opp Rabat, in silva Mamora, inter *Querc. suber*, solo arenoso, [34°10′N, 6°20′W], 2 May 1926, *Lindberg 1608* (B; K). – [Tanger] Tangiers, [35°46′N, 5°50′W], Mar 1937, *Trethewy 229* (K). circa Tingidem: Charf-el-Agab, in pascuis, solo calcareo, [35°46′N, 5°50′W], 27 Apr 1924, *Maire* (MPU-AfN; P; G). – [Tetouan] Larache, [35°15′N, 6°10′W], 1914, *Pérez Carnareno 52* (MA 127030). Hab. in arenosis, c. El Araix; [35°15′N, 6°10′W], 4 May 1930, *Font Quer 666* (G; MA 127031). – [Not located] Mamora - sables, [34°10′N, 6°20′W], 15 May 1939, *Sauvage* (MPU-Sauvage). La Mamora, [34°10′N, 6°10′W], 23 Apr 1928, *Braun-Blanquet, G. & I.* (MPU-Braun-Blanquet). In silva Mamora, ligulae extus sulphureae intus aureae, [34°0′N, 6°34′W], 15 Apr 1926, *Maire* (P). Forêt de la Mamora, Maroc, [34°0′N, 6°34′W], 23-26 Apr 1887, *Grant* (P). Dunas de Buamara (Marruecos), May 1913, *Dantin* (MA 127092, 127099). – [Cultivated]: Cult. Churelle[?] e sem. marocc. pr. Casablanca a cl. Mellerio lectit, [33°35′N, 7°33′W], 27 Jul 1888 (P). Mamora Forest Marocco, [34°0′N, 6°34′W], Jun 1887, *Abdul Grant* (K).

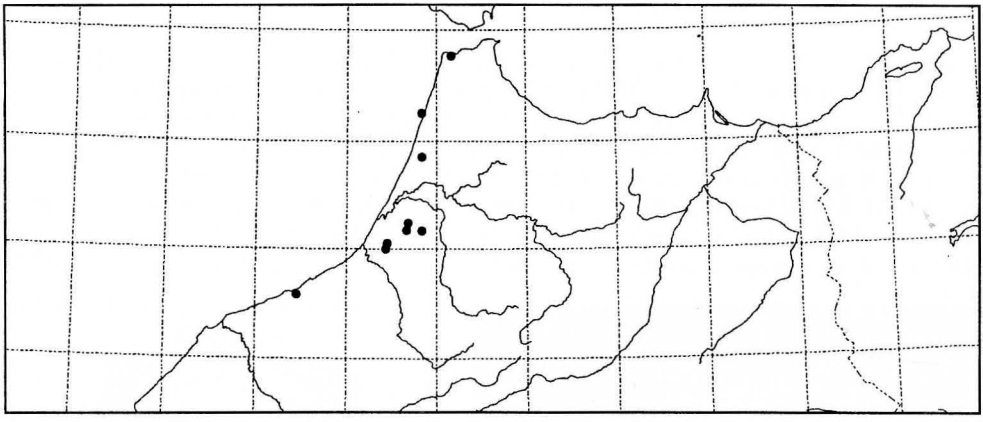


Fig. 71. Total distribution of *Anthemis gharbensis*.

9. ***Anthemis maroccana*** Battand. & Pitard in Pitard, Contr. Fl. Maroc: 19 (1918) ≡ *A. boveana* var. *maroccana* (Battand. & Pitard) Maire in Bull. Soc. Hist Nat. Afrique N. 14: 151 (1923). – Ind. loc.: "Maroc central: Aïne Cheggag. Fl. et fr. en avril. Pentes des collines arides." – Holotype: [Morocco] "Endroits secs, Ain Cheggag", Apr 1913, *Mouret* (P!).

Note. – Pitard's *Contribution à l'étude de la flore du Maroc* was published in normal print in 1931, but as an autograph (by lithography of the hand-written text) already in 1918, as quoted in a list of bibliographic references by Jahandiez & Maire (1931: xxv): "(135) Pitard (C. J.). – Contribution à l'étude de la flore du Maroc. – In-4°, 56 pages autographiées; Tours, 1918" and mentioned by Briquet & Cavillier (1930: 226): "(65).- Contribution à l'étude de la flore du Maroc. Tours, 3 juillet 1918. Broch. autogr. de 56 p., format 22 × 27.5 cm. – Une réimpression de cet important mémoire est actuellement en cours d'éxecution [...]" Publication by indelible autograph before 1. Jan. 1953 is effective (*Code,* Art. 30).

Annual, single-stemmed or rarely branched immediately above the ground and then few- to many-stemmed. Stems erect or ascending-erect, 3-35 cm tall, basally 0.2-4.0 mm in diameter, unbranched and with a single capitulum, or branched in the upper half and with 2-30 capitula, green, in the lower half often tinged with red or black, sulcate, appressed hairy. Basal and lower cauline leaves 6-40 mm long and 2-20 mm wide, elliptical



Fig. 72. *Anthemis maroccana* subsp. *maroccana:* general habit *(Vogt 10296 & Oberprieler 4744).* – Scale bar = 10 cm.

to narrowly elliptical or obovate to narrowly obovate in outline, petiolate; petiole 5-20 mm long, basally rarely without, usually with 1-5 entire or dissected teeth; blade 2-3-pinnatisect with 1-3 pairs of primary lobes; ultimate segments obovate or elliptical to linear, 0.6-2.7 mm long and 0.3-0.8 mm wide, mucronate, sparingly to densely hairy, glandular-punctate. Upper cauline leaves 3-25 mm long and 1-15 mm wide, linear with entire or dentate margins or elliptical in outline and 1-2-pinnatisect; petiole (1-)3-5(-8) mm long, basally usually with teeth. Peduncles 15-110 mm long, remaining slender or becoming only slightly inflated at maturity, sulcate, densely appressed hairy. Capitula 7-25 in diameter, heterogamous. Involucre 4-11 mm in diameter, hemispherical. Involucral bracts in 3 rows, green, with pale or brown, membranous margins, sparsely to densely appressed hairy; the outermost triangular to narrowly triangular, 1.5-3.3 mm long and 0.7-1.0 mm wide, with laterally 0.05-0.3 mm wide, apically 0.2-0.7 mm wide membranous margins; the middle ones narrowly ovate-elliptical to narrowly obovate-elliptical, 2.6-4.6 mm long and 0.9-1.4 mm wide, acute or obtuse, with laterally 0.1-0.4 mm wide, apically 0.2-1.1 mm wide membranous margins; the innermost elliptical or obovate to narrowly obovate, 2.8-4.3 mm long and 0.9-1.5 mm wide, obtuse to acute, with laterally 0.1-0.6 mm wide, apically with 0.4-1.1 mm wide membranous margins. Receptacle flat to hemispherical at anthesis, ovoid-conical at maturity, paleate throughout. Ray florets 7-14 per capitulum, yellow, female; limb elliptical to broadly elliptical, 3.0-9.0 mm long and 2.7-4.3 mm wide; tube sparsely glandular, 0.9-2.3 mm long and 0.5-1.0 mm wide. Pales narrowly elliptical to narrowly obovate, 3.2-3.7 mm long and 0.6-0.9 mm wide, slightly convex, distally bent towards the centre of the capitulum, membranous, gradually tapering into a yellow, acute to rounded, sometimes slightly hooded tip not reached by the midrib. Disc florets yellow, hermaphrodite, sparsely glandular, 2.8-3.5 mm long; the basal part inflated, spongy and subtetragonous at maturity, 1.3-1.8 mm long and 0.8-1.3 mm wide; the distal part funnel-shaped, 5-lobed; lobes triangular with a 0.1-0.3 mm long dorsal appendage. Achenes of ray florets 1.6-2.3 mm long and 0.4-0.8 in diameter, subcylindrical, tapering towards the base, 8-11-ribbed; adaxial ribs rather indistinct, smooth, without mucilage cells; abaxial ribs distinct, slightly tuberculate, with elongate mucilage cells; abaxial furrows with glands. Achenes of disc florets heteromorphic; the peripheral ones 1.5-1.9 mm long and 0.7-1.1 mm in diameter, cylindrical to obconical, 10-ribbed, persistent at maturity; ribs slightly to conspicuously tuberculate, tubercles topped with ± isodiametric mucilage cells; furrows between ribs with glands; corona missing or an adaxially up to 0.6 mm long, crenulate auricle; the central ones smaller than the peripheral ones, c. 1.4-1.9 mm long and 0.5-0.9 mm in diameter, obconical to obovoidal, 10-ribbed, readily falling off at maturity; ribs moderately to strongly tuberculate; corona missing or a 0.1-0.4 mm long, dentate rim.

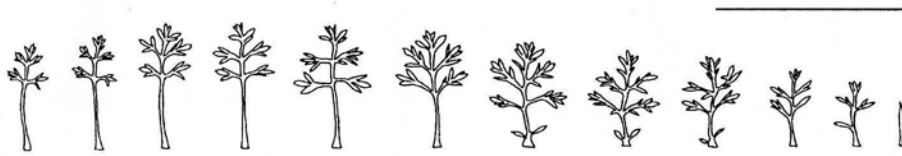


Fig. 73. *Anthemis maroccana* subsp. *maroccana:* leaf spectrum *(Vogt 10296 & Oberprieler 4744).* – Scale bar = 3 cm.

Chromosome number. – $n = 9$ (for discussion see chapter 10).

Distribution and habitat. – Endemic to C and N Morocco where it is found from altitudes of c. 400 m in the C Moroccan highlands around Fès and Meknès, up to 1200 m in the N parts of the Middle Atlas, and up to 1900 m in the Rif mountains (Fig. 76). It is usually found growing in arable fields, along field margins and road embankments, and on stony slopes with shallow, calcareous or siliceous soils.

Variation and taxonomy. – *Anthemis maroccana* holds a central position in the group of species formerly included in *A. boveana*. It characteristically differs from the other members of the group by its rather large peripheral disc achenes. Additionally, it differs from *A. boveana* by rather blunt and yellow-tinged pale tips never reached by the midrib; from *A. gharbensis* by its tuberculate achenes with rounded ribs and isodiametric or only slightly elongate mucilage cells; from *A. tenuisecta* subsp. *jahandiezii* by its tuberculate achenes with rather flat apical plates, and from *A. tenuisecta* subsp. *tenuisecta* by its erect habit, longer ray florets, distinctly petiolate leaves, and achenes with a comparatively thick pericarp and continuous sclerenchymatic cylinder in the mesocarp.

On the basis of differences in achene dimensions and ray floret number, two subspecies can be distinguished.

Key to subspecies

1. Achenes of peripheral disc florets 1.5-1.8 mm long and with up to 0.3 mm long corona; corona of central disc florets up to 0.1 mm long; capitula with (7-)13-14 ray florets ..... 9a. *A. maroccana* subsp. *maroccana*
– Achenes of peripheral disc florets longer than 1.8 mm and with 0.2-0.6 mm long corona; corona of central disc florets 0.1-0.4 mm long; capitula with 7-9(-14) ray florets .... 9b. *A. maroccana* subsp. *aguilarii*

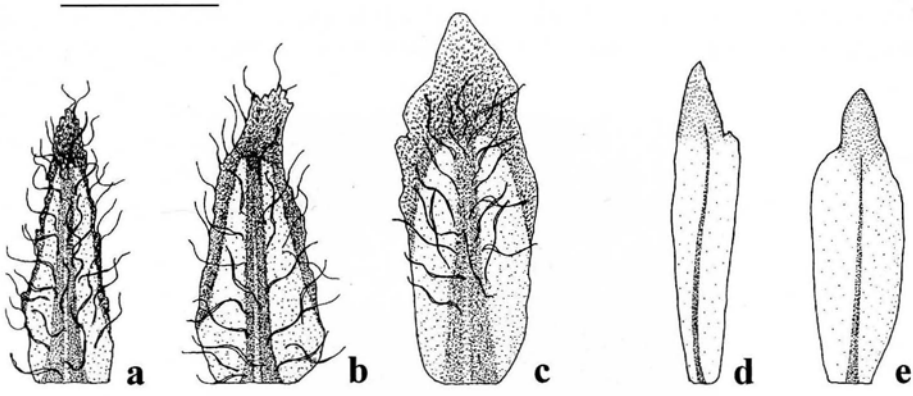


Fig. 74. *Anthemis maroccana* subsp. *maroccana:* (a-c) involucral bracts, (d-e) pales *(Vogt 10296 & Oberprieler 4744).* – Scale bar = 2 mm.

9a. ***Anthemis maroccana*** Battand. & Pitard subsp. ***maroccana***

– *Anthemis boveana* var. *typica* Maire in Bull. Soc. Hist Nat. Afrique N. 14: 151 (1923), nom. inval. [Art. 24.3.], p.p.

Stems (3-)5-20(-35) cm tall, basally (0.2-)0.5-2.5(-4.0) mm in diameter, unbranched and with a single capitulum, or branched in the upper half and with 2-10(-30) capitula. Basal and lower cauline leaves (6-)10-30(-40) mm long and (2-)5-15(-20) mm wide; petiole 5-15(-20) mm long, basally rarely without, usually with 1-3 (-5) pairs of entire or dissected teeth; ultimate segments elliptical to linear, 1.2-2.7 mm long and 0.4-0.8 mm wide, mucronate. Upper cauline leaves (3-)5-15(-25) mm long and 1-10(-15) mm wide; petiole (1-)3-5(-8) mm long. Peduncles (15-)20-50(-110) mm long. Capitula (7-)15-25 in diameter. Involucre (4-)6-11 mm in diameter. Involucral bracts with brown, membranous margins; the outermost (2.0-)2.3-3.3 mm long and 0.9-1.0 mm wide, with laterally 0.05-0.3 mm wide, apically 0.2-0.7 mm wide, membranous margins; the middle ones 3.4-4.4(-4.6) mm long and 1.0-1.4 mm wide, obtuse, with laterally 0.1-0.3 mm wide, apically 0.2-1.1 mm wide, membranous margins; the innermost (3.3-)3.5-4.3 mm long and (0.9-)1.0-1.5 mm wide, obtuse to acute, with laterally 0.3-0.6 mm wide, apically with 0.4-1.1 mm wide membranous margins. Ray florets (7-)13-14 per capitulum; limb elliptical, 4.0-9.0 mm long and 3.0-4.3 mm wide; tube 1.2-2.3 mm long and c. 1.0 mm wide. Pales 3.4-3.7 mm long and 0.6-0.8 mm wide. Disc florets 2.8-3.5 mm long; the basal part 1.3-1.8 mm long and 0.8-1.1 mm wide; lobes of the distal part with 0.2-0.3 mm long dorsal appendages. Achenes of ray florets 1.8-2.3 mm long and 0.4-0.6 in diameter, 9-11-ribbed. Achenes of disc florets heteromorphic; the peripheral ones 1.5-1.8 mm long and 0.7-0.9 mm in diameter, corona missing or an up to 0.3 mm long, crenulate auricle; the central ones c. 1.5-1.7 mm long and 0.5-0.7 mm in diameter, corona missing or an up to 0.1 mm long, dentate rim.

Chromosome number. – $n = 9$ (see discussion in chapter 10).

Distribution and habitat. – C Moroccan highlands around Fès and Meknès, N foothills of the Middle Atlas and S foothills of the Rif mountains, from 450 m to 1200 m above sea

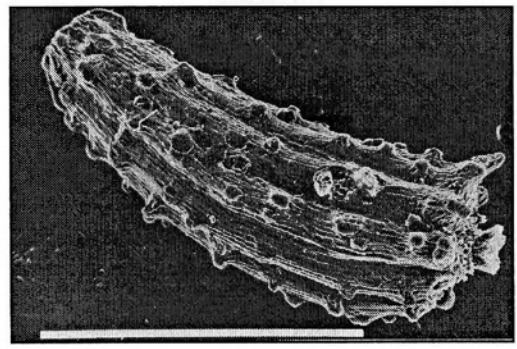


Fig. 75. SEM micrograph of achene of disc floret of *Anthemis maroccana* subsp. *maroccana (Jahandiez 159).* – Scale bar = 1 mm.

level. In the surroundings of the locus classicus in the Plaine du Sais near Aïn-Cheggag S of Fès at around 620 m above sea-level, *A. maroccana* subsp. *maroccana* grows along field margins and road embankments together with other weedy annuals like *Anacyclus radiatus* (L.) Link subsp. *radiatus, Atractylis cancellata* L., *Bifora testiculata* (L.) Roth, *Galium verrucosum* Huds., *Glossopappus macrotus* (Durieu) Briq., *Rhagadiolus stellatus* (L.) Gaertn., *Scandix pecten-veneris* L., *Vaccaria hispanica* (Mill.) Rauschert, and *Vicia ervilia* (L.) Willd. In the Massif de Kandar S of Sefrou in the Middle Atlas mountains, it was found on limestone scree together with *Anthericum algeriense* (Boiss. & Reuter) Skalicky, *Anthyllis vulneraria* subsp. *maura* (G. Beck) Maire, *Anthyllis polycephala* var. *mesatlantica* Maire, *Calendula eckerleinii* Ohle, *Centaurea nana* Desf., *C. pullata* var. *claryi* (Debeaux) Batt., *Erodium crenatum* Pomel, *Fumaria bastardii* Boreau, *Linaria multicaulis* subsp. *heterophylla* (Desf.) D. A. Sutton, *L. tristis* subsp. *mesatlantica* D. A. Sutton, *Polygala saxatilis* Desf., *Ranunculus spicatus* subsp. *fontqueri* Romo, *Rupicapnos africana* subsp. *mairei* (Pugsley) Maire, and *Thymus munbyanus* subsp. *coloratus* (Boiss. & Reuter) Greuter & Burdet.

Variation and taxonomy. – *Anthemis maroccana* subsp. *maroccana* differs from subsp. *aguilarii* by its comparatively large capitula with longer ray florets, smaller achenes, and shorter corona.

Specimens seen. – [Morocco, Fès] Aïne Cheggag. endroits secs, [34°0′N, 5°0′W], Apr 1913, *Moaret 2422* (P). Aïne Cheggag, endroits secs, [34°0′N, 5°0′W], Apr 1913, *Mouret (Pitard 2421)* (P). Plaine du Sais, road 3360 between Aïn-Cheggag and road P 24 (Fès - Ifrane), roadsides and field margins 2.6 km SW of junction with P 24, 620 m, 33°59′N, 5°0′W, 27 Apr 1993, *Vogt 10281 & Oberprieler 4729* (B). In Atlantis Medii montibus supra oppidum Sefrou; in rupestr. calcareis, 1000 m, [33°50′N, 4°50′W], 22 Apr 1926, *Maire* (MPU-AfN). Middle Atlas, Massif du Kandar S Sefrou, road P 20 between Sefrou and Boulmane, limestone cliffs near the road c. 4.4 km S of Sefrou, heavily grazed, 1060 m, 33°47′N, 4°50′W, 27 Apr 1993, *Vogt 10284 & Oberprieler 4732* (B). Middle Atlas, Massif du Kandar S Sefrou, road P 20 between Sefrou and Boulmane, limestone cliffs near the street c. 7.5 km S of Sefrou, 1150 m, 33°45′N, 4°51′W, 28 Apr 1993, *Vogt 10296 & Oberprieler 4744* (B; G; K; Herb. Oberprieler; Herb. Vogt). – [Ifrane] entre Kasbet el Hadjeb et

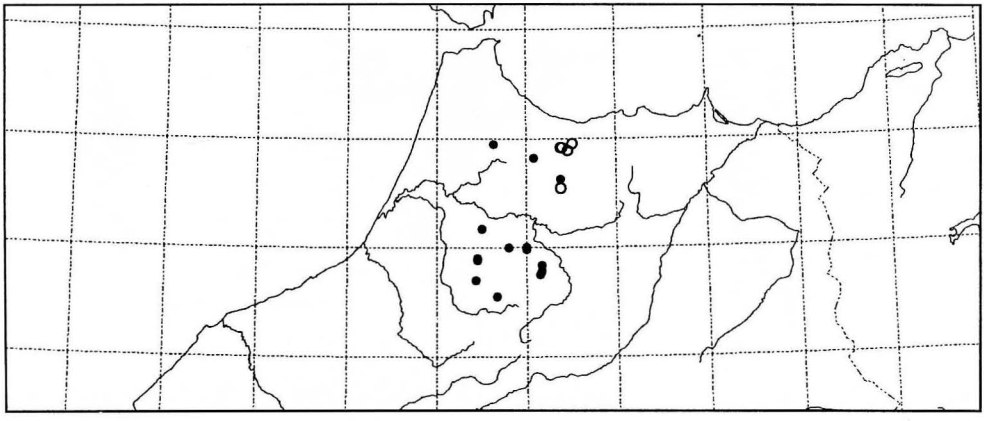


Fig. 76. Total distribution of *Anthemis maroccana* (● subsp. *maroccana*, ○ subsp. *aguilari*).

Dar Caïd Ito, [33°33′N, 5°20′W], 5 Jun 1918, *Benoist 550* (P). – [Meknès] Meknès, [33°54′N, 5°33′W], 22 Apr 1918, *Benoist 255* (P). Environs de Mekinez, [33°53′N, 5°33′W], Jun 1888, *Grant* (P). El Hajeb, 900 m, calc., [33°42′N, 5°34′W], Apr 1928, *Braun-Blanquet, G. & I.* (MPU-Braun-Blanquet). – [Ouezzane] road to Mokrissèt, from Pont du Loukos, dry path, 34°57′N, 6°8′W, 660 m, 21 Apr 1995, *Jury 16581 & al.* (SEV). – [Sidi Kacem] Col après Zagota, [34°10′N, 5°30′W], Apr 1926, *Braun-Blanquet* (MPU-Braun-Blanquet). In lapidosis calcareis prope jugum Zegotta, [34°10′N, 5°30′W], 21 Apr 1926, *Maire* (P). – [Taounate] in dumetis ditionis Beni-Zeroual prope Zghariin, 600-700 m, solo margaceo, [34°49′N, 4°55′W], 19 Jun 1928, *Maire* (MPU-AfN). entre Taounate y Taounate-el-Kchour, margas, taludes y cultivos, 34°37′N, 4°37′W, 650 m, 8 Apr 1994, *Montserrat & Valdés 2794/94* (SEV). – [Not located] Meknès, vers D'Khissa, bords des champs, 9 May 1929, *Jahandiez 159* (G; MA 127094). in dumetis inter urbes Fes et Meknes, [34°0′N, 5°12′W], 26 Mar 1923, *Maire* (P).

9b. ***Anthemis maroccana*** subsp. ***aguilarii*** (Maire & Sennen) Oberprieler, **comb. & stat. nov.** ≡ *A. boveana* var. *aguilarii* Maire & Sennen in Bull. Soc. Hist. Nat. Afrique N. 24: 217 (1933). – Ind. loc.: "Rif (Sennen)." – Lectotype (designated here): [Morocco] "Rif (Atlas) Beni-Seddat à Isaguen", 1650 m, 6 Jul 1932, *Sennen & Mauricio 8432* (P!; isolectotypes: BC-Sennen 819901!, BC-Sennen 819906!, G!, MA 127097!, P!).
Note. – The specimen designated here as lectotype is a part of a cut specimen (see p. 118). The complementary half is presumed to be housed in MPU-AfN but was on loan during my visit there in 1992.

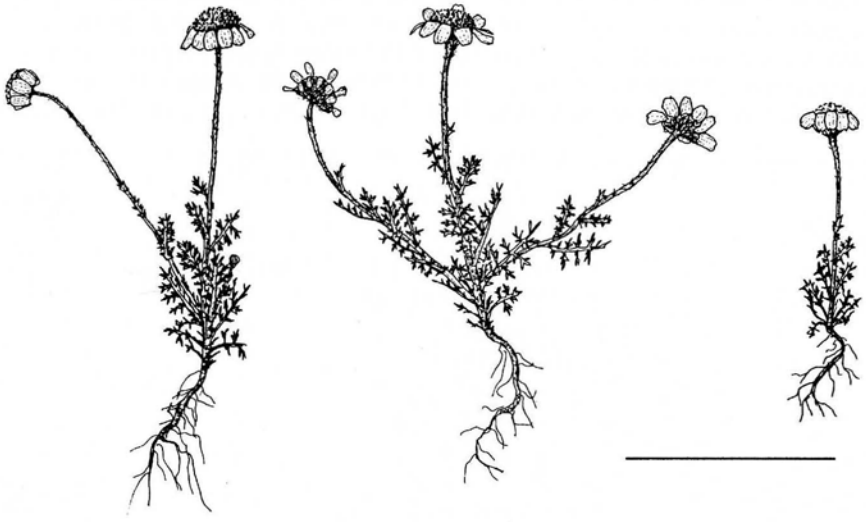


Fig. 77. *Anthemis maroccana* subsp. *aguilarii:* general habit *(Font Quer n° 441).* – Scale bar = 5 cm.

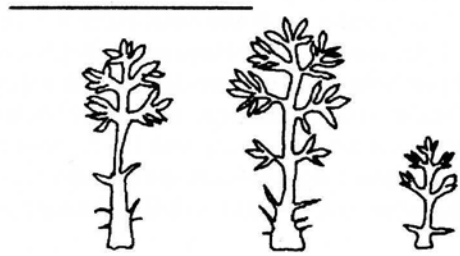


Fig. 78. *Anthemis maroccana* subsp. *aguilarii:* leaf spectrum *(Font Quer n°441)* – Scale bar = 2 cm.

Exs.: Font Quer, Iter Marocc. 1929: n° 441 (sub *"Anthemis bovei"*); Sennen, Pl. Esp. 1932: n° 8432, & 1934: n° 9406.

Stems 5-12(-25) cm tall, basally 1-2.5 mm in diameter, unbranched and with a single capitulum, or branched in the upper half and then with 2-10 capitula. Basal and lower cauline leaves (10-)12-20(-30) mm long and 5-10(-15) mm wide; petiole 7-12 mm long, basally with 2-3 pairs of entire or dissected teeth; ultimate segments linear or elliptical to obovate, 0.6-2.3 mm long and 0.3-0.8 mm wide. Upper cauline leaves (5-)10-20 mm long and 3-6 mm wide. Peduncles 20-50(-110) mm long. Capitula (7-)10-22 in diameter. Involucre (5-)8-10 mm in diameter. Involucral bracts with pale to brown, membranous margins; the outermost 1.5-2.6 mm long and 0.7-0.8 mm wide, with laterally 0.05-0.2 mm wide, apically 0.2-0.4 mm wide, membranous margins; the middle ones 2.6-3.2 mm long and 0.9-1.2 mm wide, acute, with laterally 0.1-0.4 mm wide, apically 0.2-0.9 mm wide, membranous margins; the innermost 2.8-3.8 mm long and 0.9-1.5 mm wide, acute, with laterally 0.1-0.4 mm wide, apically 0.4-0.9 mm wide, membranous margins. Ray florets 7-

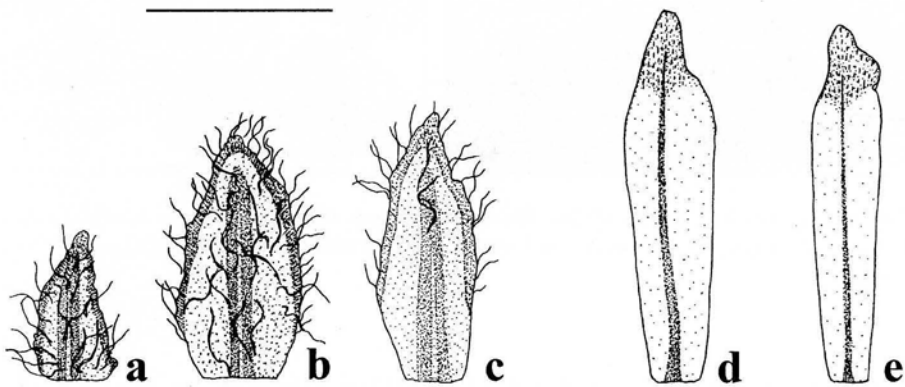


Fig. 79. *Anthemis maroccana* subsp. *aguilarii:* (a-c) involucral bracts (6 Jul 1932, *Sennen & Mauricio*), (d-e) pales (d, *id.;* e, 20 Jun 1934, *Sennen & Mauricio*). – Scale bar = 2 mm.

9(-14) per capitulum; limb elliptical to broadly elliptical, 3.0-7.0 mm long and (2.7-)2.9-3.7 mm wide; tube 0.9-1.5 mm long and 0.5-1.0 mm wide. Pales 3.2-3.6 mm long and 0.7-0.9 mm wide. Disc florets 3.1-3.5 mm long; the basal part 1.3-1.5 mm long and 0.8-1.3 mm wide; lobes of the distal part with a 0.1-0.3 mm long dorsal appendage. Achenes of ray florets 1.6-2.2 mm long and 0.5-0.8 in diameter, 8-9-ribbed. Achenes of disc florets heteromorphic; the peripheral ones 1.8-1.9 mm long and 1.0-1.1 mm in diameter, persistent at maturity; corona a 0.2-0.6 mm long, crenulate auricle; the central ones c. 1.4-1.9 mm long and 0.6-0.9 mm in diameter; corona a (0.1-)0.2-0.4 mm long, dentate rim.

Chromosome number. – Unknown. Pollen measurements suggest a diploid number (see chapter 11).

Distribution and habitat. – Restricted to high altitudes of the N Moroccan Rif mountains (Fig. 76), where it is found between 1400 m and 1900 m above sea level.

Specimens seen. – [Morocco, Al Hoceima] Atlas Rifain, Beni Seddat, à Isaguen, 1650 m, [34°57′N, 4°30′W], 6 Jul 1932, *Sennen & Mauricio, n° 8432* (G; P; BC-Sennen 819906, 819901; MA 127097). Hab. in collibus schistosis c. Asib de Ktama, 1600 m, [34°55′N, 4°38′W], 22 May 1929, *Font Quer, n° 441* (G; MA 127090). Atlas Rifain, Azib de Ketama, 1600 m, [34°55′N, 4°38′W], 20 Jun 1934, *Sennen & Mauricio, n° 9406* (MPU-AfN; G; BC-Sennen 819902, 819904, 819905; MA 127096). Yebel Daddog, 1900 (Djebel Dehdog, 1900 m, 34°55'N, 4°37'W), 28 Jun 1929, *Font i Quer* (BC 808312, 808318). Azib al Ketama 1600 (Azib de Ketama, 1600 m, 34°53'N, 4°33' W), 30 Apr 1929, *Font i Quer* (BC 808325). – [Taounate] Rif SW, Suberain de Rhomara, chemin, 1450 m, [34°32′N, 4°38′W], 11 Jul 1959, *Sauvage* (MPU-AfN).

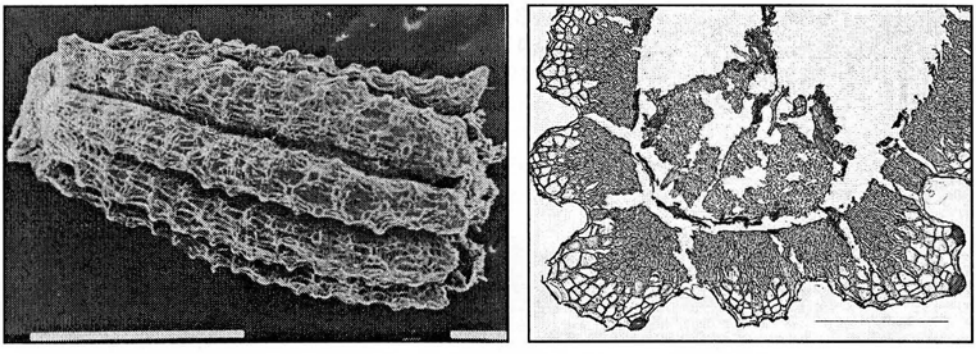


Fig. 80. Micrographs of achenes of disc florets of *Anthemis maroccana* subsp. *aguilarii* (20 Jun 1934, *Sennen & Mauricio*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

10. ***Anthemis tenuisecta*** Ball in J. Bot. 11: 365 (1873) ≡ *A. boveana* var. *tenuisecta* (Ball) Maire in Bull. Soc. Hist. Nat. Afrique N. 14: 151 (1923) ≡ *A. chrysantha* var. *tenuisecta* (Ball) Pau in Font Quer, [sched. impr.] Iter Marocc. 1930: n° 666 (1930). – Ind. loc.: "Hab. Haud procul urbem Marocco, in Prov. Mesfioua!" – Holotype:

[Morocco] "In clivo septentr. Atlantis Majoris, Distr. Mesfiouia", 800-1000 m, May 1871, *Ball* (K!; isotype: P!).

Note. – According to the map in Hooker & Ball (1878) the province of Mesfioua, which is the ditio classica of *Anthemis tenuisecta,* extends from Marrakech ("urbs Marocco") to the villages of Tassilunt and Aït Zebad c. 30 miles to the S and SE of Marrakech. Relating to the discovery of *A. tenuisecta,* Hooker & Ball (1878: 157-164) wrote: "It has been arranged that our first day's journey from Marocco was to be a short one, and accordingly our final start on Monday, May 8, was delayed until 8 A.M. [...] Our way lay about due south-east through the district of Mesfioua, which is under the rule of a Kaïd, or subgovernor, subject to the orders of El Graoui. [...] After riding about three hours we approached an inhabited place, which we were told was the residence of the Kaïd. [...] The country, after quitting the kasbah, gradually changed its character. [...] Among other characteristic species not before seen were *Aïzoon canariense* and a new species of *Anthemis* [...] When nearly ready to start on the morning of May 9, we were informed that the Kaïd meant to accompany us on the way to Tasseremout. [...]". Assuming that the village of "Tasseremout" corresponds to today's "Tasghimout" c. 12 km NE of Tiguemmi-n-Oumzil et Tnine (= Tnine de l'Ourika), the locus classicus may be located in the area NW of the mouth of the Ourika valley.

Annual, single-stemmed or branched immediately above the ground and then few- to many-stemmed. Stems procumbent or shortly ascending-erect, rarely erect, 5-35 cm tall,

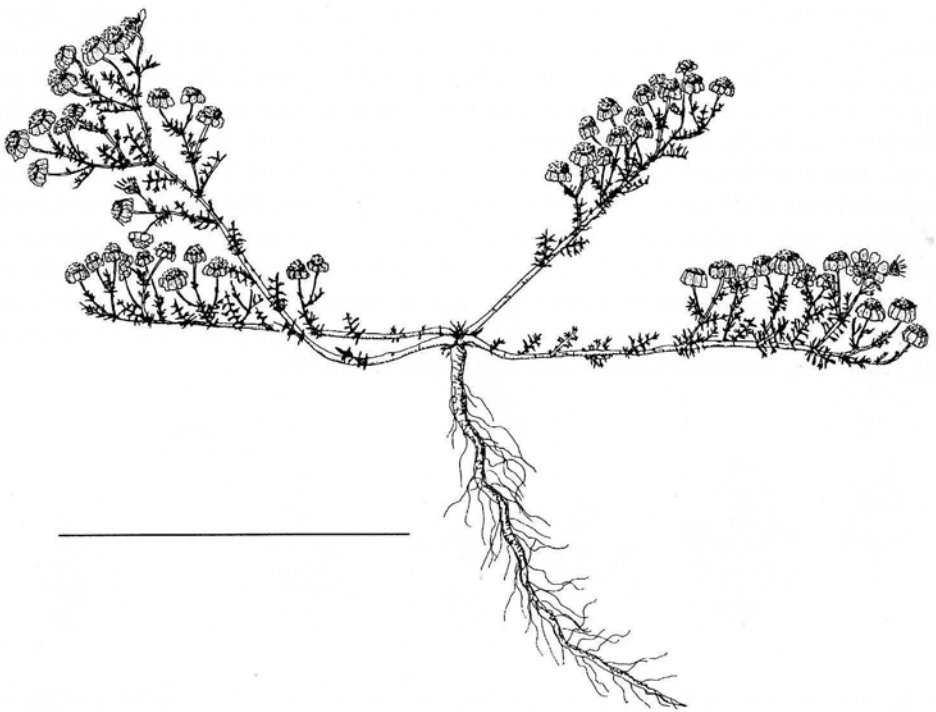


Fig. 81. *Anthemis tenuisecta* subsp. *tenuisecta:* general habit *(Vogt 11930).* – Scale bar = 10 cm.

basally 1-4 mm in diameter, branched in the lower or in the upper half, bearing 2-60 capitula, sometimes tinged with red or black, sulcate, ± densely appressed hairy. Basal and lower cauline leaves 10-45 mm long and 3-30 mm wide, elliptical to narrowly elliptical or obovate to narrowly obovate in outline; petiole 5-20 mm long, basally sometimes without, usually with 1-4 pairs of short, sometimes dissected teeth; blade 2-3-pinnatisect with 2-4 pairs of primary lobes; ultimate segments linear to elliptical, 0.8-3.8 mm long and 0.3-0.8 mm wide, mucronate, sparsely to densely hairy, glandular-punctate. Upper cauline leaves 5-25 mm long and 1-20 mm wide, linear or elliptical to nearly circular in outline, entire or dentate to 1-2-pinnatisect, sessile or with 3-8 mm long petiole, glandular-punctate. Peduncles 7-80 mm long, remaining slender at maturity, sulcate, sparsely to densely hairy. Capitula 10-23 mm in diameter, heterogamous. Involucre 3-10 mm in diameter, hemispherical. Involucral bracts in 2-3 rows, green; the outermost triangular to narrowly triangular-elliptical, 1.7-3.0 mm long and 0.7-1.0 mm wide, appressed hairy, with up to 0.2 mm wide, membranous margins; the middle ones elliptical to narrowly so, 2.3-3.3 mm long and 0.7-1.2 mm wide, acute to obtuse, in the distal half appressed hairy, with laterally 0.1-0.3 mm wide, apically 0.2-0.7 mm wide, brown, membranous margins; the innermost elliptical to narrowly obovate, 2.2-3.4 mm long and 0.7-1.0 mm wide, with laterally 0.1-0.4 mm wide, pale, membranous margins, apically obtuse to truncate with 0.3-0.7 mm wide, brown, membranous margins, appressed hairy in the distal half. Receptacle ovoid-conical at anthesis and at maturity, paleate throughout. Ray florets 5-13 per capitulum, yellow, female, limb elliptical to nearly circular, 4.0-9.0 mm long and 2.6-4.9 mm wide, apically 3-lobed; tube sparsely glandular, 1.0-1.7 mm long and 0.5-1.0 mm wide. Pales narrowly elliptical to narrowly obovate, 2.1-3.4 mm long and 0.4-1.0 mm wide, slightly convex and bent, membranous, with yellow, acute to rounded, slightly hooded tips not reached by the midrib. Disc florets yellow, hermaphrodite, sparsely glandular, 2.0-2.9 mm long; the basal part inflated, spongy and subtetragonous at maturity, 0.9-1.6 mm long and 0.7-0.9 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular with a 0.1-0.2 mm long dorsal appendage. Achenes of ray florets 1.2-1.7 mm long and 0.5-0.8 mm in diameter, fusiform or subcylindric-obovoid, 9-10-ribbed; ribs smooth or moderately tuberculate, with ± elongate, rectangular mucilage cells; furrows glandular. Achenes of disc florets homomorphic, 1.0-1.6 mm long and 0.6-0.8 mm in diameter, obovoid-obconical, 10-ribbed; ribs smooth or tuberculate, with ± elongate, rectangular mucilage cells; furrows with yellow glands; corona missing or (due to the apically protruding ribs) an up to 0.1 mm long, dentate rim; apical plate flat to conical-convex.

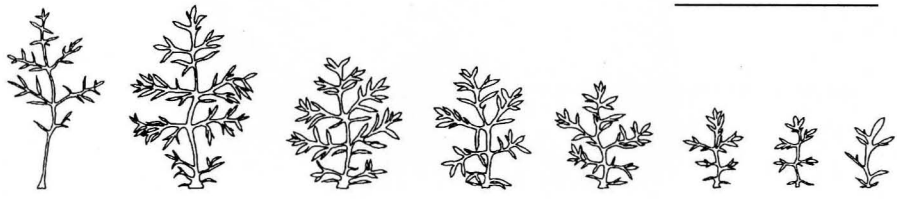


Fig. 82. *Anthemis tenuisecta* subsp. *tenuisecta:* leaf spectrum *(Vogt 11905 & Oberprieler 6353).* – Scale bar = 3 cm.

Chromosome number. – $n = 9$; $2n = 18$ (discussion see chapter 10).

Distribution and habitat. – Endemic to the SW parts of Morocco, where it grows on sandy inland plains along the Atlantic coast between Safi and Tiznit (Fig. 85), at 10-400 m above sea level. It also penetrates into the Souss valley S of the High Atlas and the steppe highlands around Marrakech, where it may reach altitudes of 800-1000 m above sea level in the N foothills of the High Atlas (locus classicus!).

Variation and taxonomy. – *Anthemis tenuisecta* is closely related to the other two Moroccan endemics of *A.* ser. *Chrysanthae, A. maroccana* and *A. gharbensis,* with which it forms a monophyletic group characterised by pales with yellow-tinged, somewhat hooded tips never reached by the midribs. *A. tenuisecta* differs from *A. maroccana* by its comparatively small achenes and from *A. gharbensis* by the lack of the latter's uniquely sculptured achenes with strongly elongate mucilage cells. Throughout its distributional range the species exhibits a considerable amount of morphological variation. The following subspecies can be distinguished, mainly based on differences in growth habit, shape of leaves, and the shape, sculpturing and colour of achenes.

Key to subspecies

1. Plants branched immediately above the ground and few- to many-stemmed; stems procumbent to ascending-erect; leaves in the distal half of the stem usually sessile; achenes of disc florets smooth or tuberculate, whitish ..... 10a. *A. tenuisecta* subsp. *tenuisecta*

– Plants single-stemmed; stems erect; leaves in the distal half of the stem sessile or petiolate; achenes of disc florets smooth, brown or red-brown ..... 10b. *A. tenuisecta* subsp. *jahandiezii*

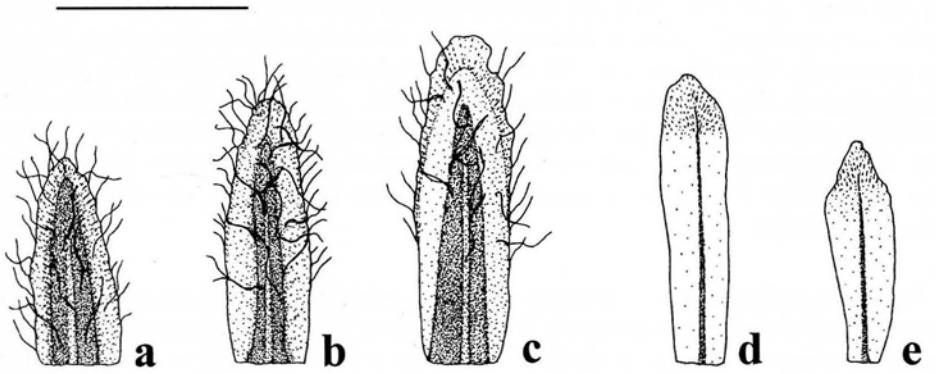


Fig. 83. *Anthemis tenuisecta* subsp. *tenuisecta:* (a-c) involucral bracts *(Vogt 11930),* (d-e) pales (d, *id.;* e, *Fernandez Casas & al. 9171*). – Scale bar = 2 mm.

10a. ***Anthemis tenuisecta*** Ball subsp. ***tenuisecta***

Annual, usually branched immediately above the ground and then few- to many-stemmed, rarely single-stemmed. Stems procumbent or shortly ascending-erect, (5-)10-25(-30) cm tall, basally 1-3(-4) mm in diameter, usually branched all over its length, rarely only in the upper half, with (2-)10-30(-60) capitula. Basal and lower cauline leaves (10-)15-35(-45) mm long and (7-)10-20(-30) mm wide; petiole (5-)7-15(-20) mm long, basally rarely without, usually with 1-4 pairs of short, sometimes dissected teeth; blade 2-3-pinnatisect; ultimate segments 0.9-3.8 mm long and 0.4-0.8 mm wide. Upper cauline leaves (5-)10-20(-25) mm long and 1-15(-20) mm wide, entire or dentate to 1-2-pinnatisect, usually sessile. Peduncles (7-)10-40(-80) mm long. Capitula 10-18 mm in diameter. Involucre (3-)5-9 mm in diameter. Involucral bracts in 2-3 rows; the outermost 1.7-3.0 mm long and 0.7-1.0 mm wide, with up to 0.2 mm wide, membranous margins; the middle ones 2.3-3.2 mm long and 0.7-1.1 mm wide, with laterally 0.1-0.3 mm wide, apically 0.2-0.7 mm wide, membranous margins; the innermost (2.2-)2.4-3.2 mm long and 0.8-1.0 mm wide, with laterally 0.1-0.4 mm wide, apically 0.3-0.7 mm wide, membranous margins. Ray florets 5-9 per capitulum, canary yellow [R.H.S. Colour Chart (Anon. 1966): 9A]; limb elliptical to nearly circular, 4.0-7.0 mm long and 3.2-3.8 mm wide; tube 1.0-1.5 mm long and 0.7-1.0 mm wide. Pales 2.1-3.4 mm long and 0.6-0.9 mm wide. Disc florets 2.1-2.7 mm long; the basal part 1.1-1.6 mm long and c. 0.9 mm wide. Achenes of ray florets 1.2-1.7 mm long and 0.5-0.8 mm in diameter, fusiform-obovoid, whitish; ribs smooth or moderately tuberculate. Achenes of disc florets 1.0-1.6 mm long and 0.6-0.8 mm in diameter; ribs smooth or tuberculate; apical plate flat to moderately convex.

Chromosome number. – $n = 9$; $2n = 18$ (discussion see chapter 10).

Distribution and habitat. – On sandy inland plains along the Atlantic coast between Tiznit and Essaouïra in SW Morocco, the steppe highlands around Marrakech, and the N foothills of the High Atlas (Fig. 85). In the S part of its distributional range between Agadir and Tiznit, *Anthemis tenuisecta* subsp. *tenuisecta* was observed to co-occur with *Anacyclus radiatus* Loisel. subsp. *radiatus* and subsp. *coronatus* (Murb.) Humphries, *Centaurea gentilii* Br.-Bl. & Maire, *Fagonia cretica* L., *Launaea fragilis* (Asso) Pau, *Limonium mucronatum* (L. fil.) O. Kuntze, *Matthiola lunata* DC., and *Senecio glaucus* subsp. *coronopifolius* (Maire) C. Alexander on sandy road embankments and adjacent plains. Near the Cap Ghir between Agadir and Essaouïra it grows in the company of *Ifloga spicata* (Forssk.) Schultz Bip., *Ononis mogadorensis* Förther & Podlech, and *Retama monosperma* (L.) Boiss.

Variation and taxonomy. – *Anthemis tenuisecta* subsp. *tenuisecta* is characterised by its prostrate habit, sessile and delicately dissected leaves, comparatively small capitula with rather short ray florets, and a tendency to reduce the of sclerenchymatic tissue in the mesocarp of its achenes. Plants of the inland populations around Marrakech and the S part of the distribution area between Tiznit and Agadir usually have achenes with conspicuously tuberculate and rather sharply keeled ribs. Achenes of plants from the Cap Ghir area are usually smooth and their ribs are comparatively shallow and rounded. Intermediate

forms are found in the surroundings of Agadir and the Souss plains. The two intergrading forms are not considered worthy of formal taxonomical recognition.

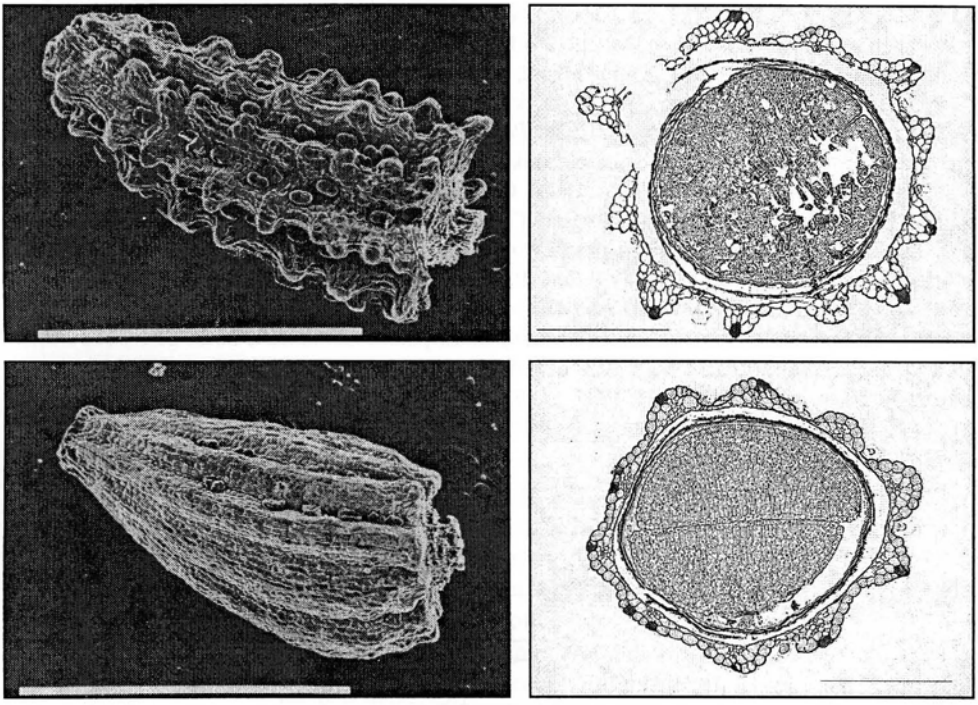


Fig. 84. Micrographs of achenes of disc florets of *Anthemis tenuisecta* subsp. *tenuisecta*. Upper row: achenes of plants from populations S of Agadir (left, *Podlech 45076;* right, *Vogt 11905 & Oberprieler 6353*); lower row: achenes of plants from the Cap Ghir area *(Fernández Casas & al. 9171).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Specimens seen. – [Morocco, Agadir] Douar Tamra (Haha), champs secs, sablonneux, 350 m, [31°0′N, 9°41′W], 26 Apr 1923, *Jahandiez 181* (G; P). Above Tamri, 4 km along road to Essaoira, 400 m, 30°55'N, 9°50'W, broken grounds in hills, [30°55′N, 9°50′W], 2 Jun 1974, *Reading Univ. BM. Exped 204* (RNG). en cuenta arenosa al pie de roquedo 15 km al NE de Tamri (Safi), 335 m, [30°49′N, 9°50′W], 18 Apr 1994, *Gómiz* (BC 820511). road P 8 between Agadir and Essaoira, sandy plaines and roadsides c. 10 km N Tamri, 120 m, [30°49′N, 9°50′W], 22 May 1993, *Vogt 11930* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Vogt; Herb. Oberprieler). Straße Essaouira - Agadir, ca. 2-3 km N von Tamri. [30°49′N, 9°50′W], 9 May 1994, *Kilian 3668* (Herb. Oberprieler). Safi, pr. oppidulum Tamanar, loco dicto Tamri, 60 m, in sabulosis ad oras Atlanticas, [30°44′N, 9°54′W], 23 May 1985, *Fernandez Casas & al. 9171* (G; BC 812998; SEV 123869; MA 340947; B, RNG). Oued Aït Ameur, sables, Maroc, [30°43′N, 9°54′W], Apr 1926, *Braun-Blanquet* (MPU-Braun-Blanquet). Haha grèves de l'Acif-n-Aït Amer près Tamri, [30°43′N, 9°54′W], 30 Mar 1922, *Maire* (P). road P 8 between Agadir and Essaouira, c. 5 km N Tamri, sandy plains with Retama and Ononis, 160 m, [30°43′N, 9°52′W], 21 May 1993, *Vogt 11924* (Herb. Vogt; Herb. Oberprieler). dunes maritimes du Cap Ghir, [30°39′N, 9°55′W], 12 Apr 1935, *Gattefossé 1198* (G; P; K). In planitibus arenosis ditionis Sous, [30°18′N, 9°30′W], 13 Apr 1934, *Maire & Wilczek* (G;

P). Sables maritimes à l'embouchure de l'O. Massa, [30°5′N, 9°40′W], 17 Apr 1946, *Sauvage 3998 & al.* (MPU-Sauvage). Regio austro-occidentalis: route d'Agadir à Tiznit, [30°0′N, 9°37′W], 19 Apr 1935, *Maire & Wilczek 551* (G). Souss: Souk-et-Tnine, route de Tiznit, champs sablonneux, [30°0′N, 9°37′W], 29 Mar 1931, *Jahandiez 63* (G). 6 km S Ait-ou-Mribeta, 21 km N Tiznit an der Straße nach Agadir (P 30), 250 m, Ödland, 9°40′W, 29°54′N, 22 Apr 1987, *Podlech 42958* (MSB). Tiznit - Agadir (P 30), 13 km N Tiznit, Ödland, 250 m, 9°40′W, 29°54′N, 22 Apr 1987, *Vogt 5737 & al.* (Herb. Oberprieler; Herb. Vogt). 15 km N Tiznit an der Straße nach Agadir (P 30), Straßenrand, 9°39′W, 29°49′N, 25 Apr 1989, *Podlech 45076* (MSB; G). road P 30 between Tiznit and Agadir, c. 14.3 km N Tiznit, road embankments, 180 m, [29°49′N, 9°39′W], 19 May 1993, *Vogt 11905 & Oberprieler 6353* (B; Herb. Oberprieler; Herb. Vogt). – [Essaouïra] Atlas magnum, in monte Djebel Amsitten, Tis Raria[?], in marg. via, [31°10′N, 9°44′W], 17 May 1926, *Lindberg 2260* (K). – [Marrakech] In clivio septentr. Atlantis Majoris, Distr. Mesfiouia, 800-1000 m, [31°25′N, 7°53′W], May 1871, *Ball* (P; K). Mesfeua W. Marocco, 8 May 1871, *Maw* (K). Greater Atlas, Msfuia, May 1871, *Hooker* (K). – [Safi] Djebileh, au N. de Marrakech, [31°52′N, 7°58′W], 21 Apr 1921, *Wilczek* (G). – [Tiznit] Sous, plaine sablonneuse au S. de l'Oued Massa sur la route de Tiznit, [29°54′N, 9°40′W], 7 Apr 1922, *Maire* (P). SW, Above Sidi Mousa (nr. Tiznit), 30-50 m, sandy fields, [27°42′N, 9°47′W], 19 Mar 1972, *Davis 53553* (RNG). – [Not located] Djebel Tizelmi et montagnes du Tazeroualt, 1876, *Mardochée [Abi Serour]* (P; G; K). Tamraguette, 27 May 1888, *Ibrahim* (P).

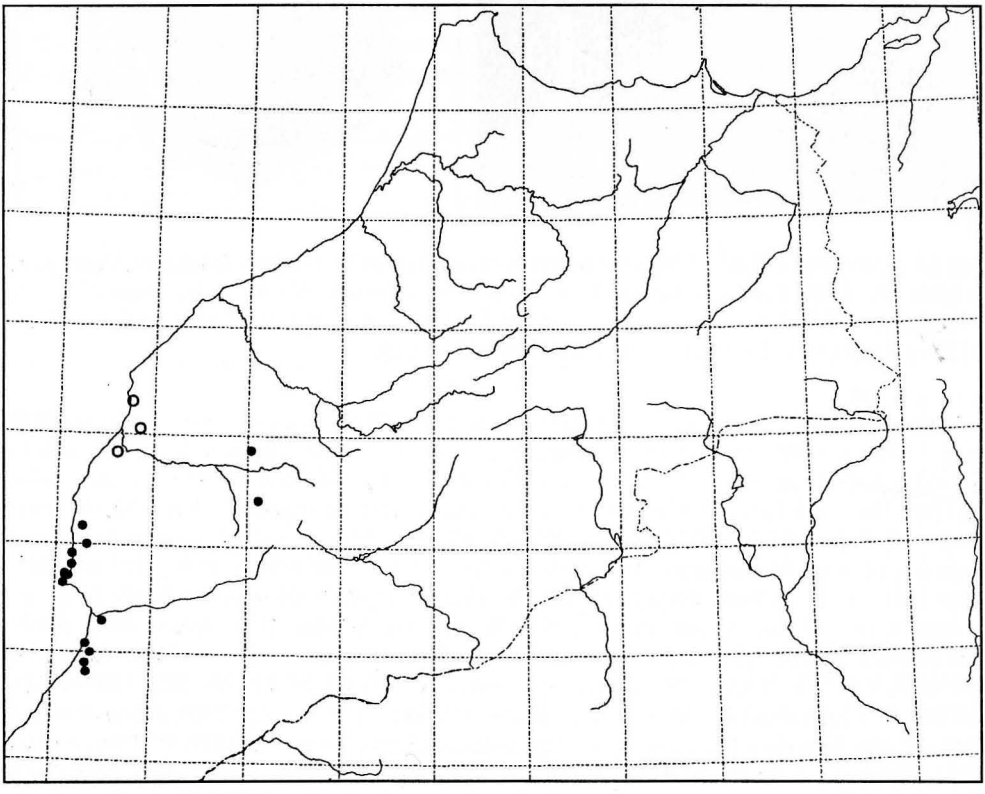


Fig. 85. Total distribution of *Anthemis tenuisecta* (● subsp. *tenuisecta*, ○ subsp. *jahandiezii*).

10b. ***Anthemis tenuisecta*** subsp. ***jahandiezii*** (Maire) Oberprieler, **comb. & stat. nov.**
≡ *A. boveana* var. *jahandiezii* Maire in Bull. Soc. Hist. Nat. Afrique N. 14: 151 (1923). – Ind. loc.: "Hab. in Imperio Maroccano austro-occidentali: in collibus et planitiebus argillosis ad septentrionem montis Hadid!, prope Souk-et-Tnine-er-Riat! (Jahandiez), ubi aprili et maio floret." – Lectotype (designated here): [Morocco] "Souk el Tenin des Riat [Souk-et-Tnine des Riat], 8 Apr 1920, *Jahandiez 370* (P!).

Annual, single-stemmed. Stems erect, 15-35 cm tall, basally 1-2.5 mm in diameter, branched in the upper half with (3-)5-15(-25) capitula. Basal and lower cauline leaves (10-)15-25(-30) mm long and (3-)6-10 mm wide; petiole (5-)8-12 mm long, basally with 0-2 pairs of short teeth; blade 2-3-pinnatisect; ultimate segments 0.8-2.0(-3.0) mm long and 0.3-0.6 mm wide. Upper cauline leaves (5-)10-20(-25) mm long and 1-15 mm wide, entire or dentate to 1-2-pinnatisect, sessile or with 3-8 mm long toothed petiole. Peduncles (10-)15-50(-75) mm long. Capitula 12-23 in diameter. Involucre 5-10 mm in diameter. Involucral bracts in 3 rows; the outermost 1.7-2.4 mm long and 0.7-1.0 mm wide; the middle ones 2.4-3.3 mm long and 0.9-1.2 mm wide, with laterally c. 0.1 mm wide, apically c. 0.4-0.7 mm wide, membranous margins; the innermost 2.6-3.4 mm long and 0.7-0.9 mm wide, with laterally c. 0.1-0.2 mm wide, apically 0.3-0.4 mm wide, membranous margins. Ray florets 7-13 per capitulum, yellow; limb elliptical to broadly elliptical, 5.0-9.0 mm long and (2.6-)2.9-4.7(-4.9) mm wide; tube 1.2-1.7 mm long and 0.5-0.7 mm wide. Pales 2.4-3.3 mm long and 0.4-1.0 mm wide. Disc florets 2.0-2.9 mm long; the basal part 0.9-1.4 mm long and c. 0.7 mm wide. Achenes of ray florets 1.4-1.6 mm long and c. 0.6 mm in diameter, subcylindric-obovoid; ribs smooth to slightly tuberculate. Achenes of disc florets 1.0-1.4 mm long and 0.6-0.8 mm in diameter, brown or red-brown; ribs rounded, smooth; apical plate usually extremely conical-convex.

Chromosome number. – Unknown. Pollen dimensions suggest a diploid number (see chapter 11).

Distribution and habitat. – Restricted to inland plains and mountain habitats near the Atlantic coast between Essaoïra and Safi in SW Morocco (Fig. 85).

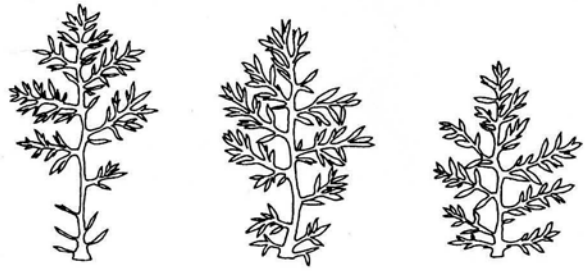


Fig. 86. *Anthemis tenuisecta* subsp. *jahandiezii:* leaf spectrum *(Jahandiez 115).* – Scale bar = 3 cm.

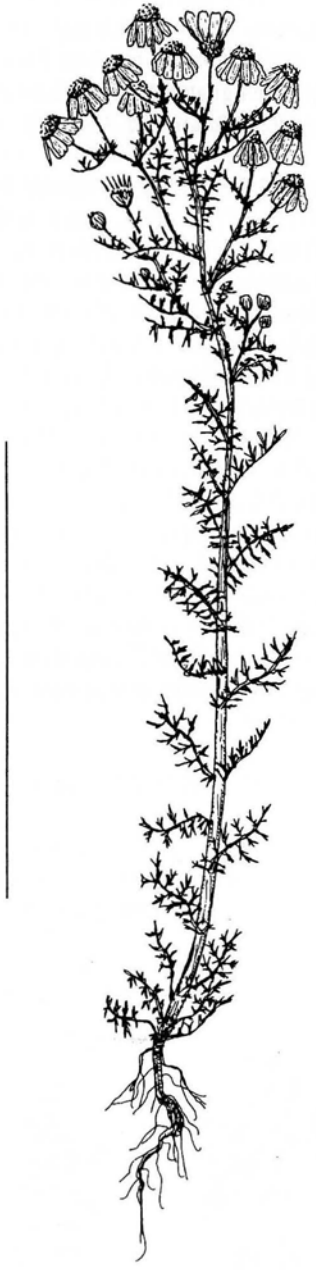


Fig. 87. *Anthemis tenuisecta* subsp. *jahandiezii:* general habit *(Jahandiez 115).* – Scale bar = 10 cm.

Variation and taxonomy. – As set out above (p. 167), *Anthemis tenuisecta* subsp. *jahandiezii* holds a somewhat intermediate position between subsp. *tenuisecta* and *A. gharbensis* (see also multivariate analysis of the *A. boveana* group in chapter 13).

Specimens seen. – [Morocco, Essaouïra] Sud Ouest: de Mogador à Safi, [32°3′N, 9°10′W], Apr 1927, *Weiller 27.21* (MPU-Weiller). Entre le Tensoft et El Tleta, Maroc, Trift, [31°50′N, 9°24′W], 8 Apr 1921, *Braun-Blanquet* (MPU-Braun-Blanquet). broussailes ou pied N. du Djebel Hadid, [31°50′N, 9°24′W], 8 Apr 1921, *Maire* (MPU-AfN). Entre Mogador & Mazagan, plateau rocheux, entre l'Oued Tensift & Souk et Tleta, [31°50′N, 9°24′W], 8 Apr 1921, *Romieux 1348* (G). – [Safi] Safi, champes pierreux, [32°18′N, 9°15′W], 18 Apr 1924, *Jahandiez 115* (B; G; MA 127095). Souk-et-Tnine des Riat, [32°3′N, 9°10′W], 8 Apr 1920, *Jahandiez 370* (P).

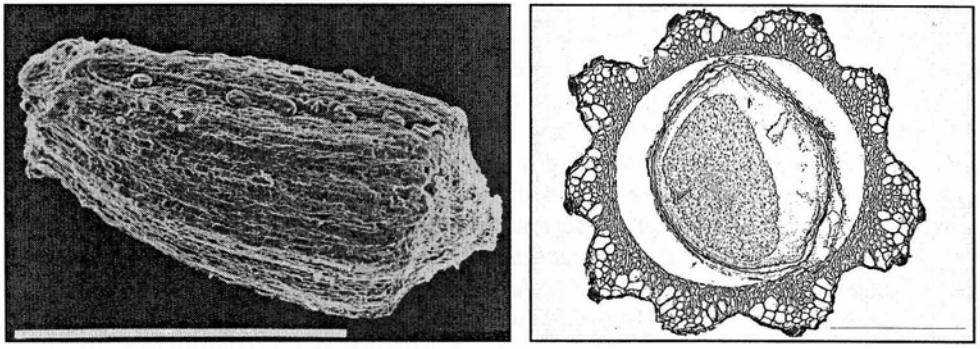


Fig. 88. Micrographs of achenes of disc florets of *Anthemis tenuisecta* subsp. *jahandiezii (Romieux 1348).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

d. ***Anthemis*** ser. ***Secundirameae*** Yavin in Israel J. Bot. 21: 169 (1972). – Type: *A. rigida* (Sm.) Boiss. & Heldr.

Note. – Though named after *Anthemis secundiramea,* the type of *A.* ser. *Secundirameae* was stated by Yavin (1972) to be *A. rigida* Boiss. & Heldr. from the Aegean archipelago. This is permissible under Art. 22.5 of the *Code* (Greuter & al. 1994).

= *Lyonnetia* Cass. in Cuvier, Dict. Sci. Nat. 34: 106 (1825) ≡ *Anthemis* sect. *Lyonnetia* (Cass.) Griseb., Spicil. Fl. Rumel. 2: 209 (1845). – Type: *L. pusilla* Cass. [= *Anthemis rigida* Boiss. & Heldr.].

Annuals. Stems procumbent to ascending, usually repeatedly branched, the branches often perpendicular to the main axis. Leaves obovate to narrowly obovate, 2-3-pinnatipartite; ultimate segments usually elliptical in outline, mucronate. Peduncles usually becoming moderately to strongly thickened, sometimes remaining slender at maturity. Capitula radiate or discoid. Involucre hemispherical, attenuate or moderately to strongly umbonate at maturity. Involucral bracts moderately to densely hairy, rarely glabrous, with pale to brown, membranous margins; the outer ones triangular, the inner ones obtuse to acuminate. Ray florets (when present) white, female. Receptacle conical to narrowly conical at maturity. Pales elliptical to obovate in outline, persistent at maturity, acuminate or mucro-

nate to even tricuspidate; apex either formed by the protruding midrib, or not reached by the midrib, tinged with yellow, and somewhat hooded. Disc florets yellow, hermaphrodite; the basal part usually longer than the funnel-shaped, distal part, usually spongy and inflated at maturity, sometimes *(A. glareosa)* remaining slender. Achenes of disc florets homomorphic to moderately heteromorphic, subcylindrical to obconical or obovoidal; the peripheral ones often persistent on receptacles, the central ones readily falling off at maturity; ribs distinct, smooth or tuberculate, coinciding with ribs of the mesocarpic sclerenchyma cylinder; corona absent or an adaxially protracted auricle.

Basic chromosome number. – $x = 9$.
Ploidy level. – 2x.

Taxonomy. – *Anthemis* ser. *Secundirameae* in its present circumscription consists of nine species distributed in the C and E Mediterranean area: the seven species found in N Africa (E Algeria, Tunisia, Libya), the Sicilian endemic *A. muricata* Guss. and the type *A. rigida* Boiss. & Heldr. from the Aegean archipelago. It is difficult to decide whether the series is monophyletic. No synapomorphy is known as yet that would be common to all members of the group. Most are characterised by the combination of peduncles becoming inflated at maturity with conical to narrowly conical receptacles and a tendency to form discoid capitula *(A. muricata, A. kruegeriana, A. cyrenaica, A. rigida)*. However, none of these characters is found in all species. Also, the delimitation of *A.* ser. *Secundirameae* against Yavin's (1972) *A.* ser. *Induratae,* which comprises the E Mediterranean endemics *A. indurata* Delile, *A. leucanthemifolia* Boiss. & Blanche, and *A. microsperma* Boiss. & Kotschy, is presumably artificial. To address these questions properly, a revision of the latter series and a more detailed cladistic study of *A.* sect. *Anthemis* would be necessary.

11. ***Anthemis confusa*** Pomel, Nouv. Mat. Fl. Atl.: 49 (1874). – Ind. loc.: "Lieux incultes: Gabès (Kralik, n° 356)." – Lectotype (designated here): [Tunisia] "In incultis et pascuis deserti, Gabes", 21 Apr 1854, *Kralik n° 356* (MPU-AfN!; isolectotypes: P[2x]! G!, K!).
= *Anthemis pedunculata* var. *decumbens* Bonnet & Barratte, Expl. Sci. Tunisie, Cat. Pl.: 218 (1896) ≡ *A. stiparum* var. *decumbens* (Bonnet & Barratte) Murb. in Acta Univ. Lund, sect. 2, 33(12): 97 (1897) ≡ *A. tuberculata* [unranked] *decumbens* (Bonnet & Barratte) Battand., Fl. Algérie, Suppl. Phan.: 53 (1910) ≡ *A. monilicostata* var. *decumbens* (Bonnet & Barratte) Maire & Weiller in Bull. Soc. Hist. Nat. Afrique N. 30: 283 (1939). – Ind. loc: "Sables, lieux secs, jardins de palmiers: Hammam-el-Lif, îles Kerkenna, Gabès, El-Hamma près Gabès, Oued Zitoun, Bir Knafès, El-Hamma (Djerid), entre El-Hamma et Fratis, Tozzer, Oued Ferd, El-Golea, Hadedj (Matmata), etc." – Lectotype (designated here): [Tunisia] "El Hamma (Djerid)", 7 Jun 1884, *Letourneux* (P!).
Note. – Bonnet & Barratte based their new variety on an unnamed variety published earlier (Cosson in Roudaire 1881: 182), providing their own description and a list of additional localities. Apart from the above lectotype, the following specimens belonging to the original material were traced: [Tunisia] "In planitie dumosa inter El Hamma et Fratis (Beni Zid)", 27 May 1884, *Letourneux* (P[2x]!); [Tunisia] "El Hamma beni

Zid", 11 Mar 1886, *Letourneux* (P[2x]); [Tunisia] "Hadedj (Djeb. Matmata)", 23 Apr 1884, *Letourneux* (P!); [Tunisia] "El Hamma prope Gabes", 26 May 1856, *Letourneux* (P!); [Tunisia] "Hammam-El-Lif", 8 May 1883, *Cosson, & al.* (P!). All but the last specimen, which represents *Anthemis secundiramea* var. *cossyrensis,* fall within the circumscription of *A. confusa.*

– *Anthemis pedunculata* var. *mucronulata* Le Houérou in Bull. Soc. Bot. France 107: 28 (1960), nom. inval. [Art. 36.1]; Le Houérou in Mém. Inst. Rech. Sahariennes Univ. Alger 6: 121 (1962), nom. inval. [Art. 36.1].

Exs.: Kralik, Pl. Tunet. 1854: n° 356 (sub *"Anthemis pedunculata* var."); Pitard, Pl. Tunisie 1907: n° 147 (sub *"Anthemis pedunculata"*).

Annual, usually branched from immediately above the ground, few- to many-stemmed. Root (0.5-)1.0-2.7(-3.7) mm in diameter. Stems procumbent to ascending-erect, rarely erect, (3.5-)9-20(-25) cm long, basally (0.5-)1.0-1.8(-2.4) mm in diameter, usually branched in the upper half, with 1-8(-16) capitula, green, sometimes tinged with red, sulcate, sparsely to densely hairy with appressed, medifixed hairs. Basal and lower cauline leaves (10-)15-25(-37) mm long and (3-)6-12 mm wide, elliptical to obovate or narrowly elliptical to narrowly obovate in outline, petiolate; petiole (3-)5-13(-25) mm long; base with 1-3 pairs of teeth, sometimes without teeth; blade 1-2-pinnatipartite with 2-3 pairs of primary lobes; primary lobes with 1-3 secondary segments; ultimate segments elliptical to narrowly so or linear, (0.8-)1.5-2.8(-3.8) mm long and (0.5-)0.6-1.0(-1.5) mm wide, mucronate, glabrous or sparsely to densely tomentose, glandular-punctate. Middle and upper cauline leaves (5-)10-20(-25) mm long and (1-)4-11 mm wide, linear with entire or dentate margins, or elliptical to narrowly elliptical in outline; sessile or with a 4-8(-10) mm long petiole; base with 1-3 pairs of teeth; lamina 1-2-pinnatifid to -pinnatipartite; with 2-3

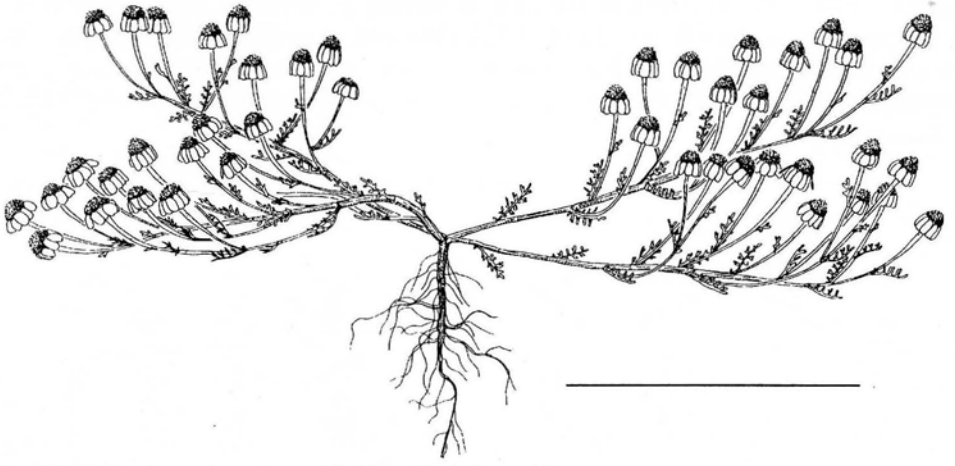


Fig. 89. *Anthemis confusa:* general habit. – Scale bar = 10 cm.

pairs of primary lobes, each with 1-3 secondary segments; ultimate segments triangular or elliptical to narrowly elliptical or linear, (1.1-)1.4-3.1(-5.3) mm long and (0.45-)0.6-1.1 (-1.3) mm wide, mucronate, glabrous or sparsely to densely tomentose, glandular-punctate. Peduncles (10-)30-70(-120) mm long and (0.7-)0.9-1.5(-1.8) mm in diameter, becoming moderately incrassate at maturity, sulcate, moderately to densely tomentose with medifixed hairs. Capitula heterogamous, (16-)18-25(-28) mm in diameter. Involucre (7-)8-10 (-11) mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 2-3 rows, abaxially glabrous or moderately to densely appressed hairy, central part usually green, margins pale to dark brown, membranous; the outermost triangular to narrowly triangular, (2.0-)2.3-3.0(-3.6) mm long and (0.8-)1.0-1.3(-1.5) mm wide, acute, with laterally up to 0.4 mm wide, apically 0.4-1.3 mm wide, membranous margins; the middle ones narrowly ovate to narrowly elliptical, 3.0-3.9(-4.7) mm long and up to (1.0-)1.2-1.5(-1.8) mm wide, acute, with laterally 0.3-0.8 mm wide, apically 0.6-1.6 mm wide, membranous margins; the innermost narrowly elliptical to narrowly obovate, (3.1-)3.5-4.5(-4.9) mm long and 1.4-1.9 mm wide, acute to obtuse, with laterally 0.4-0.8 mm wide, apically 0.6-2.2 mm wide, membranous margins. Receptacle conical to narrowly conical at maturity, 2.0-3.5 mm in diameter and 4.5-5.5 mm high, paleate throughout. Ray florets 8-13 per capitulum, white, female, (8-)9-12 mm long; limb elliptical to narrowly elliptical, (7.0-)7.7-10.5 mm long and (3.4-)3.7-4.7(-5.0) mm wide, apically 3-lobed; tube 1.2-1.8 mm long and (0.3-)0.6-0.9 mm wide. Pales linear or narrowly obovate, (2.6-)2.9-3.4(-3.8) mm long and (0.6-)0.8-1.1(-1.3) mm wide, carinate, membranous, basally 0.3-0.6 mm wide, apically tricuspidate or tapering rapidly into a rigid mucro formed by the protruding midvein, persistent at maturity. Disc florets yellow, hermaphrodite, glandular, 2.3-2.7 mm long; the proximal part spongy and inflated, round to subtetragonous at maturity, 1.2-1.4 mm long and 0.6-1.0 mm in diameter; the distal part funnel-shaped and apically 5-lobed; lobes triangular, with a dorsal appendage. Achenes of ray florets 1.1-1.7 mm long and 0.4-0.7 mm in diameter, subcylindrical to fusiform; ribs rather inconspicuous and smooth; without corona. Achenes of disc florets ± heteromorphic; the peripheral ones c. 1.0-1.6 mm long and 0.6-1.1 mm in diameter, stout and subcylindrical, persistent at maturity, c. 10-ribbed, light to dark brown; ribs smooth or moderately to strongly tuberculate with ± isodiametrical mucilage cells; furrows with yellow glands; with an adaxially up to 0.2 mm long corona; the central ones comparatively more slender than the marginal ones, 1.0-1.4(-1.6) mm long and 0.6-0.9 mm in

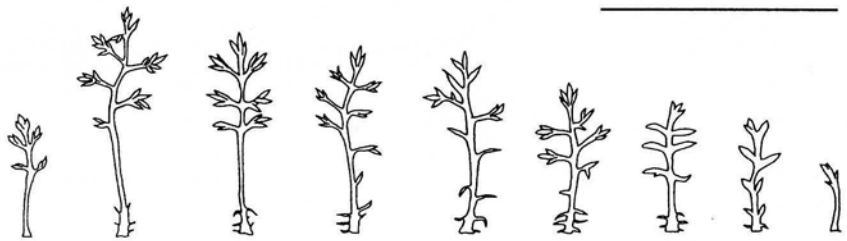


Fig. 90. *Anthemis confusa:* leaf spectrum (21 Apr 1854, *Kralik*). – Scale bar = 3 cm.

diameter, obconical-obovoidal, readily falling off at maturity, c. 10-ribbed; ribs smooth or moderately to strongly tuberculate with mucilage cells; furrows with glands; corona usually absent or an up to 0.1 mm long crenulate auricle.

Chromosome number. – $n = 9$, $2n = 18$, 20 (see discussion in chapter 10).

Distribution and habitat. – Centred on the semi-desertic areas of C and S Tunisia, extending to some localities in E Algeria and W Libya (Fig. 95). In Tunisia, it is found both along the Mediterranean coast and in inland areas, e.g. in the Chott el Jerid depression, in sandy wastelands around Gafsa, or in the Matamata mountains S of Gabès. To some extent, within Tunisia the distribution area of *A. confusa* coincides with those of *Anacyclus monanthos* (L.) Thell. and *Launaea quercifolia* (Desf.) Maire, the latter showing some preferences for gypsaceous soils (Kilian 1997: 360), which may also apply to *A. confusa*. In sandy and gypsaceous habitats around Moulares and Redeyef (W Tunisia) *Aaronsohnia pubescens* (Desf.) Bremer & Humphries, *Anacyclus monanthos* (L.) Thell. subsp. *monanthos, Carduus* cf. *getulus* Pomel, *Catananche arenaria* Coss. & Dur., *Centaurea dimorpha* Viv., *Chrysanthoglossum trifurcatum* (Desf.) Wilcox & al., *Cleome amblyocarpa* Barratte & Murb., *Euphorbia dracunculoides* subsp. *glebulosa* (Coss.) Maire, *Filago desertorum* Pomel, *Hedypnois cretica* (L.) Willd., *Helianthemum stipulatum* (Forssk.) C. Chr., *Heteromera fuscata* (Desf.) Pomel, *Ifloga spicata* (Forssk.) Schultz Bip., *Launaea fragilis* (Asso) Pau, *L. nudicaulis* (L.) Hook. f., *Nolletia chrysocomoides* (Desf.) Cosson, *Onopordum arenarium* (Desf.) Pomel, and *Reichardia tingitana* (L.) Roth were recorded as companion species. In the S Tunisian Matmata mountains, *A. confusa* grows in sandy patches along roads and arable fields together with *Aaronsohnia pubescens, Anacyclus monanthos* subsp. *cyrtolepidioides* (Pomel) Humphries, *Pallenis hierochuntica* (Michon) Greuter, *Atractylis cancellata* L., *A. flava* Desf., *A. prolifera* Boiss., *Carduncellus eriocephalus* Boiss., *Centaurea contracta* Viv., *C. dimorpha* Viv., *C. furfuracea* Coss. & Durieu, *C. melitensis* L., *Chrysanthoglossum deserticola* (Murb.) Wilcox & al., *Echinops spinosus* subsp. *bovei* (Boiss.) Murb., *Endopappus macrocarpus* Schultz-Bip., *Evax argentea* Pomel, *Filago desertorum* Pomel, *Helianthemum crassifolium* Pers., *H. lippii* (L.) Pers., *Heteromera fuscata* (Desf.) Pomel, *Ifloga spicata* (Forssk.) Schultz Bip., *Koelpinia linearis* Pallas, *Launaea capitata* (Spreng.) Dandy, *L. fragilis, L. nudicaulis, Nolletia chrysocomoides, Phagnalon saxatile* (L.) Cass., *Picris cupuligera* (Durieu) Walp., *P. saharae* (Coss. & Kralik) Hochreutiner, *Reichardia tingitana,* and *Volutaria lippii* (L.) Cass.

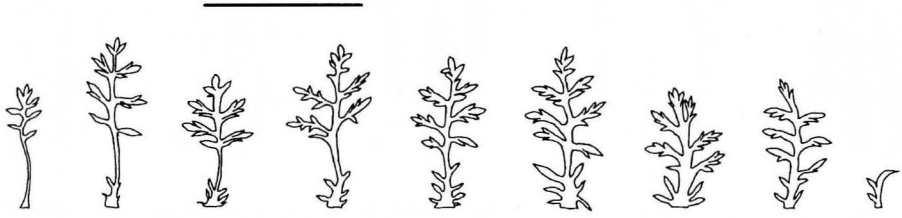


Fig. 91. *Anthemis confusa:* leaf spectrum *(Vogt 12747 & Oberprieler 7052).* – Scale bar = 2 cm.

Variation and taxonomy. – *Anthemis confusa* holds an intermediate position between *A. secundiramea, A. ubensis,* and *A. glareosa,* which may account for its rather great morphological variability throughout its distributional range. From *A. secundiramea* and *A. ubensis* it differs by its less dissected leaves (usually 2-3-pinnatipartite to -pinnatisect in *A. secundiramea* and *A. ubensis* but only 1-2-pinnatipartite to -pinnatisect in *A. confusa*). Additionally, it differs from *A. ubensis* by its usually prostrate growth and smaller involucres. With *A. glareosa* it shares the 1-2-pinnatipartite leaves, but differs markedly by its pale tip formed by the protruding midrib. Le Houérou (1960, 1962) described an (invalidly named) "var. *mucronulata*" within *"A. pedunculata* subsp. *glareosa"* to comprise plants from S Tunisia (Matamata mountains, Djerba), thought to be more closely related to *A. glareosa* than to *A. confusa (A. pedunculata* var. *decumbens).* However, as expressed by the epithet, these plants have pale tips that are acuminate and reached by the midribs, and therefore clearly belong to *A. confusa.*

Inland plants of *Anthemis confusa,* especially those growing around Chott El Jerid (including the lectotype specimen of *A. pedunculata* var. *decumbens*) superficially resemble *A. stiparum* subsp. *sabulicola* by the dense indumentum of their leaves, stems and involucral bracts, which led Murbeck (1897) to propose the combination *A. stiparum* var. *decumbens.* However, both coastal and inland populations of *A. confusa,* with their pales persistent at maturity, clearly differ from *A. stiparum.* In addition, *A. confusa* has 1.0-1.6 mm long disc achenes while in *A. stiparum* subsp. *stiparum* and subsp. *sabulicola* they are more slender and more than 1.7 mm long.

Anthemis confusa varies, in particular, with respect to the colouring of the membranous margins of involucral bracts, the ornamentation of the achenes, and indumentum density. Specimens from near the type locality of *A. confusa* at Gabès show dark brown to even blackish membranous margins (Fig. 92), whereas those from the Matmata mountains have light brown bract margins, and in most of the inland plants around Chott El Jerid and from the N and S border of the distributional range the membranous margins are light brown to

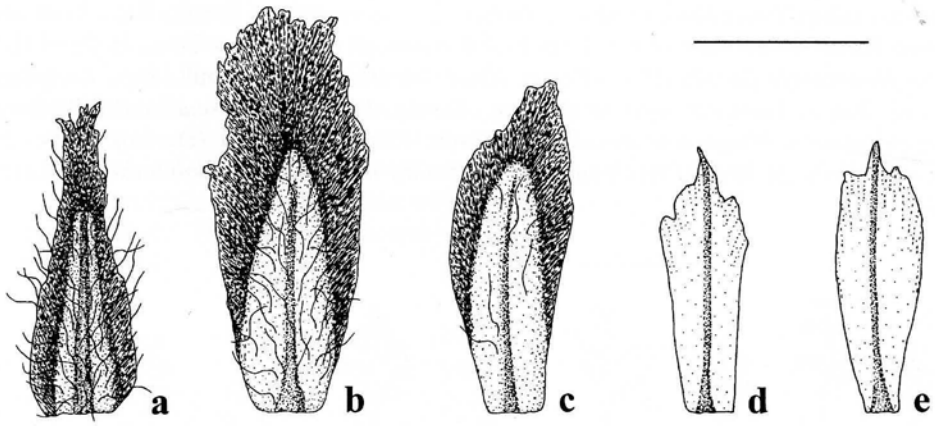


Fig. 92. *Anthemis confusa:* (a-c) involucral bracts *(Pitard 147),* (d-e) pales (d, *id.;* e, 21 Apr 1854, *Kralik*). – Scale bar = 2 mm.

pale (Fig. 93). Clinal variation can be observed concerning the ornamentation of achenes: plants from around Gabès and from the Matmata mountains tend to have moderately tuberculate achenes, those from the inland populations usually have achenes with smooth ribs. A somewhat paralleled variation is seen in indumentum density: in plants from Gabès and Matmata, the leaves, stems, and involucral bracts are glabrous or sparsely hairy, in inland plants they are sparsely to densely hairy, perhaps in adaptation to more xeric habitats. However, the observed variation is more or less continous and not clearly correlated for the different characters concerned. Also, geographic exceptions do occur (e.g. plants with dark brown membranous bract margins from around Gafsa; plants with pale bract margins from the coast near Sfax). A formal recognition of two varieties within *A. confusa* is therefore impracticable and undesirable.

Specimens seen. – [Algeria, Biskra] Oued Rir, [35°4′N, 5°56′E], Hiver 1874-75, *Jacquemet* (P). – [Tébessa] 30 km W Ferkan, Boden sandig-tonig, ansalzig, [34°35′N, 7°5′E], 28 Mar 1969, *Leippert 7294* (GOET). – [Tunisia, Gabès] Dj. Toual (au S. de Gabès), [33°N, 10°E], 2 Apr 1912, *Humbert* (MPU-AfN). Gabès arvensis [?] de Hanidam, Trapferne [?], [33°57′N, 10°7′E], *Herb. Battandier* (MPU-AfN). El Hamdou de Gabès, in segetibus, [33°55′N, 9°47′E], Feb 1913, *Pitard* (G). In arenosis maritimis, Gabès, [33°54′N, 10°7′E], 25 Mar 1854, *Kralik* (P). Gabès (Raz-el-Oued): in pascuis deserti, [33°54′N, 10°7′E], Feb 1907, *Pitard 147* (B; G; MA 127035). Désert Ouadi, près Gabés, [33°54′N, 10°7′E], 1 May 1854, *Kralik* (K). In incultis et pascuis deserti, Gabés, [33°54′N, 10°7′E], 21 Apr 1852, *Kralik, n° 356* (MPU-AfN, P, G, K). In alluvie exsiccata Oued Gabes, [33°54′N, 10°7′E], 1 May 1854, *Kralik* (P; G). El Hamma prope Gabès, [33°51′N, 9°50′E], 26 May 1856, *Letourneux* (P). El Hamma beni Zid, [33°51′N, 9°50′E], 11 Mar 1886, *Letourneux* (P). El Hamma de Gabès, in arenosis deserti, [33°51′N, 9°50′E], Feb 1913, *Pitard* (G). In planita dumosa inter El Hamma et Frates (Beni Zid), [33°51′N, 9°50′E], 27 May 1884, *Letourneux* (P). Tunisie du Sud, road P 16 between Kebili and Gabès, Oued Rebaies c. 20 km W El Hamma, 140 m, 33°49.382'N, 9°32.313'E, 11 May 1994, *Vogt 12885 & Oberprieler 7190* (B). Tunisie du Sud, road P 16 between Kebili and Gabès, c. 28 km W El Hamma, stony slopes, 150 m, 33°48.135'N, 9°29.649'E, 11 May 1994, *Vogt 12882 & Oberprieler 7187* (B). Ketennah, inter Gabès et Medenine, in segetibus, [33°45′N, 10°12′E], Feb 1913, *Pitard* (G). Oued Feret prope Ketenna,

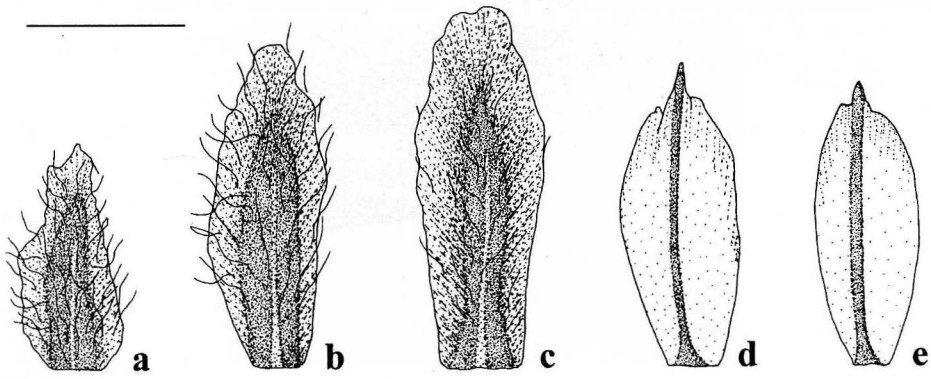


Fig. 93. *Anthemis confusa:* (a-c) involucral bracts *(Vogt 13333 & Oberprieler 7638)*, (d-e) pales (d, *id.;* e, *Vogt 13006 & Oberprieler 7311*). – Scale bar = 2 mm.

[33°45′N, 10°12′E], 27 Apr 1884, *Letourneux* (P). Sebkhet Zarkin pr. Gabès, [33°40′N, 10°17′E], 4 Apr 1912, *Humbert* (MPU). Hadedj (Djeb. Matmata), [33°37′N, 10°0′E], 23 Apr 1884, *Letourneux* (P). Matmata près Gabès, [33°35′N, 10°0′E], *Herb. Battandier* (MPU-AfN). Gebirgs-Halbwüste, Matmata, Tunisie sud, [33°33′N, 9°58′E], 25 Mar 1971, *Röthlisberger* (G). Tamezret (Djebel Matmata), [33°33′N, 9°53′E], 21 Apr 1886, *Letourneux* (P). Nouil (Nefzaoua merid.), [33°31′N, 8°54′E], 18 Mar 1886, *Letourneux* (P). Oase Douz, [33°28′N, 9°0′E], 22 Mar 1971, *Röthlisberger* (G). Bir-el-Ahmar, [33°11′N, 10°27′E], 4 May 1884, *Letourneux* (P). – [Gafsa] Südtunesien: ca. 16 km nordöstl. Gafsa. Aristida-Steppe auf Sand, [34°31′N, 8°52′E], 17 Apr 1968, *Wagenitz 1280* (B; GOET). Sened, Gafsa: in aridis deserti, [34°28′N, 9°11′E], Apr 1910, *Pitard 2186* (G). Tunisie du Sud, road C 201 between Moulares and Redeyef, sandy plaines of Oued Selja c. 7 km S Moulares, 400 m, 34°27.032'N, 8°13.213'E, 9 May 1994, *Vogt 12712 & Oberprieler 7017* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). Gafsa: In aridis deserti, [34°25′N, 8°47′E], Apr 1909, *Pitard* (B; G). Gafsa, in aridis deserti, [34°25′N, 8°47′E], Apr 1908, *Pitard* (BC 29679). Gafsa: in aridis deserti, [34°25′N, 8°47′E], Mar 1908, *Pitard 406* (G; K; BC 29680; MA 127037). 14 km NE Gafsa an der Straße nach Kairouan, 340 m; sandig-lehmige Flächen; 8°53′E, 34°24′N, 10 Apr 1980, *Podlech 34243* (MSB; G; M; CAI). road C 201 between Redeyef and Tamerza, c. 3 km NW Redeyef, road embankments, sand, 680 m, 34°24.497'N, 8°7.067'E, 9 May 1994, *Vogt 12747 & Oberprieler 7052* (B; G; Herb. Oberprieler; Herb. Vogt). Maknassy, Gafsa: in aridis deserti, Apr 1910, *Pitard 2187* (G). 3 km W Tozeur an der Straße nach El Oued, 45 m; Sandwüste; 8°06′E, 33°55′N, 9 Apr 1980, *Podlech 34145* (MSB; G). on banks of Oued El Kebir, N of Gafsa, 16 Apr 1986, *Kennedy* (RNG). – [Kairouan] Getreideacker SW Kairuan, [35°40′N,

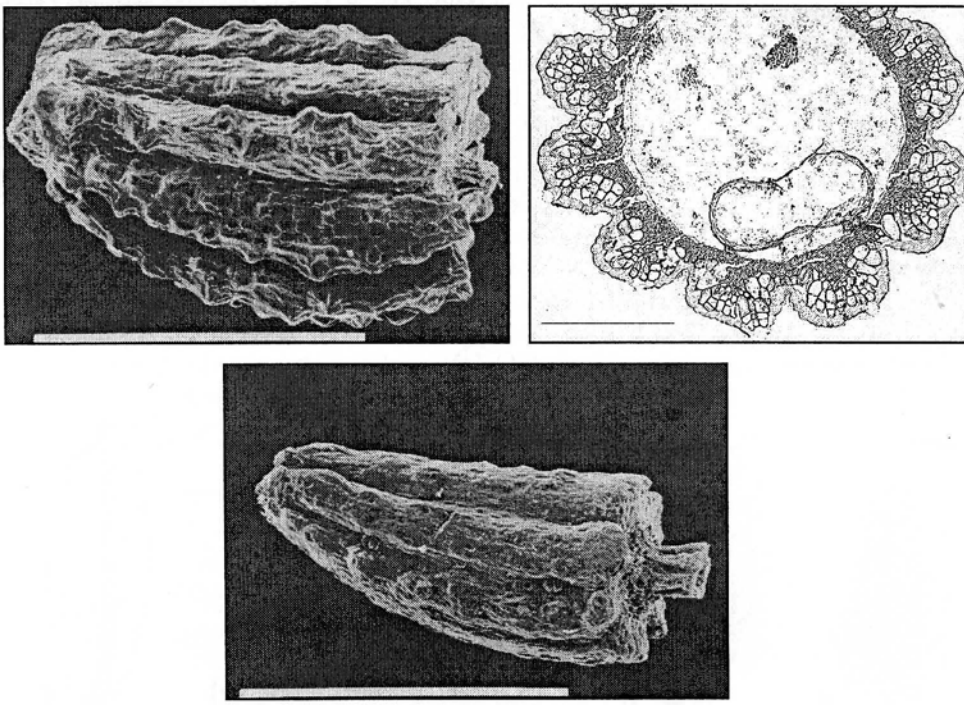


Fig. 94. Micrographs of achenes of *Anthemis confusa*. Upper row: achenes of peripheral disc florets (left, *Kralik n° 356;* right, *Vogt 13049 & Oberprieler 7354*); lower row: achene of central disc floret *(Kralik n° 356).* – Scale bars = 1 mm (SEM) and 0.3 mm (LM, top right).

10°6′E], 8 Apr 1968, *Leippert 7237* (B). Aïn Cherichira, Ouest de Kairouan, [35°38′N, 9°48′E], 20 Jun 1883, *Cosson & al.* (P). – [Monastir] Monastir à Souss, 20 May 1885, *Rouére* (P). – [Sfax] Rég. de Tunis, Sfax, [35°45′N, 10°45′E], 1854, *Espina* (P). Sfax, [35°45′N, 10°45′E], 1910, *Cuénod* (G). Sebkha au S. d'El-Djem, [35°15′N, 10°42′E], *Pomel* (MPU-AfN). El-Djem - Sfax, [35°5′N, 10°44′E], *Pomel* (MPU-AfN). Sfax, sables aubbord de la route de Sidi Mansour, [34°47′N, 10°45′E], 17 May 1856, *Robert* (P). Route de Sfax à Gabès, 7 Apr 1909, *Hibon* (P). Schichina [Hachichina] de Sfax a Gabès, *Herb. Battandier* (MPU-AfN). Schichina, *Herb. Battandier* (MPU-AfN). – [Sidi-Bouzid] road P 3 between Gafsa and Kairouan, c. 6 km SW Jelma, Oued, stony and sandy plains, 370 m, 35°13.267'N, 9°23.187'E, 17 May 1994, *Vogt 13333 & Oberprieler 7638* (B; Herb. Oberprieler; Herb. Vogt). – [Tataouine] Monts de Matmata, road C 207 between Tataouine and Ghomrassen, c. 8 km S Ghomrassen, road embankments and stony slopes, 340 m, 32°59.952'N, 10°20.524'E, 14 May 1994, *Vogt 13131 & Oberprieler 7436* (B). road C 207 between Tataouine and Chenini, c. 5 km W the turn-off to Ghomrassen, sandy plaines, 390 m, 32°55.619'N, 10°20.841'E, 14 May 1994, *Vogt 13111 & Oberprieler 7416* (B; G; Herb. Oberprieler; Herb. Vogt). road C 207 between Tataouine and Chenini, c. 5 km W Tataouine, rocks

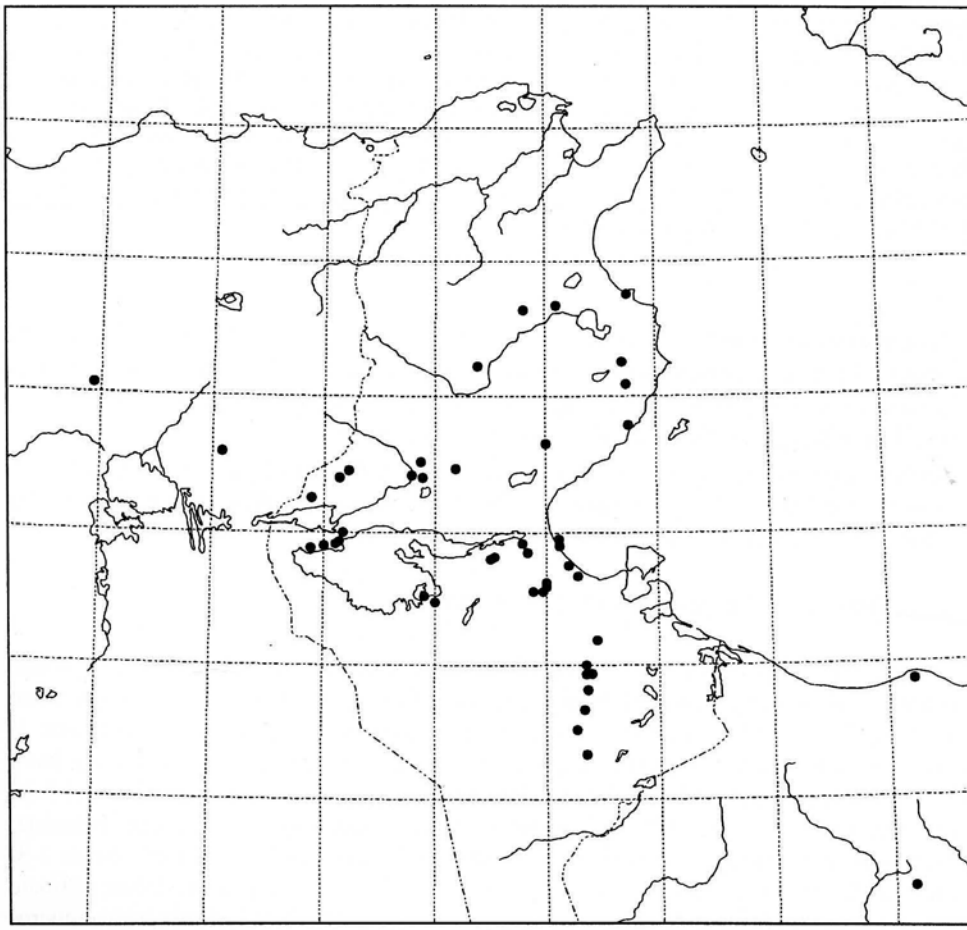


Fig. 95. Total distribution of *Anthemis confusa*.

and stony slopes, 320 m, 32°55.524'N, 10°23.524'E, 13 May 1994, *Vogt 13093 & Oberprieler 7398* (B; Herb. Oberprieler; Herb. Vogt). road P 19 between Tataouine and Remada, c. 15 km N Bir Thlethine, road embankments and *Artemisia* steppe, 400 m, 32°48.763'N, 10°22.475'E, 12 May 1994, *Vogt 13006 & Oberprieler 7311* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). road P 19 between Tataouine and Remada, c. 4.5 km S Bir Thlethine, sandy plaines and fields E of the road, 420 m, 32°39.549'N, 10°19.871'E, 13 May 1994, *Vogt 13009 & Oberprieler 7314* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). road P 19 between Tataouine and Remada, c. 27 km NW Remada, road embankments and sandy plaines, 450 m, 32°30.757'N, 10°16.204'E, 13 May 1994, *Vogt 13049 & Oberprieler 7354* (B; G; K; RAB; RNG; SEV; MA; Herb. Oberprieler; Herb. Vogt). road P 19 between Tataouine and Remada, Oued Semna 8 km NW Remada, sandy plaines, 440 m, 32°20.444'N, 10°21.018'E, 13 May 1994, *Vogt 13062 & Oberprieler 7367* (B). – [Tozeur] Nefta, in arenis deserti, [34°25′N, 8°47′E], Apr 1909, *Pitard 2359* (G). Tozeur, Le Belvedere, cercanias del Camping, El Palmeral, [34°15′N, 7°53′E], 31 Mar 1986, *JGR & Aparicio* (SEV). Tunisie du Sud, Chott Er Rahim, road P 16 between Chbika and Tozeur, c. 10 km SE Chbika, sand, c. 0 m, 34°14.973'N, 7°52.954'E, 10 May 1994, *Vogt 12803 & Oberprieler 7108* (B). El Hamma (Djerid), [34°0′N, 8°10′E], 7 Jun 1884, *Letourneux* (P). Tozeur, [33°56′N, 8°8′E], Apr 1934, *Cuénod* (G). de Tozeur à Nefta, [33°54′N, 8°0′E], 8 Apr 1912, *Humbert* (MPU-AfN). Nefta, Schott-el-Jerid, [33°53′N, 7°53′E], 31 Mar 1986, *JGR & Aparicio* (SEV). Nefta, [33°53′N, 7°53′E], *Babault* (P). Nefta, sables, [33°53′N, 7°53′E], Mar 1930, *Braun-Blanquet, G. & I.* (MPU-Braun-Blanquet). – [Not located] El Oudiane, in aridis deserti, Apr 1908, *Pitard 405* (G; MA 127295). Oued el Jetour [?], 19 Apr 1884, *Letourneux* (P). Foum Khangued et Teldj aïn Kemuriscetes [?], 7 May 1889, *Letourneux* (P). – [Libya, Gharyan] Tmad El Mlaghi, delta of inland wash channel (cultivation), [31°20′N, 13°10′E], 1966, *Mitchell 122* (K). – [Tarabulus] Tripolitanien, Tripolis, [32°52′N, 13°13′E], Apr 1932, *Baschant* (B).

12. ***Anthemis cyrenaica*** Coss. in Bull. Soc. Bot. France 19: 82 (1872). – Ind. loc.: "In planitie Cyrenaica littorali inter Bengasi et Schadabia detexit cl. G. Rohlfs et legit floriferam et vix fructiferam 9 Mart. 1869." – Holotype: [Libya] "In planitie Cyrenaica littorali inter Bengasi et Schadabia", 9 Mar 1869, *Rohlfs* (P!).

= *Anthemis cyrenaica* var. *radiata* Pamp. in Arch. Bot. (Forli) 12: 46 (1936). – Ind. loc.: none. – Lectotype (designated here): [Libya] "Cirenaica, Bir Acheim Bir Zeidan", 26 Mar 1933, *Pampanini 7993* (FI!).

Exs.: Béguinot & Vaccari, Fl. Lyb. Exs.: n° 205.

Annual, rarely single-stemmed, usually branched from immediately above the ground and then few- to many-stemmed. Stems erect or ascending-erect, sometimes procumbent, (5-)10-20(-25) cm tall, basally 0.5-2 mm in diameter, branched in the upper half, with 1-5(-10) capitula, green, sometimes tinged with red, sulcate, sparsely to moderately hairy with appressed, medifixed hairs. Basal and lower cauline leaves 15-35 mm long and 5-10 (-15) mm wide, narrowly elliptical to narrowly elliptical-obovate in outline, petiolate; petiole 4-10 mm long; base usually with 1-3 pairs of entire or dissected teeth; blade 2-3-pinnatipartite to -pinnatisect with 3-4 pairs of elliptical to obovate primary lobes; ultimate segments linear or elliptical, (1.5-)1.7-2.8(-3.3) mm long and 0.35-0.6 mm wide, mucronate (up to 0.2 mm), sparsely to densely tomentose with medifixed hairs, glandular-punctate. Upper cauline leaves (5-)7-25 mm long and (1-)3-15 mm wide, linear with entire or

dentate margin, or elliptical to obovate in outline, usually sessile, rarely with an up to 5 mm long petiole; lamina 2-pinnatipartite to -pinnatisect with 2-3 pairs of primary lobes; ultimate segments (0.7-)0.9-1.6(-2.2) mm long and 0.3-0.6 mm wide, linear or narrowly elliptical, sometimes narrowly ovate or triangular, glandular-punctate. Peduncles (13-)30-55(-75) mm long and 0.6-1.0 mm in diameter, remaining slender or becoming slightly incrassate at maturity and then 0.7-1.5 mm in diameter, sulcate, densely and ± appressed tomentose. Capitula homogamous or heterogamous. Involucre 8-12(-14) mm in diameter, hemispherical, strongly umbonate at maturity. Involucral bracts in 3-4 rows, abaxially densely appressed tomentose with asymmetrically medifixed or basifixed hairs, with a green or brown, longitudinal strip and rather wide, pale or light brown, membranous lateral and apical margins; the outermost triangular-elliptical to narrowly triangular-elliptical or linear, 2.5-4 mm long and 1.0-1.5 mm wide, acute, with laterally 0.2-0.5 mm wide, apically up to 2 mm wide, membranous margins; the middle ones narrowly elliptical to linear, 3.5-5 mm long and 0.8-1.6 mm wide, acute, with laterally 0.4-0.8 mm wide, apically up to 2.5 mm wide, membranous margins; the innermost elliptical-obovate or usually

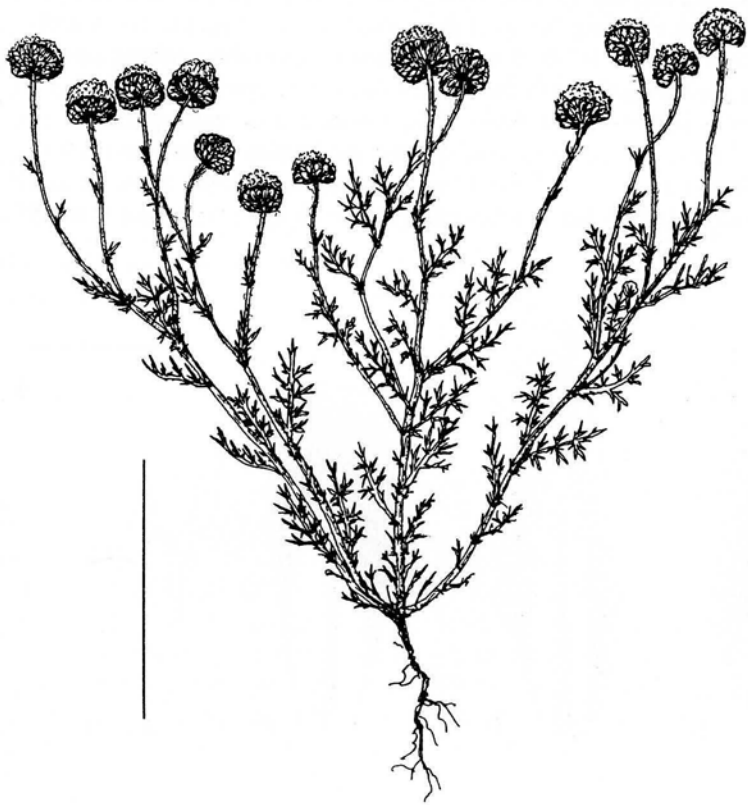


Fig. 96. *Anthemis cyrenaica:* general habit. – Scale bar = 5 cm.

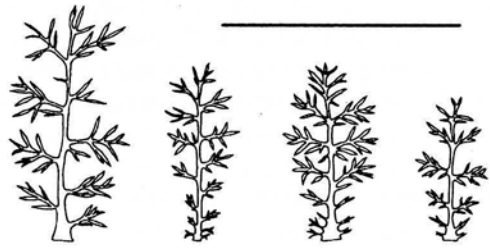


Fig. 97. *Anthemis cyrenaica:* leaf spectrum *(Pampanini 7986).* – Scale bar = 3 cm.

narrowly elliptical-obovate, 3.4-4.2 mm long and 0.6-1.6 mm wide, acute to obtuse, with laterally 0.2-0.7 mm wide, apically up to 1.0 mm wide margins, usually appressed tomentose only in the distal half. Ray florets missing or very minute, c. 4 mm long and 1.5 mm wide. Receptacle hemispherical at anthesis, globose to ovate at maturity (c. 3.5 mm in diam., c. 2-3.5 mm high). Peripheral pales linear to narrowly elliptical-obovate, (2.4-)2.7-3.3(-3.5) mm long and 0.6-1.0 mm wide, tapering rather abruptly into an erose apex, midvein rather distinct, reaching the tip of the scale; the central ones linear or narrowly elliptical, 2.4-3.1 mm long and 0.6-0.75 mm wide, flat to somewhat carinate, tapering gradually (sometimes rather abruptly) into an acute or mucronate apex formed by the ± protruding midrib; all pales persistent at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 2.2-3.3 mm long; the basal part spongy, moderately inflated and subtetragonous to somewhat winged at maturity, 0.8-1.4 mm long and 0.5-0.8 mm wide; the distal part funnel-shaped and apically 5-lobed; lobes triangular or elongate triangular (0.4-0.55 mm long,

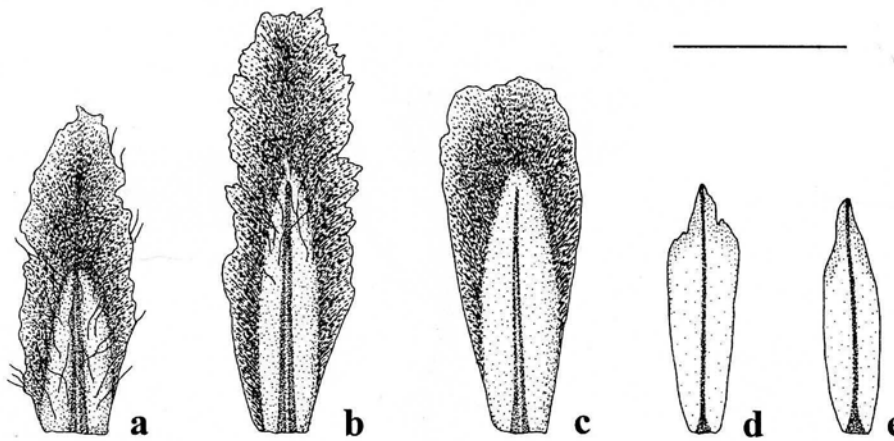


Fig. 98. *Anthemis cyrenaica:* (a-c) involucral bracts *(Davis 49914),* (d-e) pales (d, *Pampanini 7986;* e, *Pampanini 7994*). – Scale bar = 2 mm.

0.3-0.4 mm wide) with a 0.2-0.3 mm long dorsal appendage. Achenes of disc florets homomorphic, 1.0-1.4 mm long and 0.5-0.6 mm in diameter, obconical-obovoid, readily falling off at maturity, c. 10-ribbed; ribs broad and rounded, smooth to slightly tuberculate with rows of ± isodiametrical mucilage cells; furrows with yellow glands; corona an up to 0.6 mm long adaxial auricle or sometimes (due to the apically protruding ribs) a crenulate rim.

Chromosome number. – $2n = 18$ (Brullo & al. 1990).

Distribution and habitat. – According to Brullo & al. (1990), *Anthemis cyrenaica* is endemic to the pre-desertic countries of Cyrenaica. Revised herbarium specimens (Fig. 100) came from the semi-desert plains around Banghazi and the W part of the mountain areas of the Al Jabal al Akhdar (Baladiyahs of Banghazi and Al Fatih). However, localities given by Alavi (1983) point to the occurrence of *A. cyrenaica* also in E Cyrenaica. The species is recorded to grow from the coastal plains to altitudes of c. 300 m where it is found along margins of arable fields.

Variation and taxonomy. – *Anthemis cyrenaica* is closely related to *A. kruegeriana* with which it shares discoid capitula, involucres that are umbonate at maturity, and little divided (1-2-pinnatipartite to -pinnatisect) leaves. The latter contrast markedly with the more strongly dissected leaves of *A. taubertii*. *A. cyrenaica* differs from *A. kruegeriana* by its homomorphic and smooth achenes and by the midvein reaching the tip of its pales.

With *Anthemis taubertii, A. cyrenaica* shares the smooth achenes and the shape of involucral bracts, but it differs by its capitula being discoid or possessing only few minute ray florets, smaller achenes (1.0-1.4 mm in *A. cyrenaica*; 1.1-1.6 mm in *A. taubertii*), and the shape of receptacular scales, especially their tips (tapering and erose or simple in *A. cyrenaica,* truncate to even tricuspidate in *A.taubertii*).

Brullo & al. (1990) consider *Anthemis cyrenaica* to be "taxonomically related to *A. muricata* Guss. from Sicily". Obviously, this suggested relationship is solely based on the occurrence of discoid capitula in both species. Specimens of *A. muricata* from near Caltanisetta in C Sicily (*Ross 146;* May 1901, *Ross; Huet du Pavillion, n° 138;* all in G) have

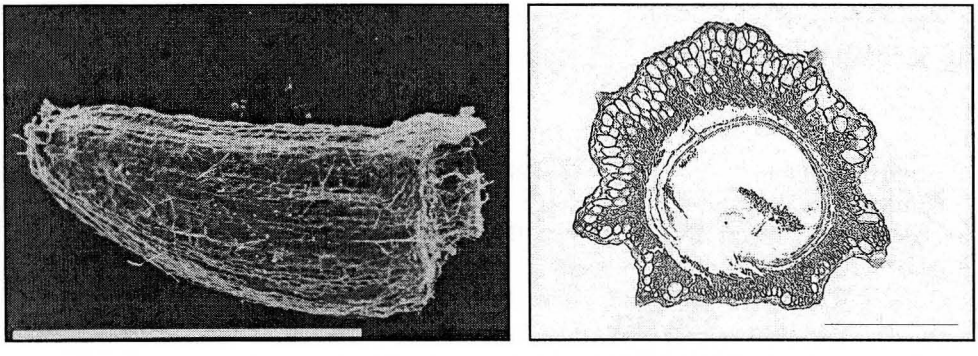


Fig. 99. Micrographs of achenes of disc florets of *Anthemis cyrenaica (Pampanini 7986).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

strongly incrassate peduncles, conical receptacles, and obconical, not umbonate involucres. They resemble the radiate *A. secundiramea* var. *secundiramea* and are phenetically rather distant from *A. cyrenaica*.

As in *Anthemis kruegeriana,* some plants of *A. cyrenaica* have small ray florets while most have discoid capitula. The former were described as *A. cyrenaica* var. *radiata* by Pampanini (1936). I do not consider the presence of such minute ray florets to justify formal taxonomic recognition.

Specimens seen. – [Libya, Al Fatih] around El Abiar, 50-60 km E of Benghazi, 300 m, banks at edge of wheat fields on low plateau, [32°10′N, 20°35′E], 24 Mar 1970, *Davis 49914* (K). – [Banghazi] Benghasi, [32°5′N, 20°4′E], 3 Apr 1883, *Ruhmer 182* (GOET; MPU). In planitie Cyrenaica littorali inter Bengasi et Schadabia, [31°25′N, 20°10′E], 9 Mar 1869, *Rohlfs 100* (P). Cyrenaica: in pascuis aridis et arvis arenosis 21 km ad meridiem oppidi Gemines, [31°25′N, 20°10′E], 18 Apr 1938, *Maire & Weiller 843* (P; MPU). In planitie Cyrenaica littorali inter Bengasi et Schadabia, 9 Mar 1869, *Rohlfs 800[?]* (P). – [Darnah] Cirenaica, Gat ed-Dghigh tra Derna e Mechili, 10 Apr 1933, *Pampanini 7986* (G).

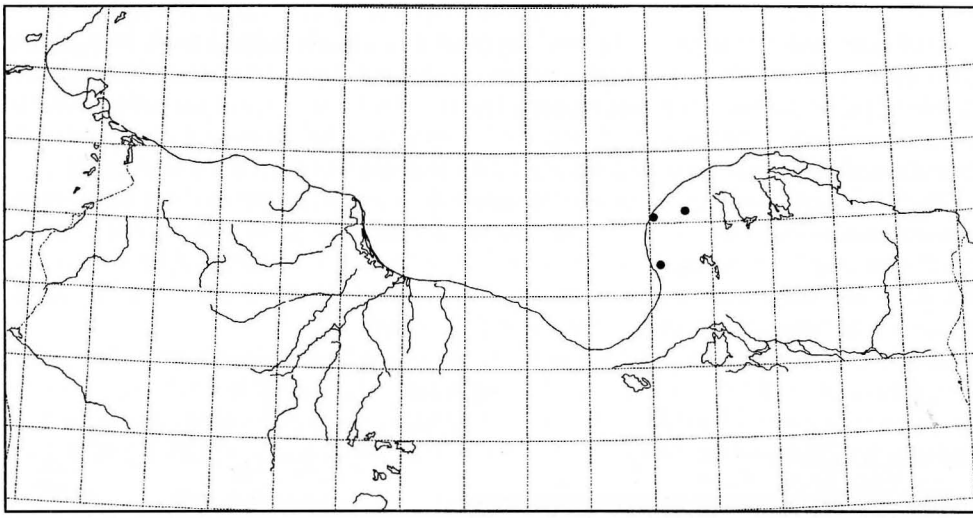


Fig. 100. Distribution of *Anthemis cyrenaica* according to revised herbarium material.

13. ***Anthemis glareosa*** E. A. Durand & Barratte, Fl. Libyc. Prodr.: 130 (1910). – Ind. loc.: "Environs de Tripoli: dans la parie de l'oasis à l'Est de la ville (Letourneux, 5 avril 1886), Sidi-el-Maçri, dans les sables (Letourneux, 6 avril 1886), dans les sables du désert, commun (Taubert. 20 mars 1887, n° 113)". – Lectotype (designated here): [Libya] "Tripoli", 20 Mar 1887, *Taubert 113* (P!; isolectotype: P!, G!).

= *Anthemis glareosa* var. *saccardoana* Bég. & Vacc. in Ann. Bot. (Rome) 13: 32 (1914). – Ind. loc.: "Sirte (27.III.1914)". – Lectotype: not traced.

Note. – In an annotation to *Anthemis glareosa* collected in Libya, Maire & Weiller (1939: 282) state: "Le var. *Saccardoana* Bég. et Vacc. Ann. di Bot., 13, p. 26 (1914)

paraît rare; il n'avait pas été retrouvé depuis sa découverte par Vaccari. Nous l'avons récolté dans les graviers de l'Ouadi Sofedjin (n° 840) et comparé avec le type que notre excellent collège Béguinot a bien voulu nous communiquer." The alleged type seen by Maire & Weiller seems to be the specimen labelled "Sabbie deserti che presso la Scuola d'Agricoltura", 21 Mar 1914, *Vaccari 1194* (MPU-AfN!, FI!). This specimen, however, is cited as representing the typical variety of *A. glareosa* by Béguinot & Vaccari (1914) and, therefore, is to be ruled out as a candidate for lectotypification.

= *Anthemis indurata* var. *angulata* Pamp. in Bull. Soc. Bot. Ital. 1914: 19 (1914). – Ind. loc.: "(N. 15, 3425)". – Lectotype (designated here): [Libya] "Tripoli, Gargaresc", 21 Apr 1913, *Pampanini 3425* (FI!).

– *Anthemis pedunculata* subsp. *glareosa* (E. A. Durand & Barratte) Le Houérou in Bull. Soc. Bot. France 107: 28 (1960), comb. inval. [Art. 32.1].

– *Anthemis pedunculata* subsp. *glareosa* var. *glareosa* (E. A. Durand & Barratte) Le Houérou in Bull. Soc. Bot. France 107: 28 (1960); Le Houérou in Mém. Inst. Rech. Sahariennes Univ. Alger 6: 121 (1962), comb. inval. [Art. 32.1].

– *Anthemis tuberculata* [unranked] *decumbens* auct. [non (Bonnet & Barratte) Battand. 1910]: Battandier, Fl. Algérie, Suppl. Phan.: 53 (1910), p.p. ("échantillion [...] remarquable par les écailles du disque très obtuses et jaunes au sommet.")

Exs.: Béguinot & Vaccari, Fl. Lyb. Exs.: n° 204.

Annual, usually branched from immediately above the ground, few- to many-stemmed. Stems procumbent to ascending-erect, rarely erect, 5-15(-35) cm long, basally 0.5-2(-3)

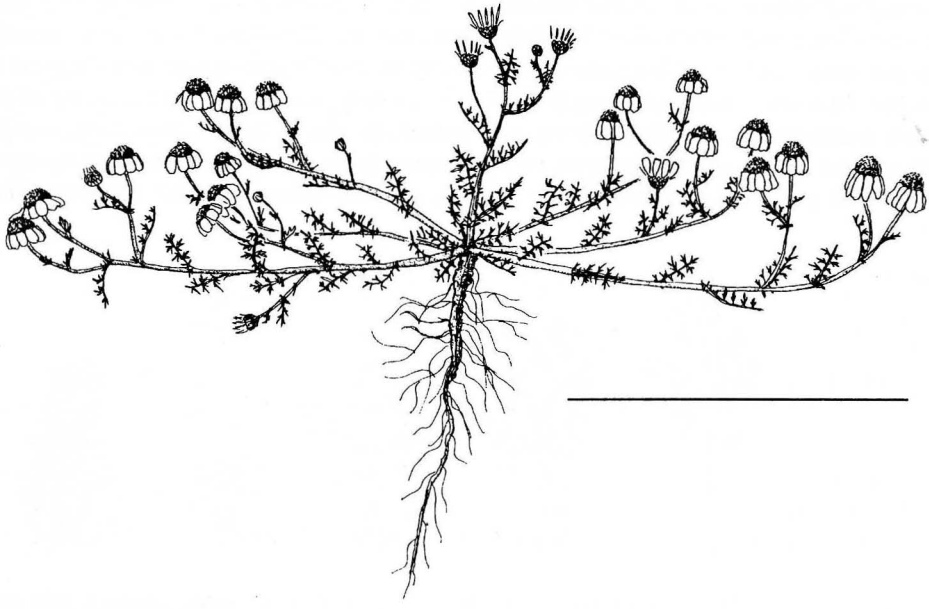


Fig. 101. *Anthemis glareosa:* general habit *(Taubert 113).* – Scale bar = 10 cm.

mm in diameter, usually branched in the upper half, with (1-)4-10(-25) capitula, green, sometimes tinged with red, sulcate, moderately to densely appressed tomentose with medifixed hairs. Basal and lower cauline leaves c. 20-30 mm long and c. 7-15 mm wide, elliptical to narrowly elliptical or narrowly obovate in outline, petiolate; petiole c. 10 mm long; base with 1-3 pairs of teeth; blade 2-3-pinnatipartite with 3-4 pairs of primary lobes, each with 1-4 secondary segments; ultimate segments linear or narrowly elliptical, 1.4-2.2 mm long and 0.4-0.7 mm wide, shortly mucronate, sparsely to densely tomentose, glandular-punctate. Middle and upper cauline leaves up to 10-35 mm long and up to c. 20 mm wide, linear with entire or dentate margins, or elliptical to obovate in outline, sessile; base with 1-3 pairs of teeth; lamina 2-3-pinnatipartite, with 2-4 pairs of primary lobes, each with 1-4 secondary segments; ultimate segments elliptical to linear, 1.5-3.0 mm long and 0.6-1.1 mm wide, mucronate, tomentose, glandular-punctate. Peduncles 8-20(-25) mm long and 0.5-1.3 mm in diameter, remaining slender or becoming moderately inflated and 0.5-2.2 mm in diameter at maturity, sulcate, moderately to densely tomentose with crisped, medifixed hairs. Capitula heterogamous, 9-25 mm in diameter. Involucre 5-10 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 2-3 rows, abaxially moderately to densely appressed tomentose with asymmetrically medifixed or basifixed hairs; central part usually green, margins pale to light brown, membranous; the outermost triangular to ovate-elliptical, c. 1.8-3 mm long and 0.8-1.5 mm wide, acute, with 0.1-0.5 mm wide lateral and apical margins; the middle ones narrowly elliptical-ovate to narrowly elliptical-obovate, c. 2.5-4.5 mm long and up to 1.0-1.8 mm wide, acute to obtuse, laterally with up to 0.6 mm wide, apically with up to 1.0 wide margins; the innermost narrowly elliptical to narrowly elliptical-obovate, c. 3.5-4.5 mm long and 1.0-1.7 mm wide, acute to obtuse, laterally with up to 0.6 mm wide, apically with up to 1.0 mm wide margins. Receptacle conical-ovoid to narrowly cylindrical at maturity(1.5-2.5 mm in diam., c. 2.5-5.0 mm high), paleate throughout. Ray florets 4-8(-13) per capitulum, white, female, (4.5-)6.0-11.5 mm long; limb elliptical, (3.5-)5.0-9.5 mm long and (2.5-)3.5-6.0 mm wide, apically 3-lobed; tube 1.0-2.0 mm long and 0.5-1.1 mm wide. Pales linear or narrowly elliptical to narrowly obovate, 2.6-3.6 mm long and 0.7-1.3 mm wide, carinate (except at the tip of the scale), membranous, sometimes beset with glands, basally c. 0.3-0.6 mm wide, usually with a broad, obtuse to truncate apex, rarely tapering gradually into a rather acute tip; apex tinged with yellow, sometimes slightly hooded; midvein rather indistinct, never reaching

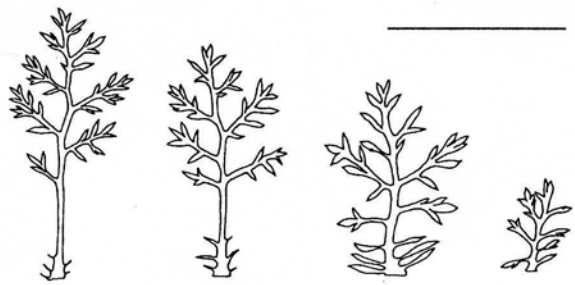


Fig. 102. *Anthemis glareosa:* leaf spectrum *(Davis 49463).* – Scale bar = 2 cm.

the tip of the scale. Disc florets yellow, hermaphrodite, glandular, c. (2.2-)2.4-3.1 mm long; the basal part remaining slender or becoming moderately spongy, inflated and round to subtetragonous at maturity, 1.5-1.9(-2.1) mm long and 0.3-0.8(-1.0) mm in diameter; the distal part funnel-shaped and apically 5-lobed; lobes triangular (0.4-0.6 mm long and 0.4-0.5 mm wide) mm, with an up to 0.15 mm long dorsal appendage. Achenes of ray florets (1.1-)1.3-1.5 mm long and 0.5-0.8 mm in diameter, subcylindrical to fusiform; ribs rather inconspicuous and smooth; corona usually a very short crenulate auricle, sometimes (due to protruding ribs) up to 0.2 mm long. Achenes of disc florets ± heteromorphic; the peripheral ones c. 1.2-1.7 mm long and 0.7-1.0 mm in diameter, stout and subcylindrical, persistent at maturity, c. 10-ribbed, light to dark brown; ribs tuberculate with ± isodiametrical mucilage cells; furrows with yellow glands; with an adaxially 0.2-1.0 mm long corona; the central ones more slender than the marginal ones, 1.2-1.5 mm long and 0.5-0.7 mm in diameter, obconical-obovoidal, readily falling off at maturity, c. 10-ribbed; ribs tuberculate with mucilage cells; furrows with glands; corona usually absent or an up to 0.2 mm, sometimes up to 0.9 mm long adaxial auricle.

Chromosome number. – Unknown. Pollen dimensions suggest a diploid number (see chapter 11).

Distribution and habitat. – Restricted to the Gefara Plain in NW Libya and SE Tunisia and the plains along the coasts of the W part of the Gulf of Sirte where it is found on sandy plains near the sea and as a weed in arable fields. From sea level to 100 m above sea level.

Variation and taxonomy. – *Anthemis glareosa, A. secundiramea, A. confusa,* and *A. kruegeriana* form a group of closely related species. With the exception of *A. confusa* which she did not accept as distinct, Yavin (1970) included them, along with the phenetically more distant *A. taubertii* and *A. cyrenaica,* in *A.* ser. *Secundirameae.*

Anthemis secundiramea and *A. confusa* differ from *A. glareosa* by their pales possessing a rigid and conspicuous midvein that reaches the tip. A further difference between these species is the shape of disc florets: in *A. glareosa* the basal, cylindrical part of the

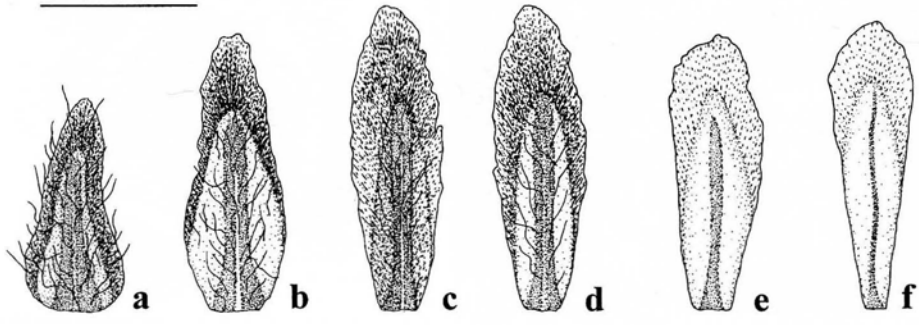


Fig. 103. *Anthemis glareosa:* (a-d) involucral bracts (6 Apr 1886, *Letourneux*), (e-f) pales (e, *Davis 49463;* f, *Vaccari 1194*). – Scale bar = 2 mm.

floret comprises c. 2/3 of the floret's total length and remains slender or becomes only moderately inflated at maturity, in *A. secundiramea* and *A. confusa* this part makes up only c. 1/2 of the floret's total length and becomes inflated at maturity. *A. kruegeriana* has the same type of pales and disc florets as *A. glareosa* but differs from it by its reduced or absent ray florets and by its involucre being umbonate at maturity. From *A. cyrenaica* and *A. taubertii, A. glareosa* differs by its tuberculate achenes, blunt and yellow-tipped pales, and less dissected leaves.

Due perhaps to its intermediate position between *Anthemis secundiramea, A. confusa,* and *A. kruegeriana, A. glareosa* varies appreciably in some characters. Plants with strongly inflated peduncles (e.g. 6 Apr 1886, *Letourneux; Maire & Weiller 834,* specimen at P; *Vaccari 1194*) resemble *A. secundiramea* or *A. confusa,* whereas normally the peduncle remains slender in *A. glareosa* (e.g. *Taubert 113,* lectotype; *Maire & Weiller 834,* specimen at MPU-AfN). The two specimens of *Maire & Weiller 834* demonstrate that plants with inflated and slender peduncles may form mixed stands, so that acknowledgement of corresponding entities at a higher taxonomic level than forma is not justified. Achene shape, especially the presence and length of an adaxial corona, is also very variable. In some specimens (e.g. *Taubert 113,* lectotype; *Davis 49463*) achenes are more or less devoid of a corona, while in other specimens (e.g. *Davis 49829, Maire & Weiller 840*) the corona is up to 1 mm high. However, corona length neither correlates with peduncle thickening nor with geographical distribution and, hence, does not warrant recognition of variants at a higher taxonomic level than forma. Plants with very small capitula (3 May 1938, *Maire & Weiller*) were labelled by Maire as *"A. glareosa* var. *microcephala"* (unpublished); they are also very small in overall size, which may rather reflect malnutrition or extreme aridity than a hereditary difference.

Specimens seen. – [Tunisia, Medenine] In arenosis, 20 kil. ad meridiem oppidi Ben Gardan [Ben Guerdane], [33°0′N, 11°15′E], 3 May 1938, *Maire & Weiller* (MPU-AfN). Sebkha Legguine, Sud Tunisien, 23 Feb 1907, *Herb. Joly* (MPU-AfN). – [Libya, Al Khums] Tripolitania, in desertis ad "Leptis Magna" (Lebda), [32°35′N, 14°20′E], 11 Apr 1933, *Bornmüller 744* (K). – [An Nuqat al Khams] Tripolitania, ad Sabratha, in aridis, [32°49′N, 12°28′E], 17 Apr 1933, *Bornmüller 745* (B). – [Misratah] T, Gulf of Sirte, between Misurata and Bu-Gren, 20 m, poor sandy barley field in sebkha, [32°15′N, 15°10′E], 23 Mar 1970, *Davis 49829* (RNG; K). – [Surt]

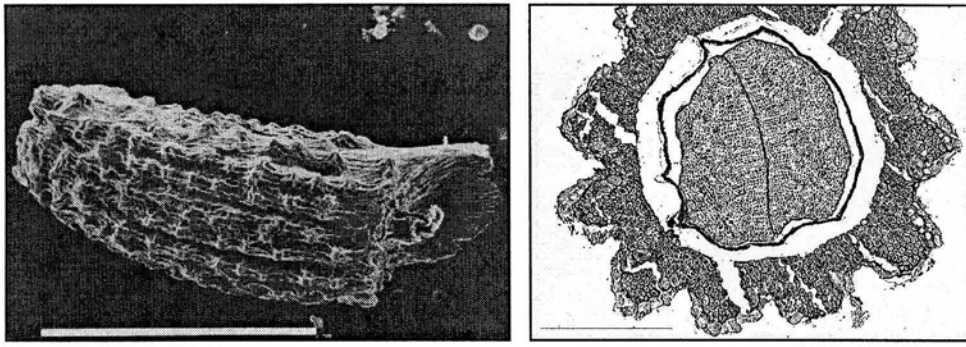


Fig. 104. Micrographs of achenes of disc florets of *Anthemis glareosa* (left, *Davis 49829;* right, *Bornmüller 746).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Tripolitania, corn crops in sandy desert 2 km west of Syrte, [31°12′N, 16°35′E], 20 Apr 1939, *Sandwith 2694* (K). – [Tarabulus] Tripolitania, Tripolis, in desertis glareosis ad (merid. vers.) Tadjura, [32°55′N, 13°20′E], 19 Apr 1933, *Bornmüller 743* (B). Tripoli, [32°53′N, 13°12′E], 24 Mar 1946, *Brown* (K). Tripolitania: Tripolis, in arenis aridis ad Tadjura (merid. vers), [32°53′N, 13°22′E], 19 Apr 1933, *Bornmüller 749* (P). Tripoli, nr. University of Libya, 100 m, edge of sandy barley fields, [32°52′N, 13°10′E], 12 Mar 1970, *Davis 49463* (RNG; K). Tripolitania, Tripolis, ad Gargurersh, in campis aridis, [32°50′N, 13°12′E], 21 Apr 1933, *Bornmüller 746* (B). 12 miles S of Tripoli, open roadside bank, [32°45′N, 13°10′E], 24 Mar 1970, *Maitland 82* (K). Tripoli, 20 Mar 1887, *Taubert 113* (P; G). In arenis prope Sidi El Macri haud procul a Tripoli, 6 Apr 1886, *Letourneux* (P). Tripolitania: in arenosis circa Tripolim, 14 Apr 1938, *Maire & Weiller 834* (P; MPU-AfN). Tripolitania, Tripolis, in arenosis desertis (merid. vers.) pr. Fadjura, 19 Apr 1933, *Bornmüller 743* (K). Tripoli, sabbie deserti che presso la Scuola d'Agricultura, 21 Mar 1914, *Vaccari 1194* (MPU-AfN). In palmetis ad orientem urbis Tripolis, 5 Apr 1886, *Letourneux* (P). – [Not located] Tripolitania: in arenosis prope Souk-el-Djemâa, 15 Apr 1938, *Maire & Weiller 837* (MPU-AfN). Tripolitania: Sidi ben Nour in arenosis litoris, 15 Apr 1938, *Maire & Weiller 836* (MPU-AfN). Tripolitania: in glareosis amnis Sofedjin, 16 Apr 1938, *Maire & Weiller 840* (MPU).

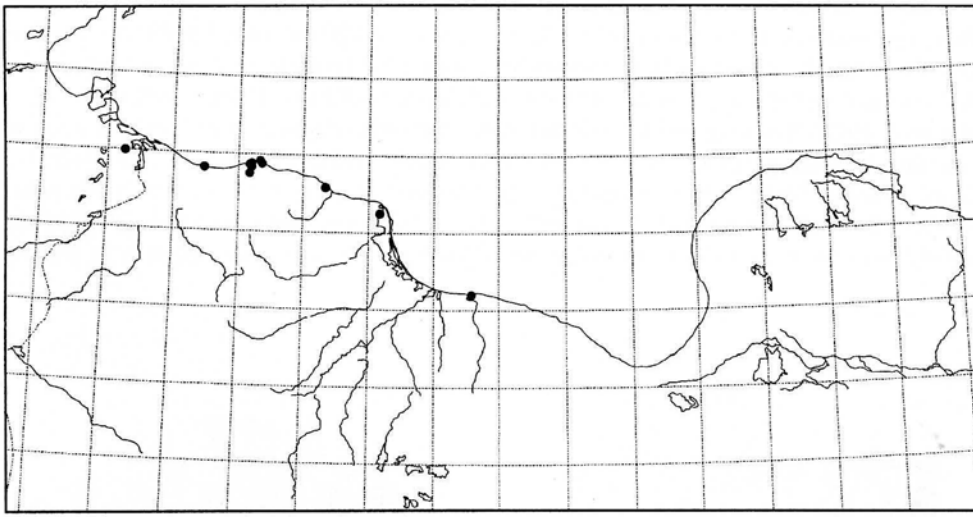


Fig. 105. Total distribution of *Anthemis glareosa*.

14. ***Anthemis kruegeriana*** Pamp. in Agric. Colon. 22: 365, t. 1 verso, f. 5 (1928). – Ind. loc.: protologue not seen. Pampanini (1930: 441) indicates the following location: "Sirtica or.: fra l'Uadi Faregh e Maaatan Risam, 18 aprile, ed a sud di Gars es Sahabi, 20 aprile (Krüger, 1928 [P])." – Lectotype (designated here): [Libya] "Sirtica or.: fra l'Uadi Faregh e Maatan Bisam", 18 Apr 1928, *Krüger* (FI!).

= *Anthemis rotata* var. *auriculata* Pamp. in Arch. Bot. (Forlì) 12: 46 (1936). – Ind. loc.: none; Pampanini (1938: 78) indicates: "Agheila; Marsa Brega; Sidi Mohamed Scerif; Agedabia; fra Agedabia e Gtafia; l. d. Bir Gelulia; Magrun." – Lectotype (designated here): [Libya] "el-Agheila", 14 Mar 1933, *Pampanini 8019* (FI!).

= *Anthemis kruegeriana* var. *radiata* Maire & Weiller in Bull. Soc. Hist. Nat. Afrique N. 30: 282 (1939). – Ind. loc.: "Cyrenaïque: pâturages arides de la plaine du Sud d'Adjedabia (n°841), avec le var. *discoidea*." – Lectotype (designated here): [Libya] "Cyrenaica: in aridis ad meridiem oppidi Adjedabia", 17 Apr 1938, *Maire & Weiller 1703* (MPU-AfN!; isolectotype: P!).
Note. – The indication relating to the collecting number *(841)* in an error, as is borne out by label information in Maire's own handwriting: the specimen *Maire & Weiller 841* is devoid of ray florets and was identified as *Anthemis kruegeriana* var. *discoidea* Maire & Weiller; Maire's annotation "*Anthemis kruegeriana* var. *radiata* Maire & Weiller" appears on the collection *Maire & Weiller 1703,* which consists of plants with minutely radiate capitula. Both collections were made in the same site and on the same day, and presumably numbered later.

– *Anthemis kruegeriana* var. *discoidea* Maire & Weiller in Bull. Soc. Hist. Nat. Afrique N. 30: 282 (1939), nom. inval. [Art. 26.2]

Annual, usually branched from immediately above the ground, few- to many-stemmed. Stems procumbent to ascending-erect, rarely erect, (3-)10-20 cm long, basally 0.5-2 mm in diameter, usually branched in the upper half, with 1-10 capitula, dull green, tinged with red, sulcate, densely appressed tomentose with medifixed hairs. Basal and lower cauline leaves c. 15-25 mm long and c. 7-10 mm wide, narrowly elliptical to narrowly obovate in outline, petiolate; petiole c. 5-7 mm long; base usually without teeth, sometimes with 1-3 pairs of teeth; blade 1-2-pinnatipartite with 2-4 pairs of primary lobes which are either undivided or with 1-2 secondary segments; ultimate segments linear or narrowly elliptical, 1.0-4.0 mm long and 0.3-1.0 mm wide, shortly (-0.2 mm) mucronate, sparsely to densely

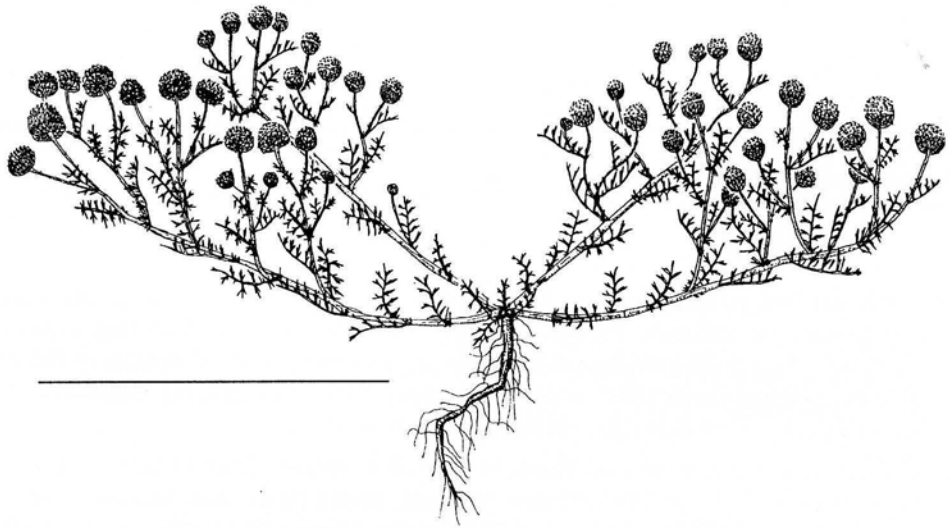


Fig. 106. *Anthemis kruegeriana:* general habit *(Pampanini 7995).* – Scale bar = 10 cm.

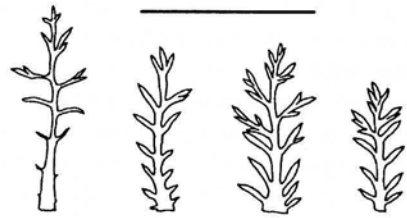


Fig. 107. *Anthemis kruegeriana:* leaf spectrum *(Pampanini 7995).* – Scale bar = 2 cm.

tomentose, glandular-punctate. Upper cauline leaves c. 5-20 mm long and c. 1-10 mm wide, linear with entire or dentate margin, or elliptical to obovate in outline, sessile; base with 1-2 pairs of teeth; lamina 1-2-pinnatipartite with 2-4 pairs of primary lobes; each with 1-2 linear or narrowly elliptical secondary lobes. Peduncles 8-20 mm long and 0.3-1.2 mm in diameter, remaining slender at maturity, sulcate, densely, ± appressed tomentose with crisped medifixed hairs. Capitula homogamous or heterogamous. Involucre 5-8(-10) mm in diameter, hemispherical, umbonate at maturity. Involucral bracts in 2-3 rows, abaxially densely appressed tomentose with asymmetrically medifixed or basifixed hairs, margins pale to light brown, membranous; the outermost triangular, c. 2-3 mm long and 1.0-1.5 mm wide, acute, with 0.2-0.4 mm wide apical and lateral margins; the middle ones elliptical, c. 4 mm long and up to 2 mm wide, acute to obtuse, laterally with up to 0.9 mm wide, apically with up to 1.3 mm wide margins; the innermost narrowly elliptical to narrowly elliptical-obovate, c. 4.0-4.5 mm long and 1.0-1.5 mm wide, acute to obtuse, laterally with up to 0.7 mm wide, apically with up to 1.5 mm wide margins. Receptacle conical-ovoid at maturity(1.5-3.5 mm in diam., c. 2-5 mm high), paleate throughout. Ray florets missing or

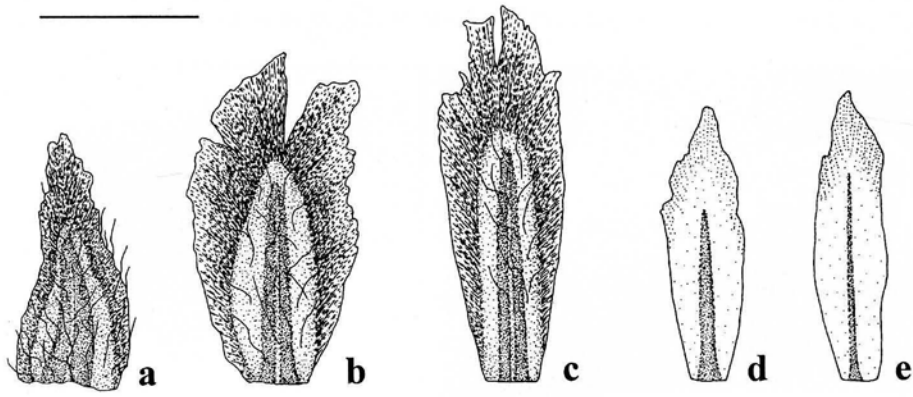


Fig. 108. *Anthemis kruegeriana:* (a-c) involucral bracts, (d-e) pales *(Pampanini 7995).* – Scale bar = 2 mm.

1-3 per capitulum, white, female, up to 5 mm long; limb circular to elliptical, c. 3-4 mm long and 3-4 mm wide, apically deeply 3-lobed; tube c. 1.0-1.5 mm long and c. 0.8 mm wide. Pales linear or narrowly elliptical, c. 3.0-3.5 mm long and 0.8-1.0 mm wide, carinate (except at the tip), membranous, sometimes glandular, basally c. 0.4-0.7 mm wide, gradually tapering into acute to somewhat blunt, sometimes slightly hooded tip tinged with yellow; midvein rather inconspicuous, never reaching the tip of the scale. Disc florets yellow, hermaphrodite, glandular, c. 3.0 mm long; the basal part moderately spongy, inflated and round to subtetragonous at maturity, c. 1.6-1.7 mm long and 0.6-0.8 mm wide, sometimes tinged with dark red; the distal part funnel-shaped, apically 5-lobed; lobes elongate triangular (0.7-0.8 mm long and 0.35-0.45 mm wide), with an up to 0.15 mm long dorsal appendage. Achenes of ray florets (when present) c. 1.7 mm long and 0.8 mm in diameter, subcylindrical, strongly tuberculate at least on the abaxial ribs, adaxially coronate. Achenes of disc florets heteromorphic; the peripheral ones c. 1.0-1.4 mm long and 0.6-0.9 mm in diameter, stout and subcylindrical, persistent at maturity, c. 10-ribbed, light brown or white; at least the abaxial ribs tuberculate with ± isodiametrical mucilage cells; furrows with yellow glands; corona an adaxially 0.3-0.5 mm long crenulate auricle; those of central disc florets more slender than the peripheral ones, 1.0-1.3 mm long and 0.5-0.7 mm in diameter, obconical-obovoidal, readily falling off at maturity, c. 10-ribbed; at least the abaxial ribs tuberculate with mucilage cells; furrows with glands; corona an adaxially up to 0.1-0.5 mm long crenulate auricle.

Chromosome number. – $2n = 18$ (Brullo & al. 1990).

Distribution and habitat. – Endemic to the coastal and semi-desertic inland plains along the E coast of the Gulf of Sirte in NE Libya (Fig. 110).

Variation and taxonomy. – *Anthemis kruegeriana* holds an intermediate position between *A. glareosa* and *A. cyrenaica,* combining characteristics of both in a reticulate pattern. It shows strong affinities to *A. glareosa* with which it shares yellow-tinged, somewhat hooded pale tips not reached by the midribs, while pales in *A. cyrenaica* are acuminate to mucronate with excurrant midribs. Additionally, as in *A. glareosa,* disc florets of

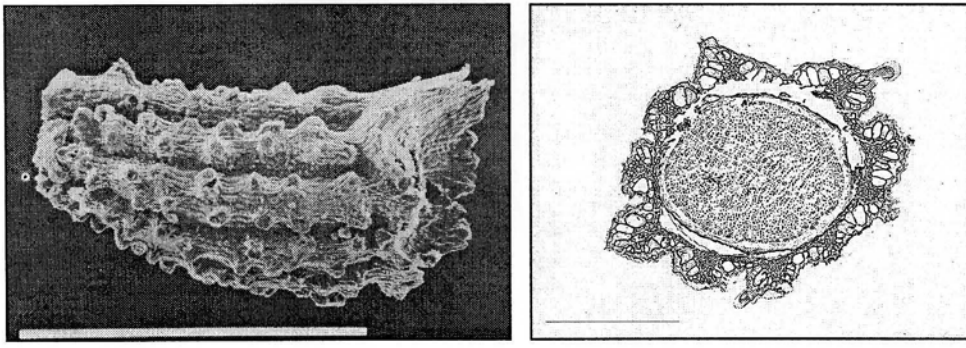


Fig. 109. Micrographs of achenes of disc florets of *Anthemis kruegeriana (Pampanini 7995).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

A. kruegeriana have an elongate and inconspicuously inflated basal part and somewhat elongate apical lobes while in *A. cyrenaica* the basal part of disc florets is shorter and inflated at maturity, and the apical lobes less elongate. In contrast to *A. cyrenaica,* achenes of *A. kruegeriana* are moderately to strongly tuberculate as in *A. glareosa*. Conversely, *A. kruegeriana* shares with *A. cyrenaica* the discoid capitula with involucres conspicuously umbonate at maturity, whereas in *A. glareosa* the capitula are radiate and involucres basally attenuate at maturity. Although plants with radiate capitula occur both in *A. kruegeriana* and in *A. cyrenaica,* their ray florets are minute and not consistently found in all capitula of an individual plant. The recognition of such plants as a separate variety (*A. kruegeriana* var. *radiata;* Maire & Weiller 1939) is impracticable.

Specimens seen. – [Libya, Ajdabiya] Cyrenaica: in arenosis et lapidosis aridis ad meridiem oppidi Adjedabia, [30°40′N, 20°15′E], 17 Apr 1938, *Maire & Weiller 841* (MPU-AfN). Cyrenaica, desert between Agedabia and the Wadi Zaregh, [30°35′N, 20°25′E], 30 Mar 1939, *Sandwith 2132* (K). Cirenaica, el-Agheila [Al Uqaylah], giardini, [30°15′N, 19°13′E], 15 Mar 1933, *Pampanini 7994* (G). Libia, Cirenaica, Tra Agedabia ed el-Agheila Melch en Nogra, 15 Mar 1933, *Pampanini 7995* (K). Cyrenaïca: in aridis ad meridionem oppidi Adjedabia, 17 Apr 1938, *Maire & Weiller 1703* (P).

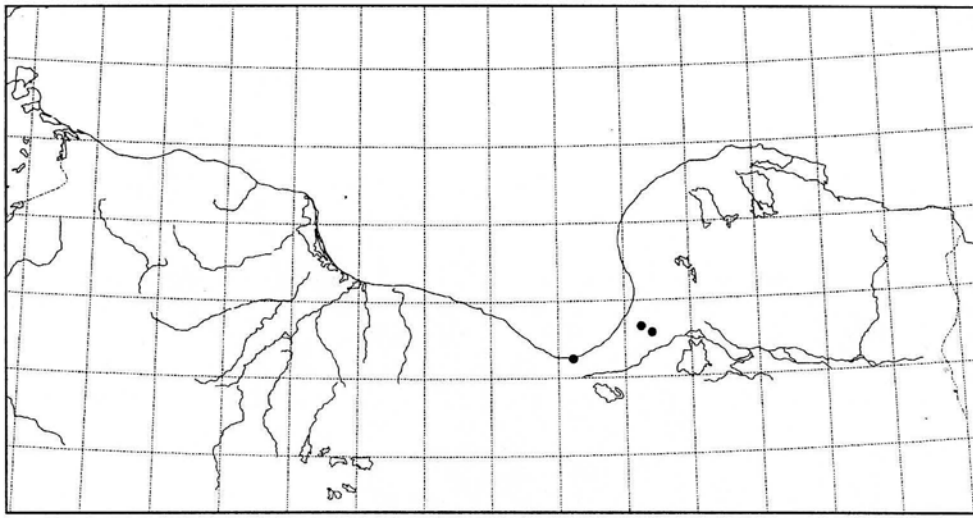


Fig. 110. Total distribution of *Anthemis kruegeriana.*

15. ***Anthemis secundiramea*** Biv., Sic. Pl. Cent. 2: 10 (1807) ≡ *A. maritima* var. *secundiramea* (Biv.) C. Presl, Fl. Sic. 1: 29 (1826). – Ind. loc.: "Habitat in maritimis prope Cataniam." – Type: not seen.

– *Anthemis secundiramea* var. *typica* Fiori in Fiori & Béguinot, Fl. Italia 3: 255 (1903), nom. inval. [Art. 24.3]

Annual, usually branched from immediately above the ground, few- to many-stemmed. Roots (1.0-)1.4-2.7(-3.5) mm in diameter. Stems procumbent to ascending-erect, (1.5-)6-18(-27) cm long, basally (0.5-)0.8-1.7(-2.8) mm in diameter, rarely unbranched and with 1 capitulum, usually squarrously branched in the middle and proximal part and with up to 10(-15) capitula, usually tinged with red, sulcate, glabrous to sparsely hairy with appressed, medifixed hairs. Basal and lower cauline leaves (9-)15-30(-40) mm long and (3-)5-12(-20) mm wide, elliptical to obovate or narrowly elliptical to narrowly obovate in outline, moderately succulent, petiolate; petiole (4-)7-16(-22) mm long; base usually with 1-3 pairs of teeth, rarely without teeth; blade 2(-3)-pinnatipartite with 2-3 pairs of primary lobes, each with 1-3 pairs of secondary segments, elliptical to ovate in outline; ultimate segments elliptical to obovate or narrowly elliptical to narrowly obovate, (0.8-)1.3-2.1(-2.7) mm long and 0.6-1.0(-1.3) mm wide, mucronate, glabrous to sparsely hairy, glandular-punctate. Middle and upper cauline leaves (6-)8-20(-30) mm long and (1-)3-10(-20) mm wide, linear with entire or dentate margins, or elliptical to obovate or narrowly elliptical to narrowly obovate in outline, moderately succulent, sessile or with a 3-8(-15) mm long petiole; base with 1-3 pairs of teeth; lamina 1-2-pinnatipartite; with 2-3 pairs of primary lobes, each with 1-3 pairs of secondary segments; ultimate segments usually ellipti-

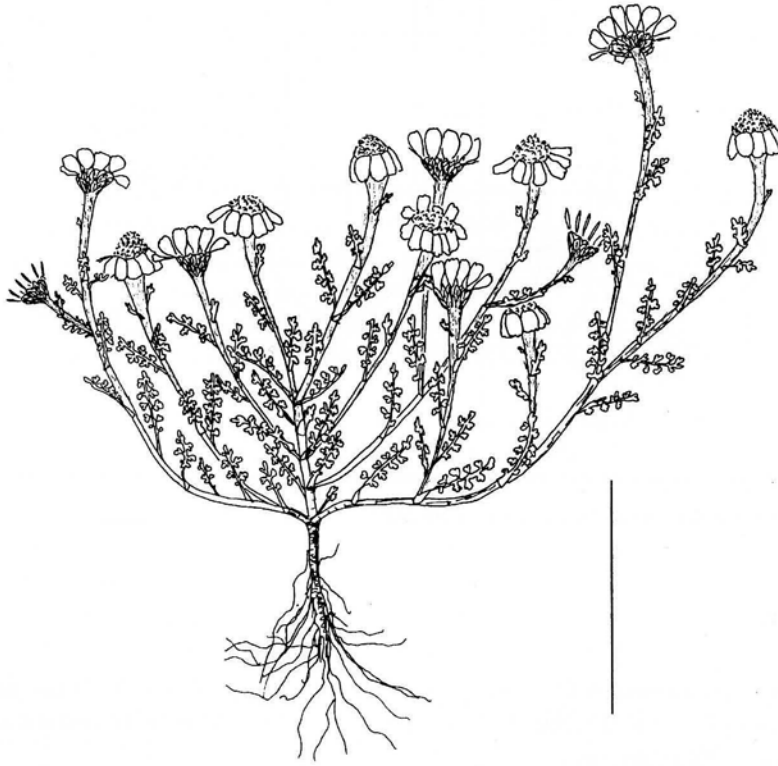


Fig. 111. *Anthemis secundiramea* var. *secundiramea:* general habit (27 Apr 1841, *Durieu de Maisonneuve*). – Scale bar = 5 cm.



Fig. 112. *Anthemis secundiramea* var. *secundiramea:* leaf spectrum (30 Apr 1914, *Clavé*). – Scale bar = 4 cm.

cal to obovate, sometimes triangular or linear, (0.9-)1.2-2.4(-4.2) mm long and 0.7-1.3 (-2.0) mm wide, mucronate, glabrous to sparsely hairy, glandular-punctate. Peduncles (4-)10-40(-80) mm long and (0.6-)1.7-2.9(-4.0) mm in diameter, becoming moderately to strongly inflated and bent at maturity, sulcate, sparsely to densely hairy with medifixed hairs. Capitula heterogamous, (15-)17-24(-28) mm in diameter. Involucre (7-)9-12(-14) mm in diameter, obconical, not umbonate at maturity. Involucral bracts in 2-3 rows, abaxially glabrous to moderately appressed hairy, central part usually green, margins pale or brown, membranous; the outermost narrowly triangular, (2.2-)2.8-3.9(-4.2) mm long and (0.8-)1.0-1.4(-1.6) mm wide, acute, with laterally up to 0.2 mm wide, apically 0.2-1.0 mm wide, membranous margins; the middle ones narrowly ovate to narrowly elliptical, (2.7-)3.5-4.7(-5.4) mm long and 1.1-1.8 mm wide, acute, with laterally 0.2-0.6 mm wide, apically 0.3-1.0 mm wide, brown, membranous margins; the innermost narrowly elliptical to narrowly obovate, (3.4-)3.6-4.7(-5.3) mm long and (0.9-)1.2-1.7 mm wide, acute to obtuse, with laterally 0.2-0.4 mm wide, apically 0.5-1.5 mm wide, membranous margins. Receptacle conical to narrowly conical at maturity, 2.0-5.0 mm in diameter, 5.5-9.0 mm high, paleate throughout. Ray florets 7-14 per capitulum, white, female, 5.5-13 mm long; limb elliptical to narrowly elliptical, (3.8-)5.0-8.6(-10.5) mm long and (2.4-)2.8-3.8(-4.6) mm wide, apically 3-lobed; tube (1.2-)1.6-2.1(-2.5) mm long and 0.7-1.2(-1.5) mm wide. Pales elliptical to narrowly obovate, (2.9-)3.2-4.1(-4.4) mm long and (0.7-)0.9-1.4 mm wide, carinate, membranous, basally 0.3-0.6 mm wide, apically tricuspidate or tapering rapidly into a rigid mucro formed by the protruding midvein, persistent at maturity. Disc florets yellow, hermaphrodite, glandular, (2.3-)2.6-3.2(-3.6) mm long; the basal part inflated, spongy and round to subtetragonous at maturity, (1.0-)1.3-1.6(-1.8) mm long and 0.7-0.8 mm in diameter; the distal part funnel-shaped and apically 5-lobed; lobes triangular with a dorsal appendage. Achenes of ray florets 1.3-1.6(-1.8) mm long and 0.5-0.8 mm in diameter, subcylindrical to fusiform, usually whitish; ribs moderately tuberculate, with mucilage cells; furrows with glands; without corona. Achenes of disc florets ± heteromorphic; the peripheral ones 1.2-1.6(-1.8) mm long and 0.7-1.0(-1.2) mm in diameter, stout and subcylindrical, persistent at maturity, c. 10-ribbed, light to dark brown; ribs moderately tuberculate with ± isodiametrical mucilage cells; furrows with yellow glands; corona absent or an adaxially up to 0.5(-0.7) mm long auricle; those of central florets more slender than the peripheral ones, 1.2-1.5(-1.7) mm long and 0.6-0.8(-1.0) mm in diameter, obconical-obovoidal, readily falling off at maturity, c. 10-ribbed, usually whitish; ribs moderately

tuberculate with mucilage cells; furrows glandular; corona absent or an up to 0.7(-1.0) mm long auricle.

Chromosome number. – $n = 9$; $2n = 18$ (see discussion in chapter 10).

Distribution and habitat. – C and W Mediterranean region, with scattered populations in littoral habitats in S France, Menorca, Corsica, Sardinia, Sicily, C and S Italy, Malta, NE Algeria, and N Tunisia (Fig. 115). Indications of the occurrence of *Anthemis secundiramea* in Portugal (Coutinho 1939) and its inclusion among the "species inquirendae" by Willkomm & Lange (1865), found no support in the recent revision of the genus for the Iberian peninsula by Benedí i González (1987).

Variation and taxonomy. – *Anthemis secundiramea* is generally a decumbent annual with a reduced main stem and creeping, and numerous, perpendicular side branches. It is morphologically very variable, especially in Sicily and the islands between Tunisia and Sicily, which has resulted in the description of several species and infraspecific taxa. Fernandes (1983) subdivided European material of *A. secundiramea* into three subspecies: subsp. *secundiramea,* subsp. *intermedia,* and subsp. *urvilleana.*

According to Fernandes (1983), *Anthemis secundiramea* subsp. *secundiramea* is characterised by the following features: glabrous or subglabrous leaves and stems, hairy peduncles conspicuously prolonging and becoming inflated at maturity, and conical or narrowly conical receptacles. It is said to comprise two forms: the radiate f. *secundiramea* found throughout the range of the species (S France, C and S Italy, N and E coast of Sicily), and f. *gymnopoda* with discoid capitula, only known to occur around Comiso and Vittoria in S Sicily. Benedí i González (1987) reports *A. secundiramea* f. *secundiramea* also from the Balearic Island of Menorca. *A. secundiramea* subsp. *intermedia* is said to differ from subsp. *secundiramea* by its longer stems which are usually tinged with red, its shorter peduncles remaining slender or becoming only slightly inflated at maturity, its smaller capitula, its receptacle remaining hemispherical at maturity, and its denser indu-

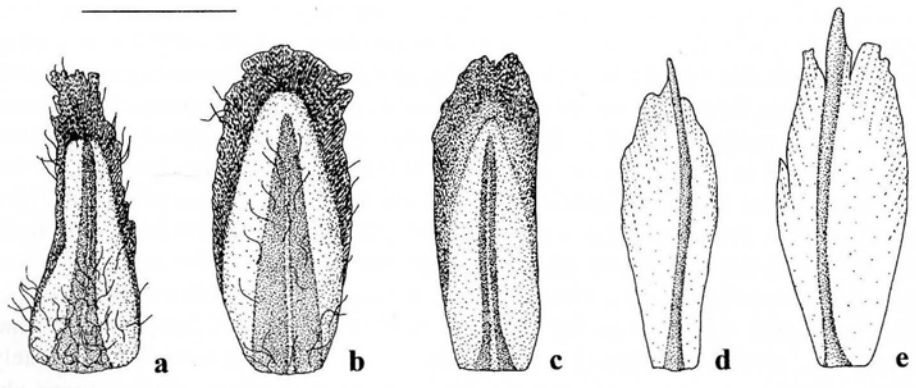


Fig. 113. *Anthemis secundiramea* var. *secundiramea:* (a-c) involucral bracts (17 May 1883, *Cosson & al.*), (d-e) pales (d, *id.;* e, 16 May 1883, *Cosson & al.*). – Scale bar = 2 mm.

mentum [However, a few years earlier, in her treatment of *Anthemis* for *Flora Europaea,* Fernandes (1976) states "usually glabrous" for subsp. *intermedia*]. It is reported to grow on the W, N and E coasts of Sicily and the adjacent islands of Marettimo, Lampedusa, and Pantelleria. *A. secundiramea* subsp. *urvilleana*, endemic to Malta, is characterised by its more compact habit, lack of peduncles (the stems are leafy up to the capitula), smaller capitula, and hemispherical receptacles.

The N African populations of *Anthemis secundiramea* are not easily correlated with the pattern of variation observed in Europe (where, anyway, the definition of subsp. *secundiramea* and subsp. *intermedia* by Fernandes (1983) is not fully satisfactory). Plants from the westernmost population, around La Calle in E Algeria, have glabrous or sparsely hairy stems tinged with red, glabrous leaves with obovate, apically blunt to acuminate but not mucronate ultimate segments, hairy and moderately inflated peduncles, and narrowly conical receptacles; they fit nicely within Fernandes's *A. secundiramea* subsp. *secundiramea*. Moving eastward, the next population of *A. secundiramea* is found at Cap Blanc on the coast of N Tunisia, where plants have hairy stems and leaves with conspicuously mucronate ultimate segments, hairy peduncles remaining slender at maturity, and hemispherical to conical receptacles, thus approaching *A. secundiramea* subsp. *intermedia*. Plants from the surroundings of Carthago, described by Battandier (1917) as *A. carthaginis,* combine characters of both subspecies, having the conspicuously hairy stems and hairy leaves with mucronate ultimate segments of the latter but peduncles becoming strongly inflated at maturity, and conical to narrowly conical receptacles as in the former. The same is true for plants from the tip of the Cap Bon Peninsula, whereas plants from Hammam Lif and Nabeul on either side of the Peninsula have peduncles remaining slender and hemispherical to conical receptacles, fitting *A. secundiramea* subsp. *intermedia*.

The reticulate combination of character states observed in the N African populations and their weak correlation with geography, both in N Africa and Sicily, makes it impracticable to recognise separate subspecies; plants with peduncles remaining slender and with hemispherical to conical receptacles, and those with peduncles becoming inflated at maturity and with conical to narrowly conical receptacles are best treated as varieties. In that rank, the correct name for *A. secundiramea* subsp. *intermedia* is *A. secundiramea* var. *cossyrensis,* typified by plants from Pantellaria, halfway between Tunisia and Sicily.

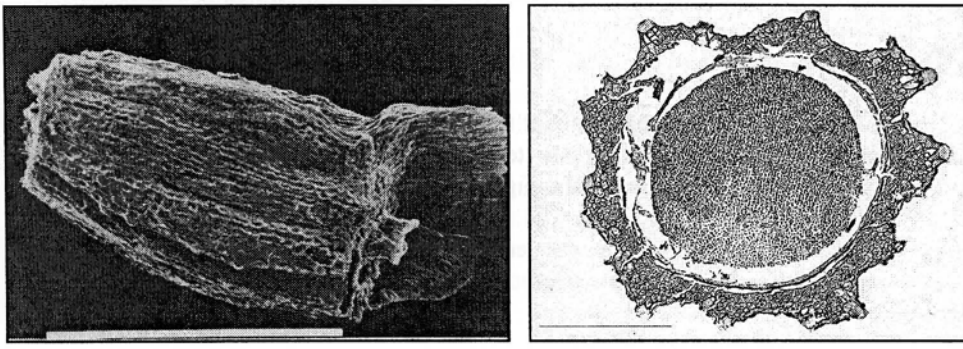


Fig. 114. Micrographs of achenes of disc florets of *Anthemis secundiramea* var. *secundiramea* (17 May 1883, *Cosson & al.*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Key to varieties

1. Peduncles becoming conspicuously inflated at maturity; receptacle conical to narrowly conical; involucral bracts with pale or brown, membranous margins; leaves and stems glabrous or hairy; ultimate leaf segments blunt, acuminate or mucronate ..... 15α. *A. secundiramea* var. *secundiramea*
– Peduncles slender or inconspicuously inflated at maturity; receptacle hemispherical to conical; involucral bracts with pale, membranous margins; leaves and stems hairy; ultimate leaf segments acuminate or mucronate ..... 15β. *A. secundiramea* var. *cossyrensis*

15α. ***Anthemis secundiramea*** Biv. var. ***secundiramea***

= *Anthemis carthaginis* Battand. in Bull. Soc. Hist. Nat. Afrique N. 8: 132 (1917). – Ind. loc.: "à Carthage entre Sainte Monique et la briqueterie". – Lectotype (designated here): [Tunisia] "Carthage, [...] entre S^te^ Monique et la briqueterie", May 1917, *Battandier* (MPU-AfN!; isolectotype: MPU-AfN!).

Basal and lower cauline leaves (13-)15-29(-37) mm long and (4-)6-11 mm wide, glabrous or sparsely to densely hairy; ultimate segments (1.2-)1.3-2.0(-2.5) mm long and (0.6-)0.7-1.0(-1.3) mm wide, elliptical to obovate, apically blunt, acuminate or mucronate. Peduncles 7-36(-80) mm long, in flower 0.9-1.7(-2.3) mm in diameter, becoming strongly inflated at maturity and (1.6-)1.8-3.3(-4.0) mm in diameter. Capitula with (8-)9-13(-14) ray florets. Involucre (8-)9-12(-14) mm in diameter. Involucral bracts with pale or brown, membranous margins; the outermost (2.8-)3.1-4.0(-4.2) mm long and (1.0-)1.1-1.4(-1.6) mm wide; the middle ones (3.5-)3.8-4.8(-5.4) mm long and (1.1-)1.3-1.8 mm wide; the innermost (3.4-)3.7-4.3(-4.5) mm long and (0.9-)1.1-1.6(-1.7) mm wide. Pales 2.9-4.0 (-4.4) mm long and (0.7-)0.9-1.4 mm wide, elliptical to obovate. Ray florets 7.0-10.0 (-11.0) mm long; limb (5.0-)5.3-8.6(-9.5) mm long and (2.4-)2.7-3.6(-4.0) mm wide. Disc florets (2.3-)2.6-3.2(-3.6) mm long; basal part (1.0-)1.3-1.6(-1.8) mm long. Achenes of peripheral disc florets 1.2-1.6(-1.8) mm long and 0.7-1.1 mm in diameter; corona absent or an up to 0.7 mm long adaxial auricle; achenes of central disc florets 1.2-1.5(-1.6) mm long and 0.6-0.8(-1.0) mm in diameter; corona absent or an up to 1.0 mm long adaxial auricle.

Chromosome number. – $n = 9$; $2n = 18$ (see discussion in chapter 10).

Distribution and habitat. – Throughout the range of the species. In N Africa, *Anthemis secundiramea* var. *secundiramea* is restricted to the coasts of NE Algeria (La Calle) and N Tunisia (Cap Blanc, Cap Bon peninsula, Fig. 115).

Variation and taxonomy. – As mentioned above, this taxon varies considerably with respect to indumentum density, as both completely glabrous and moderately hairy individuals are found.

Specimens seen. – [Algeria, Annaba] La Calle, rochers sablonneux, [36°54′N, 8°25′E], 30 Apr 1914, *Clavé, n° 2141* (G). La Calle, [36°54′N, 8°25′E], May 1914, *Clavé* (MPU-AfN). La Calle, in pascuis siccis [...] maritimis, [36°54′N, 8°25′E], 27 Apr 1841, *Durieu de Maisonneuve* (P).

La Calle, [36°54′N, 8°25′E], May 1915, *Battandier* (MPU-AfN; P). La Calle, [36°54′N, 8°25′E], *Durieu de Maisonneuve* (P). La Calle, [36°54′N, 8°25′E], 27 Apr 1841, *Durieu de Maisonneuve* (P). La Calle, falaises maritimes gréseuses, [36°54′N, 8°25′E], 28 Apr 1930, *Maire* (MPU-AfN; P; G; MA 127076). La Calle, herbages maritimes, [36°54′N, 8°25′E], 28 Apr 1918, *Clavé* (P). – [Tunisia, Nabeul] El-Haouiria, [37°0′N, 10°54′E], 16 May 1883, *Cosson & al.* (P). Grottes d'Hermoéum, 17 May 1883, *Cosson & al.* (K; P; G). Cap Bon, 17 May 1883, *Cosson & al.* (K; P). 5 km SE of La Haouaria (Cap Bon), 10 m, sandy depression (previously a lake ?), 28 Apr 1975, *Davis 56896 & Lamond* (RNG). – [Tunis] Carthage, champs incultes entre Ste. Moniques et la Briqueterie, [36°56′N, 10°18′E], May 1917, *Battandier* (MPU-AfN).

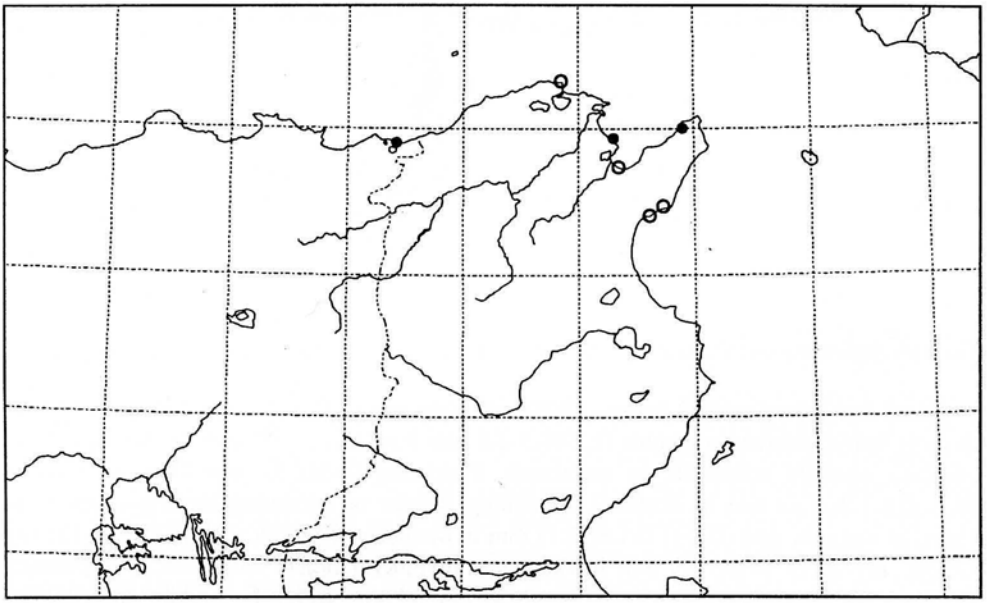


Fig. 115. N African distribution of *Anthemis secundiramea* (● var. *secundiramea*, ○ var. *cossyrensis*).

15β. ***Anthemis secundiramea*** var. ***cossyrensis*** Guss., Fl. Sic. Syn. 2: 489 (1843) ≡ *A. cossyrensis* (Guss.) Guss., Fl. Sic. Syn. 2: 870 (1845) ≡ *A. secundiramea* var. *tenella* J. Gay in Gussone, Fl. Sic. Syn 2: 870 (1845), nom. illeg. ≡ *A. secundiramea* f. *cossyrensis* (Guss.) Fiori in Fiori & Béguinot, Fl. Italia 3: 255 (1903). – Ind. loc.: "Pantellaria". – Type: not seen.

= *Anthemis intermedia* Guss., Fl. Sic. Syn. 2: 491 (1843) ≡ *A. secundiramea* var. *intermedia* (Guss.) Fiori in Fiori & Béguinot, Fl. Italia 3: 255 (1903) ≡ *A. secundiramea* subsp. *intermedia* (Guss.) R. Fernandes in Bot. J. Linn. Soc. 70: 13 (1975). – Ind. loc.: "Palermo a Mondello, Marsala, Mazzara, et in Ustica, Maretimo, Favignana, Pantellaria." – Type: not seen.

– *Anthemis pedunculata* var. *decumbens* auct.: Bonnet & Barratte, Expl. Sci. Tunisie, Cat. Pl.: 218 (1896), p.p. min. [non s.str.].

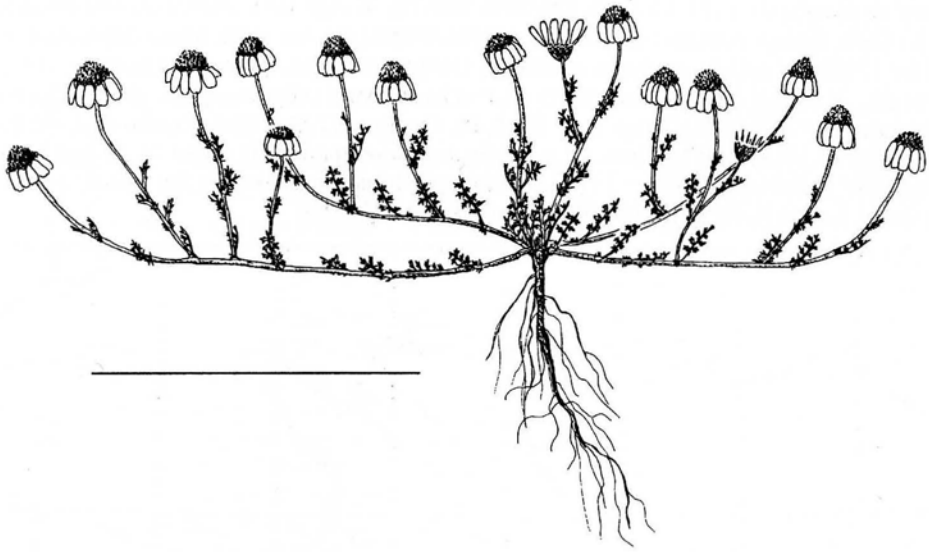


Fig. 116. *Anthemis secundiramea* var. *cossyrensis:* general habit *(Pitard 2479).* – Scale bar = 10 cm.

Basal and lower cauline leaves 13-20 mm long and 4-10(-15) mm wide, sparsely to densely hairy; ultimate segments (1.2-)1.5-2.1 mm long and c. 0.7 mm wide, elliptical to obovate, apically acuminate or mucronate. Peduncles (4-)13-34 mm long, at anthesis (0.6-)0.8-1.3(-1.4) mm in diameter, remaining slender or becoming inconspicuously inflated at maturity and (0.8-)1.0-1.8(-2.1) mm in diameter. Capitula with (7-)8-11(-13) ray florets. Involucre 9-10(-11) mm in diameter. Involucral bracts with pale, membranous margins; the outermost 2.8-4.2 mm long and 0.9-1.4 mm wide; the middle ones 2.9-4.6 mm long and 1.2-2.0 mm wide; the innermost 3.3-4.4 mm long and 1.5-1.8 mm wide. Pales 3.0-4.0 mm long and 0.7-1.3 mm wide, elliptical to obovate. Ray florets (5.6-)6.7-9.5 mm long; limb (3.8-)4.9-7.8(-8.3) mm long and 2.9-3.4 mm wide. Disc florets (2.2-)2.4-3.1 mm long; basal part (0.9-)1.1-1.6 mm long. Achenes of peripheral disc florets (1.3-)1.5-1.8 mm long and (0.8-)0.9-1.2 mm in diameter; corona absent or an up to 0.1 mm long adaxial auricle; achenes of central disc florets 1.3-1.7 mm long and 0.7-0.9 mm in diameter; corona absent or an up to 0.7 mm long adaxial auricle.

Chromosome number. – $n = 9$; $2n = 18$ (see discussion in chapter 10).

Distribution and habitat. – Restricted to the Mediterranean coasts of N and E Sicily, some of the Liparic islands, the islands of the Sicilian Channel (Egadi, Pantelleria, Lampedusa), and NE Tunisia (Fig. 115). Near Cap Blanc (NE Tunisia) this variety was found growing together with *Anthemis maritima* subsp. *maritima, Pallenis maritima* (L.) Greuter, *Centaurea sonchifolia* L., *Helichrysum stoechas* (L.) DC., and *Reichardia picroides* (L.) Roth on limestone cliffs and stony slopes near the shore, at altitudes between 10 m and 30 m above sea level.

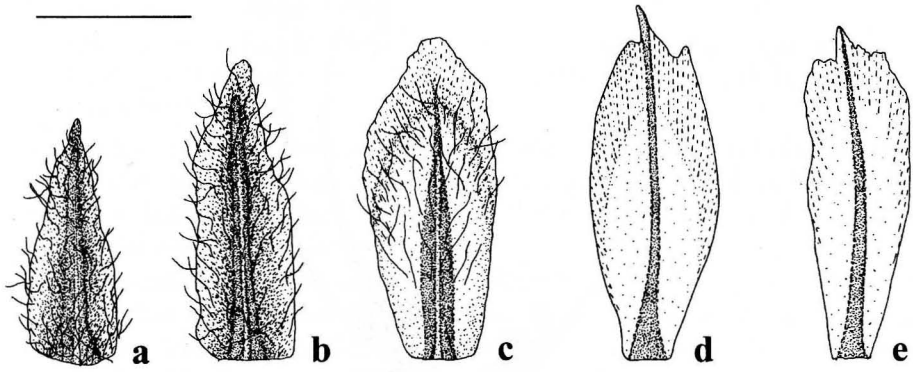


Fig. 117. *Anthemis secundiramea* var. *cossyrensis:* (a-c) involucral bracts (11 May 1883, *Cosson & al.*), (d-e) pales (d, *id.;* e, *Vogt 13791 & Oberprieler 8096*). – Scale bar = 2 mm.

Variation and taxonomy. – By its peduncles remaining slender at maturity, its hairy stems and leaves, and its mucronate ultimate leaf segments, this variety superficially resembles N Tunisian inland populations of *A. ubensis*. It can be easily distinguished from the latter species by its prostrate habit, divaricate branching, moderately succulent leaves and by the consistently pale membranous margins of its involucral bracts.

Plants of *Anthemis secundiramea* var. *cossyrensis* also show similarities with *A.* confusa, a related species form C and S Tunisia, especially with plants of that species with pale-margined involucral bracts from inland populations and the Mediterranean coast between Sousse and Sfax. They differ in leaf dissection, the leaves being 2-3-pinnatipartite to -pinnatisect in *A. secundiramea* but only 1-2-pinnatipartite to -pinnatisect in *A. confusa*.

Specimens seen. – [Tunisia, Bizerte] Tunisie du Nord-Est, Cap Blanc NW Bizerte, limestone cliffs and stony slopes near the shore, 10-30 m, 37°19.968'N, 9°50.325'E, 22 May 1994, *Vogt 13791 & Oberprieler 8096* (B; G; Herb. Oberprieler; Herb. Vogt). – [Nabeul] Nabeul plage, [36°28′N, 10°43′E], 13 Jun 1949, *Cuénod* (G). Nabeul, in arenis maritimis, [36°28′N, 10°43′E], May 1910, *Pitard 2479* (G). Nabeul, [36°28′N, 10°43′E], May 1919, *Battandier* (MPU-AfN). Hammamet, Presqu'ile du Cap Bon, [36°24′N, 10°36′E], 11 May 1883, *Cosson & al.* (P). Hammamet, [36°24′N, 10°36′E], 11 May 1883, *s.coll.* (P). – [Tunis] Hammam-El-Lif, [36°44′N, 10°20′E], 8 May 1883, *Cosson & al.* (P).

16. ***Anthemis taubertii*** E. A. Durand & Barratte, Fl. Libyc. Prodr.: 129 (1910). – Ind. loc.: "Cyr. Mouseïlga près Koubba, dans les bois (Taubert, 29 avril 1887, n° 478), Derna, dans les lieux herbeux de la plaine à l'Est de la ville (Taubert, 9 avril 1887, n° 244)." – Lectotype (designated here): [Libya] "Derna", 9 Apr 1887, *Taubert 244* (P!).

= *Anthemis scaettae* Pamp. in Bull. Soc. Bot. Ital. 1925: 25 (1925) ≡ *A. taubertii* f. *scaettae* (Pamp.) Pamp. in Rendic. Sem. Fac. Sci. Univ. Cagliari 8: 77 (1938). – Ind.

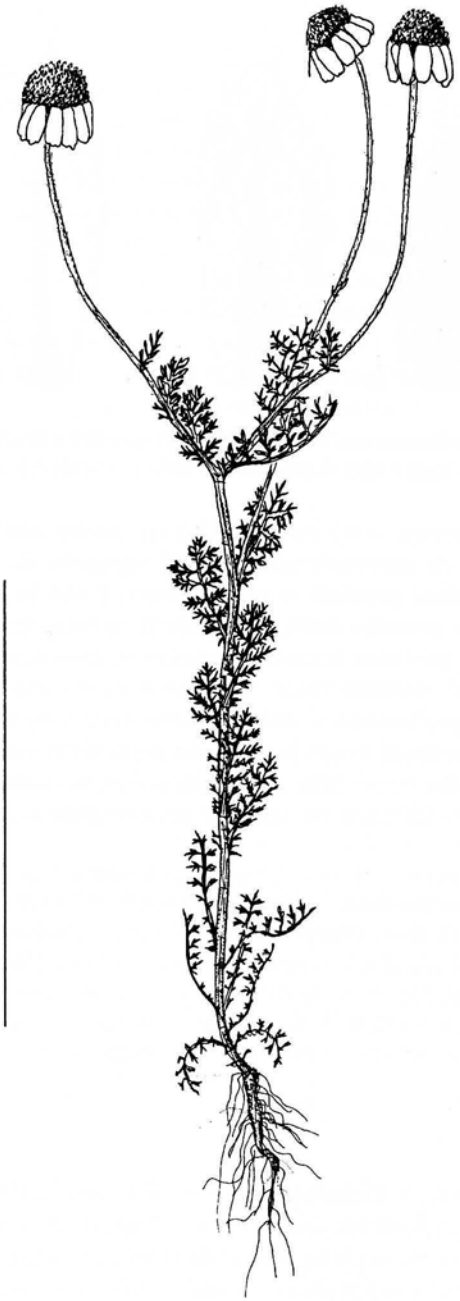


Fig. 118. *Anthemis taubertii:* general habit *(Maire & Weiller 844).* – Scale bar = 10 cm.

loc.: "Merg, ciglione del II terazzo, 10 mart, 1925. - leg. Doct. Helios Scaetta." – Holotype: [Libya] "Merg, Ciglione del II terazzo", 1925, *Scaetta* (FI!).

= *Anthemis pichii* Pamp. in Archiv Bot. (Forlì) 12: 46 (1936). – Ind. loc.: "Vaccari [Tobruk])." – Holotype: [Libya] "Marmarica, Tobruk, Arene marittime", 18 Apr 1912, *Vaccari 419* (FI [2x]!).

= *Anthemis taubertii* var. *arenicola* Pamp. in Rendic. Sem. Fac. Sci. Univ. Cagliari 8: 77 (1938) ≡ *A. taubertii* subsp. *arenicola* (Pamp.) Brullo & Furnari in Webbia 34: 171 (1979). – Ind. loc.: "Hania." – Holotype: "Libia, Cirenaica, el-Hania", 8 Mar 1934, *Pampanini 8044 & Pichi-Sermolli* (FI!).

= *Anthemis taubertii* var. *coronata* Pamp. in Rendic. Sem. Fac. Sci. Univ. Cagliari 8: 77 (1938). – Ind. loc.: "Driana; Gerdes; Tecnis; Gsur; Bu Gassal; Maraua." – Lectotype (designated here): "Libia, Cirenaica, Tecnis a est di Barce el-Gsar", 15 Apr 1934, *Pampanini 8047 & Pichi-Sermolli* (FI!).

= *Anthemis taubertii* var. *subcoronata* Maire & Weiller in Bull. Soc. Hist. Nat. Afrique N. 30: 282 (1939). – Ind. loc.: "Cyrenaïque: bords d'une daya à l'W de Barce, 350 m (n° 845); maquis au dessus des gorges de l'Ouadi Kouf (n° 844); Aïn Messa, 500 m (n° 1725)." – Lectotype (designated here): [Libya] "Cyrenaica: in dumetis supra fauces amnis Kouf, solo calcareo", 500 m, 21 Apr 1938, *Maire & Weiller 844* (MPU-AfN!; isolectotype: P!)

Annual, usually single-stemmed, sometimes branched from immediately above the ground and then few-stemmed. Stems usually ascending-erect or erect, (10-)13-22(-30) cm tall, basally (0.5-)1-2.5 mm in diameter, usually branched in the upper half, with (1-)2-7 (-11) capitula, light green, sometimes tinged with red, sulcate, moderately appressed tomentose with medifixed hairs. Basal and lower cauline leaves (20-)25-35 mm long and 6-14 mm wide, obovate to narrowly obovate in outline, petiolate; petiole 5-20 mm long, basally usually with 2-4 pairs of teeth; blade 2-3-pinnatipartite to pinnatisect with 2-4 pairs of elliptical to obovate primary lobes; ultimate segments linear or elliptical, (0.9-)1.4-3.2

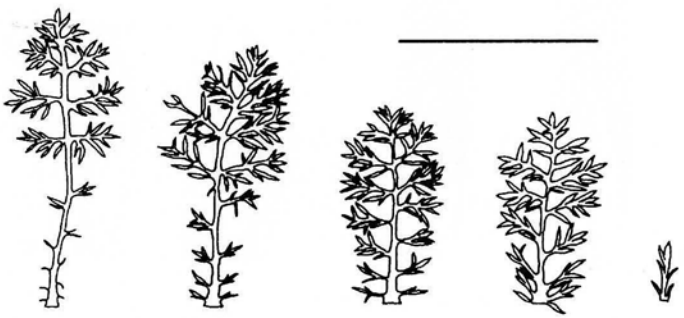


Fig. 119. *Anthemis taubertii:* leaf spectrum *(Davis 49985).* – Scale bar = 2 cm.

(-4.0) mm long and 0.4-0.8 mm wide, mucronate (up to 0.3 mm), sparsely to densely tomentose, glandular-punctate. Upper cauline leaves (5-)9-20(-25) mm long and 1-12 mm wide, linear with entire or dentate margins, or elliptical to elliptical-obovate in outline, usually sessile, sometimes with up to 5 mm long petiole; base usually with 1-3 pairs of teeth; lamina 2-3-pinnatipartite to -pinnatisect with 2-5 pairs of primary lobes; ultimate segments (0.9-)1.4-2.7(-3.7) mm long and 0.4-0.9 mm wide, linear or elliptical. Peduncles (15-)30-60(-80) mm long and 0.8-1.2 mm in diameter, remaining slender or becoming only slightly inflated at maturity and then 1.1-1.6 mm in diameter, sulcate, densely, ± appressed tomentose with medifixed hairs. Capitula 18-28 mm in diameter, heterogamous. Involucre (8-)10-14 mm in diameter, hemispherical, attenuate or moderately umbonate at maturity. Involucral bracts in 3 rows, abaxially appressed tomentose with medifixed and basifixed hairs, with a green, longitudinal strip and rather wide, usually light to dark brown, membranous margins; the outermost triangular to narrowly so, c. 3-4 mm long and 1.2-1.7 mm wide, acute, with laterally 0.3-0.6 mm wide, apically up to 1.3 mm wide margins; the middle ones narrowly triangular-elliptical to narrowly elliptical, c. 3-5 mm long and 1.0-1.5 mm wide, acute, with laterally 0.2-0.5 mm wide, apically up to 2.0 mm wide margins; the innermost narrowly elliptical to narrowly obovate, c. 4-5 mm long and 1.0-2.0 mm wide, acute to obtuse, with laterally 0.1-0.5 mm wide, apically up to 2.0 mm wide margins. Receptacle hemispherical at anthesis (2.0-3.0 mm in diam., 1.5-2.5 mm high), conical or conical-ovoid at maturity (4.0-5.0 mm in diam., c. 4.0-6.5 mm high), paleate throughout. Ray florets 8-15 per capitulum, white, female, (8.8-)9.1-11.4(-12.5) mm long; limb elliptical to narrowly so [index 1.9-2.5], 7.0-10.5 mm long and (3.0-)3.4-4.1 mm wide, apically 3-lobed; tube sparsely glandular, 1.6-2.3 mm long and 0.6-0.9 mm wide. Peripheral pales narrowly obovate or linear, 3.2-4.0 mm long and 0.8-1.5 mm wide, apically usually tricuspidate, sometimes tapering very abruptly into an erose tip, flat to somewhat carinate, hairy and glandular, tip sometimes tinged with brown; the central pales 3.2-4.0 mm long and 0.6-1.1 mm wide, apically tapering abruptly (sometimes gradually) into a mucro formed by the protruding midrib, hairy and glandular, persistent at maturity. Disc

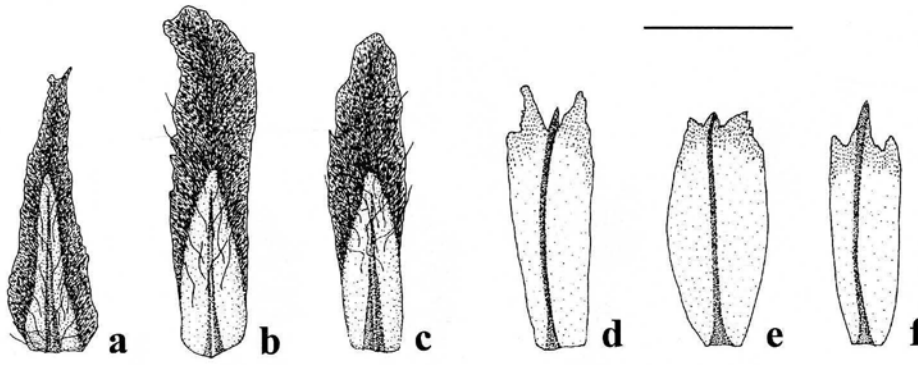


Fig. 120. *Anthemis taubertii:* (a-c) involucral bracts *(Simpson 39522),* (d-f) pales (d, *Taubert 478;* e-f, *Maire & Weiller 846*). – Scale bar = 2 mm.

florets yellow, hermaphrodite, sparsely glandular, 2.9-3.5 mm long; the basal part becoming moderately inflated, spongy and subtetragonous at maturity, 1.3-1.9 mm long and 0.6-1.0 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular, 0.4-0.5 mm long and 0.3-0.5 mm wide, with an up to 0.25 mm long dorsal appendage. Achenes of ray florets 1.4-2.0 mm long and 0.5-0.8 mm in diameter, fusiform, adaxially bent, c. 10-ribbed; ribs abaxially more conspicuous than adaxially, smooth, with elongate mucilage cells; furrows glandular; achenes of disc florets ± homomorphic, 1.1-1.6 mm long and 0.5-0.7 mm in diameter, narrowly obconical-obovoidal, readily falling off at maturity, 10-ribbed; ribs rounded and smooth, with ± elongate mucilage cells; furrows glandular; apical plate rounded towards the edges; corona absent or an adaxially up to 0.5 mm long auricle.

Chromosome number. – $2n = 18$ (Brullo & al. 1990, sub *Anthemis taubertii* subsp. *taubertii* and subsp. *arenicola*).

Distribution and habitat. – As stated by Brullo & al. (1990), *Anthemis taubertii* is endemic to the Gebel-el-Akhdar area in NE Libya. The species grows along field margins and on road embankments, but also descends to the coastal plains along the Mediterranean coast where it is found on sandy soils (Fig. 122).

Variation and taxonomy. – In its smooth achenes *Anthemis taubertii* resembles *A. cyrenaica* from which it differs by its well developed ray florets, more strongly dissected leaves, abruptly acuminate to tricuspidate pales, and attenuate or inconspicuously umbonate involucres. The achenes are usually longer in *A. taubertii* than in *A. cyrenaica,* apically rounded rather than flat, and (with exceptions - see below) adaxially coronate.

As evidenced by the long list of quoted synonyms, *Anthemis taubertii* is rather variable. Plants possessing achenes with an up to 0.5 mm long adaxial corona were described by Pampanini (1938) as *A. taubertii* var. *coronata;* others, whose achenes have a truncate rather than rounded apical plate were named *A. taubertii* var. *subcoronata* by Maire & Weiller (1939). Plants with pale-margined involucral bracts were described as *A. pichii* by Pampanini (1936), those with dark brown to black membranous margins were called *A. scaettae* (Pampanini 1925) and later reduced to the status of a forma of *A. taubertii*

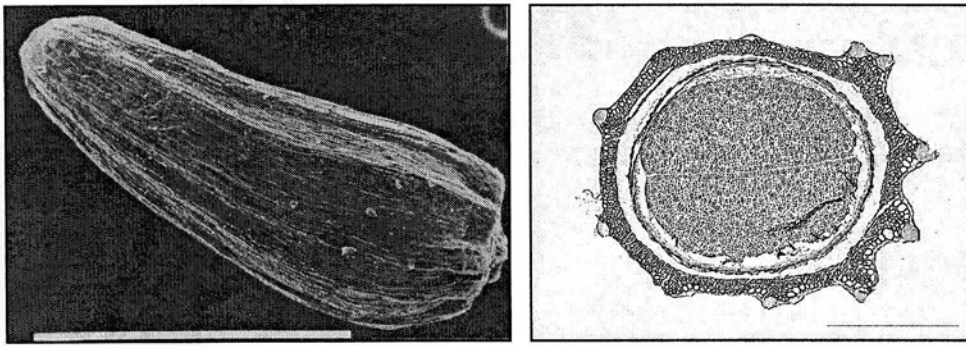


Fig. 121. Micrographs of achenes of disc florets of *Anthemis taubertii* (left, *Taubert 478;* right, *Maire & Weiller 846*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

(Pampanini 1938). Plants from sandy soils along the coast of Cyrenaica were said to differ from plants of inland populations of *A. taubertii* by their prostrate habit, leaves with a broader rhachis and wider ultimate segments, smaller capitula, and coronate achenes, and named *A. taubertii* var. *arenicola* (Pampanini 1938), later to be raised to a subspecific level (Brullo & Furnari 1979). More material of *A. taubertii* from throughout its distributional range is needed to assess the complete extent of its morphological variation and to judge on its taxonomical relevance. It may well appear that some morphologically deviating forms of *A. taubertii* described as separate taxa are geographically and ecologically well defined subspecies or varieties. For the moment, it is felt premature to further subdivide the species.

Specimens seen. – [Libya, Al Fatih] Cyrenaica: in nemoribus inter Karmous et Tecnis, solo calcareo, 500 m, [32°29′N, 21°7′E], 26 Apr 1938, *Maire & Weiller 846* (MPU). – [Al Jabal al Akhdar] Shahat (Cyrene) to Faidia, S of the Baida crossroads, 700 m, field margins, [32°43′N, 21°47′E], 1 Apr 1970, *Davis 50508* (RNG; K). 5 km W of Baiada (El Marj-Beida), 300-350 m, limestone macchie *(Juniperus phoenicia - Pistacia lentiscus),* [32°46′N, 21°42′E], 25 Mar 1970, *Davis 49985* (RNG; K). – [Darnah] Cyrenaïque: Mouseilga près de Koubba, dans le bois [m. Maire], [32°47′N, 22°13′E], 29 Apr 1887, *Taubert 478* (P; MPU-AfN). Cyrenaïca: in nemoribus inter El Alerag et Lamluda, solo calcareo, 600-700 m, [32°47′N, 22°5′E], 23 Apr 1938, *Maire & Weiller 847* (P). Near El Qubba (Giovanni Berta), [32°47′N, 22°13′E], 11 Apr 1939, *Simpson 39522* (K). Derna, [32°44′N, 22°40′E], 9 Apr 1887, *Taubert 244* (P). – [Not located] Cyrenaïca: in dumetis supra fauces amnis Kouf, solo calcareo, 500 m, 21 Apr 1938, *Maire & Weiller 844* (P; MPU). Cyrenaïca: in planitie lapidosa calcarea 27 km ad meridiem oppidi Tauchirae, 20 Apr 1938, *Maire & Weiller 838* (P; MPU-AfN). Cyrenaica: in dumetis collium supra Tauekizan, solo calcareo, 300 m, 20 Apr 1938, *Maire & Weiller 848* (MPU-AfN). Cirenaica, Bir Acheim Bir Zeidan, 26 Mar 1933, *Pampanini 8008* (G). Cirenaica, Sidi Omar Hagfet el-Bdehi, 24 Mar 1933, *Pampanini 8005* (K).

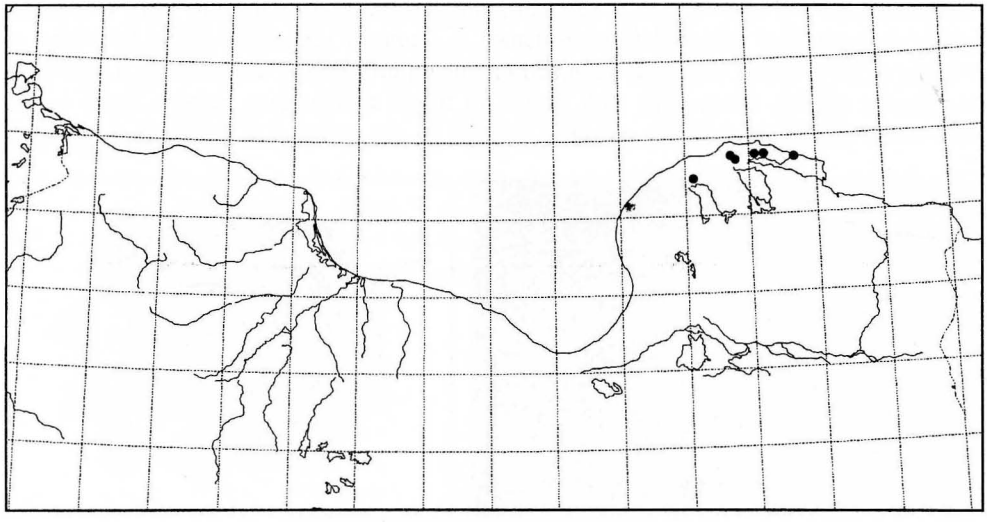


Fig. 122. Total distribution of *Anthemis taubertii*.

17. ***Anthemis ubensis*** Pomel, Nouv. Mat. Fl. Atl.: 289 (1875). – Ind. loc.: "Prairies sablonneuses: bords de la basse Seybouse." – Lectotype (designated here): [Algeria] "[...] Seybouse", 28 May 1874, *Pomel* (MPU-AfN!; isolectotype: P!).
- *Anthemis arvensis* var. *ubensis* Quézel & Santa, Nouv. Fl. Algérie 2: 974 (1963), comb. inval. [Art. 33.2].
- *Anthemis pedunculata* var. *decumbens* auct.: Bonnet & Barratte, Expl. Sci. Tunisie, Cat. Pl.: 218 (1896), p.p.; Pottier-Alapetite, Fl. Tunisie 2: 987 (1981), p.p. [non s.str.].
- *Anthemis arvensis* auct. [non L. 1753]: Pottier-Alapetite, Fl. Tunisie 2: 989 (1981), p.p.

Exs.: Dukerley, Frag. Fl. Alger. Exs. 1865: n° 531 (sub *"Anthemis tuberculata"*).

Annual, single-stemmed or branched immediately above the ground and then few-stemmed. Rhizome (0.3-)0.9-3.8(-6.5) mm in diameter. Stems erect or ascending-erect, (4-)8-23(-38) cm tall, basally 0.7-2(-3) mm in diameter, sometimes unbranched and with a single capitulum, usually branched in the upper half and with 2-6(-15) capitula, green, basally tinged with red, sulcate, sparsely appressed hairy with rather long, thin, medifixed hairs. Basal and lower cauline leaves (10-)20-40(-60) mm long and (6-)7-15(-25) mm wide, elliptical to narrowly elliptical or narrowly elliptical-obovate in outline, petiolate; petiole (4-)8-21(-34) mm long, basally usually with 2-6 pairs of simple or dissected teeth; blade (2-)3-pinnatisect with 2-4 pairs of ovate to broadly elliptical primary lobes; ultimate segments triangular or narrowly elliptical to linear, (0.9-)1.4-2.6(-3.8) mm long and 0.4-0.8(-1.3) mm wide, mucronate, densely tomentose with thin, medifixed hairs, glandular-punctate. Upper cauline leaves (3-)9-22(-31) mm long and (2-)4-13(-22) mm wide, ovate to elliptical or narrowly elliptical in outline, sessile or with an up to 10 mm long petiole, basally with 1-4 pairs of teeth; blade 1-2(-3)-pinnatipartite to -pinnatisect with 2-4 pairs of primary lobes; ultimate segments (0.7-)1.2-2.9(-5.5) mm long and 0.3-0.8(-1.4) mm wide, linear or narrowly elliptical, sometimes triangular, glandular-punctate. Peduncles (10-)20-55(-80) mm long and (0.6-)0.9-1.7(-3.0) mm in diameter, becoming moderately to strongly inflated at maturity, sulcate, densely, ± appressed tomentose with rather long and thin, medifixed hairs. Capitula (16-)21-30(-36) mm in diameter, heterogamous. Involucre (6-)10-13(-15) mm in diameter, hemispherical, attenuate or moderately umbonate at maturity. Involucral bracts in 3 rows, abaxially moderately to densely appressed tomentose with rather thin, asymmetrically medifixed to basifixed hairs; central strip usually green; margins light brown to dark brown, membranous; the outermost narrowly triangular or narrowly triangular-elliptical, 3.0-4.2(-5.1) mm long and (0.6-)1.0-1.5(-1.7) mm wide, acute, laterally with up to 0.4 mm wide, apically with up to 1.0 mm wide margins; the middle ones narrowly ovate or narrowly elliptical, (3.4-)4.0-5.2(-5.7) mm long and (1.1-)1.3-1.8(-2.3) mm wide, acute to obtuse, laterally with up to 1.0 mm wide, apically with up to 2.0 mm wide margins; the innermost narrowly elliptical to narrowly obovate, (3.9-)4.4-5.6(-6.6) mm long and (1.0-)1.4-2.0(-2.6) mm wide, obtuse, laterally with up to 1.0 mm wide, apically with up to 2.0 mm wide margins. Receptacle ovate to conical at anthesis, conical to narrowly conical at maturity, (2.5-)3.0-4.7(-5.6) in diameter and (3.2-)3.4-6.6(-8.5) mm high, paleate throughout. Ray florets (3-)11-15(-18) per capitulum, white, female, c. (6.4-)8.2-12.0(-13.0) mm long; limb elliptical to narrowly so [index 1.4-2.8], (4.6-)6.5-

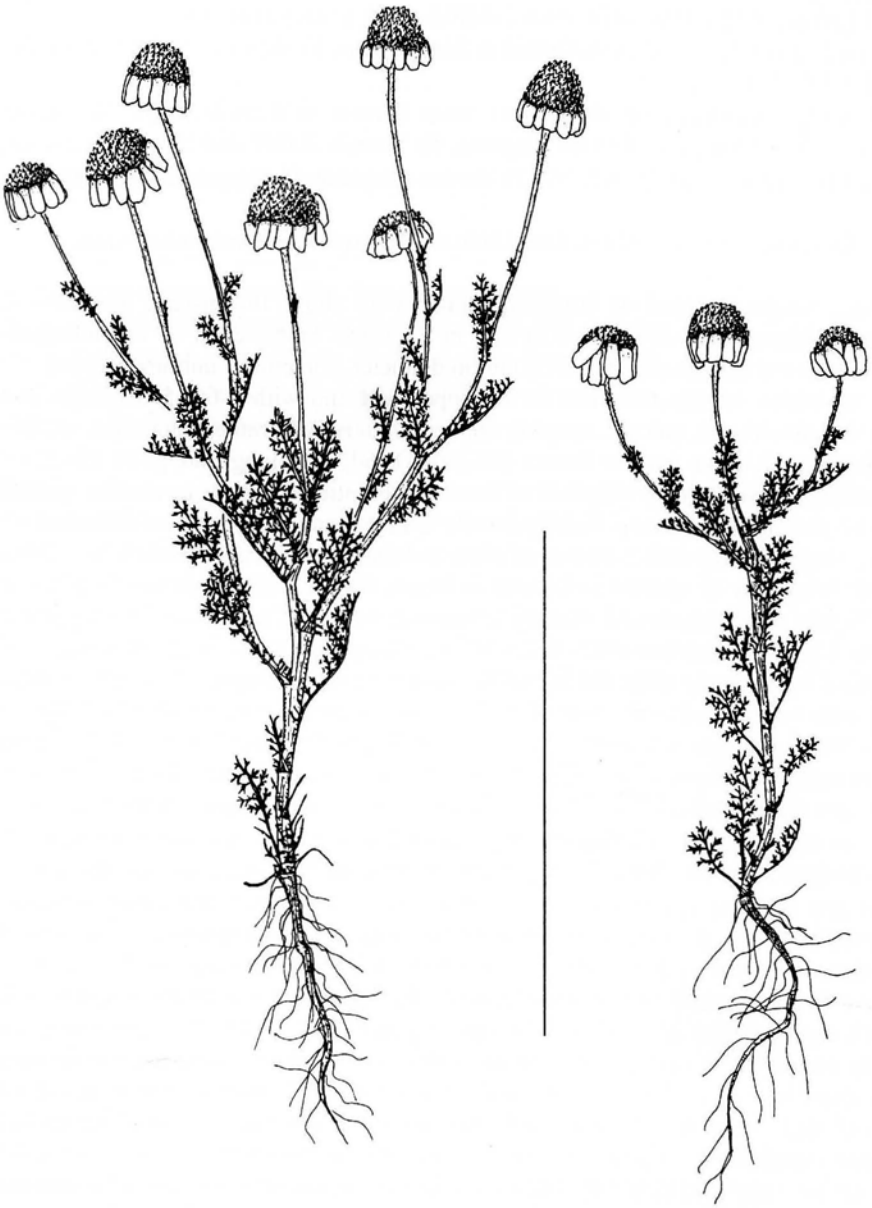


Fig. 123. *Anthemis ubensis:* general habit *(Vogt 13524 & Oberprieler 7829).* – Scale bar = 10 cm.

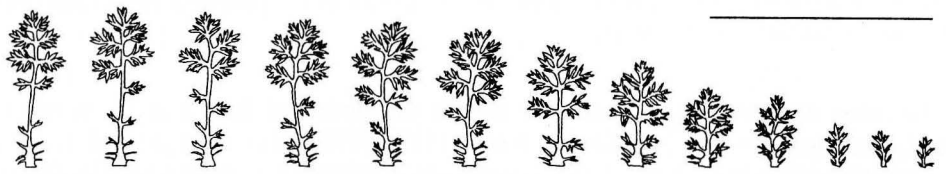


Fig. 124. *Anthemis ubensis:* leaf spectrum *(Vogt 13524 & Oberprieler 7829).* – Scale bar = 4 cm.

10.0(-11.0) mm long and (2.8-)3.2-4.4(-4.7) mm wide, apically 3-lobed; tube sparsely glandular, (1.3-)1.6-2.6 mm long and 0.7-1.1 mm wide. Pales narrowly elliptical-obovate to narrowly obovate, (3.1-)3.5-4.4(-4.9) mm long and 0.8-1.3(-1.6) mm wide, flat to carinate, apically usually abruptly acuminate to tridentate, with a conspicuously protruding midrib forming a rather rigid, sometimes black-tinged mucro. Disc florets yellow, hermaphrodite, sparsely glandular, (2.5-)2.7-3.3(-3.5) mm long; the basal part becoming inflated, spongy and subtetragonous or rounded at maturity, 1.0-1.5(-1.7) mm long and 0.6-1.0 mm in diameter; the distal part funnel-shaped, apically 5-lobed; lobes triangular, 0.35-0.4 mm wide and 0.35-0.45 mm long, with an up to 0.25 mm long dorsal appendage. Achenes of ray florets 1.5-2.1(-2.3) mm long and 0.5-0.8 mm in diameter, fusiform to obovoid, adaxially bent, c. 10-ribbed; ribs smooth to slightly tuberculate, with isodiametrical to rectangular mucilage cells; furrows glandular; corona usually missing, or sometimes an up to 0.3 mm long adaxial auricle; achenes of disc florets ± homomorphic; 1.2-1.8(-2.1) mm long and 0.6-0.9 mm in diameter, obconical-obovoidal, 10-ribbed; ribs rounded and smooth or moderately tuberculate, with isodiametrical to rectangular mucilage cells; corona absent or a short and (due to the apically protruding ribs) crenulate rim, or an up to 0.7(-1.2) mm long auricle; at maturity those of the peripheral disc florets persistent, those of the central disc florets readily falling off.

Chromosome number. – $n = 9$; $2n = 19$ (see discussion in chapter 10).

Distribution and habitat. – Endemic to NE Algeria and N Tunisia (Fig. 127). *Anthemis ubensis* is mostly a ruderal of disturbed cultivated land and adjacent stony slopes, but also occurs on sand dunes in coastal localities, along rivers and in dried-up wadis. In N Tunisia the species was found up to an altitude of c. 1200 m above sea level, on more or less intensively grazed mountain slopes, along field margins and road embankments, where it grows in the company of *Bellis annua* L. subsp. *annua, B. sylvestris* Cyr., *Carduncellus caeruleus* (L.) C. Presl, *Carduus macrocephalus* Desf., *Catananche lutea* L., *Centaurea acaulis* subsp. *balansae* (Boiss. & Reuter) Maire, *C. nicaeensis* All. subsp. *nicaeensis, C. pullata* L., *Coleostephus myconis* (L.) Rchb. fil., *Euphorbia cossoniana* Boiss., *E. helioscopia* L., *Filago pyramidata* L., *Globularia alypum* L., *Glossopappus macrotus* (Dur.) Briq., *Hedypnois cretica* (L.) Willd., *Hyoseris radiata* L., *Launaea fragilis* (Asso) Pau, *Lonas annua* (L.) Vines & Druce, *Mantisalca salmantica* (L.) Briq. & Cavillier, *Asteriscus aquaticus* (L.) Less., *Pallenis spinosa* (L.) Cass. subsp. *spinosa, Picris hispanica* (Willd.) P. D. Sell, *Podospermum laciniatum* (L.) DC., *Reichardia picroides* (L.) Roth, *R. tingitana* (L.) Roth, *Stemmacantha acaulis* (L.) Dittrich, and *Urospermum*

dalechampii (L.) F. W. Schmidt. In some localities, limestone cliffs adjacent to the habitats of *Anthemis ubensis* are inhabited by the perennials *A. punctata* subsp. *punctata* or *A. pedunculata* subsp. *atlantica*.

Variation and taxonomy. – *Anthemis ubensis* was described from near the mouth of Oued Seybousse in NE Algeria by Pomel (1874-1875) who distinguished it from *A. arvensis* by its achenes topped with a continuous or adaxially protracted auricle. Quézel & Santa (1963) considered the differences between *A. arvensis* and *A. ubensis* as small and reduced the latter to a (invalidly named) variety of the former. The weedy habit, conical receptacles, and moderately to strongly inflated peduncles may indeed suggest a relation between the two mentioned species, but there is an important difference to distinguish *A. ubensis* from the whole of *A.* ser. *Anthemis:* cross-sections of achenes of *A. ubensis* show the normal pattern of mesocarp arrangement, with external ribs coinciding with the ribs (not the furrows) of the sclerenchymatic cylinder in the mesocarp.

Once a direct relationship with *Anthemis arvensis* is ruled out, a close morphological link of *A. ubensis* with *A. secundiramea* emerges. Both species are characterised by comparatively short, moderately tuberculate achenes with short to long auricles, conical to narrowly conical receptacles, and a tendency (at least in some populations) towards inflated peduncles. The occurrence of pales with black tinged tips in some populations of *A. ubensis (Vogt 12352 & Oberprieler 6657, Vogt 12439 & Oberprieler 6744)* and results of the a molecular study (see chapter 14) also suggest a quite different relationship, with the perennials *A. pedunculata* and *A. punctata* of *A.* sect. *Hiorthia*. *A. ubensis* differs markedly from the latter by its annual habit, distally tightly branched stems, short peduncles tending to become inflated at maturity, conical to narrowly conical receptacles, and achenes with a long corona in some of the populations. The molecular affinity and similar pale tips thus reflect an intermediate position of *A. ubensis* between *A. pedunculata* and *A. secundiramea,* perhaps resulting from hybridisation between the two latter species. The

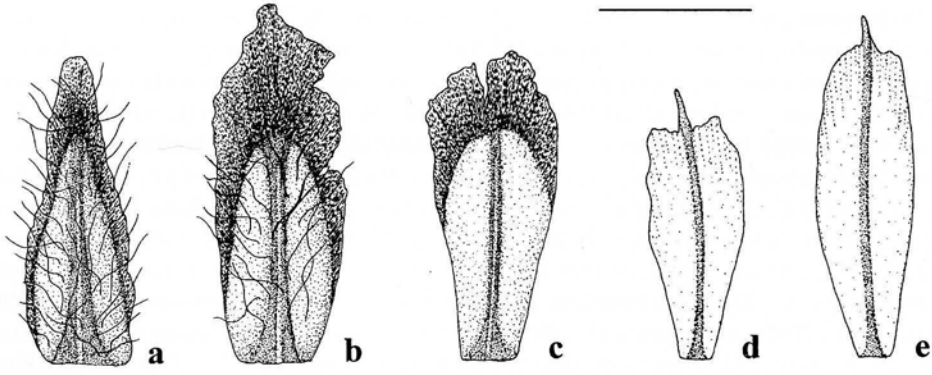


Fig. 125. *Anthemis ubensis:* (a-c) involucral bracts *(Vogt 13524 & Oberprieler 7829),* (d-e) pales (d, *id.;* e, *Vogt 12291 & Oberprieler 6596*). – Scale bar = 2 mm.

observed genomic imbalance in some populations of *A. ubensis* (aneuploid chromosome numbers, irregular bivalent formation at PMC meiosis; see chapter 10) support such an interpretation.

The suggested hybrid origin of *Anthemis ubensis* would also explain the considerable amount of morphological variation observed within and between populations of this species throughout its distributional range. Particularly the degree of peduncle inflation and the length of achene corona was found to vary markedly.

Specimens seen. – [Algeria, Annaba] Bône, embouchure de la Seybouse, sables limoneux, [36°55′N, 7°45′E], 13 May 1906, *Romieux 756* (G). embouchure de la Seybouse à Bône, [36°55′N, 7°45′E], 13 May 1906, *Romieux* (MPU-AfN). Bône, pâturages sablonneux vers l'embouchure de la Seybouse, [36°55′N, 7°45′E], 28 May 1874, *Pomel* (MPU-AfN; P). Lieux sablonneux parmi les *Cistus* à La Calle, [36°54′N, 8°25′E], 7 Jun 1841, *Durieu de Maisonneuve* (P). Champs de la tribu des Beni-Urdjin, près de Bône, [36°38′N, 7°45′E], 26 May 1841, *Durieu* (K). Forêts de l'Edough, [36°38′N, 7°45′E], 27 May 1865, *Dukerley, n° 531* (MPU-AfN; K; G). – [Tunisia, Béja] Dorsal Tunisienne, Monts de Teboursouk, plateau of Djebel Goraa, pastures and field margins, 960 m, 36°29.045'N, 9°8.853'E, 3 May 1994, *Vogt 12305 & Oberprieler 6610* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). Dorsal Tunisienne, Monts de Teboursouk, plateau of Djebel Goraa, pastures and field margins, 960 m, 36°29.045'N, 9°8.853'E, 3 May 1994, *Vogt 12291 & Oberprieler 6596* (B; G; K; RAB; RNG; Herb. Oberprieler; Herb. Vogt). Dorsal Tunisienne, Monts de Teboursouk, mountain ridge SE Djebel Goraa, *Pinus* forest, 690 m, 36°28.511'N, 9°10.611'E, 4 May 1994, *Vogt 12313 & Oberprieler 6618* (B; Herb. Oberprieler). Dorsale Tunisienne, Monts de Teboursouk, c. 5 km N Teboursouk, mountain ridge S of Djebel Goraa, *Pinus forest*, road and field margins, stony slopes, 730 m, 36°28.063'N -9°9.998'E, 3 May 1994, *Vogt 12216 & Oberprieler 6521* (B; Herb. Oberprieler; Herb. Vogt). – [Jendouba] Ben Bachir, vallée de la Medjerda, SE de la station de Souk-el-Khamis, [36°37′N, 9°0′E], 1881, *Roux* (P). – [Kasserine] Dorsale Tunisienne, track from Thala to Khanguet Slougui, 1 km S turn-off from road P 17 between Thala and Kasserine, stony slopes and moist meadows, 1100 m, 35°33.075'N, 8°40.503'E, 6 May 1994, *Vogt 12546 & Oberprieler 6851* (B; Herb. Oberprieler). Dorsale Tunisienne, road P 17 between Oued El Hatab and Kasserine, road embankments, 750 m, 35°16.298'N, 8°44.498'E, 7 May 1994, *Vogt 12587 & Oberprieler 6892* (B). Feriana, [34°58′N, 8°35′E], 12 Apr 1912, *Humbert* (MPU-AfN). – [Le Kef] Dorsale Tunisienne, Djebel Dyr, limestone cliffs and mountain pastures, 1000 m, 36°12.868'N, 8°44.637'E, 4 May 1994, *Vogt 12352 & Oberprieler 6657* (B; G; K; RAB; RNG;

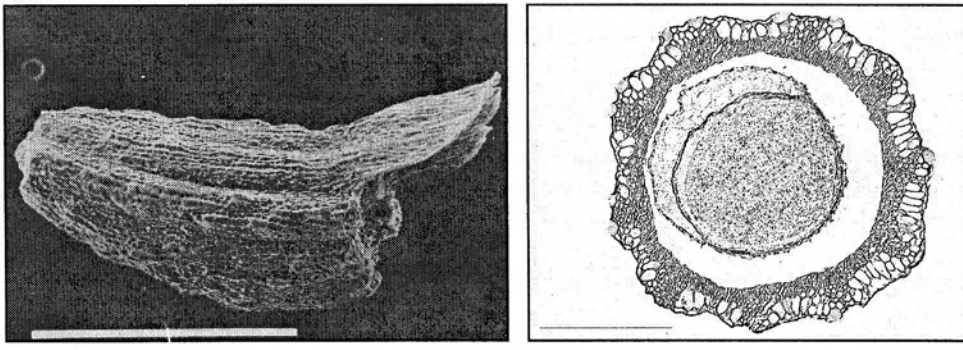


Fig. 126. Micrographs of achenes of disc florets of *Anthemis ubensis* (left, *Vogt 13824 & Oberprieler 8129;* right, *Romieux 756*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

SEV; Herb. Oberprieler; Herb. Vogt). Dorsale Tunisienne, Djebel Dyr, 4.2 km NE El Kef, road from El Kef towards Djebel Dyr, stony slopes, limestone, 840 m, 36°11.787'N, 8°43.422'E, 5 May 1994, *Vogt 12439 & Oberprieler 6744* (B). Kef, [36°10'N, 8°41'E], 27 Jun 1883, *Cosson & al.* (P). Kalâat es Senam, [35°46'N, 8°22'E], 20 May 1945, *Serres* (MPU-AfN). Dorsale Tunisienne, Table de Jugurtha, limestone cliffs, stony slopes, 1200-1270 m, 35°44.804'N, 8°22.666'E, 5 May 1994, *Vogt 12467 & Oberprieler 6772* (B; Herb. Oberprieler). Guelaat Es Snam ad rupes versus occidentem, [35°45'N, 8°23'E], 12 May 1886, *Letourneux* (P). – [Nabeul] Djebel Abd-er-Rahman El Mekki, presqu'ile du Cap Bon, [36°50'N, 10°44'E], 22 May 1883, *Cosson & al.* (P). Presqu'ile du Cap Bon, Menzel Temine, [36°47'N, 10°59'E], 15 May 1883, *Cosson & al.* (P). Est de Menzel-bou-Jelfa, [36°41'N, 10°35'E], 23 May 1883, *Cosson & al.* (P). Gorombalia, [36°37'N, 10°30'E], *Pomel* (MPU-AfN). Krombalia, [36°37'N, 10°30'E], 11 May 1883, *Cosson & al.* (P). Bir b[ou] Rekba, [36°25'N, 10°37'E], May 1941, *Cuénod* (G). – [Siliana] Dorsale Tunisienne, Forêt de Kesra, track between Kesra and Djebel Ballouta, c. 6.6 km NE Kesra, limestone rocks, stony slopes and fields, 1040-1100 m, 35°50.826'N, 9°22.805'E, 18 May 1994, *Vogt 13524 & Oberprieler 7829* (B; Herb. Oberprieler; Herb. Vogt). – [Tunis] Hammam Lif, [36°44'N, 10°20'E], *Herb. Battandier* (MPU-AfN). – [Zaghouan] Bordj Toum, vallée de la Medjerda, NE de Medjez-el-Bab, [36°45'N, 9°45'E], 1881, *Roux* (P). Dorsale Tunisienne, NW-facing slopes of Djebel Zaghouan, 500-700 m, 36°22.098'N, 10°7.325'E, 23 May 1994, *Vogt 13824 & Oberprieler 8129* (Herb. Oberprieler). – [Not located] Ben Bachir, Jun 1881, *Roux* (MPU-AfN). Bando, 24 Apr 1898, *Cuénod* (G). Sidi Reghis, Jun 1883, *Reboud* (P).

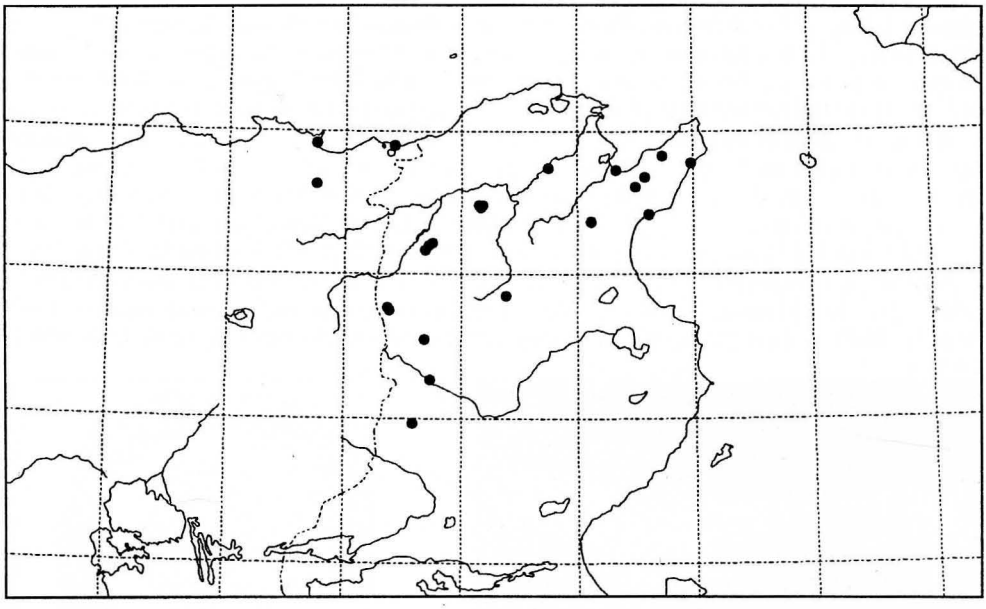


Fig. 127. Total distribution of *Anthemis ubensis*.

B. ***Anthemis*** sect. ***Hiorthia*** (DC.) R. Fernandes in Bot. J. Linn. Soc. 70: 6 (1975) ≡ *Anacyclus* sect. *Hiorthia* DC., Prodr. 6: 17 (1838). – Type (Fernandes 1975b): *Anthemis orientalis* (L.) Degen (*Anacyclus orientalis* L.).

= *Anthemis* sect. *Chamaemelum* Griseb., Spicil. Fl. Rumel. 2: 208 (1845). – Type: *Anthemis montana* L., nom. illeg. (*A. cretica* L.).

= *Anthemis* sect. *Rumata* Fedorov in Komarov, Fl. SSSR 26: 865 (1961). – Type: *A. saportana* Alb.

– *Hiorthia* Necker, Elem. 1: 97 (1790), nom. inval. [Art. 32.8, App. V].

– *Lyonnetia* [unranked] *Perennes* DC., Prodr. 6: 17 (1838), nom. inval. [Art. 32.1].

– *Anthemis* ser. *Perennes* Boiss., Fl. Orient. 3: 278 (1875), nom. inval. [Art. 32.1].

Short- to long-lived perennial herbs or subshrubs. Stems arising from a rootstock formed by the lignified bases of primary and subsequent annual shoots, simple to few-branched. Peduncles remaining slender at maturity. Capitula radiate or discoid. Receptacles hemispherical to conical, paleate throughout. Ray florets usually female. Pales narrowly elliptical to nearly subulate or narrowly obovate, persistent at maturity; apex usually formed by the protruding midribs, stramineous or tinged with brown or black. Achenes of disc florets homomorphic to slightly heteromorphic, quadrangular to circular in cross-section, smooth or with more or less distinct, smooth to tuberculate ribs. Mesocarp usually with a continuous ring of sclerenchymatic tissue.

Basic chromosome number. – $x = 9$.
Ploidy levels. – $2x$, $4x$, $6x$, $8x$.

Taxonomy. – *Anthemis* sect. *Hiorthia* comprises c. 50 perennial species, ranging from biennial herbs to strongly lignified subshrubs of mostly mountainous habitats. In contrast to other sections of *Anthemis*, the infrasectional taxonomy is rather incompletely worked out as yet. Thin (1983), when revising the genus for Bulgaria, proposed a subdivision into two subsections, *A.* subsect. *Hiorthia* Thin (nom./comb. inval.) and subsect. *Virescentes* Thin (as *"Virescens"*) and in the former recognised three series, ser. *Argyrophyllae,* ser. *Rumelicae,* and ser. *Carpaticae*. Fedorov (1961) had subdivided the same section, which he named *A.* sect. *Rumata,* into four series, *A.* ser. *Saportanae,* ser. *Anatolicae,* ser. *Fruticulosae,* and ser. *Marschallianae,* all invalidely named due to lack of a latin diagnosis. While *A. cretica* belongs to Thin's (1983) *A.* ser. *Carpaticae,* the other N African representatives of this section do not fit within either of the two proposed classifications, which are restricted in geographical scope and do not reflex the phylogeny of the section as a whole. Since the section is often considered to form the basal group of *A.* subg. *Anthemis* due to its perennial habit (Meusel & Jäger 1992), and as no synapomorphies are known for it, it is likely of paraphyletic nature.

18. ***Anthemis abylaea*** (Font-Quer & Maire) Oberprieler, **stat. nov.** ≡ *A. punctata* var. *abylaea* Font-Quer & Maire in Bull. Soc. Hist. Nat. Afrique N. 22: 296 (1931). – Ind. loc.: "Hab. in rupibus calcareis peninsulae Tingitanae, ad alt. 400-1000 m, junio florens. In monte Abyla (Djebel Moussa, Dj. Fahies) supra Ceuta; in monte Dersa supra



Fig. 128. *Anthemis abylaea:* general habit. – Scale bar = 10 cm.

Tetuan; in montibus Beni-Hosmar (Font Quer et Maire, 1930)." – Lectotype (designated here): [Morocco] "In rupibus calcareis Abylae, loco dicto Djebel Fahies", 500-600 m, 28 Jun 1930, *Maire* (MPU-AfN!; isolectotype: P!).

= *Anthemis tuberculata* var. *tetuanensis* Pau ex Maire in Bull. Soc. Hist. Nat. Afrique N. 22: 296 (1931) ≡ *A. pedunculata* var. *tetuanensis* (Pau ex Maire) Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934). – Ind. loc.: "Tetuan (Mas y Guindal)" [Sennen, Pl. Espagne n° 6980 (1929)]. – Lectotype (designated here): [Morocco] "Tetuan, sites bas, Culta ex semin.", Apr 1929, *Mas y Guindal* [Sennen, Pl. Esp. 1929: n° 6980] (MPU-AfN!; isolectotypes: BC 84440!, G!, MA-127040!).

– *Anthemis tetuanensis* Pau in Sennen, Pl. Esp. 1929: n° 6980, nom. nud.

– *Anthemis cupaniana* var. *kabylica* auct. [non (Battand. & Trab.) Pau 1924]: Font Quer, Iter Marocc. 1930: n° 665.

Exs.: Sennen, Pl. Esp. 1929: n° 6980 (sub *"Anthemis tetuanensis"*); Font Quer, Iter Marocc. 1930: n° 665 (sub *"Anthemis cupaniana* var. *kabylica"*).

Perennial with annual shoots arising from a woody stock formed by the bases of the primary shoot and subsequent annual shoots. Rootstock 3.5-10.0 mm in diameter. Stems herbaceous, basally lignified, ascending-erect to erect, (20-)24-40(-45) cm long, basally (2.0-)2.2-3.3(-4.0) mm in diameter, leafy in the lower half, very rarely unbranched and bearing a single capitulum, usually branched in the distal half and with 2-6(-10) capitula, sulcate, sparsely to densely hairy with medifixed hairs, basally sometimes tinged with red. Lower cauline leaves and leaves of non-flowering shoots (22-)32-56(-80) mm long and (8-)12-25(-35) mm wide, elliptical to obovate or narrowly obovate in outline, petiolate; petiole (11-)16-27(-32) mm long; base usually with 2-6 pairs of entire teeth; blade 2-3-pinnatipartite to -pinnatisect with 2-4 pairs of ovate to elliptical primary lobes; ultimate segments triangular or narrowly elliptical to linear, (1.2-)2.0-3.4(-4.5) mm long and (0.6-)0.8-1.2(-1.4) mm wide, mucronate, sparsely to densely hairy, glandular-punctate. Middle and upper cauline leaves (14-)20-38(-52) mm long and (5-)9-23(-30) mm wide, elliptical in outline, sessile or with an up to 14 mm long petiole, basally with 2-4 pairs of entire teeth; lamina (1-)2-3-pinnatipartite with 2-4 pairs of primary lobes; ultimate segments (1.1-)1.4-3.4(-6.2) mm long and 0.6-1.3(-1.9) mm wide, triangular or narrowly elliptical to linear, mucronate, sparsely to densely hairy, glandular-punctate. Peduncles (10-)25-95(-135) mm long and 1.4-2.1(-2.4) mm in diameter, remaining slender or becoming slightly inflated at



Fig. 129. *Anthemis abylaea:* leaf spectrum *(Vogt 9897 & Oberprieler 4345).* – Scale bar = 5 cm.

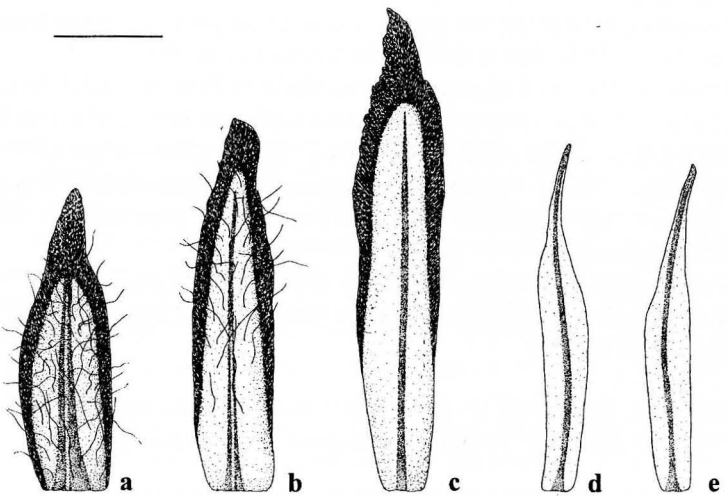


Fig. 130. *Anthemis abylaea:* (a-c) involucral bracts, (d-e) pales *(Vogt 12045).* – Scale bar = 2 mm.

maturity, sulcate, sparsely to densely hairy. Capitula (30-)35-43(-50) mm in diameter, heterogamous. Involucre 13-19(-21) mm in diameter, hemispherical, attenuate or slightly umbonate at maturity. Involucral bracts in 2-3 rows, with a green, longitudinal strip and brown, membranous margins; the outermost narrowly triangular, (3.1-)3.6-5.0(-5.8) mm long and 1.2-1.8(-2.0) mm wide, acute, sparsely to densely hairy, with laterally 0.1-0.4 mm wide, apically 0.5-1.5 mm wide, membranous margins; the middle ones narrowly elliptical, (4.7-)5.0-6.9(-7.5) mm long and 1.4-1.8(-2.0) mm wide, acute, glabrous to sparsely hairy, with laterally 0.2-0.7 mm wide, apically 0.5-1.5 mm wide, membranous margins; the innermost narrowly elliptical, (5.7-)6.0-7.5(-8.0) mm long and 1.3-1.8(-2.0) mm wide, acute to obtuse, glabrous to sparsely hairy, with laterally 0.2-0.8 mm wide, apically 0.5-1.6 mm wide, membranous margins. Receptacle hemispherical at anthesis, c. 4-5 mm in diameter and c. 3 mm high; hemispherical at maturity, c. 6-10 mm in diameter and c. 3-7 mm high, paleate throughout. Ray florets (13-)16-23 per capitulum, white, female, (11.5-)14.0-18.0(-19.0) mm long; limb elliptical to narrowly so [index 2.0-3.5], (10.0-)12.5-16.2(-17.0) mm long and (4.6-)4.8-6.4(-7.0) mm wide, apically 3-lobed; tube sparsely glandular, 1.4-2.0(-2.2) mm long and 0.5-1.2 mm wide. Pales narrowly elliptical, (4.1-)4.6-5.5(-5.8) mm long and (0.5-)0.6-0.9(-1.1) mm wide, tapering gradually into an apex tinged with black, basally 0.3-0.5 mm wide, carinate, membranous; persistent at maturity. Disc florets yellow, hermaphrodite, fertile, sparsely glandular, 3.1-3.6(-3.9) mm long; the proximal part usually not inflated and compressed but sometimes moderately spongy and inflated at maturity, 1.0-1.6(-1.8) mm long and 0.5-1.1 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular. Achenes of ray florets 2.4-2.8 mm long and 0.6-0.8 mm in diameter, fusiform, round to somewhat triangular in cross-section, adaxially bent; ribs 8-10; without corona. Achenes of disc florets ± homomorphic, 2.0-2.7 mm long and (0.8-)1.1-1.4 mm in diameter, obconical to narrowly obconical, quadrangular to circular in cross-section, with c. 10 ribs; ribs moderately tuberculate; tubercles tipped

with mucilage cells; furrows with glands; corona absent; peripheral achenes persistent, the central ones readily falling off at maturity.

Chromosome number. – $n = 18$, $2n = 36$ (discussion see chapter 10).

Distribution and habitat. – Restricted to the limestone mountains of the E part of the Tangier peninsula in NW Morocco (Fig. 132), between Djebel Moussa and Djebel Kelti, where it is found growing in cracks of limestone cliffs and in calcareous scree between 500 m and 1200 m together with another endemic member of *Compositae-Anthemideae, Rhodanthemum hosmariense* (Ball) Wilcox & al. Further characteristic species of these plant communities at Djebel Fahies near Djebel Moussa and at Djebel Bou Zaïtoune (Beni Hosmar) S of Tetouan are *Ampelodesmos mauritanicus* (Poir.) Durand & Schinz, *Anthyllis vulneraria* var. *hosmarensis* (Pau) Maire, *Asplenium trichomanes* L., *A. sagittatum* (DC.) A. J. Bange, *Cynoglossum arundanum* Coss., *Euphorbia characias* L., *Fumaria macrosepala* subsp. *megasepala* (Pau) Lidén, *Geranium atlanticum* Boiss. & Reuter, *Iberis gibraltarica* L., *Iris filifolia* Boiss., *Mercurialis reverchonii* Rouy, *Scilla peruviana* L., *Senecio leucanthemifolius* var. *major* Ball, and *Viola arborescens* L. In roadside habitats and arable fields adjacent to the habitats of *Anthemis abylaea* a second representative of the genus, *A. arvensis* subsp. *incrassata,* is often encountered.

Variation and taxonomy. – Its perennial habit, and achenes which are roundish in cross-section and with 10 conspicuously tuberculate longitudinal ribs, identify *Anthemis abylaea* as a member of the *A. pedunculata* - *A. punctata* complex. In morphological respect it stands between *A. pedunculata* and *A. punctata,* which is reflected by Maire's (1931b) treatment of its different populations as varieties of either *A. punctata* or *A. tuberculata.* Owing to its showy capitula with large involucres, its very long middle and inner involucral bracts, and its relatively large basal leaves, *A. abylaea* differs from *A. pedunculata* and resembles *A. punctata.* It differs, however, from *A. punctata* subsp. *punctata* by its narrower middle and inner involucral bracts with comparatively narrow membranous margins and its narrower pales which taper gradually rather than abruptly into their tip and are never tricuspidate. From *A. punctata* subsp. *kabylica,* with similar involucral bracts and

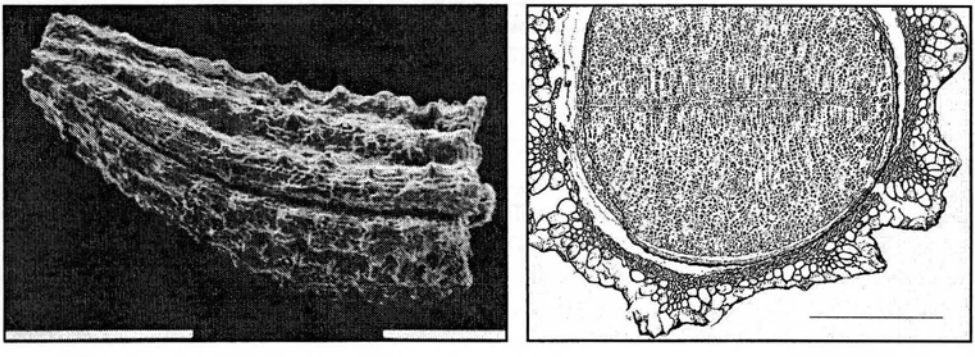


Fig. 131. Micrographs of achenes of disc florets of *Anthemis abylaea* (Apr 1929, *Mas y Guindal*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

pales, *A. abylaea* differs by its achenes devoid of an adaxial auricle. Morphological, cytological, and molecular data discussed in chapter 13 of the present study suggest that *A. abylaea* may represent a tetraploid segregate of Moroccan *A. pedunculata* rather than being phylogenetically connected with the tetraploid *A. punctata* from Algeria and Tunisia. Its recognition as an independent species therefore adds to the paraphyletic nature of what remains in *A. pedunculata*. It nevertheless seems justified, since paraphyletic species can hardly be avoided when speciation by polyploidysation has occured, and since the inclusion of *A. abylaea* in *A. pedunculata* would result in a morphologically very heterogeneous species.

Specimens seen. – [Morocco, Tetouan] Dj. Fahies, 500 (Djebel Fahies, 500 m, 35°54'N, 5°25' W), 25 Jun 1930, *Font i Quer* (BC 808329). In rupibus calcareis Abylae, loco dicto Djebel Fahies, 500-600 m, [35°53′N, 5°27′W], 28 Jun 1930, *Maire* (MPU-AfN; P). Tanger peninsula, Ceuta (Sebta), Djebel Fahies (S Djebel Musa), southern slopes of Djebel Fahies above the track between the road Souk-Tleta-Taghramet - Ceuta and Ben Younnech, limestone rocks and screes, 550-600 m, 35°53′N, 5°24′W, 31 May 1993, *Vogt 12045* (B; G; K; Herb. Oberprieler; Herb. Vogt). Tanger Peninsula, Ceuta (Sebta), Djebel Fahies (S Djebel Musa), southern slopes of Djebel Fahies above the track between the road Souk-Tleta-Taghramet - Ceuta and Ben Younnech, limestone rocks and limestone scree, 550-600 m, 35°53′N, 5°24′W, 20 Apr 1993, *Vogt 9897 & Oberprieler 4345* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). Hafa-el-Gorbeb (Andjera, 35°50'N, 5°32' W), 11 Jun 1930, *Font i Quer* (BC 810704). In lapidosis calcareis montis Dersa supra Tetuan, 500-600 m, [35°38′N, 5°25′W], 28 Jun 1930, *Maire* (MPU-AfN). Dersa, 100 m, pr. Salah, [35°36′N, 5°24′W], 15 May 1930, *Font i Quer* (BC 808313; BC 810706). in declivibus calc. montis Dj. Dersa, supra Tetauen, ad 400 m, [35°36′N, 5°24′W], 20 May 1930, *Font i Quer* (BC 808339). Beni Hosmar, peñascos de la Gorgues, [35°30′N, 5°21′W], 8 May 1921, *Pau* (BC 29526; MA 127079, 127080). Hab. in rupestribus calc. montis Gorgues (Beni Hosmar), ad 700 m, [35°30′N, 5°21′W], 30 May 1930, *Font Quer, n° 665* (MPU-AfN; G; BC 137336; MA 127081). In montium Beni-Hosmar rupibus calcareis infra castellum Gorgues, 800-900 m, [35°30′N, 5°21′W], 29 Jun 1930, *Maire* (MPU-AfN; P). Yebel Gorgues, Yebala, [35°30′N, 5°21′W], 10 Jun 1957, *Ruiz de la Torre* (MA 169193). Tanger Peninsula, Monts de Beni Hosmar S Tetouan, track from Tetouan / Toretta to transmitting installation on Djebel Bou Zaïtoune, limestone cliffs, 1200 m, 35°30′N, 5°21′W, 21 Apr 1993, *Vogt 10023 & Oberprieler 4471* (B; G; Herb. Oberprieler; Herb. Vogt). Afr. Sept., Tanger, Beni Hosmar, alt. 1000 m, [35°30′N, 5°21′W], May 1921, *d'Alleizette*

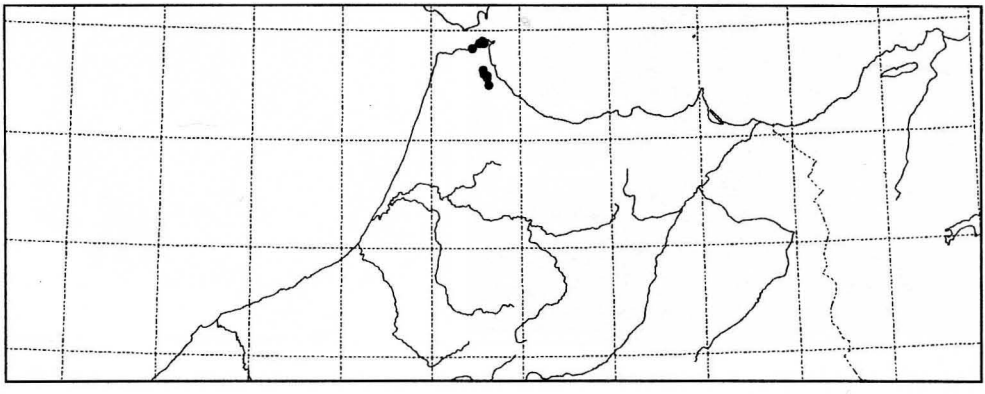


Fig. 132. Total distribution of *Anthemis abylaea*.

(P). Gorgues, tambien en Bu Zeitun, [35°30'N, 5°21'W], 30 May 1930, *Font i Quer* (BC 808335). Tanger peninsula, Monts de Beni Hosmar S Tetouan, road from Tetouan / Toretta to transmitting installation on Djebel Bou Zeïtoune, limestone cliffs, 1200 m, 35°30'N, 5°21'W, 30 May 1993, *Vogt 12039* (B; G; Herb. Vogt; Herb. Oberprieler). – [Cultivated specimens] Tetuan, sites bas (Culta ex semin.), [35°35'N, 5°22'W], Apr 1929, *Mas y Guindal, n° 6980* (MPU-AfN; G; BC 84440; MA 127040). que cultivo de Tetuan / Escrita éste, recibo de la Gra[...], que incluyo (Tetuán, 35°34'N, 5°22'W), *Font i Quer* (BC 808317).

19. ***Anthemis cretica*** L., Sp. Pl.: 895 (1753) ≡ *A. montana* L., Sp. Pl., ed. 2: 1261 (1763), nom. illeg. (see Grierson 1974: 212). – Ind. loc.: "in Creta?" – Lectotype (Grierson in Grierson & Yavin 1975, Fernandes 1975a, Franzén 1986): Herb. Clifford 415/2 (BM, microfiche!).

Perennial with annual shoots arising from a woody stock formed by the bases of the primary shoot and subsequent annual shoots. Rootstock woody and branched, up to 4 mm in diameter. Flowering stems ascending to erect, (5-)10-40 cm long, basally lignified, unbranched, rarely branched basally, glabrous to densely sericeous. Lower cauline leaves and leaves of non-flowering shoots 15-90 mm long and 7-30 mm wide, petiolate; petiole up to 60 mm long, basally usually with up to 5 pairs of minute teeth; blade 1-2-pinnatisect, glabrous to sericeous, glandular-punctate; ultimate segments elliptical to narrowly elliptical or linear, up to 10(-20) mm long and 0.3-1.5(-2.0) mm wide, blunt to mucronate. Peduncles up to 160 mm long, remaining slender or becoming slightly incrassate at maturity. Capitula up to 40 mm in diameter, heterogamous or homogamous. Involucre 6-15 mm in diameter, hemispherical, attenuate or slightly umbonate at maturity. Involucral bracts in 3-5 rows, 4-8 mm long, ovate or elliptical in outline, acute to obtuse, glabrous to densely sericeous, with pale to brown or black, membranous margins. Receptacle hemispherical at anthesis, usually ovoid or conical at maturity, paleate throughout. Ray florets (when present) 13-21 per capitulum, white, female, 6-16 mm long; limb elliptical to narrowly elliptical, 5-13 mm long. Pales narrowly elliptical, membranous, persistent at maturity; apex erose or dentate, sometimes tinged with brown or black. Disc florets yellow, hermaphrodite, 2-4 mm long; the basal part inflated and spongy at maturity; the distal part funnel-shaped and 5-lobed. Achenes of disc florets obconical to obpyramidal, quadrangular-rhombic in cross-section, 1.4-2.6 mm long, slightly curved, smooth to inconspicuously ribbed and rarely tuberculate; corona absent or an up to 1.0 mm long adaxial auricle.

Variation and taxonomy. – *Anthemis cretica* is a polymorphic species growing on many mountains of S and C Europe and SW Asia. A great number of infraspecific taxa, or even segregate species, have been recognised throughout its vast range. The centre of diversity is said to lie in SW Asia, where Grierson (in Grierson & Yavin 1975) tentatively recognised 12 subspecies connected by numerous intermediates. Franzén (1986) studied the *A. cretica* group in Greece and accepted 4 subspecies in that area. A workable taxonomy of the whole complex, based on biosystematic studies, is still urgently needed. In N Africa the species is represented by a single taxon.

19a. ***Anthemis cretica*** subsp. ***columnae*** (Ten.) R. Franzén in Willdenowia 16: 40 (1986) ≡ *A. montana* var. *columnae* Ten., Fl. Neap. Syll.: 439 (1831) ≡ *A. montana* subsp. *columnae* (Ten.) Arcang., Comp. Fl. Ital.: 354 (1882). – Ind. loc.: "ad rupes Montevergine; prope Coenobium (Column.)". – Type: not seen.

= *Anthemis numidica* Battand. in Battandier & Trabut, Fl. Algérie, App. 2: xiii (1890) ≡ *A. montana* var. *numidica* (Battand.) Battand. in Battandier & Trabut, Fl. Algérie Tunisie: 182 (1905). – Ind. loc.: "Djebel-Tamesguida, Djebel-Meghris." – Lectotype (designated here): [Algeria] "Mégis, Djebel Meghris au N. de Sétif", *Battandier* (MPU-AfN!).

– *Anthemis montana* subsp. *numidica* Quézel & Santa, Nouv. Fl. Algérie 2: 976 (1963), comb. inval. [Art. 33.2]

Exs.: Battandier & Trabut, Pl. Algérie 1890: n° 546.

Hemicryptophytic perennial. Rhizome woody, up to 4 mm in diameter, shortly branched, bearing clustered non-flowering and flowering shoots. Non-flowering shoots 1-5(-7) cm long, densely leafy. Flowering stems herbaceous, basally lignified, ascending-erect to erect, (5-)12-26(-36) cm long, basally 1-3 mm in diameter and with brown, fibrously withered base, usually unbranched or rarely branched basally, leafy in the lower third to lower half, bearing a single capitulum, dull green to white, round to sulcate, sericeous. Lower cauline leaves and leaves of non-flowering shoots (20-)26-60(-90) mm long and 7-19(-30) mm wide, narrowly elliptical to narrowly obovate in outline, petiolate; petiole (5-)10-35(-60) mm long; base usually with 3-5 pairs of teeth; blade 1-2-pinnatisect with 2-3 pairs of elliptical to obovate primary lobes; ultimate segments elliptical or narrowly elliptical to linear, 1.7-10.5(-20.0) mm long and 0.6-1.5(-2.0) mm wide, blunt to mucronate, sericeous, glandular-punctate. Middle and upper cauline leaves (10-)15-32(-40) mm long and 3-15(-20) mm wide, elliptical to obovate in outline, sessile or with an up to 18 mm long petiole and 1-3 pairs of basal teeth; lamina 1-2-pinnatisect, with 2-3 pairs of primary lobes; ultimate segments (1.5-)1.8-3.4(-5.0) mm long and 0.4-1.7 mm wide, elliptical or linear, sometimes triangular, glandular-punctate. Peduncles (20-)50-160 mm long and 1.2-1.8 mm in diameter, remaining slender or becoming slightly incrassate at maturity, sulcate, sericeous. Capitula 25-35(-40) mm in diameter, heterogamous. Involucre 10-15 mm in diameter, hemispherical, attenuate or slightly umbonate at maturity. Involucral bracts in 3-5 rows, abaxially densely appressed tomentose, with a green longitudinal strip;

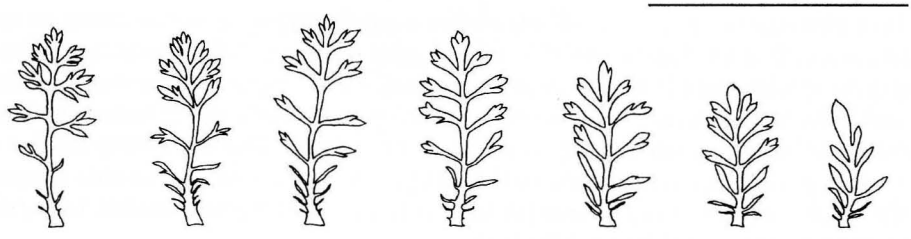


Fig. 133. *Anthemis cretica* subsp. *columnae:* leaf spectrum (Jun 1890, *Battandier*). – Scale bar = 5 cm.



Fig. 134. *Anthemis cretica* subsp. *columnae:* general habit (Jun 1890, *Battandier*). – Scale bar = 10 cm.

the outermost triangular or ovate to narrowly triangular or ovate, 3.5-5.0 mm long and 1.2-2.2 mm wide, acute, with rather narrow, laterally up to 0.3 mm wide, apically up to 1.5 mm wide dark-brown, membranous margins; the middle ones narrowly elliptical to narrowly elliptical-ovate, 5.0-6.0 mm long and 2.0-2.2 mm wide, acute to obtuse, with laterally around 1.0 mm, apically up to 2.0 wide membranous margins; the innermost narrowly elliptical to narrowly obovate, 5.2-6.8 mm long and 1.7-2.5 mm wide, obtuse, laterally with up to 0.5 mm wide, apically up to 2.0 mm wide, membranous margins, usually appressed tomentose only in the distal half. Receptacle hemispherical at anthesis, ovate-conical at maturity(4.5-5.0 mm in diam., c. 5.0 mm high), paleate throughout. Ray florets 13-21 per capitulum, white, female, 10-16 mm long; limb narrowly elliptical [index 2.1-3.7], 9-13 mm long and 3.5-6.0 mm wide, apically 3-lobed; tube sparsely glandular, 1.5-2.7 mm long and 0.8-1.2 mm wide. Pales narrowly oblong, 3.5-5.0 mm long and 0.8-1.3 mm wide, apex erose, rarely dentate, tapering rather rapidly into a ± distinctly projecting mucro, basally 0.6-0.7 mm wide, flat to somewhat convex, membranous, sometimes apically tinged with brown, persistent at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 3.0-4.0 mm long; the basal part inflated and spongy at maturity, 1.0-1.6 mm long and 0.8-1.0 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular, with an up to 0.1-0.2 mm long dorsal appendage. Achenes of ray florets c. 2.5 mm long and 0.7-0.8 mm in diameter, fusiform, somewhat triangular in cross-section, adaxially bent; ribs 8-10, 2 lateral ones, 3 on the flatish abaxial face, and 3-5 on the ± rounded adaxial face; corona a c. 0.1-0.3 mm long auricle. Achenes of disc florets homomorphic, 1.8-2.1 long and 0.9-1.2 mm in diameter, narrowly obconical, quadrangular-rhombic in cross-section, slightly curved, smooth; corona a 0.1-0.4 mm long, adaxially protracted auricle.

Chromosome number. – $2n = 36$ (Strid & Franzén 1983, sub *Anthemis carpatica;* Papanicolaou 1984, sub *A. cretica*) for Greek plants. Plants from the locus classicus in Italy also yielded tetraploid chromosome numbers (chapter 10). The chromosome number of N African representatives of *A. cretica* subsp. *columnae* is unknown. Pollen dimensions are intermediate between values typical for diploids and those for tetraploids (chapter 11).

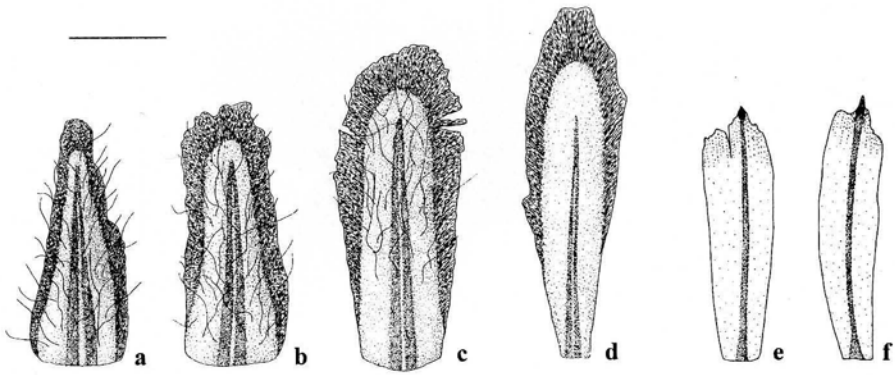


Fig. 135. *Anthemis cretica* subsp. *columnae:* (a-d) involucral bracts, (e-f) pales (Djebel Meghris, *Battandier*). – Scale bar = 2 mm.

Distribution and habitat. – According to Franzén (1986), *Anthemis cretica* subsp. *columnae* is distributed throughout the mountains of S Europe, from France eastwards to Bulgaria and Greece. In Greece it is found growing on stony slopes and cliffs between 1500 and 2000(-2500) m on various substrates (Franzén 1986). At the locus classicus near the monastery on Monte Vergine near Naples (Italy) it is found at an altitude of c. 1200 m. In N Africa, *A. cretica* subsp. *columnae* is restricted to two mountains (Djebel Tamesguida, Djebel Meghris) of the "Petite Kabylie" mountain range S of Jijel, where it grows on limestone or sandstone cliffs at altitudes between 1500 and 1800 m. Pottier-Alapetite (1981) also indicates it for Djebel Chambi, the highest mountain of Tunisia, were it is supposed to grow at the summit at an altitude of around 1500 m. However, in spite of a thorough search in 1994, no evidence for the presence of this taxon on Djebel Chambi was found.

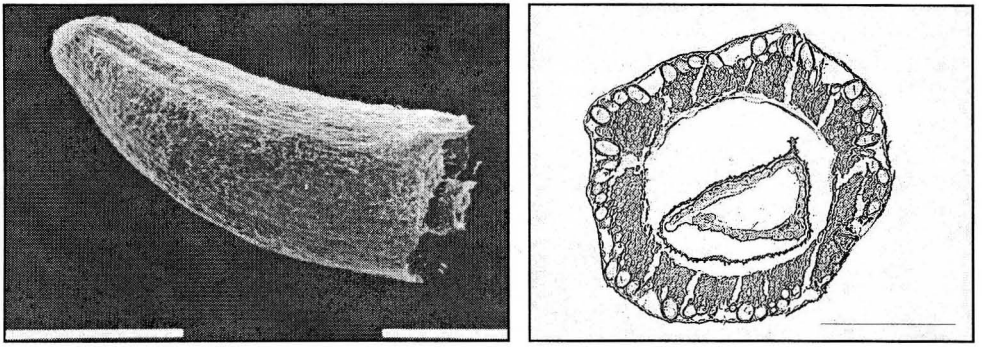


Fig. 136. Micrographs of achenes of disc florets of *Anthemis cretica* subsp. *columnae* (Djebel Meghris, *Battandier*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Variation and taxonomy. – *Anthemis cretica* subsp. *columnae* was described from Monte Vergine near Naples. I have not seen the type but have studied the classical population near the monastery on Monte Vergine in 1994. No differences with respect to the N African representatives of *A. numidica* were found. Battandier (in Battandier & Trabut 1888-1890: xiii), when describing *A. numidica,* noted: "Elle diffère de l'*A. Columnae* Tenore par ses ligules bien développées", so he seems to have thought the Italian populations to be discoid. However, Tenore's (1831) protologue of *A. montana* var. *columnae* has "floribus sesquipollicaris diametri" which means that the capitula are rather large (diameter at least 1.5 inches = 36 mm) and certainly not discoid. Additionally, Tenore (1831) cites the polynomial "*Absinthium montanum, Abrothani foeminae flore.* Column. phytob. (Neap.) part. 2 pag. 23 tab. 33", and both the description and illustration in Colonna (1744: 117, t. 33) relate to a plant with radiate capitula.

Anthemis cretica subsp. *columnae* is characterised by its densely sericeous indumentum on leaves and shoots, a unique feature among the N African representatives of the genus. It is found growing together with *A. pedunculata* and *A. punctata,* which are easily distinguished by their comparatively sparse indumentum and tuberculate achenes.

Specimens seen. – [Algeria, Jijel] Djebel Tamesguida, rochers de grès èocènes, 1500-1600 m, [36°N, 5°E], *Battandier* (MPU-AfN; P). Sommet du Tamesguida, grès, 1625 m, [36°N, 5°E], 3

Jul 1912, *Maire* (MPU-AfN; P). Sommet du Djebel Tamesguida, [36°N, 5°E], Jun 1890, *Battandier* (G). Djebel Tamesguida (Babors), [36°N, 5°E], Jun 1890, *Battandier & Trabut, n° 546* (GOET; G). Djebel Tamesguida, [36°N, 5°E], Jun 1890, *Battandier* (P). – [Setif] Djebel Meghris au N. de Sétif, [36°19′N, 5°20′E], *Battandier* (MPU-AfN). Djebel Meghris, [36°19′N, 5°20′E], Jun 1890, *Battandier* (P). – [Not located] Takoucht, rochers calcaires du sommet, 1800 m, 8 Jul 1912, *Maire* (MPU-AfN). Sommets da Tamesguida et du Meghris, Jun 1890, *Battandier* (P).

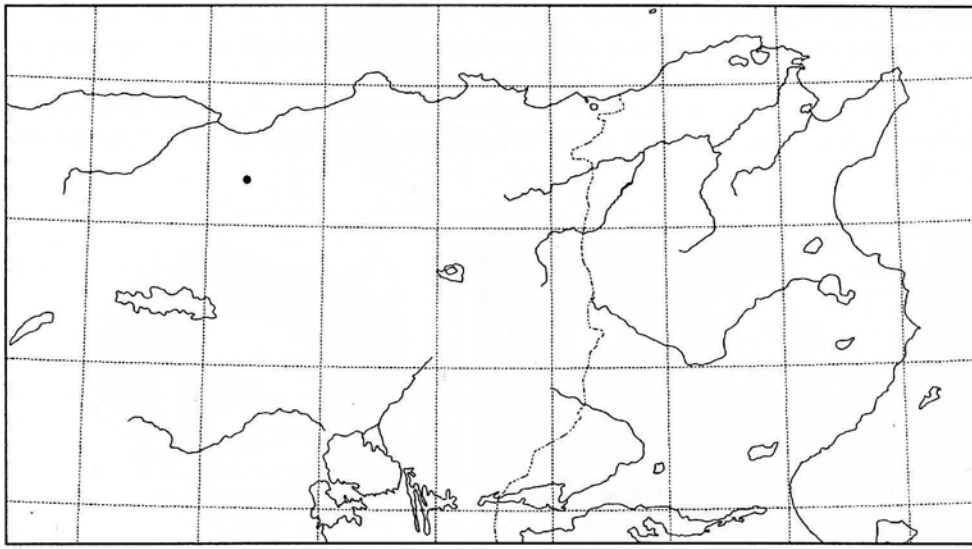


Fig. 137. N African distribution of *Anthemis cretica* subsp. *columnae*.

20. ***Anthemis maritima*** L., Sp. Pl.: 893 (1753). – Ind. loc.: "Habitat Monspelii, inque Italia." – Lectotype (Fernandes 1975a, Humphries in Jarvis & al. 1993): Herb. Burser VII (1): 18 (UPS, microfiche!).
- *Anthemis maritima* var. *typica* Fiori in Fiori & Béguinot, Fl. Italia 3: 258 (1903), nom. inval. [Art. 24.3].

Hemicryptophytic to suffrutecent perennial. Rhizome woody, up to 10 mm in diameter, usually unbranched, bearing thin roots and a woody caudex with non-flowering and flowering shoots. Stems ascending-erect, sometimes long creeping and ascending, sometimes even descending proximally and ascending distally, usually unbranched basally and leafy in the lower half, but often naked in the proximal part due to the withering and complete vanishing of leaves; often with supplementary shoot-borne roots; green, often tinged with red in the lower half, rounded or sulcate, glabrous or sparsely hairy, unbranched and bearing a single capitulum or branched in the distal half and with 2-15 capitula. Lower and middle cauline leaves and leaves of non-flowering shoots elliptical to obovate or narrowly elliptical in outline, moderately succulent, petiolate; petiole with up to 5 pairs of basal teeth; blade pinnatipartite to 2-pinnatisect; ultimate segments broadly triangular to linear, mucronate, glabrous to moderately hairy, glandular-punctate. Upper cauline leaves linear

to ovate or obovate in outline, sessile or petiolate; petiole with up to 4 pairs of basal teeth; lamina entire to 2-pinnatisect; ultimate segments broadly triangular to linear, glandular-punctate. Peduncles remaining slender or becoming slightly incrassate at maturity, sulcate, sparsely to moderately hairy with medifixed hairs. Capitula heterogamous. Involucre hemispherical to obconical, umbonate at maturity. Involucral bracts in 3-4 rows, with a green, median strip and rather narrow, pale or brown, membranous margins, glabrous to densely hairy. Receptacle hemispherical at anthesis, hemispherical to ovate-conical at maturity, paleate throughout. Ray florets white, female; limb elliptical to narrowly elliptical, apically 3-lobed; tube sparsely glandular. Pales narrowly elliptical to narrowly obovate, carinate, membranous, persistent at maturity; apex tricuspidate or tapering gradually or abruptly into a projecting mucro. Disc florets yellow, hermaphrodite, sparsely glandular; the basal part not or conspicuously inflated and spongy at maturity; the distal part funnel-shaped, apically 5-lobed; lobes triangular, with an up to 0.1-0.2 mm long dorsal appendage. Achenes of ray florets fusiform, round to somewhat triangular in cross-section, adaxially bent; ribs 8-10, 2 lateral ones, 3 on the flattish abaxial face, and 3-5 on the ± rounded adaxial face, smooth to slightly tuberculate; corona absent or an up to 0.5 mm long, adaxial auricle. Achenes of disc florets heteromorphic to homomorphic, stout and subcylindrical to broadly obconical or obconical, rounded to quadrangular-rhombic in cross-section, with 10 ± conspicuous, smooth to slightly tuberculate ribs; corona absent or an up to 0.7 mm long auricle.

Chromosome number. – $n = 9, 10, 18$; $2n = 18, 20, 36$.

Distribution and habitat. – Restricted to the coasts of the W and C part of the Mediterranean area and the SW Spanish and S Portuguese coasts of the Atlantic Ocean. Interestingly, *Anthemis maritima* has not so far been reported from the Mediterranean and Atlantic coasts of Morocco, although it is quite common on the N shores of the Strait of Gibraltar at Cabo Roche and Cabo Trafalgar. In N Africa, the species is only found on the Mediterranean coast between Algiers (Algeria) and the Cap Bone peninsula (N Tunisia), in the vicinity of Tripoli (Libya), and according to Alavi (1983) also near Al Qubbah and between Darnah and Susah in Cyrenaica. It usually grows on rocks and sand dunes near the sea shore. Benedí i Gonzáles (1987) reports that Spanish populations are found in Critmo-Limonietea and Ammophiletea (Ammophiletum arundinaceae, Crucianelletum maritimae) communities.

Variation and taxonomy. – Marked differences exist between N African populations of *Anthemis maritima,* relating to size and dissection of leaves, colour of the membranous margins of involucral bracts, and size of capitula, ray florets and achenes. Three subspecies are therefore distinguished in the domain of this study.

Key to subspecies

1. Involucral bracts with brown membranous margins, outermost triangular to narrowly triangular, glabrous; peduncles hairy ..... 20c. *A. maritima* subsp. *pseudopunctata*
– Involucral bracts with pale membranous margins (sometimes tip of bracts tinged brown or black), outermost triangular to ovate, glabrous or hairy; peduncles glabrous or hairy . 2.



Fig. 138. *Anthemis maritima* subsp. *maritima:* general habit *(Clavé 2142).* – Scale bar = 10 cm.

2. Peduncles and involucral bracts glabrous; basal leaves (20-)35-60(-76) mm long, 1(-2)-pinnatipartite; rhachis of basal leaves between first and second primary leaf lobes (3-)4-7 mm broad; limb of ray florets (3.8-)5.2-7.8(-8.0) mm long; achenes 1.5-2.0 mm long; corona of achenes up to 0.2 mm long ..... 20b. *A. maritima* subsp. *bolosii*
– Peduncles and involucral bracts sparsely to densely hairy; basal leaves (10-)15-35(-50) mm long, 1-2-pinnatipartite to 1-2-pinnatisect; rhachis of basal leaves between first and second primary leaf lobes 2-3 mm broad; limb of ray florets 7.5-12.0 mm long; achenes 1.9-2.5 mm long; corona of achenes (0.1-)0.2-0.7 mm long ..... 20a. *A. maritima* subsp. *maritima*

20a. ***Anthemis maritima*** L. subsp. ***maritima***

= *Anthemis maritima* var. *incana* Guss. ex DC., Prodr. 6: 8 (1837). – Ind. loc.: "in Siciliâ prope Girgenti legit cl. Gussone". – Holotype: [Italy] "Sicilia/Girgenti," m[isit] 1831, *Gussone* (G-DC).
Note. – Benedí Gonzáles (1987) treats this variety as a homotypic synonym of the junior and presumably not homotypic *A. maritima* var. *villosiuscula* J. Gay.
= *Anthemis maritima* var. *villosiuscula* J. Gay ex Guss., Fl. Sic. Syn. 2: 869 (1844). – Ind. loc.: "In arenosis maritimis Siciliae, Girgenti una cum specie". – Type: not seen.
= *Anthemis maritima* var. *bipinnatipartita* J. Gay ex Guss., Fl. Sic. Syn. 2: 869 (1844). – Ind. loc.: "Girgenti". – Type: not seen.
Note. – A specimen from La Calle, 8 Jun 1841, *Durieu* (K) was labelled as "γ bipinnatipartita" by Gay in September 1840.

Stems (10-)15-35(-50) cm long, basally 1-3 mm in diameter, glabrous or sparsely hairy, unbranched and bearing a single capitulum or branched in the distal half and with 2-5(-10) capitula. Lower and middle cauline leaves and leaves of non-flowering shoots (15-)27-45(-60) mm long and 8-20(-26) mm wide, narrowly elliptical to narrowly obovate in outline; petiole (5-)10-20(-25) mm long; base with 3-5 pairs of teeth; rhachis between first and second primary leaf lobes c. 2-3 mm broad; blade 1-2-pinnatipartite to 1-2-pinnatisect, with 3-4 pairs of cuneate to elliptical primary lobes; ultimate segments ovate or triangular to broadly triangular, (1.0-)1.4-2.4(-3.0) mm long and 0.7-1.7(-2.2) mm wide, glabrous to moderately hairy. Upper cauline leaves (7-)12-22(-30) mm long and 3-10(-15) mm wide, linear to obovate in outline, sessile or with an up to 5 mm long petiole and 1-4 pairs of

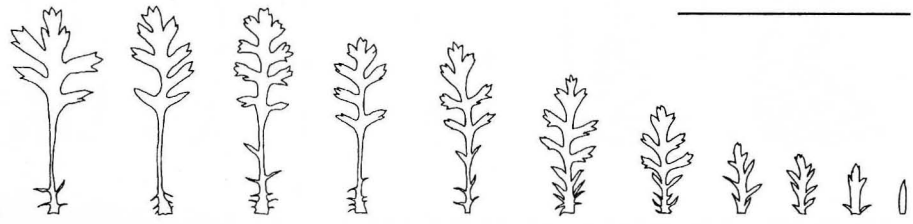


Fig. 139. *Anthemis maritima* subsp. *maritima:* leaf spectrum *(Clavé 2142).* – Scale bar = 5 cm.

basal teeth; lamina entire or 1(-2)-pinnatifid to pinnatisect, with 3-4 pairs of entire to dentate lobes; ultimate segments (1.8-)2.3-3.9(-4.5) mm long and (0.7-)1.1-2.6(-3.0) mm wide, linear, broadly elliptical or broadly triangular. Peduncles (12-)23-84(-140) mm long and 0.8-1.5 mm in diameter, sparsely to densely hairy. Capitula 25-30(-35) mm in diameter. Involucre (7-)11-14(-16) mm in diameter. Involucral bracts with rather narrow, laterally pale and apically pale to brown, membranous margins; the outermost triangular or ovate, (2.9-)3.1-4.1(-4.4) mm long and (1.3-)1.6-2.1(-2.3) mm wide, sparsely to densely hairy, acute, with rather narrow, laterally up to 0.3 mm wide, apically up to 0.5 mm wide, membranous margins; the middle ones ovate to elliptical or narrowly elliptical, 3.8-4.9(-5.5) mm long and 1.7-2.2 mm wide, acute to obtuse, with laterally up to 0.4 mm, apically up to 1.0 mm wide, membranous margins; the innermost narrowly elliptical to narrowly obovate, (4.6-)4.8-5.4(-5.7) mm long and (1.5-)1.7-2.2 mm wide, glabrous to sparsely hairy, obtuse, with laterally with up to 0.5 mm wide, apically up to 1.3 mm wide, membranous margins. Receptacle 2.0-3.5 mm high and 2.5-3.5 mm in diameter at anthesis, 3.5-4.5(-6.0) mm high and 3.5-4.5 mm in diameter at maturity. Ray florets (8-)13-18 per capitulum, 9-14 mm long; limb elliptical to narrowly so [index 1.5-2.7], 7.5-12.0 mm long and 3.2-6.0 mm wide; tube 1.5-2.4 mm long and 0.8-1.3 mm wide. Pales narrowly elliptical to narrowly obovate, (3.8-)4.5-5.7 mm long and 1.2-1.7 mm wide, basally 0.7-1.0 mm wide; apex tridentate or tapering ± abruptly into a projecting mucro, usually concolourus. Disc florets 3.3-4.0 mm long; the basal part remaining slender or becoming inconspicuously inflated, flattened and somewhat wing-like laterally, or distinctly spongy, inflated and subtetragonous at maturity, 1.0-1.8 mm long and 0.8-1.2 mm wide. Achenes of ray florets 2.1-2.8 mm long and 0.8-1.3 mm in diameter, with an up to 0.5 mm long, adaxial auricle. Achenes of disc florets ± heteromorphic; the peripheral ones 1.9-2.5 long and 1.0-1.5 mm in diameter, stout and subcylindrical to broadly obconical, with an adaxially up to 0.7 mm, abaxially up to 0.3 mm long auricle; persistent at maturity; the central ones more slender than the peripheral ones, obconical, tetragonal in cross-section, with rather indistinct ribs; readily falling off at maturity.

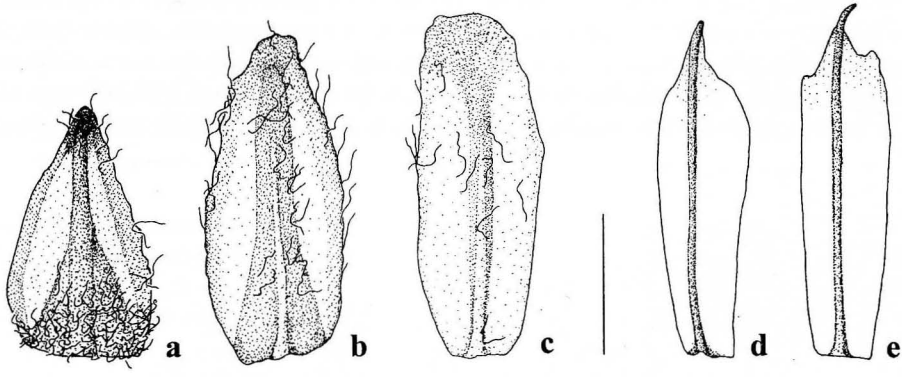


Fig. 140. *Anthemis maritima* subsp. *maritima:* (a-c) involucral bracts, (d-e) pales *(Vogt 13813 & Oberprieler 8118).* – Scale bar = 2 mm.

Chromosome number. – $n = 9, 10, 18$; $2n = 18, 20, 36$ (see discussion in chapter 10).

Distribution and habitat. – Found throughout the range of the species (Fig. 142). On the Mediterranean coast of N Tunisia (Cap Blanc NW of Bizerte), *Anthemis maritima* subsp. *maritima* was found to grow in rocky and sandy habitats from 10 to 30 m above sea level together with *A. secundiramea* var. *cossyrensis, Pallenis maritima* (L.) Cass., *Centaurea sonchifolia* L., *Crucianella maritima* L., *Helichrysum stoechas* (L.) DC., and *Reichardia picroides* (L.) Roth.

Variation and taxonomy. – As pointed out by Benedí i González (1987) for populations of the Iberian Peninsula, *Anthemis maritima* subsp. *maritima* shows considerable variation in the hairiness of stems, leaves, and involucral bracts. The same is true for N African specimens, whose stems and leaves may be completely glabrous or sparsely hairy, and the involucral bracts, sparsely to densely hairy. Unlike *A. maritima* subsp. *bolosii,* subsp. *maritima* has always at least sparsely hairy peduncles and outer involucral bracts. Indumentum is very variable both within and between populations, and has little if any taxonomical value. Some specimens from around Annaba (Bône) and the nearby Cap de Garde in N Algeria (30 May 1874, *Pomel,* MPU-AfN; May 1876, *Letourneux,* P; 1834, *Steinheil,* P) and a specimen labelled *"Anthemis maritima* subsp. *algeriensis"* by Benedí i González in 1987 (7 May 1951, Cap de Garde, *Herb. Faurel,* MPU-Dubuis) hold a somewhat intermediate position between *A. maritima* subsp. *maritima* and subsp. *bolosii* in having relatively short ray florets, short achenes (1.9-2.0 mm) with short coronas (c. 0.1 mm), and relatively weakly dissected leaves. Hairy peduncles and relatively short leaves support their being placed in *A. maritima* subsp. *maritima.*

Specimens seen. – [Algeria, Alger] Alger, [36°47′N, 3°4′E], 1839, *Bové* (G). – [Annaba] In rupibus maritimis promontori "Cap de Gard" prope Hipponem Regium, [36°58′N, 7°46′E], 24 Jun 1931, *Maire* (MPU-AfN). Falaises rocheuses du Cap de Garde, près de Bône, [36°58′N, 7°46′E], 7 May 1951, *Herb. Faurel* (MPU-Dubuis). Bône, Cap de Garde, [36°58′N, 7°46′E], 9 Jun 1880, *Herb. Roux* (MPU-AfN). Cap de Garde, [36°58′N, 7°46′E], Jun 1876, *Letourneux* (P). Grottes près le Cap de Garde, [36°58′N, 7°46′E], *Letourneux* (P). Cap de Garde, [36°58′N, 7°46′E], 30 May 1874, *Herb. Pomel* (MPU-AfN). Bône, embouchure de la Seybouse, [36°55′N, 7°45′E],

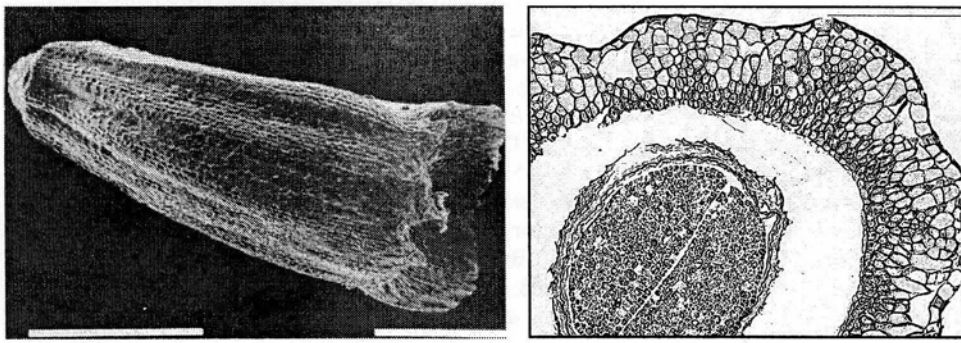


Fig. 141. Micrographs of achenes of disc florets of *Anthemis maritima* subsp. *maritima (Vogt 13792 & Oberprieler 8097).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

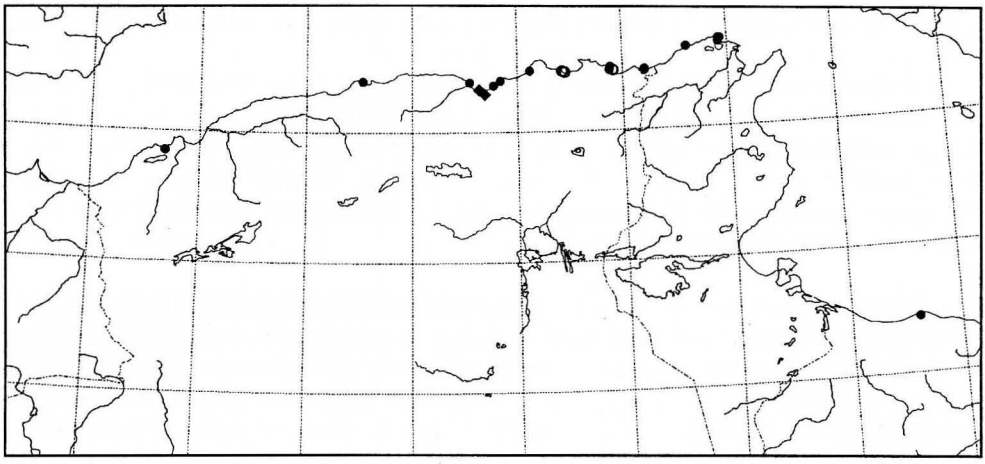


Fig. 142. N African distribution of *Anthemis maritima* (● subsp. *maritima*, O subsp. *bolosii*, ◆ subsp. *pseudopunctata*).

Apr 1904, *Pourveille* (BC 29543). In arenis maritimis ditionis Senhadja ad ostium amnis Dissia, [36°55′N, 8°25′E], 20 Jun 1934, *Maire* (MPU-AfN; P). Bône, rochers maritimes, Batterie du Lion, [36°55′N, 7°45′E], 14 May 1906, *Romieux 758* (G). Rochers maritimes, Env. Bone, [36°55′N, 7°45′E], *Steinheil* (G). Bône, [36°55′N, 7°45′E], 1834, *Steinheil* (P). S. de Bône, Reg. litt., [36°55′N, 7°45′E], 185[?], *Le Cowineux* (MPU-AfN). Bône, [36°55′N, 7°45′E], *Herb. Battandier* (MPU-AfN). La Calle, [36°54′N, 8°25′E], *Durieu de Maisonneuve* (P). Rochers maritimes à La Calle, [36°54′N, 8°25′E], 8 Jun 1841, *Durieu de Maisonneuve* (P; K). La Calle, [36°54′N, 8°25′E], *Clavé* (MPU-AfN). La Calle, [36°54′N, 8°25′E], *Durieu de Maisonneuve* (P). La Calle, dunes au dessus de la Sardinerie, [36°54′N, 8°25′E], 2 May 1914, *Clavé 2142* (G). La Calle. Près de la mer, [36°54′N, 8°25′E], Jun 1839, *Bové* (B; P; G; K). La Calle, dunes de la Grand Sardinerie, [36°54′N, 8°25′E], 2 May 1914, *d'Alleizette* (P). La Calle, dunes maritimes, [36°54′N, 8°25′E], 27 Apr 1930, *Maire* (MPU-AfN; P; BC 136269). La Calle, [36°54′N, 8°25′E], *Durieu de Maisonneuve* (P). – [Bejaïa] Bougie, [36°46′N, 5°5′E], *Herb. Battandier* (MPU-AfN). few km W of Les Falaises (Bejaïa - Djidjelli), sea-level, old dunes, 28 May 1971, *Davis 52916* (RNG). – [Jijel] Dunes sablonneuses du littoral, à l'embouchure de l'Oued Zhour, Kabylie de Collo, [36°56′N, 6°15′E], 7 Jun 1944, *Herb. Faurel* (MPU-Dubuis). Sables littoraux de la baie des Aftis entre Ziama-Mansouria et Cavallo (Dept. de Bougie), [36°43′N, 5°32′E], 27 Apr 1964, *Herb. Faurel* (MPU-Dubuis). 5 km W of Jijel, 100 m, 36 04'N, 05 40'E, hills above coast, 28 Apr 1976, *Sutton & Sutton 873* (RNG). – [Oran] Oran, [35°42′N, 0°38′W], *Herb. Jaubert* (P). – [Tunisia, Béja] Cap Negro, Kroumirie orientale, 26 Jun 1888, *Cosson & al.* (P). – [Bizerte] Cap Blanc, 8km N Bizerte, 20 m, 9°52'E, 37°20'N, 3 Apr 1981, *Podlech 35772* (MSB; G; M; HUJ). Tunisie du Nord-Est, Cap Bizerte NW Bizerte, limestone, 20 m, 37°20.006'N, 9°51.455' E, 22 May 1994, *Vogt 13813 & Oberprieler 8118* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). Tunisie du Nord-Est, Cap Blanc NW Bizerte, limestone cliffs and stony slopes near the shore, 10-30 m, 37°19.968'N, 9°50.325' E, 22 May 1994, *Vogt 13792 & Oberprieler 8097* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). Bizerte, [37°20′N, 9°51′E], 1 Jun 1888, *Cosson & al.* (P). Dunes ouest d. Bizert, [37°20′N, 9°51′E], 9 Apr 1914, *Cuénod* (G). In arenis ad maris litus prope Hipponem Zarytum, [37°17′N, 9°50′E], 8 May 1938, *Maire & Weiller* (MPU-AfN). Cap Serrat, [37°14′N, 9°13′E], Jul 1880, *Roux* (MPU-AfN). – [Nabeul] Cap Bon, 4 Jun 1888, *Cosson & al.* (P). – [Libya, Tarabulus]

Tripolitanien, Tripolis, [32°52'N, 13°13'E], Apr 1932, *Baschant* (B). – [Not located] De Barbarie, *Poiret* (G). in Numidia, *Poiret* (G). ex Numidia, *Herb. Poiret* (P). de la côte de barbarie, *s.coll.* (P-Lamarck). – [Cultivated specimens] Alger, naturalisé sur les rocailles du jardin de l'université; orig. Algérie orientale, May 1945, *Maire, n° 1024* (MPU-AfN).

20b. ***Anthemis maritima*** subsp. ***bolosii*** Benedí & Molero in Fontqueria 28: 1 (1990). – Ind. loc.: "Algérie: Skikda (Philippeville), rochers au bord de la mer, à l'embouchure Chaulette 19-VI-1893". – Holotype: 19 Jun 1853, *Choulette* (LY-Rouy, not seen).
Note. – As noted above, Benedí González & Molero Briones (1990) cite the label of the holotype incorrectly. According to Cosson (1881), Sébastien Choulette [not Chaulette] worked as a pharmacist at the hospital of Philippeville between 1852 and 1854, so that the collecting year was 1853 rather than 1893.

Exs.: Choulette, Fragm. Fl. Alger. Exs. 1858: n° 546 (sub *"Anthemis maritima"*).

Stems (18-)26-45(-58) cm long, basally 1-4 mm in diameter, glabrous, unbranched and bearing a single capitulum, or branched in the distal half and with 2-5(-15) capitula. Lower and middle cauline leaves (20-)35-60(-76) mm long and (9-)14-28(-38) mm wide, elliptical to obovate or narrowly elliptical in outline; petiole (10-)15-30(-40) mm long, base with 3-5 pairs of teeth; rhachis between first and second primary leaf lobes c. (3-)4-7 mm broad; blade 1(-2)-pinnatipartite, with 1-3 pairs of cuneate, pinnatifid to pinnatipartite primary lobes; ultimate segments triangular to broadly triangular, (1.0-)1.5-2.8(-3.5) mm long and (1.2-)1.5-2.8(-3.3) mm wide, glabrous, rarely sparsely hairy. Upper cauline leaves (11-)17-37(-45) mm long and (2-)5-18(-20) mm wide, linear to obovate in outline, sessile or with an up to 13 mm long petiole and 1-4 pairs of basal teeth; lamina entire or pinnatifid to pinnatipartite, with 1-2 pairs of entire to dentate lobes; ultimate segments 1.4-3.2(-4.5) mm long and (1.1-)1.5-2.4(-3.0) mm wide, linear or triangular to broadly triangular. Peduncles (10-)23-90(-160) mm long and 0.8-1.7(-2.3) mm in diameter, glabrous. Capitula (14-)17-25(-35) mm in diameter. Involucre (7-)10-14(-16) mm in diameter. Involucral bracts with rather narrow, laterally pale and apically pale to brown, membranous margins; the outermost triangular or ovate, (2.4-)2.7-3.6(-4.3) mm long and (1.1-)1.3-1.9(-2.1) mm wide, glabrous, acute, with rather narrow, laterally up to 0.2 mm wide, apically

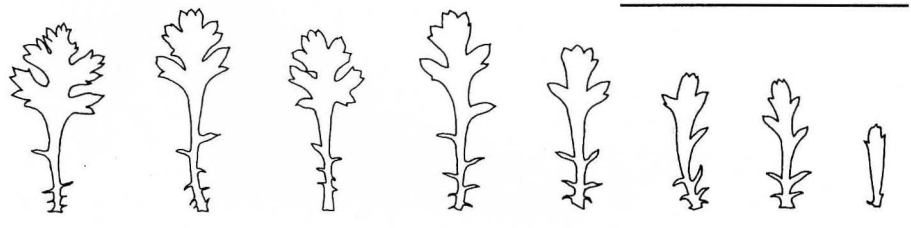


Fig. 143. *Anthemis maritima* subsp. *bolosii:* leaf spectrum *(Choulette n° 546).* – Scale bar = 5 cm.



Fig. 144. *Anthemis maritima* subsp. *bolosii:* general habit *(Choulette n° 546).* – Scale bar = 10 cm.

up to 0.5 mm wide, membranous margins; the middle ones triangular to elliptical or narrowly elliptical, (3.0-)3.3-4.5(-5.2) mm long and 1.4-2.1 mm wide, glabrous, acute to obtuse, with laterally up to 0.4 mm, apically up to 0.7 mm wide, membranous margins; the innermost elliptical to narrowly so, (3.5-)3.8-5.0(-6.0) mm long and 1.2-1.8 mm wide, glabrous, obtuse, with laterally with up to 0.3 mm wide, apically up to 0.8 mm wide, membranous margins. Receptacle hemispherical at anthesis, hemispherical to ovate-conical at maturity(c. 4-5 mm in diam., c. 5 mm high). Ray florets 8-20 per capitulum, (5-)6-10 mm long; limb elliptical [index 1.5-2.4], (3.8-)5.2-7.8(-8.0) mm long and (2.2-)2.6-4.2 (-4.5) mm wide; tube 1.4-2.1 mm long and 0.6-1.4 mm wide. Pales narrowly elliptical to narrowly obovate, (3.5-)3.7-4.3(-4.7) mm long and 0.7-1.2 mm wide, basally 0.3-0.7 mm wide; apex tridentate or tapering ± abruptly into a projecting, usually concolourus mucro. Disc florets 2.8-3.9 mm long; the basal part conspicuously inflated, spongy and subtetragonous at maturity, 1.1-1.9 mm long and 0.6-1.3 mm wide. Achenes of ray florets 1.5-2.0 mm long and 0.6-1.0 mm in diameter, with an up to 0.2 mm long, adaxial auricle. Achenes of disc florets ± homomorphic, 1.5-2.0 long and 0.7-1.0 mm in diameter, obconical, tetragonal in cross-section, readily falling off at maturity; ribs rather indistinct; corona an up to 0.2 mm long adaxial auricle.

Chromosome number. – Unknown. Pollen dimensions are conspicuously lesser than in *Anthemis maritima* subsp. *maritima* and subsp. *pseudopunctata* and fall within the range typical for diploids (see chapter 11).

Distribution and habitat. – Endemic to the Mediterranean coast around Skikda (Philippeville), Stora and Annaba (Bône) in NW Algeria, where it grows on coastal cliffs. In the latter area, it is found growing together with *Anthemis maritima* subsp. *maritima* and with morphologically intermediate plants.

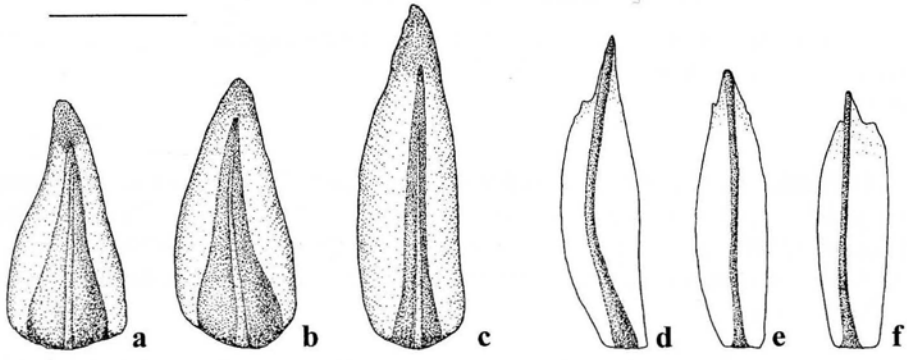


Fig. 145. *Anthemis maritima* subsp. *bolosii:* (a-c) involucral bracts (23 Jun 1920, *Maire*), (d-e) pales (d, *id.;* e-f, 28 Jul 1840, *Durieu de Maisonneuve*). – Scale bar = 2 mm.

Variation and taxonomy. – Benedí González & Molero Briones (1990) briefly discuss the differences between *Anthemis maritima* subsp. *maritima* and their new subsp. *bolosii,* known only by its type specimen. The latter is said to be characterised by tricuspidate (rather than acuminate) pale tips. However, this distinction breaks down completely when abundant N African material of both subspecies, along with Spanish, Italian and French representatives of *A. maritima* subsp. *maritima* are studied. Abruptly acuminate or tricuspidate pales are also found in subsp. *maritima,* and subsp. *bolosii* is also found having regularly acuminate pale tips.

The best feature to discriminate *Anthemis maritima* subsp. *bolosii* from subsp. *maritima* is the complete lack of hairs on peduncles and involucral bracts (in subsp. *maritima* at least the peduncles are sparsely to densely hairy).

Specimens seen. – [Algeria, Annaba] Bône, [36°55′N, 7°45′E], *Letourneux* (P). Bône, [36°55′N, 7°45′E], *Herb. Battandier* (MPU-AfN). – [Skikda] Philippeville, [36°55′N, 6°51′E], 28 Jul 1840, *Durieu de Maisonneuve* (P). Philippeville, falaises de Stora, [36°55′N, 6°51′E], Dec 1916, *Maire* (MPU-AfN). Philippeville, [36°55′N, 6°51′E], 11 May 1853, *Cosson* (P). Stora, [36°55′N, 6°51′E], May 1913, *Herb. Battandier* (MPU-AfN). Rochers maritimes à Philippeville, [36°55′N, 6°51′E], 28 Jun 1840, *Durieu de Maisonneuve* (P). Stora, rochers maritimes, micaschistes, [36°55′N, 6°51′E], 23 Jun 1920, *Maire* (MPU-AfN; P). Rochers à l'embouchure du Saf-saf à Philippeville, [36°54′N, 6°54′E], May 1858, *Choulette, n° 546* (MPU-AfN; P; K).

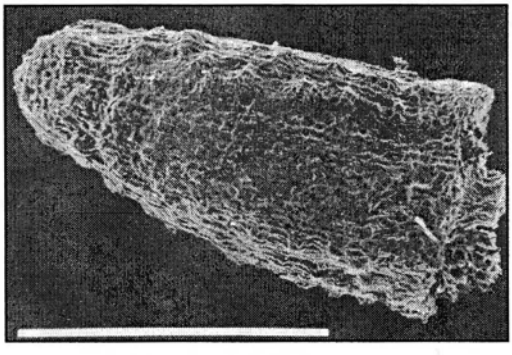


Fig. 146. SEM micrograph of achene of disc floret of *Anthemis maitima* subsp. *bolosii* (28 Jun 1840, *Durieu de Maisonneuve*). – Scale bar = 1 mm.

20c. ***Anthemis maritima*** subsp. ***pseudopunctata*** Oberprieler, **subsp. nov.** – Holotype: [Algeria] "Cap Aôkas, lieux arides et sablonneux, sur le calcaire", May 1896, *Reverchon, n° 128* (B!; isotypes: B!, G [2 sheets]!, P [3 sheets]!, MA 127078!)

– *Anthemis punctata* var. *salditana* Debeaux & Reverchon, Pl. Algérie Kabylie 1896: n° 128, nom. nud.

Exs.: Debeaux & Reverchon, Pl. Algérie Kabylie 1896: n° 128 (sub *"Anthemis punctata* var. *salditana"*).

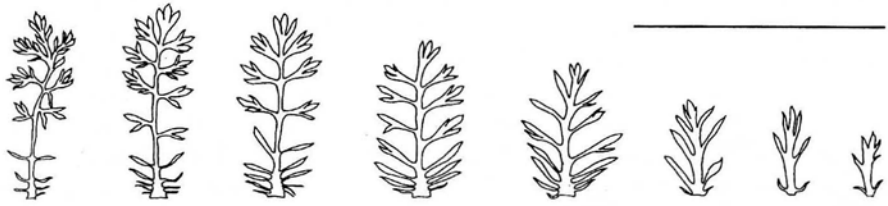


Fig. 147. *Anthemis maritima* subsp. *pseudopunctata:* leaf spectrum *(Sutton & Sutton 892).* – Scale bar = 5 cm.

Ab *Anthemidis maritimae* subsp. *maritima* et subsp. *bolosii* involucri squamis margine scarioso fusco cinctis differt.

Stems (13-)24-39(-55) cm long, basally 1-4 mm in diameter, glabrous, unbranched and bearing a single capitulum, or branched in the distal half and with 2-7 capitula. Lower and middle cauline leaves (15-)25-36(-40) mm long and (6-)9-20(-30) mm wide, elliptical to narrowly elliptical in outline; petiole (5-)8-16 mm long, base with 2-4 pairs of teeth; rhachis between first and second primary leaf lobes c. 0.5-2 mm broad; blade 2-pinnatipartite to 2-pinnatisect with 3-4 pairs of cuneate to elliptical, pinnatipartite to pinnatisect primary lobes; ultimate segments elliptical to linear, (0.8-)1.8-4.0(-5.0) mm long and 0.7-1.5(-2.2) mm wide, glabrous. Upper cauline leaves (8-)13-27(-33) mm long and 2-15(-20) mm wide, linear or elliptical to ovate in outline, sessile, with 1-4 pairs of basal teeth; lamina entire, pinnatifid or 1-2-pinnatipartite to pinnatisect with 2-4 pairs of entire to pinnatipartite lobes; ultimate segments (1.4-)2.1-3.6(-4.0) mm long and 0.8-1.4(-1.8) mm wide, linear to elliptical. Peduncles (25-)40-85(-130) mm long and 0.9-2.0 mm in diameter, hairy. Capitula 24-36 mm in diameter. Involucre 11-15 mm in diameter. Involucral bracts with rather narrow, laterally and apically brown, membranous margins; the outermost triangular to narrowly triangular, (3.0-)3.5-4.5 mm long and 1.7-2.1(-2.4) mm wide,

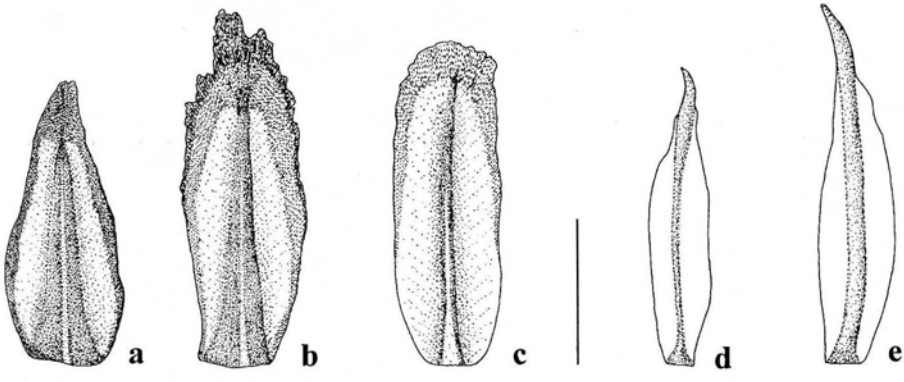


Fig. 148. *Anthemis maritima* subsp. *pseudopunctata:* (a-c) involucral bracts *(Reverchon n° 128),* (d-e) pales (d, *id.;* e, *Sutton & Sutton 892*). – Scale bar = 2 mm.

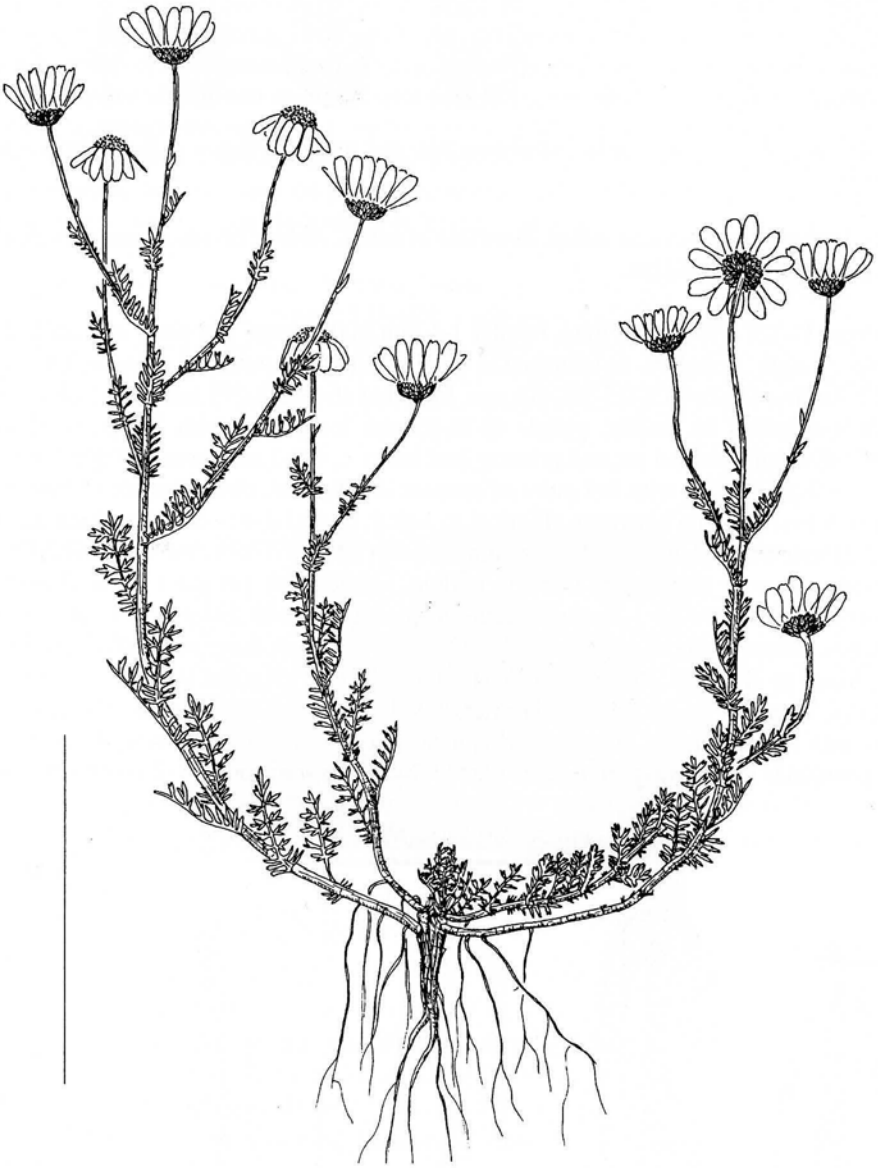


Fig. 149. *Anthemis maritima* subsp. *pseudopunctata:* general habit *(Reverchon n° 128).* – Scale bar = 10 cm.

glabrous, acute, with rather narrow, laterally up to 0.3 mm wide, apically up to 0.6 mm wide, membranous margins; the middle ones triangular or narrowly triangular to narrowly elliptical, (4.0-)4.3-5.1(-5.3) mm long and (1.4-)1.6-1.9 mm wide, acute to obtuse, with laterally up to 0.4 mm, apically up to 0.8 mm wide, membranous margins; the innermost narrowly elliptical to narrowly obovate, 5.2-5.8(-6.0) mm long and (1.3-)1.5-1.8 mm wide, glabrous, acute to obtuse, with laterally with up to 0.4 mm wide, apically up to 1.1 mm wide, membranous margins. Receptacle hemispherical at anthesis, hemispherical to ovate-conical at maturity. Ray florets 12-16 per capitulum, 11-16 mm long; limb elliptical to narrowly elliptical [index 1.9-2.7], 9.5-13.0 mm long and 3.5-6.0 mm wide; tube 1.5-2.5 mm long and 0.7-1.0 mm wide. Pales narrowly elliptical to narrowly obovate, (3.5-)4.1-4.8 mm long and 0.7-1.2 mm wide, basally 0.4-0.6 mm wide; apex rarely tridentate, usually tapering gradually into a projecting, usually concolourus, sometimes brown-tinged mucro. Disc florets 3.2-4.0 mm long; the basal part 1.5-2.5 mm long and 0.7-1.0 mm wide, remaining slender or becoming inconspicuously inflated and spongy at maturity, flattened and somewhat wing-like laterally. Achenes of ray florets 1.8-2.2 mm long and 0.7-0.8 mm in diameter. Achenes of disc florets ± homomorphic, (1.5-)1.8-2.0 long and 0.8-1.0 mm in diameter, obconical, tetragonal in cross-section, readily falling off at maturity; ribs rather inconspicuous; corona an up to 0.3 mm long adaxial auricle.

Chromosome number. – Unknown. Pollen dimensions suggest a tetraploid number (see chapter 11).

Distribution and habitat. – Only known from three collections from the Mediterranean coast around Cap Aokas between Bejaïa and Ziama Mansouria in N Algeria. On calcareous rocks near the beach.

Variation and taxonomy. – *Anthemis maritima* subsp. *pseudopunctata* can be easily distinguished from the two other N African subspecies of *A. maritima* by brown rather than pale (sometimes dark-tipped) membranous margins of its involucral bracts. In that

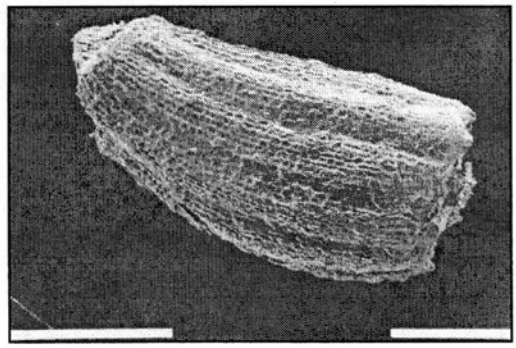


Fig. 150. SEM micrograph of achene of disc floret of *Anthemis maitima* subsp. *pseudopunctata (Reverchon n° 128).* – Scale bar = 1 mm.

feature, in leaf shape and dissection, and in the narrowly triangular rather than triangular-ovate involucral bracts it resembles *A. pedunculata* and *A. punctata*. However, the glabrous and somewhat succulent leaves, glabrous stems and involucral bracts, along with the abundant shoot-borne roots and the coastal habitat clearly argue for its inclusion in *A. maritima*. Pollen fertility (specimen *Sutton & Sutton 892:* 93 %) is even higher than in Tunisian populations of *A. maritima* subsp. *maritima* (*Vogt 13792 & Oberprieler 8097:* 89 %; *Vogt 13813 & Oberprieler 8118:* 80 %), which does not support the assumption of a hybrid origin of this subspecies that its intermediate character combination might suggest.

Specimens seen. – [Algeria, Bejaïa] Cap Aôkas, lieux arides et sablonneux, sur le calcaire, Rare, [36°39′N, 5°14′E], May 1896, *Reverchon, n° 128* (B; P; G; MA 127078). 30 km E of Bejaïa, 3 km W of Souk-el-Tenine, 5 m, 36°35'N, 5°20'E, top of beach, 28 Apr 1976, *Sutton & Sutton 892* (RNG). O[ue]d. Machiri, 15 May 1874, *Herb. Pomel* (MPU-AfN).

21. ***Anthemis pedunculata*** Desf., Fl. Atl. 2: 288 (1799) ≡ *Anacyclus pedunculatus* (Desf.) Pers., Syn. Pl. 2: 465 (1807). – Ind. loc.: "Habitat in arvis." – Lectotype (designated here): "*Anthemis pedunculata,* Herbier de la *Flore Atlantique* (P!; isolectotypes: G!, FI-Webb!).

Note. – The specimen housed at G is the best conserved of the three duplicates. It bears an annotation by J. Gay, dated 20 Jan 1841: "il n'en existe que deux autres exemplaires, l'un dans l'herbier Atlantique de Desfontaines, dont tous les capitules sans exception ont été mangés par les vers, l'autre dans l'herbier de M. Webb, qui a perdu sept capitules sur huit. Celui-ci est donc le mieux conservé, et c'est aussi de lui que j'ai tiré tous les details de ma description des parties florales de mon *Anthemis pedunculata*. Je l'ai passé au sublimé pour empêcher, pendant qu'il en est encore temps, qu'il ne partage le sort des deux autres." The specimen at P was designated as lectotype because it is accompanied by a Latin description in Desfontaine's handwriting on the envelope, which agrees with the original description in *Flora atlantica* (Desfontaines 1799), except that the achenes are described as "marginata", not "bialata" as (mistakenly) in the published version. Presumably, this error led Persoon (1807) to place Desfontaine's species in *Anacyclus*. Desfontaines visited Tunisia and Algeria between August 1783 and the beginning of 1786. His itinerary can be seen in Peyssonel & Desfontaines (1838). The first volume of this work, by Peyssonel, includes a map of Algeria and Tunisia with the author's travel routes with Desfontaines, and those of Desfontaines alone. The second volume, by Desfontaines, brings reports on the single excursions, with more of a biological bias. Cosson (1881: 8) summarises the schedule as follows: until April 1784: Tunisia; April-June 1784: W Algeria (Algiers - Tlemcen); July-September 1784: Tunisia; after September 1784: E Algeria (Algiers - Constantine - La Calle). Morphological features of the types, especially the shape of the pales, best fit plants from W Algeria and Morocco, and the specimens are flowering but not fruiting. It is therefore likely that the type collections were made on Desfontaine's journey to Tlemcen in April-June 1784.

- *Anthemis pedunculata* subsp. *eu-pedunculata* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934), nom. inval. [Art. 24.3].
- *Anthemis pedunculata* var. *trachycarpa* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934), nom. inval. [Art. 26.2].

Short- to long-lived perennial (sometimes flowering already in the first year) with annual shoots arising from a woody stock formed by the bases of the primary and subsequent annual shoots. Rootstock 0.3-14 mm in diameter. Stems herbaceous, basally lignified, ascending-erect to erect, 3.5-65 cm long, basally 0.5-5.5 mm in diameter, unbranched and bearing a single capitulum or branched apically and with up to 15 capitula, sulcate, glabrous or sparsely to densely hairy with medifixed hairs, sometimes tinged with red. Lower cauline leaves and leaves of non-flowering shoots 10-40(-75) mm long and 3-15(-30) mm wide, elliptical to obovate or narrowly elliptical to narrowly obovate in outline, petiolate; petiole 4-25(-37) mm long; base usually with 2-5(-7) pairs of entire or dissected teeth; blade 1-2-pinnatifid to 2-3-pinnatisect, with 2-4 pairs of ovate or elliptical to obovate primary lobes; ultimate segments triangular to elliptical or narrowly elliptical to linear, 0.8-4.2 mm long and 0.3-1.1 mm wide, mucronate, glabrous or sparsely to densely hairy, glandular-punctate. Middle and upper cauline leaves 3-30(-85) mm long and 1-20(-38) mm wide, ovate or broadly elliptical to narrowly elliptical in outline, sessile or with an up to 25 mm long petiole, basally with 1-4 pairs of entire teeth; lamina 1-3-pinnatipartite to -pinnatisect, with 2-4 pairs of primary lobes; ultimate segments 0.7-4.2 mm long and 0.3-1.5 mm wide, triangular or narrowly elliptical to linear, mucronate, glabrous or sparsely to densely hairy, glandular-punctate. Peduncles 10-180 mm long and 0.3-2.1 mm in diameter, remaining slender at maturity, sulcate, glabrous to densely hairy. Capitula 6-38 mm in diameter, homogamous or heterogamous. Involucre 5-13(-14) mm in diameter, hemispherical, attenuate or only slightly umbonate at maturity. Involucral bracts in 2-3 rows, glabrous or sparsely to densely hairy, with a green, longitudinal strip and pale, brown or black, membranous margins; the outermost ovate or triangular to narrowly triangular, 2.0-4.4(-5.1) mm long and 0.6-1.6 mm wide, acute, with laterally up to 0.5 mm wide, apically up to 1.3 mm wide, membranous margins; the middle ones ovate or narrowly ovate to narrowly elliptical, 2.7-5.7 mm long and 0.8-2.3 mm wide, acute or obtuse, with laterally up to 1.0 mm wide, apically up to 2.0 mm wide, membranous margins; the innermost narrowly elliptical or narrowly obovate to obovate, 2.9-6.0 mm long and 0.8-2.5 mm wide, obtuse or acute, with laterally up to 0.7 mm wide, apically up to 2.0 mm wide, membranous margins. Receptacle hemispherical to conical, paleate throughout. Ray florets absent or 3-16(-21) per capitulum; (when present) white, female, 5.9-16.3 mm long; limb elliptical to narrowly elliptical, 4.6-14.5 mm long and 2.7-5.8 mm wide, apically 3-lobed; tube sparsely glandular, 1.0-2.6 mm long and 0.4-1.1 mm wide. Pales subulate to narrowly elliptical or narrowly obovate, 2.6-4.6(-5.5) mm long and 0.2-1.0(-1.2) mm wide, apically gradually or abruptly acuminate to tridentate; tip tinged with brown to black, rarely concolourous; basally 0.2-0.7 mm wide, flat to carinate, membranous; persistent at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 1.9-3.5 mm long; the basal part remaining slender and becoming compressed, or sometimes becoming moderately inflated and spongy at maturity, 0.65-1.9 mm long and 0.45-1.3 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular. Achenes of ray florets (when present) 1.5-2.3 mm long and 0.5-0.9 mm in diameter, fusiform, round to somewhat triangular

in cross-section, adaxially bent; ribs 8-10, smooth to slightly tuberculate; furrows glandular; without corona or with an up to 0.1 mm long adaxial auricle. Achenes of disc florets ± homomorphic, (1.3-)1.6-2.6 mm long and 0.6-1.3 mm in diameter, obconical to narrowly obconical, quadrangular to circular in cross-section, with c. 10 ribs; ribs nearly smooth to strongly tuberculate; tubercles tipped with mucilage cells; furrows glandular; without corona or with an up to 0.3(-0.6) mm long adaxial auricle.

Chromosome number. – $n = 9, 18$; $2n = 18, 36, 37$ (see discussion in chapter 10).

Distribution and habitat. – Endemic to the mountains of Spain, Morocco, Algeria, and Tunisia. In Spain, restricted to the mountain ranges of the Sistema Ibérico *(Anthemis pedunculata* subsp. *turolensis)* and the Sistemas Béticos (subsp. *pedunculata).* In Morocco it is known from the Rif mountains, the Middle Atlas, the C and W High Atlas, and the Anti-Atlas. In Algeria it is distributed from the Sahara Atlas and the Tell Atlas through the Grande and Petite Kabylie to the Monts de la Médjerda and the Aurès mountain ranges in the east. In Tunisia it is restricted to some locations in the mountains of the Dorsale Tunisienne in N Tunisia. In Spain it grows in the mountane and subalpine belt between 800 and 2000 m (Benedí i Gonzáles 1987), in N Africa from sea level (subsp. *clausonis*) up to around 3000 m (subsp. *pedunculata*) in the High Atlas mountains, usually on stony slopes and in clearings of *Cedrus atlantica* and *Quercus rotundifolia* forests between 800 and 2400 m, but also on rocky soil along roadsides, at the edge of fields, or on steep cliffs, on calcareous, schistose, and volcanic soils.

Variation and taxonomy. – The most substantial change in circumscription of *Anthemis pedunculata* proposed here is the inclusion of *A. tuberculata* in its synonymy. Previous authors concerned with the classifications of European representatives of this species (Fernandes 1975b, 1983, Benedí i Gonzáles 1987) accepted *A. pedunculata* and *A. tuberculata* as independent species, but they largely ignored N African plant material and failed to mention the type material of *A. pedunculata.* Fernandes (1983), who found the two species to be very similar in general habit, leaf dissection, and capitulum dimensions, yet considered them to differ in several important characters. *A. tuberculata* was said to have larger achenes with more marked and more strongly tuberculate ribs and narrower and more gradually tapering pales than *A. pedunculata.* Further alleged differences relate to the shape of the receptacle (hemispherical in *A. tuberculata* but subconical in *A. pedunculata*) and disc florets (inflated and spongy only at the base in *A. tuberculata* but in the lower half in *A. pedunculata*). However, Fernandes (1983) did not use the type of *A. pedunculata* for comparison, but a specimen of *A. pedunculata* subsp. *atlantica* (La Calle, 7 Jun 1841, *Durieu*). As noted above, the type material of *A. pedunculata* was presumably collected in W Algeria. The plants are devoid of mature achenes, but their pales are narrowly elliptical and apically gradually tapering, as is typical for the Moroccan and Spanish representatives of the species, including the type of *A. tuberculata.*

Anthemis pedunculata is a highly polymorphic and evidently evolving species. A number of different taxa have been recognised at specific or infraspecific levels by previous authors. Most were based on a restricted number of specimens and on minute differences. When additional specimens from a wider area are studied, most of these taxa are found to lack morphological or geographical integrity and to be linked by a continuous range of

intermediate forms. The occurrence of polyploidisation, at least within N African populations of *A. pedunculata,* has added to the further complexity of the observed pattern of morphological variation. *A. abylaea* and *A. punctata* are close relatives of *A. pedunculata* and are presumably tetraploid derivatives of it. All three together form the *A. pedunculata* - *A. punctata* complex. No satisfactory classification of this complex in general, and of *A. pedunculata* in particular, can be achieved without a thorough biosystematical study. While ample information on cytological and morphological variation within and between populations of the complex was obtained for Morocco and Tunisia, the inaccessibility of Algeria caused a regrettable gap of knowledge for that rather crucial area. Cytological and ecological study of Algerian populations of *A. pedunculata* and *A. punctata* may eventually result in an even better understanding of the observed morphological variation. For the time being, a somewhat provisional treatment, mainly based on morphological features of herbarium specimens, is presented.

Anthemis pedunculata differs from *A. abylaea* and *A. punctata* by its smaller capitula. Four morphologically defined subspecies can be distinguished, mainly based on differences in the shape of involucral bracts and pales and in the colour of membranous margins of involucral bracts (see chapter 13). One of them is restricted to the N part of the Iberian peninsula (Sistema Iberico) and, therefore, is not further considered here:

Anthemis pedunculata subsp. ***turolensis*** (Pau ex Caballero) Oberprieler, **comb. nov.**
≡ *A. turolensis* Pau ex Caballero in Anales Inst. Bot. Cavanilles 2: 274, t. 6 (1942)
≡ *A. tuberculata* subsp. *turolensis* (Pau ex Caballero) R. Fernandes & Borja in Bot. J. Linn. Soc. 70: 10 (1975).

Key to subspecies and varieties

1. Capitula discoid (rarely with minute ray florets) .... 21β. *A. pedunculata* var. *discoidea*
– Capitula radiate ..... 2.
2. All involucral bracts with pale membranous margins ..... 21b. *A. pedunculata* subsp. *clausonis*
– At least the outer involucral bracts with brown or black membranous margins ..... 3.
3. Pales narrowly elliptical to nearly subulate, tapering gradually into tip; inner involucral bracts narrowly elliptical, with light to dark brown membranous margins, usually the same colour as the outer involucral bracts ..... 21α. *A. pedunculata* var. *pedunculata*
– Pales narrowly elliptical to narrowly obovate, tricuspidate or abruptly tapering into tip; inner involucral bracts narrowly obovate or obovate, with broad, pale membranous margins; outer involucral bracts usually with brown membranous margins ..... 21c. *A. pedunculata* subsp. *atlantica*

21a. ***Anthemis pedunculata*** Desf. subsp. ***pedunculata***

Short- to long-lived perennial herb (sometimes flowering already in the first year). Rhizome 1.6-14 mm in diameter. Stems 3.5-65 cm long, basally 0.5-5.5 mm in diameter, often unbranched and bearing a single capitulum, sometimes branched and with up to 8 capitula, glabrous or sparsely to densely hairy. Lower cauline leaves and leaves of non-flowering

shoots 10-75 mm long and 3-30 mm wide; petiole 5-35 mm long; base usually with 2-5(-7) pairs of entire teeth; blade 1-3-pinnatipartite to -pinnatisect; ultimate segments triangular to elliptical or narrowly elliptical to linear, 1.0-4.2 mm long and 0.3-1.1 mm wide, glabrous or sparsely to densely hairy. Middle and upper cauline leaves 4-85 mm long and 2-38 mm wide, ovate or broadly elliptical to narrowly elliptical in outline, sessile or with an up to 25 mm long petiole; base with 1-3 pairs of entire teeth; lamina 1-2(-3)-pinnatisect; ultimate segments 0.9-4.2 mm long and 0.5-1.5 mm wide, narrowly elliptical to linear, mucronate, glabrous or sparsely to densely hairy. Peduncles 10-180 mm long and 0.3-2.1 mm in diameter, glabrous to densely hairy. Capitula 6-37 mm in diameter, homogamous or heterogamous. Involucre 6-13 mm in diameter. Involucral bracts in 2-3 rows, glabrous or sparsely to densely hairy, with a green, longitudinal strip and light to dark brown, membranous margins; the outermost ovate or triangular to narrowly triangular, 2.0-4.4 mm long and 0.7-1.6 mm wide, acute; membranous margins laterally up to 0.3 mm wide, apically up to 1.1 mm wide; the middle ones narrowly ovate to narrowly elliptical, 2.7-5.5 mm long and 0.8-1.6 mm wide, acute, with laterally up to 0.5 mm wide, apically up to 1.7 mm wide, membranous margins; the innermost narrowly elliptical, 2.9-5.3 mm long and 0.8-1.6 mm wide, usually acute, sometimes obtuse, with laterally up to 0.6 mm wide, apically up to 1.8 mm wide, membranous margins. Receptacle 1.2-3.7 mm in diameter and 1.5-4.2 mm high at maturity. Ray florets absent or (8-)11-16(-21) per capitulum. Pales narrowly elliptical to subulate, 2.6-4.6 mm long and 0.2-0.8 mm wide, apically tapering gradually into a brown-tinged mucro, basally 0.2-0.55 mm wide. Disc florets 1.9-3.5 mm long; the basal part remaining slender and becoming compressed, sometimes moderately inflated and spongy at maturity, 0.65-1.9 mm long and 0.45-1.3 mm wide. Achenes of ray florets (when present) 1.7-2.3 mm long and 0.5-0.9 mm in diameter; without corona or with an up to 0.1 mm long adaxial auricle. Achenes of disc florets (1.3-)1.6-2.6 mm long and 0.7-1.3 mm in diameter; ribs moderately to strongly tuberculate; corona absent or an up to 0.6 mm long crenulate auricle; peripheral achenes persistent, central ones readily falling off at maturity.

Chromosome number. – $n = 9, 18$; $2n = 18, 36, 37$

Distribution and habitat. – Spain (Sistemas Béticos), Morocco (Rif, Middle Atlas, C and W High Atlas, Anti-Atlas), and N Algeria (Sahara Atlas, Tell Atlas, Grande Kabylie, Petite Kabylie, Aurès), from sea-level up to c. 3000 m in the High Atlas. On stony slopes, sandy plains and in clearings of *Cedrus atlantica* and *Quercus rotundifolia* woodland, along roadsides, at the edge of arable fields, and on steep cliffs between 800 and 2400 m. On calcareous and siliceous soils.

Variation and taxonomy. – *Anthemis pedunculata* subsp. *pedunculata* differs from subsp. *turolensis* and subsp. *atlantica* by its narrowly elliptical to nearly subulate pales which taper gradually into a usually brownish or blackish tinged apex (rather than being broader and abruptly cuspidate or tricuspidate). In subsp. *turolensis,* the pale tip is usually pale, and the leaves are comparatively small (up to 20 × 6 mm), much smaller than in other subspecies of *A. pedunculata*. *A. pedunculata* subsp. *pedunculata* is distinguished from subsp. *clausonis* by its usually light to dark brown membranous involucral bract margins. Both radiate and discoid representatives occur, which are here recognised as varieties.



Fig. 151. *Anthemis pedunculata* var. *pedunculata:* general habit *(Vogt 11948).* – Scale bar = 10 cm.

21α. ***Anthemis pedunculata*** Desf. var. ***pedunculata***

= *Anthemis tuberculata* Boiss., Elench. Pl. Nov.: 59 (1838) ≡ *A. pedunculata* subsp. *tuberculata* (Boiss.) Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934) ≡ *A. pedunculata* var. *eu-tuberculata* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934), nom. illeg. – Ind. loc.: "Hab. in summo monte Sierra Tejeda in pingibus." – Neotype (Benedí i González 1987: 258): [Spain] "Sierra de Alfácar, Rambur", *Boissier* (G).

Note. – Burdet & al. (1983) failed to find specimens in G that would fit Boissier's protologue. Benedí i González's (1987) neotypification is followed here, in conformity with Art. 9.13 of the *Code* (Greuter & al. 1994). A few years earlier, in 1984, Benedí i González had labelled a different specimen, collected in the Sierra Nevada by Boissier (G), as neotype of *Anthemis tuberculata,* but must then have changed his mind, perhaps because the Rambur specimen had been used to illustrate *A. tuberculata* in Boissier (1840). Both Fernandes (1983: 386) and Benedí i González (1987) dismiss Maire's combination as not validly published, but according to Art. 32.4 and 32.5 of the *Code* (Greuter & al. 1994) the combination is perfectly valid published because there is an indirect reference to the basionym ("ssp. *tuberculata* (Boiss.) Maire, comb. nov.").

= *Anthemis tuberculata* var. *microcephala* Boiss., Voy. Bot. Espagne 2: 311 (1840) ≡ *A. pedunculata* var. *microcephala* (Boiss.) Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934). – Ind. loc.: "in Sierra Nevada vallibus propè Cortijo de Rosales." – Lectotype (Burdet & al. 1983: 761): [Spain] "Environ de Rosales, S^{a} Nevada", *Boissier* (G!).

Note. – Again, contrary to the opinion of Fernandes (1983: 386) and Benedí i González (1987: 260), Maire's combination is validly published through indirect reference to the basionym ("var. *microcephala* Boiss.").

= *Anthemis tenuisecta* Pomel, Nouv. Mat. Fl. Atl.: 50 (1874), [non Ball 1873]. – Ind. loc.: "Lieux pierreux des montagnes: Zaccar de Miliana." – Lectotype (designated here): [Algeria] "Milianah, Zaccar de Miliana", *Pomel* (P!; isolectotype: MPU-AfN!).

= *Anthemis granulata* Pomel, Nouv. Mat. Fl. Atl.: 290 (1875) ≡ *A. tuberculata* var. *granulata* (Pomel) Battand. in Battandier & Trabut, Fl. Algérie: 455 (1889) ≡ *A. pedunculata* var. *granuata* (Pomel) Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934) ≡ *A. pedunculata* subsp. *granulata* (Pomel) Maire in Bull. Soc. Hist. Nat. Afrique N. 28: 362 (1937). – Ind. loc.: "Lieux rocheux des montagnes: Tiaret." – Lectotype (designated here): [Algeria] "Tiaret", 17 May 1860, *Pomel* (MPU-AfN!; isolectotype: P!).

Note. – Battandier (in Battandier & Trabut 1888-1890: 455) lists *Anthemis granulata* Pomel not in the synonymy of *A. tuberculata* Boiss. but as its variant. I accept this as a formal varietal combination, although Battandier in the preface matter (l.c.: IX), for that given infraspecific category [with names in italics, not preceded by a Greek letter], merely states that it correspondes "aux ... variétés ... de la plupart des flores; mais nous avons cru devoir supprimer ces termes ..." (see also discussion under *A. punctata* subsp. *kabylica*). In Battandier & Trabut (1905: 414) *A. granulata* is treated as a synonym of *A. tuberculata*. Battandier (1910: 53) lists *A. granulata* along with *A. clausonis* after *A. pedunculata* as "petites espèces". The first formal combination as subspecies was by Maire (1937).

= *Anthemis laeviuscula* Humbert & Maire in Mém. Soc. Sci. Nat. Maroc. 15: 40 (1927) ≡ *A. tuberculata* var. *laeviuscula* (Humbert & Maire) Maire in Bull. Soc. Hist. Nat. Afri-

que N. 20: 186 (1929) ≡ *A. pedunculata* var. *laeviuscula* (Humbert & Maire) Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934). – Ind. loc.: "Hab. in cedretis montis Tazzeka Atlantis Medii septentrionalis, solo siliceo, ad alt. 1800-1980 m., junio florens. - Typus in Herb. Univers. Algeriensis et in Herb. Inst. Imper. Scient. Rabatensis." – Lectotype (designated here): [Morocco] "In Atlantis Medii montibus supra urbem Taza: in cedretis montis Tazzeka, solo siliceo", 1800-1900 m, 18 Jun 1925, *Maire* (MPU-AfN!; isolectotypes: P!, RAB?).

= *Anthemis punctata* var. *maroccana* Maire in Bull. Soc. Hist. Nat. Afrique N. 22: 51 (Jan 1931) et in Bull. Soc. Hist. Nat. Afrique N. 22: 296 (Nov 1931). – Ind. loc.: "Grand Atlas: Mons Ouensa, Aziouel, Touchka (Ibrahim in Herb. Univ. Alger et in Herb. Cosson)." – Lectotype (designated here): [Morocco] "Dj. Touchka, Montagne au Sud-Ouest de la Ville de Maroc", 1876, *Ibrahim* (MPU-AfN!; isolectotype: G!).

= *Anthemis punctata* var. *microcephala* Faure & Maire in Bull. Soc. Hist. Nat. Afrique N. 22: 296 (1931). – Ind. loc.: "Hab. in lapidosis arenaceis montium Algeriae occidentalis prope Daya (Bossuet), ad alt. c. 1200 m (A. Faure)." – Lectotype (designated here): [Algeria] "Environs de Bossuet, Pelouses et broussailles", 1300 m, 6 Jun 1927, *Faure* (MPU-AfN!).

– *Anthemis pedunculata* var. *tuberculata* J. Gay in Balansa [sched. impr.], Pl. Algérie 1852: n° 508, nom. nud.

– *Anthemis clausonis* auct. [non Pomel 1874]: Sennen & Mauricio, Cat. Fl. Rif Or.: 59 (1933).

Exs.: Balansa, Pl. Algérie 1852: n° 508 (sub *"Anthemis pedunculatá* var. *tuberculata"*); Balansa, Pl. Algérie 1853: n° 967 (sub *"Anthemis tuberculata"*); Bourgeau, Pl. Algérie 1856: n° 87 (sub *"Anthemis tuberculata"*); Munby, Pl. Alger. Exs. 1856: n° 12; Font Quer, Iter Marocc. 1927: n° 664 (sub *"Anthemis tuberculata"* et *"A. pedunculata"*); Soc. Cénom. Exs. 1929: n° 2253 (sub *"Anthemis laeviuscula"*); De Retz, Soc. Franç. Éch. Pl. Vasc. 1956-1957: n° 3091 (sub *"Anthemis pedunculata* var. *eu-tuberculata"*).

Rhizome (1.6-)2.3-6.8(-14.0) mm in diameter. Stems (3.5-)15-37(-65) cm long, basally (0.5-)1.1-2.7(-5.5) mm in diameter, often unbranched and bearing a single capitulum, sometimes branched in the distal half and with 2-5(-8) capitula, glabrous or sparsely to densely hairy. Lower cauline leaves and leaves of non-flowering shoots (10-)15-45(-75) mm long and (3-)6-17(-30) mm wide, elliptical to obovate or narrowly elliptical to narrowly obovate in outline, petiolate; petiole (5-)8-20(-35) mm long; base usually with 2-5(-7) pairs of entire teeth; blade (1-)2-3-pinnatisect, with 2-4 pairs of elliptical to obovate primary lobes; ultimate segments triangular to elliptical or narrowly elliptical to linear, (1.0-)1.7-2.7(-3.3) mm long and (0.3-)0.6-1.1 mm wide, glabrous or sparsely to densely hairy. Middle and upper cauline leaves (6-)9-38(-85) mm long and (3-)7-17(-38) mm wide, ovate or broadly elliptical to narrowly elliptical in outline, sessile or with an up to 3-12(-25) mm long petiole; base with 1-3 pairs of entire teeth; lamina 1-2(-3)-pinnatisect, with 2-4 pairs of primary lobes; ultimate segments (1.0-)1.7-3.3(-4.2) mm long and (0.5-)0.7-1.1(-1.5) mm wide, narrowly elliptical to linear, glabrous or sparsely to densely hairy. Peduncles (15-)45-110(-160) mm long and (0.3-)0.9-1.5(-2.1) mm in diameter. Capitula (8-)20-30(-37) mm in diameter, heterogamous. Involucre (6-)9-13 mm in diameter. In-

volucral bracts glabrous or sparsely to densely hairy; the outermost ovate or triangular to narrowly triangular, (2.1-)2.4-3.5(-4.4) mm long and (0.7-)0.9-1.3(-1.6) mm wide; membranous margins laterally 0.1-0.2(-0.3) mm wide, apically (0.2-)0.5-0.9(-1.1) mm wide; the middle ones narrowly ovate to narrowly elliptical, (2.7-)3.2-4.4(-5.5) mm long and (0.8-)1.0-1.4(-1.6) mm wide, with laterally (0.1-)0.2-0.4(-0.5) mm wide, apically (0.6-)0.7-1.2(-1.7) mm wide, membranous margins; the innermost narrowly elliptical, (3.1-)3.4-4.4(-5.3) mm long and (0.8-)0.9-1.4(-1.6) mm wide, with laterally (0.1-)0.2-0.4(-0.6) mm wide, apically (0.4-)0.7-1.2(-1.8) mm wide, membranous margins. Receptacle (1.2-)1.9-2.9(-3.7) mm in diameter and (1.5-)2.1-3.3(-4.2) mm high at maturity. Ray florets (8-)11-16(-21) per capitulum, white, female, (5.9-)7.6-12.2(-15.7) mm long; limb elliptical to narrowly elliptical [index (1.5-)1.7-2.6(-3.1)], (4.9-)6.3-10.6(-13.8) mm long and (2.7-)3.2-4.7(-5.4) mm wide, apically 3-lobed; tube sparsely glandular, (1.0-)1.2-1.7(-2.1) mm long and 0.6-0.9 mm wide. Pales (2.6-)2.9-3.9(-4.6) mm long and (0.2-)0.4-0.6(-0.8) mm wide, basally 0.2-0.55 mm wide; persistent at maturity. Disc florets (1.9-)2.5-3.1(-3.5) mm long; the basal part (0.65-)1.0-1.4(-1.9) mm long and (0.45-)0.7-1.1(-1.3) mm wide. Achenes of ray florets 1.7-2.3 mm long and 0.5-0.9 mm in diameter, fusiform, round to somewhat triangular in cross-section, adaxially bent; ribs 8-10; without corona or with an up to 0.1 mm long adaxial auricle. Achenes of disc florets (1.3-)1.6-2.1(-2.6) mm long and (0.7-)0.9-1.1(-1.3) mm in diameter; corona missing or an up to 0.25(-0.6) mm long crenulate auricle.

Chromosome number. – $n = 9, 18$; $2n = 18, 36, 37$ (see discussion in chapter 10).

Distribution and habitat. – Throughout the range of the subspecies (Fig. 156), usually on sandy and rocky soils in more or less heavily grazed clearings of *Cedrus atlantica* (Endl.) Carrière, *Quercus rotundifolia* Lam., *Q. canariensis* Willd., *Q. coccifera* L., and *Q. faginea* Lam. forests, sometimes in *Q. suber* L. forests, in N Morocco in stands of *Abies maroccana* Trabut and *A. tazaotana* Huguet de Villar, in degraded forest communities dominated by *Cistus* species and *Chamaerops humilis* L., in reafforestations with *Pinus halepensis* Miller, in arable fields and along field margins, along roadsides, and steep limestone or sandstone cliffs, on calcareous, siliceous and volcanic soils.

Variation and taxonomy. – Due to its vast distribution area and wide ecological amplitude, *Anthemis pedunculata* var. *pedunculata* exhibits considerable morphological variation, which has caused the description of a number of infraspecific taxa or separate species.

Plants with small capitula were described by Boissier (1840) as *Anthemis tuberculata* var. *microcephala.* Fernandes (1983) and Benedí i González (1987) assumed that the small

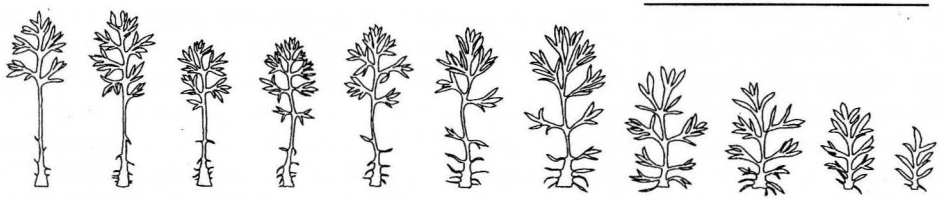


Fig. 152. *Anthemis pedunculata* var. *pedunculata* ($2n = 36$): leaf spectrum *(Vogt 9590 & Oberprieler 4026).* – Scale bar = 5 cm.

capitula along with the small overall size of the type specimen was due to unfavourable growing conditions and lacks taxonomic significance, which I accept.

Large-headed specimens from the W High Atlas mountains (Djebel Ouensa, Djebel Aziwel, Djebel Touchka), collected by Ibrahim Ammeribt, a Moroccan plant collector (see Cosson 1881: 49-51), and considered by Cosson to represent *Anthemis punctata,* were described by Maire (1931a, b) as *A. punctata* var. *maroccana.* Their involucres reach 14 mm in diameter, much more than is normal in representatives of *A. pedunculata* var. *pedunculata.* There are good reasons to deny taxonomic recognition to *A. punctata* var. *maroccana:* In other stands of *A. pedunculata* var. *pedunculata* (e.g. in the Middle Atlas mountains), cytological studies revealed a weak tendency for tetraploids to have larger flower-heads than diploids growing in the same locality. However, exceptions exist. Among the plants with the largest capitula one was a diploid *(Vogt 15264 & Oberprieler 9573),* and in most of the populations studied, specimens with extremely large flower-heads are connected with plants with smaller capitula by a series of intermediates. The same is true for Ibrahim Ammeribt's collections from the W High Atlas mountains. The occurrence of intermediates and the fact that capitula of *A. punctata* var. *maroccana* are consistently smaller than those of the tetraploid species *A. abylaea* and *A. punctata* argue for its inclusion in *A. pedunculata* var. *pedunculata.*

Anthemis pedunculata var. *pedunculata* also varies in achene sculpturing. Plants with extremely tuberculate achenes were described as *A. granulata* by Pomel (1874-1875), while specimens with nearly smooth achenes were named *A. laeviuscula* by Humbert & Maire (in Maire 1927). Both were subsequently treated as varieties of *A. pedunculata* (Jahandiez & Maire 1934). Since the achene sculpturing strongly depends on the maturity of achenes and neither a correlation of this character with any other feature nor a clear geographical pattern of variation could be detected, *A. granulata* and *A. laeviuscula* have been included in *A. pedunculata* var. *pedunculata.*

Plants described as *Anthemis punctata* var. *microcephala* by Faure & Maire (in Maire 1931b) were considered to be similar to *A. tuberculata* (= *A. pedunculata* var. *peduncu-*

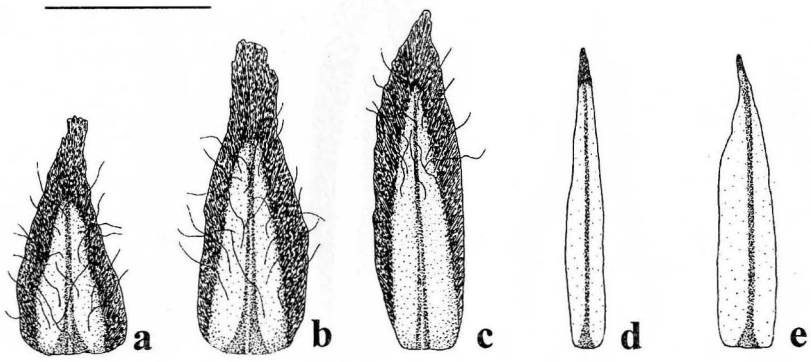


Fig. 153. *Anthemis pedunculata* var. *pedunculata* (2*n* = 18): (a-c) involucral bracts *(Vogt 9628 & Oberprieler 4064),* (d-e) pales (d, *id.;* e, *Oberprieler 3878*). – Scale bar = 2 mm.

lata) in habit and capitulum dimensions but to differ by abruptly acuminated pales and coronate achenes, which the authors held to be typical for *A. punctata*. A few years later, Maire (1933) treated *A. punctata* var. *microcephala* as a synonym of *A. granulata*. Since achenes with a long auricle are found in many specimens of *A. pedunculata* var. *pedunculata,* uncorrelated with other features and distributed randomly, and since the shape of pales falls within the variation range of the latter taxon, *A. punctata* var. *microcephala* is here included in it.

Plants of *Anthemis pedunculata* var. *pedunculata* with finely dissected leaves and narrowly elliptical to subfiliform ultimate leaf segments were illegitimately named *A. tenuisecta* by Pomel (1874). Later the same author (Pomel 1875), sank the name under *A. pedunculata*. Leaf dissection in *A. pedunculata* var. *pedunculata* is highly variable, and plants with narrow ultimate leaf segments (*Podlech 39294;* Gorges de la Chiffa, 28 May 1914, *Maire,* MPU-AfN; Milianah, 17 Apr 1873, *Joad,* K) are found throughout the geographical range of the species. Therefore, these deviating forms do not deserve formal taxonomic recognition.

Anthemis pedunculata var. *pedunculata* is usually characterised by involucral bracts with light to dark brown membranous margins. In the contact zone with *A. pedunculata* subsp. *clausonis,* around Alger and Blidah (N Algeria), plants with pale membranous margins are found (Gorges de la Chiffa, 28 May 1914, *Maire;* ibid., 5 Jun 1937, *Dubuis;* Aïn Telazit, 16 Jul 1842, *Durieu;* Oued-Sidi-el-Kebir, 19 Jul 1854, *Cosson*). They are considered to be intermediate between the two subspecies, but are referred to subsp. *pedunculata* due to their habit and their habitat in the mountainous areas of the Tell Atlas.

Plants from around Aïn el Turck near Oran (e.g. 16 Apr 1856, *Borgeau*), Tiaret (e.g. 1845, *Delestre*), and the Algerian Sahara Atlas around Aïn Sefra (e.g. Djebel Beni-Smir, 2 Jun 1918, *Maire; Hochreutiner 242, 359*) deviate from *Anthemis pedunculata* var. *pedunculata* by the broad, pale membranous margins of their middle and inner involucral bracts,

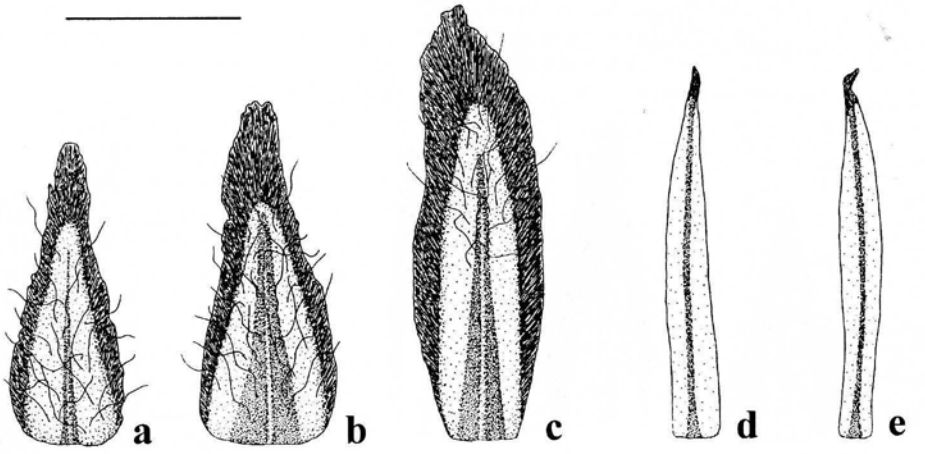


Fig. 154. *Anthemis pedunculata* var. *pedunculata* (*2n* = 36): (a-c) involucral bracts (Touchka, 1870, *Ibrahim*), (d-e) pales (d, 20 Jun 1875, *Ibrahim;* e, 22 Jun 1875, *Ibrahim*). – Scale bar = 2 mm.

by which they approach *A. pedunculata* subsp. *atlantica* from E Algeria. However, in contrast to the latter taxon, their inner involucral bracts are never obovate and their pales usually taper gradually into the tip. The mentioned specimens are, therefore, assigned to *A. pedunculata* var. *pedunculata*.

Specimens seen. – [Algeria, Alger] Terrains sabloneux, forêt de St. Ferdinand près Zeralda, [36°43′N, 2°49′E], 5 May 1889, *Moreau* (G). Environs d'Alger, [36°47′N, 3°4′E], 1838, *Bové 178* (G). – [Batna] In rupestribus calcareis prope jugem Talmet, NW ab urbe Batna, 1600-1700 m, [35°N, 6°E], 11 Apr 1938, *Maire* (MPU-AfN). Mts. de Belezma, Col Telmet, W Batna an der Straße nach Merouan, 1730 m, Zedernwälder auf Kalk, 35°36′N, 6°3′E, 9 Jun 1984, *Podlech 38937* (MSB). N side of Col de Telmet, W of Batna, 1450 m, gully in Cedrus forest, [35°36′N, 6°3′E], 21 May 1971, *Davis 52583* (RNG). Djebel Tougour près Batna, [35°34′N, 6°3′E], 22 May 1853, *Cosson* (P). Aurès: Dj. Mahmel, escarpements calcaires du verrant N, 2150 m, [35°20′N, 6°10′E], 30 Jun 1920, *Maire* (MPU-AfN). – [Bejaïa] Sommet du Dj. Babor, [36°32′N, 5°6′E], 20 Jun 1880, *Cosson* (P). Djebel Babor, [36°32′N, 5°6′E], 21 Jun 1880, *Cosson* (P). Monts Babors, lieux arides, sur le calcaire, 1800 m, [36°32′N, 5°6′E], Jul 1897, *Reverchon* (P). Parc national du Babor, pentes S du Djebel Babor, à environ 45km au SE de Béjaïa, alt. 1400 m, boisements de chênes verts sur rocailles calcaires, [36°27′N, 5°23′E], 5 Jun 1980, *Dubuis, n° 10736* (MSB; G; RNG; BC 647741; SEV 112294). – [Blidah] Kolea, sur les collines, [36°38′N, 2°46′E], May 1838, *Bové 201* (P; G). Coleah, sur les collines, [36°38′N, 2°46′E], May 1838, *Bové* (K). Col de Chréa (Atlas de Blidah),

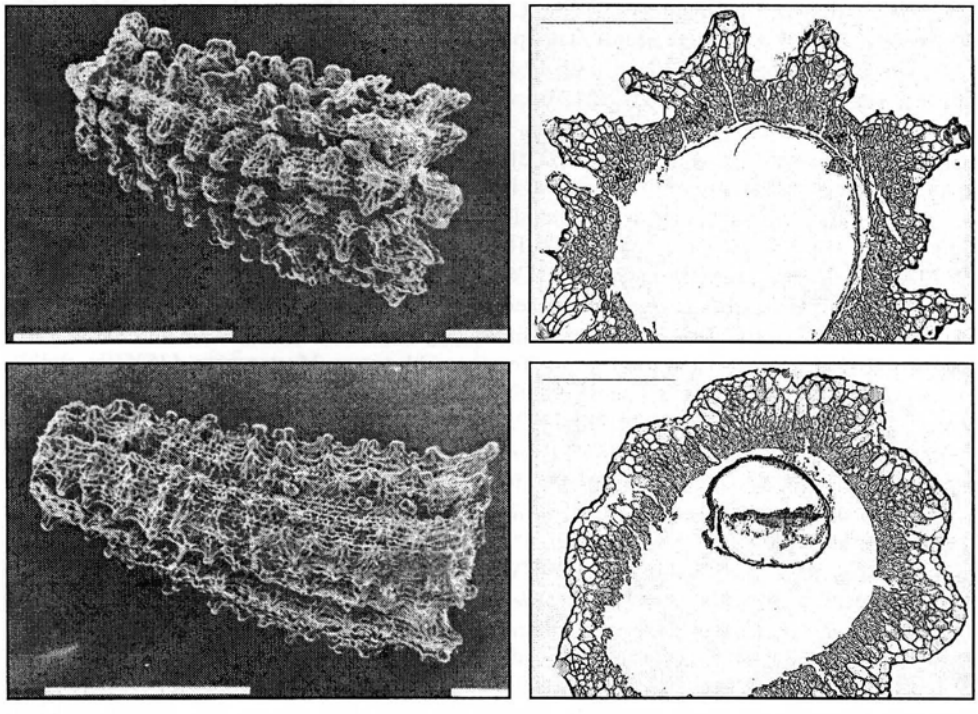


Fig. 155. Micrographs of achenes of disc florets of *Anthemis pedunculata* var. *pedunculata*. Upper row: diploid specimen *(Vogt 9440 & Oberprieler 3878);* lower row: tetraploid specimen *(Vogt 11829 & Oberprieler 6277).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

[36°29′N, 2°48′E], 23 May 1914, *Hibon* (P). Ravin de l'Oued-Sidi-el-Kebir près Blidah, [36°29′N, 2°48′E], 19 Jul 1854, *Cosson* (P). Chréa (1500 m alt.), [36°29′N, 2°48′E], 11 Jul 1939, *Gombault* (P). Sous les chênen-verts, près des Glacières, vers 1200 m, Atlas de Blidah, [36°26′N, 2°50′E], 3 Jun 1951, *Dubuis* (MPU-Dubuis). Blidah, [36°26′N, 2°50′E], Jun 1850, *s.coll.* (K). Glacièrs Laval, au dessus de Blidah au Mont des Beni-Salah, altitude 1150 m, [36°26′N, 2°50′E], Oct 1887, *Luizet* (B). Aïn Selagil [?], Blidah, [36°26′N, 2°50′E], 186[?], *Lefebvre* (K). Talus schisteux, Gorges de la Chiffa, [36°25′N, 2°46′E], 5 Jun 1937, *Dubuis* (MPU-AfN). Gorges de la Chiffa, rocailles schisteuses, [36°25′N, 2°46′E], 28 May 1914, *Maire* (MPU-AfN; P). Pentes [...] de l'Atlas, [...] Blidah, 16 Jul 1842, *Durieu de Maisonneuve* (P). Pentes inférieurs de la montagne d'Aïn Telazit près Blidah, 16 Jul 1842, *Durieu de Maisonneuve* (P). Montagnes d'Aïn Telazit, 14 Jun 1854, *s.coll.* (P; G). – [Bouira] Talus rocailleux de la route dans la cédraie du Tigouatine, vers 1500 m, près de Tikjda, Massif du Djurdjura, [36°N, 4°E], 30 Jun 1976, *Dubuis* (MPU-Dubuis). Ligne de crêtes entre le Lalla Khelidja et le col de Tirourda, [36°28′N, 4°21′E], 26 Jun 1875, *Duhamel* (G). Lalla Khadidja, rocailles calcaires vers 2300 m, [36°27′N, 4°14′E], 8 Jul 1914, *Maire* (MPU-AfN). Lalla-Khadidja (Djurdjura), rochers calcaires vers 2300 m, [36°27′N, 4°14′E], 8 Jul 1914, *Maire* (MPU-AfN). Djurdjura, cédraies à Tikjda, calcaire, 1600 m, [36°26′N, 4°10′E], 26 May 1927, *Maire* (MPU-AfN; P). Environs de Tala Rana (Versant méridional du Lalla Khelidja, [36°26′N, 4°14′E], 20 Jun 1875, *Duhamel* (G). Massif du Djurdjura, oberhalb Takerbouzt an der Straße von Chorfa zum Col de Tirourda, 1270 m, 36°25′N, 4°22′E, 10 Jun 1984, *Podlech 38994* (MSB; G 306995). In pascuis montis Dira, solo arenaceo, 1200-1800 m, [36°5′N, 3°38′E], 31 May 1936, *Maire* (MPU-AfN; P). Djurdjura, near Tikjda, c. 1400 m, rock limestone slope in *Cedrus-Quercus ilex* zone, 3 Jun 1971, *Davis 53059* (RNG). Djurdjura, near Tikjda (*Cedrus* zone), c. 1450 m, shaley banks, 7 May 1971, *Davis 52007* (RNG). – [Djelfa] Pinèdes des pentes Sud du Djebel Senalba vers 1300 m, à l'Ouest de Djelfa (Sud algérois), [34°33′N, 3°0′E], 17 Jun 1954, *Herb. Faurel* (MPU-Dubuis). – [El Asnam] Zaccar de Miliana, [36°20′N, 2°12′E], *Pomel* (MPU-AfN; P). Miliana, [36°18′N, 2°13′E], Jun 1856, *Herb. Pomel* (MPU-AfN). Milianah, [36°18′N, 2°13′E], 17 Apr 1873, *Joad 1882* (K). In cedretis prope Tenied el Had, [35°52′N, 2°2′E], 14 May 1888, *Letourneux* (P). Rocailles calcaires des pentes nord-ouest du Kef Sidi-Amar, entre 1600 et 1800 m, à environ 40 km au sud-sud-est d'El Asnam (ex Orléansville), Massif de l'Ouarensis, [35°51′N, 1°37′E], 16 Jun 1978, *Dubuis* (MPU-Dubuis). – [Jijel] Tamesguida, forêts, 1400-1800 m, [36°N, 5°E], 3 Jul 1912, *Maire* (MPU-AfN; P). – [Médéa] Atlas de Blidah, pelouses de Cédraies schistes, 1500 m, [36°26′N, 2°50′E], 27 May 1914, *Maire* (MPU-AfN; P). In pascuis arenaceis prope Ben-Chicao, 1200 m, [36°12′N, 2°45′E], 19 May 1935, *Maire* (MPU-AfN; P). Boghar, Djebel Zaig (1.100 m), [35°58′N, 2°43′E], Jun 1897, *Debeaux* (BC 801722). – [Mostaganem] Terrains sablonneux, Mostaganem, [35°56′N, 0°3′E], May 1917, *d'Alleizette* (G). – [Oran] In rupibus calcareis maritimis ad Promontorium Carbonem prope Saldas, [36°47′N, 5°7′E], 19 Jun 1937, *Maire* (MPU-AfN). Champs à Aïn el Turc, près d'Oran, [35°46′N, 0°45′W], 16 Apr 1856, *Bourgeau* (K; P; G). a la plaine des Andalous, [35°45′N, 0°46′W], Apr 1849, *Reuter* (G). Christel, [35°50′N, 0°30′W], 5 May 1875, *Cosson* (P). Cap Falcon (Oran), [35°48′N, 0°49′W], Apr 1913, *d'Alleizette* (P). Plaine du Cap Falcon, près d'Oran, [35°45′N, 0°48′W], 20 Apr 1852, *Balansa, n° 508* (MPU-AfN, K; GOET; G; BC 136271; P). In collibus siccis, Oran. Maio fl., [35°45′N, 0°48′W], 1856, *Munby, n° 12* (K; P; G). Moissons du env. d'Oran, [35°42′N, 0°38′W], May 1920, *d'Alleizette* (P). Prov. d'Oran, 9 May 1875, *Cosson* (P). Champs sablonneux, Bedean, Jun 1921, *Alleizette* (MA 127034). in arenosis prope La Stidia, Apr 1849, *Reuter* (G). Pentes du Djebel Santo [...] de St. André, env. d'Oran, 13 May 1852, *Cosson* (P). Prov. Oran, ravins du Djebel Santo, Apr 1849, *Reuter* (G). – [Saïda] Partie superieur du Djebel Ksel près Geryville (El Biad), [33°45′N, 1°10′E], 30 May 1856, *Cosson* (K). Djebel Ksel près Géryville (El Biod), [33°45′N, 1°10′E], 30 May 1856, *Cosson* (MPU-AfN; P). Djebel Aïssa, versant SE, alt. ca. 1750 m, sous bois dans la forêt de pins, [32°52′N, 0°31′W], 19 May 1901, *Hochreutiner 359* (G). Djebel Aïssa, rochers griseux, 2000 m, [32°52′N, 0°31′W], 10 Jul 1913, *Maire* (MPU-

AfN). Ras Chergui sur Aïn Sefra à mi-côte et jusqu'au sommet, 1500-2000 m, [32°45′N, 0°35′W], 16 May 1901, *Hochreutiner 242* (G). Sahara, Aïn Sefra, au Ras-Chergui, [32°45′N, 0°36′W], 3 Jun 1899, *Chevallier* (P). Haut plateau, entre Tafraoud et Saïda, 1 Jun 1852, *Cosson* (P). – [Sidi-Bel-Abbès] Tessala, [35°15′N, 0°45′W], 27 Apr 1876, *Gavard-Moreau* (G). Bussuet, Bords de la route de Margenta, 1300 m, [34°40′N, 0°43′W], 1927 & 1928, *Faure* (MPU-AfN). Env. de Bossuet, Pelouses rocailleuses, [34°40′N, 0°39′W], 21 Apr 1927, *Faure* (K). Environs de Bossuet, vers Sidi-Yayan, bords des champs et des chemin (1200 m), [34°11′N, 0°39′W], 18 Jun 1938, *Faure* (MPU-AfN). Bossuet, près du Monument de Forestiers, Pelouses et broussailles (1200 m), [34°11′N, 0°39′W], 1 Jun 1938, *Faure* (MPU-AfN). Environs de Bossuet, Pelouses et broussailles (1300 m), [34°11′N, 0°39′W], 6 Jun 1927, *Faure* (MPU-AfN). Pentes du Djebel Tessala, près Sidi-bel-Abbès, 6 May 1873, *Warion* (K). – [Tiaret] Forêt de cèdres de Teniet-el-Haad, [35°52′N, 2°2′E], 29 Jul 1854, *Cosson* (P). Montagnes de l'Ouarsensis, [35°52′N, 1°37′E], 25 Jul 1854, *Cosson* (P). Sersou, [35°30′N, 1°45′E], *Herb. Battandier* (MPU-AfN). Tiaret, [35°22′N, 1°19′E], 1845, *Delestre* (P). in quercetis circa Tiaret, solo arenaceo, 1100 m, [35°22′N, 1°19′E], 29 Jun 1932, *Maire* (MPU-AfN; P). Tiaret, [35°22′N, 1°19′E], *Pomel* (MPU-AfN; P). Nador (de Tiaret), [35°22′N, 1°19′E], *Herb. Pomel* (MPU-AfN). Tiaret, [35°22′N, 1°19′E], *Herb. Battandier* (MPU-AfN). – [Tizi Ouzou] Djurdjura, cédraies du Mont Tigounatin, calcaire, 1600-1700 m, [36°N, 4°E], 8 Jun 1930, *Maire* (MPU-AfN). Bord de la route touristique de l'Akfadou, dans la futaie des Chênes zeen et afarès, 1000 m, à environ 7km `l'est de Yakouren - Massif de l'Akfadou-Kabylie, [36°45′N, 4°27′E], 27 May 1983, *Dubuis* (MPU-Dubuis). Nördliche Djurdjura, 10 km E Yakouren, *Quercus afares*-Wälder und Felsen S der Straße nach Kseur, 930 m, 4°30′E, 36°43′N, 14 Jun 1984, *Podlech 39294* (MSB; G). Michelet (Kabylie), [36°34′N, 4°19′E], 12 Jun 1909, *Saint-Lager* (G). Massif du Djurdjura, 4 km NE der Paßhöhe Tizi N'Kouilal, 1300 m, Kalkhänge an der Straße, 4°16′E, 36°29′N, 12 Jun 1984, *Podlech 39137* (MSB; G 351006). Massif du Djurdjura, N'Hänge des Col de Tirourda, Silikatfelsen an der Straße nach Ain El Hammam, 1550 m, 4°20′E, 36°29′N, 11 Jun 1984, *Podlech 39060* (Podlech; G). Massif du Djurdjura, Col de Tirourda an der Straße von Chorfa nach Ain El Hamman, 1750-1800 m, Kalk & Silikat, 4°20′E, 36°28′N, 10 Jun 1984, *Podlech 39007* (MSB; G). Fissures des rochers dominant le chemin Lapie vers 1700 mètres, Massif de l'Aizer, Djurdjura, [36°24′N, 4°2′E], 6 Jul 1935, *Faurel* (MPU-Dubuis). – [Tlemcen] Tlemcen, à Lalla-Seti, Champs

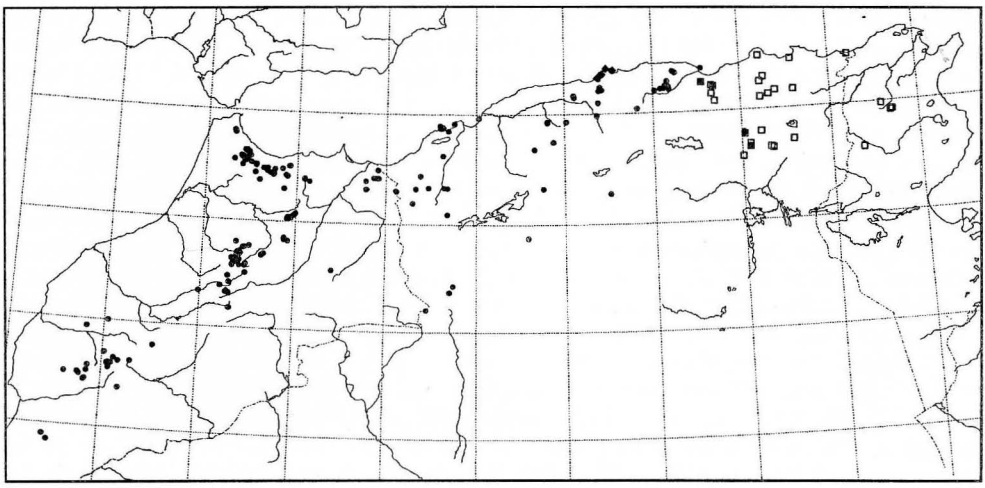


Fig. 156. N African distribution of *Anthemis pedunculata* (● var. *pedunculata*, □ subsp. *atlantica*, ◆ subsp. *clausonis*).

incultes (900 m), [34°53′N, 1°15′W], 3 Jun 1935, *Faure* (MPU-AfN). Dj. Ouargla, [34°40′N, 1°4′W], 6 Jun 1916, *Champsaur* (MPU-AfN). Sebdou, Sud-ouest de la province d'Oran, [34°39′N, 1°21′W], 21 May 1856, *Cosson* (P). Terni, [34°39′N, 1°31′E], *Herb. Pomel* (MPU-AfN). Terni, forêts vers Sebdou calcaire, 1200 m, [34°39′N, 1°21′W], 24 Jun 1914, *Maire* (MPU-AfN). Montagnes, Tlemcen, [34°36′N, 1°47′W], May 1912, *Herb. d'Alleizette* (P). Ghar-Rouban, [34°36′N, 1°47′W], 29 Jun 1881, *Herb. Pomel* (MPU-AfN). Au pied des falcaises de la vallée de Degieu, Massif de Ghar Rouban, [34°36′N, 1°47′W], 2 Jun 1936, *Herb. Faurel* (MPU-Dubuis). GR. (= O. Ghar-Rouban), [34°36′N, 1°47′W], May 1856, *Pomel* (MPU-AfN). Djebel Tirny, Tlemcen, [34°36′N, 1°47′W], May 1857, *s.coll.* (K). Plateau de Tirmy, Tlemcen, [34°36′N, 1°47′W], 12 May 1855, *Munby* (K; G). Terrains rocailleux dans les boisements dégradés de chênes-verts, sur les pentes nord du Massif de Ghar-Rouban, près du Col de Krorchef, vers 700 m, [34°36′N, 1°47′W], 23 May 1980, *Dubuis* (MPU-Dubuis). Tlemcen, [34°36′N, 1°47′W], *Lenepran* (K). Lieux pierreux à Gharrouban, au Sud de Lalla-Maghrnia, [34°36′N, 1°47′W], 23 May 1859, *Bourgeau, n° 87* (MPU-AfN; GOET; P; K; G). in montibus supra Tlemcen, [34°36′N, 1°47′W], Apr 1849, *Boissier & Reuter* (G). Lx. incult., Tlemcen, [34°36′N, 1°47′W], May 1914, *Herb. d'Alleizette* (P). Tlemsen, [34°36′N, 1°47′W], 1849, *Boissier & Reuter* (K). El Aricha, [34°23′N, 1°25′W], Jun 1891, *Trabut* (MPU-AfN). Sidi-Djiali, 5 May 1916, *Maire* (MPU-AfN). – [Not located] Djurdjura, [36°N, 4°E], Jun 1883, *Herb. Battandier* (MPU-AfN). In quercetis ad fontem cordi (Aïn-Ghoraba) supra Pomaria, solo calcareo, 1200-1300 m, 22 May 1933, *Maire* (MPU-AfN; P). Ouadhia, marges humits amb *Hordeum, Daucus, Avena,* etc., 940 m, roques Si, 8 Jun 1990, *Romo 5462 & al.* (BC 821021).

[Morocco, Agadir] W-side of Djebel Lekst, c. 7.3 km W of pass Tizi-n-Tagounit on track 7056 between Tioulit and Tanalt, field margins, 1550-1570 m, [29°48′N, 9°8′W], 16 May 1993, *Vogt 11829 & Oberprieler 6277* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). – [Al Hoceima] Targuist, carretera de Targuist a Al Hoceima, Jbal el Bábet, a 6 km de Beni Hadifa, 35°00'54"N, 4°10'49"W, 1250 m, jarales y encinares degradados sobre esquistos, 12 May 1994, *Montserrat 5261/4 & al.* (SEV). between Targuist and Beni Hadifa, 5 km to Beni Hadifa, acid soils, vegetation with *Arbutus unedo* and *Q. coccifera*, 35°01'N, 4°10'W, 1150 m, 30 Jun 1993, *Valdés 1140/93 & al.* (SEV). Targuist to Al Hoceima road near Beni-Hadifa, 35°01'N, 4°11'W, 1110 m, weed in field, 29 Jun 1993, *Jury 11298 & al.* (RNG). Atlas Rifain, Targuist à Bab-Izugar, 1230 m, [34°58′N, 4°20′W], 20 Jun 1933, *Sennen & Mauricio, n° 8818* (MPU-AfN; BC 136277; BC-Sennen 819950, 819952; MA 127119). Atlas Rifain, Ketama à Isaguen cedretum et broussaille, 1600 m, [34°57′N, 4°30′W], 10-11 Apr 1935, *Sennen & Mauricio* (MA 174441). Beni-Seddat: Isaguen, broussailles, vers 1780 m, [34°57′N, 4°30′W], 6 Jul 1932, *Sennen & Mauricio* (MPU-AfN). Rif central: Djebel Tidirhine, c. 9 km from Tetla Ketama along track to Djebel Tidirhine, *Cedrus* forest, wet area, acid soils, 1750 m, 34°53'N, 4°34'W, 20 Jun 1992, *Vogt 9590 & Oberprieler 4026* (B; Herb. Oberprieler; Herb. Vogt). In Atlante Rifano: Souk-et-Tnine, in quercetis solo schistaceo, 1450 m, [34°53′N, 4°56′W], 20 Jun 1926, *Maire* (MPU-AfN; P). Rif central: Djebel Tidirhine, 1 km SW of Tleta Ketama, 4 km along track from road S 302 to Djebel Tidirhine, *Quercus ilex* woodland with stream above village, limestone rocks, 1500 m, 34°43'N, 4°36'W, 20 Jun 1992, *Vogt 9574 & Oberprieler 4010* (Herb. Oberprieler; Herb. Vogt). Rif central: Djebel Tidirhine, summit and W ridge of Djebel Tidirhine, *Cedrus* forest and schistous scree, 2200-2450 m, 34°52'N, 4°31'W, 20 Jun 1992, *Vogt 9588 & Oberprieler 4024* (B; Herb. Oberprieler). Azila, Koudinat Tighighine, SW facing sloped in the *Cedrus* forest on schistos, 34°51'N, 4°32'W, 1850 m, 30 Jun 1993, *Mejías & Silvestre 126/93* (SEV). Sidi Nannoh (Sidi Nanouh, 34°51'N, 4°32'W), 28 Jun 1929, *Font i Quer* (BC 808321). Tizzi Iffri 1800 (Tizi Ifri, 1800 m, 34°51'N, 4°15'W), 7 Jun 1927, *Font i Quer* (BC 808327, 808328). Beni-Ammart, Tizi-Ifri, cedretum, vers 1750 m, [34°50′N, 4°13′W], 5 Jul 1932, *Sennen & Mauricio* (P). In Atlante Rifano: in cedretis mintis Timellatin, solo

arenaceo, 1900 m, [34°50′N, 4°13′W], 23 Jun 1926, *Maire* (MPU-AfN). In Linsenacker auf Gebirgsbraunerde zwischen Tizi Ifri und Beni Ammart, 1800 m, [34°50′N, 4°13′W], 27 Apr 1985, *Deil 456* (Herb. Bayreuth). In Atlante Rifano: in rupibus calcareis montis Azrou, 1800-1900 m, [34°48′N, 3°50′W], 26 Jun 1926, *Maire* (MPU-AfN). Azrú, 1800 (Djebel Azrou Akchar, 1800 m. alt. 34°47'N, 3°50'W], 11 Jun 1929, *Font i Quer* (BC 811778). In Atlante Rifano: supra Targuist in quercetis montis Timouzaï, 1500 m, solo arenaceo, [34°36′N, 4°17′W], 22 Jun 1926, *Maire* (MPU-AfN; P). – [Azilal] Tahallati, Demnat, [31°35′N, 6°57′W], 1 Jun 1881, *Ibrahim* (K; P). Djebel Bouachfal, Province de Demnat, [31°35′N, 6°57′W], 3 Jun 1881, *Ibrahim* (K; P). – [Beni Mellal] El Ksiba - Tizi-n-Ouïrra, 29SQS70, in dumosis siccis, substrato calcareo, [32°40′N, 6°2′W], 6 May 1992, *Fernández Casas 13771 & Molero* (BC 820374). – [Chaouèn] Rif occidental: Djebel Tassaot, 7 km above Talembote on track to Djebel Tassaot, cultivated fields on limestone, 1195 m, 35°17'N, 5°8'W, 25 Jun 1992, *Vogt & Oberprieler 4086bis* (Herb. Oberprieler). Chefchaouen, subida al Jebel Tassaot por el Talembote, 35°17'N, 5°10'W, 800-1200 m, 21 Jun 1994, *Talavera & al. 3915/94* (SEV). Rif occidental: Djebel Tassaot, 10 km above Talembote on track to Djebel Tassaot, mixed forest with *Quercus rotundifolia* and *Q. alpestris*, 1565 m, 35°16'N, 5°8'W, 25 Jun 1992, *Vogt & Oberprieler 4083* (B; Herb. Oberprieler; Herb. Vogt). ibid., *Vogt & Oberprieler 4084* (Herb. Oberprieler). Chefchaouen, Talembote, Jbel Tazaut, meadows in the *Abies pinsapo* forest, 35°16'N, 5°07'W, 1550 m, 2 Jul 1993, *Mejías & Silvestre 337/93* (SEV). Djebel Tassaot, 14 km above Talembote on track to Djebel Tassaot, limestone, forest of *Abies maroccana*, 1600 m, 35°15'N, 5°5'W, 25 Jun 1992, *Vogt 9638 & Oberprieler 4074* (Herb. Oberprieler). Chefchaouen, Jebel Tassaot, pinsapar, suelos calcareos, 35°14'N, 5°06'W, 1500-1600 m, 21 Jun 1994, *Talavera & al. 3975/94* (SEV). In Atlante rifano: in quercetis montis Krâa, solo lapidoso calcareo, 1600 m, [35°11′N, 5°3′W], 25 Jun 1930, *Maire* (MPU-AfN). Picos de Xauen, Jebel kalaa, in sax. cal., 1200 (Djebel Kelaa, 1200 m, 35°11'N, 5°15'W), 11 Jun 1928, *Font i Quer* (BC 808341; MA 537278; SEV). In Atlante rifano: in abietetis et in lapidosis calcareis apricis montis Krâa, 1800-2100 m, [35°11′N, 5°3′W], 25 Jun 1930, *Maire* (P). Djebel Magot, 1200 m (35 10'N, 5 13'W), 21 May 1928, *Font i Quer* (MA 537279; BC 808338; SEV). Rif Occidental, Jbel Assillenh, 1150-1250 m, vallée de Tizi'N Lel, cantiles calizos, 35°10'N 5°15'W, 20 Jun 1988, *Romo 200688 & al.* (BC 821696). Rif occidental: Djebel Talamssantane, 14 km NE Bab Taza on track to Djebel Talamssantane, around and above forest-house, forests of *Abies maroccana* and *Cedrus atlantica*, S-facing limestone cliffs, 1765-1900 m, 35°09'N, 5°12'W, 26 Jun 1992, *Vogt 9668 & Oberprieler 4105* (B; G; Herb. Oberprieler; Herb. Vogt). Lexhab, 2000 (Djebel Lechchab, 2000 m, 35°08'N, 5°09'W), *Font i Quer* (BC 808309). Lexhab, 2000 m (Djebel Lechchab, 2000 m), [35°08′N, 5°09′W], 17 Jul 1932, *Font i Quer* (BC 808334; MA 537280; SEV). in monte Lexhab (Gomarz - Imp. Maroc.), in saxosis calc, ad 2100 m, [35°08′N, 5°09′W], 22 Jul 1930, *Font i Quer* (BC 808330). Chefchaouene, Carril del Djbel Lakraa, ladera N del Djbel Talassemtane, calizas en umbría, 35°08'N, 5°07'W, 1550-1680 m, 26 Jul 1995, *Mateos & al. 7318/95* (SEV). Hauta-el-Kasdir [a prop de Lechchab (Lexhab)], 1800, [35°08′N, 5°09′W], 3 Jul 1932, *Font i Quer* (BC 808333). Bab Taza, oberhalb des Forsthauses Talassamtane (Haouta-el-Kasdir), unter "pin noir", auf Kalkschutt, 1740 m, [35°08′N, 5°07′W], 6 Jul 1971, *Dittrich 1171* (G 157922). ascenso al Djebel Lakraa, calizas, ladera de orientación Este, con cedros y pinsapos, 35°08'N, 5°09'W, 1650-2159 m, 23 Jul 1995, *Mateos & al. 7016/95* (SEV). Lexhab (Djebel Lechchab, 2000 m), [35°08′N, 5°09′W], 6 Jul 1932, *Font i Quer* (BC 808308). Bab Taza, collado entre el Jbel Lakraa y el Jbel Taloussisse, 35°07'30"N, 5°08'10" W, 1620-1670 m, pastos pedregrosos, con dominancia de caméfitos prostrados y hemocriptófitos, gleras calizas y claros del pinsapar, 17 Jun 1993, *Molero & Montserrat 3933/5* (SEV). Rif occidental: Djebel Talamssantane, 14 km NE Bab Taza on track to Djebel Talmssantane, E-facing slopes of Djebel Lakraa E of the forest-house, forests of *Abies maroccana* and *Cedrus atlantica*, limestone, 2000-2100 m, 35°07'N, 5°11'W, 26 Jun 1992, *Vogt 9678 & Oberprieler 4116* (Herb. Oberprieler; Herb. Vogt). Rif occidental: Djebel Talamssantane, 14 km NE Bab Taza on track to Djebel Talamssantane, E-facing slopes of Djebel Lakraa E of forest-house, forests of *Abies maroccana* and *Cedrus atlantica*,

limestone cliffs, 1700 m, 35°07'N, 5°11'W, 26 Jun 1992, *Vogt & Oberprieler 4114* (Herb. Oberprieler). In Atlante rifano: Bab Amegas, in querceto togae, 1400-1600 m, solo arenaceo, [35°07′N, 5°10′W], 17 Jun 1928, *Maire* (MPU-AfN). In Atlante rifano: in abietis montis Tissouka, solo calcareo, 1800 m, [35°07′N, 5°10′W], 14 Jun 1928, *Maire* (MPU-AfN; P). Rif occidental: Djebel Talamssantane, 14 km NE Bab Taza on track to Djebel Talamssantane, E-facing slopes of Djebel Lakraa E of the forest-house, forests of *Abies maroccana* and *Cedrus atlantica*, limestone cliffs, 1900-2000 m, 35°07'N, 5°11'W, 26 Jun 1992, *Vogt 9677 & Oberprieler 4115* (B; Herb. Oberprieler; Herb. Vogt). Bab Taza, barranco entre Bou Slimane y el Jbel Lakraa, 35°06'15"N, 5°08'40"W, 1350 m, encinar con robles, cantiles y grandes bloques erráticos calizos, 17 Jun 1993, *Molero & Montserrat 3879/2* (SEV). Djbel Bouhalla, afloramiento kárstico, 35°06'N, 5°08'W, 1230-1858 m, 25 Jul 1995, *Mateos & al. 7270/95* (SEV). Rif occidental: Djebel Talamssantane, 10 km NE Bab Taza on track to Djebel Talamssantane, mixed forest of *Quercus rotundifolia* and *Quercus alpestris*, limestone rocks, 1420 m, 35°06'N, 5°11'W, 26 Jun 1992, *Vogt & Oberprieler 4089* (Herb. Oberprieler). entre Bab Taza y Bab Berred a 20 km de Bab Berred, suelo esquistoso quebrado, 35°04'N, 5°02'W, 1000 m, 23 Apr 1994, *Talavera & al. 4125/94* (SEV). Rif occidental: Djebel Tizirene, 5 km up track to Djebel Tizirene from road P 39 between Ketama and Chefchaouene, W-ridge of Djebel Tizirene, *Cedrus* forest, 1700 m, 35°02'N, 4°56'W, 24 Jun 1992, *Vogt 9628 & Oberprieler 4064* (B; G; K; RAB; RNG, SEV; Herb. Oberprieler; Herb. Vogt). Tétouan, cerca de Boureït, 1300 m, Bab Berré, en el cauce pedregoso de un arroyo, [35°02′N, 4°55′W], 29 May 1981, *Fernandez Casas 5336 & al.* (MA 441419). Dj. Tizirene, au N. de Bab Berred, 35°01'N, 4°55'W, 1600-1850 m, Cédraie, 20 Jun 1980, *Jacquemoud & Jeanmonod 1102* (G 229833). In Atlante rifano: in quercetis montis Khessana. solo arenaceo, 1500 m, [35°01′N, 5°13′W], 23 Jun 1930, *Maire* (MPU-AfN; P). Rif central: road P 39 from Ketama to Chefchaouene between Bab Berret und Bab Besen, c.20 km W Ketama, *Cedrus* forest, 1400 m, 34°58'N, 4°45'W, 22 Jun 1992, *Vogt 9596 & Oberprieler 4033* (B; Herb. Oberprieler; Herb. Vogt). 15 km W of Ketama by fountain on rd to Bab-Berret, 34°58'N, 4°40'W, 1680 m, grassy bank under *Cedrus* on granite (?), 1 Jul 1993, *Jury 11462 & Springate* (RNG; SEV). Rif, Targuist to Chechauèn, between Bab-Bessen and Bab-Berred, 1400 m, 34°55'N, 4°40'W, 27 Jun 1974, *Reading Univ. / B.M. Exped. 1087* (RNG). Hab. in herbosis supra emporium Sok-et-Tnin d. (Beni Hadifa), 1200 m, [34°53′N, 4°56′W], 24 May 1927, *Font Quer, n° 664* (MPU-AfN; G; BC 29681; MA 127122, 127033). In quercetis montis Outka, solo arenaceo, 1400-1500 m, [34°45′N, 4°50′W], 21 Jun 1928, *Maire* (MPU-AfN). – [Er Rachidia] Middle Atlas, road P 21 between Midelt and Azrou, 1 km S of Col du Zad, roadsides, 2125 m, [33°10′N, 5°05′W], 26 May 1993, *Vogt 11988* (B; G; K; RAB; Herb. Vogt; Herb. Oberprieler). Hoher Atlas, Schlucht Arhbalou n'Oussaka zwischen Jebel Masker und Jebel Bou Ijallabene S Assaka, Kalk, 1950-2000 m, 32°22′N, 5°22′W, 2 Jul 1989, *Oberprieler 3390-3 (1980-3)* (Herb. Oberprieler). ibid., *Oberprieler 3385 (1975)* (B). Nordostflanke des Jebel Bou Ijallabene S Assaka, Kalk, 2250-2500 m, 32°22′N, 5°22′W, 3 Jul 1989, *Oberprieler 3417* (Herb. Oberprieler). – [Fès] Daïet Achlef, (Moyen Atlas), bois des montagnes calcaires, 1800 m, [33°32′N, 5°00′W], 30 May 1923, *Jahandiez 385* (BC 29594; G). – [Figuig] Djebel Beni-Smir, sous les Quercus, grès, 2000 m, [32°25′N, 1°6′W], 2 Jun 1918, *Maire* (MPU-AfN; P). – [Ifrane] Moyen Atlas, Forêt de Jaaba, c. 15 km SE of El Hajeb on road to Ifrane (S 309), *Quercus canariensis* wood, 1400 m, 33°36'N, 5°17'W, 9 Jun 1992, *Vogt 9383 & Oberprieler 3821* (B; Herb. Oberprieler; Herb. Vogt). Ifrane, meadows around the pond in the village, 1700 m, 33°31.940'N, 5°06.479'W, 14 May 1995, *Vogt 15019 & Oberprieler 9328* (B; Herb. Oberprieler). station de biologie d'Ifrane, cédraie sur calcaires dolomitiques, alt. 1750 m, [33°31′N, 5°06′W], 20 May 1955, *Sauvage 12672* (G). road P 24 between Azrou and Ifrane, c. 1.6 km SW Ifrane, road embankment, 1750 m, 33°30.079'N, 5°08.502'W, 14 May 1995, *Vogt 15016 & Oberprieler 9325* (B; G; K; Herb. Oberprieler; Herb. Vogt). Zaïan, near Asrou, near base of Mischliffen ski lift, 1900 m, 33°25'N, 5°15'W, under trees on limestone, 25 Jun 1974, *Reading Univ. / B.M. Exped. 1017* (RNG). Forêt de Cédres S Azrou, 22 km NE of Aïn-Leuh on forest road Azrou - Aïn-Leuh, *Quercus rotundifolius - Viburnum tinus* wood-

land, 1580 m, 33°25'N, 5°13'W, 11 Jun 1992, *Vogt 9411 & Oberprieler 3849* (B; G; Herb. Oberprieler; Herb. Vogt). Azrou, clairièrs rocailleuses calcaires à Ras-el-Ma, 1650 m, [33°25′N, 5°14′W], 18 Jun 1923, *Maire* (MPU-AfN; P). oberhalb Azrou, [33°25′N, 5°14′W], Apr 1926, *Braun-Blanquet* (MPU-Braun-Blanquet). road 3398 between Azrou and Aïn-Leuh, c. 3.2 km SW Azrou, *Quercus* woodland, 1720 m, 33°24.712'N, 5°13.081'W, 14 May 1995, *Vogt 15005 & Oberprieler 9314* (B). road between Aïn-Leuh and Azrou via El Kissarite, c. 1 km SW of the junction with road P 21 (Azrou - Midelt), *Cedrus* forest, 1830 m, 33°24.766'N, 5°11.221'W, 13 May 1995, *Vogt 14962 & Oberprieler 9271* (B; G; K; Herb. Oberprieler; Herb. Vogt). Forêt de Cédres S Azrou, 17 km NE Aïn-Leuh on the road Azrou - Aïn-Leuh, *Quercus rotundifolia* wood with *Viburnum tinus, Cedrus,* and *Ilex*, 1585m, 33°23'N, 5°14'W, 11 Jun 1992, *Vogt 9414 & Oberprieler 3852* (B; G; Herb. Oberprieler; Herb. Vogt). road 3398 between Azrou and Aïn-Leuh, c. 8.6 km SW Azrou, *Quercus* woodland, 1700 m, 33°23.346'N, 5°15.437'W, 14 May 1995, *Vogt 15010 & Oberprieler 9319* (B; Herb. Oberprieler; Herb. Vogt). ibid., *Vogt 15009 & Oberprieler 9318* (B). Forêt de Cédres S Azrou, 11 km NE of Aïn-Leuh on forest road Azrou - Aïn-Leuh, *Quercus rotundifolia* woodland with open grassy clearing, 1550 m, 33°22'N, 5°15'W, 11 Jun 1992, *Vogt 9415 & Oberprieler 3853* (B; G; Herb. Oberprieler; Herb. Vogt). road between Aïn-Leuh and Azrou via El Kissarite, c. 31.8 km NE Aïn-Leuh, *Cedrus* forest, 1900 m, 33°21.474'N, 5°13.818'W, 13 May 1995, *Vogt 14949 & Oberprieler 9258* (B; G; K; RAB; RNG; Herb. Oberprieler; Herb. Vogt). Azrou, Forït de Cèdres, road 3398 between Aïn Leuh and Azrou, c. 5.8 km W Kherzouza, meadows, 1630 m, [33°21′N, 5°16′W], 28 May 1993, *Vogt 12014* (Herb. Vogt; Herb. Oberprieler). Aïn-Leuh, pâturages de Tisfoulat, dans une petite daya, 1700 m, [33°18′N, 5°22′W], 23 Jun 1923, *Maire* (MPU-AfN). Aïn Leuh, bois des montagnes calcaires, 1600 m, [33°17′N, 5°21′W], 13 May 1924, *Jahandiez 271* (B; MA 127120). Aïn Leuh, road S 303 between Aïn Leuh and Source de l'Oum-er-Rbia, immediate S of Aïn Leuh, rock, 1510 m, [33°17′N, 5°21′W], 28 May 1993, *Vogt 12000* (B; Herb. Vogt; Herb. Oberprieler). Azrou, Forêt de Cèdres, track between Ajabo near Aïn-Leuh and road P 21, c. 5 km E Ajabo, embankments in *Cedrus* woodland, 1800 m, [33°16′N, 5°18′W], 27 May 1993, *Vogt 11992* (Herb. Oberprieler). Forêt de Cédres S Azrou, 7 km S Azrou on the road to Midelt (P 21), *Cedrus atlantica* forest surrounded by *Quercus rotundifolia*, partly heavily grazed, partly not, c. 1580 m, 33°16'N, 5°12'W, 12 Jun 1992, *Vogt 9432 & Oberprieler 3872* (B; Herb. Oberprieler). road between Aïn-Leuh and Azrou via El Kissarite, c. 10 km NE Aïn-Leuh, *Cedrus* forest, 1980 m, 33°14.151'N, 5°17.737'W, 13 May 1995, *Vogt 14927 & Oberprieler 9236* (B; G; Herb. Oberprieler; Herb. Vogt). Foum Kheneg, 34 km S Azrou on the road to Midelt (P 21), riverbed banks and adjacent NE-facing limestone cliffs, 1880 m, 33°12'N, 5°04'W, 12 Jun 1992, *Vogt 9440 & Oberprieler 3878* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). road S 303 between Aïn Leuh and Source de l'Oum-er-Rbia, c. 15km S Aïn Leuh, embankments in *Cedrus* woodland, 1790 m, [33°11′N, 5°21′W], 28 May 1993, *Vogt 12006* (B; G; K; Herb. Vogt; Herb. Oberprieler). road S 303 between Aïn Leuh and Source de l'Oum-er-Rbia, 1 km N of the Maison forestier 22 km S Aïn Leuh, roadsides, [33°10′N, 5°21′W], 28 May 1993, *Vogt 12002* (B; Herb. Vogt; Herb. Oberprieler). Tinisiourine, 15 km WSW of Timhadit, 1900 m, 33°10'N, 5°12'W, *Quercus ilex* scrub, south facing slope on limestone, 5 Aug 1975, *Crane 58* (RNG). Col du Zad, 64 km S Azrou on the road to Midelt (P 21), wet area around fountain and SE facing limestone slopes N of the Col du Zad, 2100 m, 33°02'N, 5°04'W, 12 Jun 1992, *Vogt 9442 & Oberprieler 3880* (B; G; K; Herb. Oberprieler; Herb. Vogt). – [Khenifra] Meknès, ad lacum Aguelmame Azigza dictum, 32°58'N, 5°26'W, ad 1440 m, in pascuis siccis querceto raro obsitis, substrato calcareo, 3 Jun 1985, *Fernández Casas & al. 9802* (RNG; BC 813001, 807458; SEV 123528; MA 340549, B). ibid., ad 1460 m, in terra hyeme inundata, substrato calcareo, [32°58′N, 5°26′W], 3 Jun 1985, *Fernández Casas 9805 & al.* (BC 802763; G 330399; BC 8211458). Middle Atlas, Ajdir, Timahsinine, 1550 m, 32°51'N, 5°24'W, undulating plain surrounded by rocky *Cedrus* forest, substrate silt to fine gravel, 28 Aug 1975, *Crane 4* (RNG). Ajadir, Timahsinine, 1550 m, 32°51'N, 5°24'W, margins of dry lake basin, heavily grazed, 27 Aug 1975, *Crane 180* (RNG). Tahout-ou-Fillali, road P 33 be-

tween Khenifra and Midelt, c. 2.5 km W pass, *Quercus* woodland, *Pinus* plantation, 1990 m, [32°47′N, 5°35′W], 26 May 1993, *Vogt 11948* (B; G; K; RAB; Herb. Vogt; Herb. Oberprieler). Tizi n'Tahout-ou-Fillali an der Straße P33 von Zeida nach Khenifra, Eichenwald, 2070 m, 5°27′W, 32°41′N, 4 Jul 1989, *Oberprieler 3478 (2067)* (B; Herb. Oberprieler). ibid., 4 Jul 1989, *Podlech 47622* (MSB; G 378355; LE). 3 km W der Paßhöhe Tahout-ou-Fillali an der Straße von Khenifra nach Midelt (P 33), Kalkfelsen, 1900-2000 m, 5°27′W, 32°40′N, 26 Apr 1987, *Vogt 5846 & al.* (Herb. Oberprieler; Herb. Vogt). Moyen Atlas, road P 33 between Midelt and Kasba Tadla, surroundings of Tahout-ou-Fillali, 2000 m, 32°40.308'N, 5°28.788'W, 10 May 1995, *Vogt 14722 & Oberprieler 9031* (B; Herb. Oberprieler). Im Zedernwald bei Assif Azarzou, Plateau von Ajdir, über Kalk, 2100 m, [32°39′N, 5°24′W], 19 Apr 1988, *Deil 109* (Herb. Bayreuth). – [Marrakech] Hoher Atlas, 11 km S Imi-n-Ifri (Pont naturel) an der Piste nach Toufrine, 1600 m, steinige Hänge, 6°57′W, 31°35′N, 6 Jul 1989, *Oberprieler 3526 (2115)* (B). High Atlas, Asni, 7 km from Tahanaoute on road to Oukaimeden, 1200 m, 31°24'N, 7°58'W, 13 Jun 1974, *Reading Univ. / B.M. Exped. 662* (RNG). Hoher Atlas, an der Straße nach Oukaimeden (6035), 2 km oberhalb der Abzweigung aus dem Ourika-Tal, 1150 m, 7°46'W - 31°18'N, 13 Jul 1989, *Oberprieler 3611* (B; Herb. Oberprieler). Grand Atlas: Tizi-n-Tichka, pâturages, 2100 m, [31°16′N, 7°25′W], 5 Jun 1937, *Balls 2580* (MPU-AfN). Grand Atlas, Ourika: rocailles granatiques sous *Quercus ilex* entre Iref et Anfegeïn, 1700 m, [31°15′N, 7°40′W], 9 Jul 1921, *Maire* (MPU-AfN). Grand Atlas, Ourika: prairies de la vallée entre Timichi et Abessen, grès, 2100-2300 m, [31°15′N, 7°40′W], 12 Jul 1921, *Maire* (MPU-AfN). Grand Atlas; Ourika: forêts de *Quercus ilex* au dessus d'Anfegeïn, grès, 2400 m, [31°15′N, 7°40′W], 9 Jul 1921, *Maire* (MPU-AfN). 72 km S from Marrakech, Oukaïmeden, 2700 m, 31°13'N, 7°52'W, by side of road on SE facing slope, 3 Jul 1987, *Jury 8864 & al.* (RNG; BC 688923; MA 391874). an der Straße 6035 nach Oukaimeden, ca. 6 km unterhalb Oukaimeden, 2400 m, Aufforstung, Trockenhänge, 7°49'W, 31°12'N, 13 Jul 1989, *Oberprieler 3621* (B; Herb. Oberprieler). Oukaimeden, Straße vom Sender bis zur 2. Abzweigung nach Asni (Ait Lekak), Vulkangestein, roter Sandstein, 2380 m, [31°12′N, 7°54′W], 26 Aug 1978, *Krach & Koepf 4030* (MSB). Umgebung von Oukaimeden und Berge S des Ortes, 2600-3000 m, Silikat, 7°51'W, 31°11'N, 14-16 Jul 1989, *Oberprieler 3630* (B; G; Herb. Oberprieler; Herb. Vogt). ibid., *Podlech 48063* (MSB). Fr. Amismiz t. Tizi-Hemiri, 5000-9000!, [31°08′N, 8°18′W], 1888, *Thomson* (K). Reraya: Arround, bords des ravins, 2100 m, [31°07′N, 7°52′W], 20 Jun 1921, *Jahandiez 844* (MPU-AfN). Ex regione superiori Atlantis Majoris, in cacumine Djebel Tezah, alt. 24-2900 m, [31°02′N, 8°19′W], 22 May 1871, *Ball* (P). Tizi-n-Test, 1 km N of pass, on road to Marrakesh, 2000 m, 31°00'N, 8°30'W, 12 Jun 1974, *Reading Univ. / B.M. Exped. 604* (RNG). Dj. Tabgourt (Maroc), 27. Ramadan 1884, [31°00′N, 8°47′W], 1884, *Ibrahim* (K; P; G). 70 km from Asni on road to Tizi-n-Test, Taroudant 103 km, 4 km before pass, 2050 m, 30°53'N, 8°21'W, 20 Jul 1989, *Jury 787 & al.* (RNG). Marrakech, 1914, *de Gironcourt (Pitard 561)* (P). – [Missour] In Atlantis Medii monte Tichchoukt: Lalla-Oum-el-Bent, in rupestr. calcareis, 2800 m, [33°24′N, 4°41′W], 2 Jul 1927, *Maire* (MPU-AfN; P). Mittlerer Atlas, 2 km S Boulmane, Kalkfelsen, 1820 m, 4°44′W, 33°22′N, 27 Jun 1989, *Oberprieler 3238* (Herb. Oberprieler). In Getreidefeldern in feinsandigen Depressionen bei Hassi-el-Achmar, 1550 m, [33°08′N, 3°11′W], 1 May 1987, *Deil 2296* (Herb. Bayreuth). – [Ouarzazate] Ouarzazate, in summa saltu Tizi n'Tichka dictum, ad 2100 m, in glareosis secus viam, [31°16′N, 7°25′W], 30 May 1985, *Fernández Casas 9575 & al.* (BC 812995; MA 340342). – [Oujda] Djebel Bou-Zabel, Pelouses rocailleuses (1300 m), [34°N, 2°W], 3 May 1933, *Faure* (MPU-AfN). Monts des Beni-Snassen, track 5308 between Aïn-Almou and road 5319 (Ahfir - Aïn-Sfa), surroundings of Oulad Jabein-Fouaga, road embankments, 1180 m, 34°59.824'N, 2°11.204'W, 16 May 1995, *Vogt 15280 & Oberprieler 9589* (B; G; K; Herb. Oberprieler; Herb. Vogt). track 5308 between Gorge du Zegzel and Aïn-Almou, surroundings of Bou Illone, c. 2 km W of the Maison forestière Aïn Almou, stony slopes, sandstone, 1180 m, 34°50.504'N, 2°13.137'W, 16 May 1995, *Vogt 15188 & Oberprieler 9497* (B; G; Herb. Oberprieler; Herb. Vogt). N-facing slopes of Djebel Foughal, c. 1.3 km W of the Maison forestière Aïn-Almou, limestone rocks, 1200 m,

34°50.750'N, 2°13.025'W, 16 May 1995, *Vogt 15227 & Oberprieler 9536* (B; G; RAB; Herb. Oberprieler; Herb. Vogt). track 5308 between Gorge du Zegzel and Aïn-Almou, Tizi Oulal c. 11.4 km E of the Gorge du Zegzel, schistos, 800-900 m, 34°50.514'N, 2°17.176'W, 15 May 1995, *Vogt 15123 & Oberprieler 9432* (B; Herb. Oberprieler). summit of Djebel Foughal, c. 1.1 km SW of the Maison forestière Aïn-Almou, limestone cliffs, 1280 m, 34°50.611'N, 2°12.975'W, 16 May 1995, *Vogt 15264 & Oberprieler 9573* (B; G; Herb. Oberprieler; Herb. Vogt). track 5308 between Gorge du Zegzel and Aïn Almou, Tizi Oulal c. 11.4 km E of the Gorge du Zegzel, schistos, 800-900 m, 34°50.514'N, 2°17.176'W, 15 May 1995, *Vogt 15124 & Oberprieler 9433* (B; G; Herb. Oberprieler; Herb. Vogt). Le Ras Foughal, Pelouses rocailleuses (1300 m), [34°50′N, 2°10′W], 1 Jun 1932, *Faure* (MPU-AfN; MA 127121). Le Ras-Foughal, près d'Aïn-Almou, Pelouses ombragees (1300 m), [34°50′N, 2°10′W], 3 May 1933, *Faure* (MPU-AfN). Monts des Beni-Snassen, N-facing slopes of Djebel Foughal, surroundinges of the Maison forestière Aïn-Almou, Pinus woodland, 1270 m, 34°50.952'N, 2°12.606'W, [34°50′N, 2°12′W], 16 May 1995, *Vogt 15230 & Oberprieler 9539* (B). Beni-Snassen, Taforalt, montagnes, vers 1000 m, [34°47′N, 2°27′W], 13 Apr 1935, *Sennen & Mauricio* (MA 174439). Monts des Beni-Snassen, track between Tanezzert and Taforalt, valley of Oued Tazzermoute, surroundings of pass c. 4.4 km W Taforalt, road embankments, macchia, 930-950 m, 34°47.729'N, 2°27.014'W, [34°47′N, 2°27′W], 5 May 1995, *Vogt 14270 & Oberprieler 8579* (B). track between Taforalt and Tanezzerte, valley of Oued Tazemmoute c. 2.4 km W Taforalt, roadsides, field margins, 900 m, [34°38′N, 2°26′W], 9 May 1993, *Vogt 11466 & Oberprieler 5914* (B; G; Herb. Oberprieler; Herb. Vogt). ibid., 900-950 m, [34°38′N, 2°27′W], 9 May 1993, *Vogt 11448 & Oberprieler 5896* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). Env. de Berkane, massif des Beni Snassene, gorges en allant du Camp de Taforalt au village de Guemgam, rocailles, 1000 m, [34°38′N, 2°27′W], 23 Apr 1928, *Wilczek & al. 1355* (G). Massif des Beni-Snassen, Cinissane, Pellouses rocailleuses, 1000 m, 31 May 1932, *Faure* (MPU-AfN). – [Taroudannt] Tifnout: Lac d'Ifni, rive S, débris schisteux, 2400 m, [32°0′N, 7°56′W], 28 Jul 1923, *Litardiere* (MPU-AfN). Tizi-n-Test an der Straße S 501 von Taroudant nach Marrakech, 2100 m, 8°22'W, 31°52'N, 12 Jul 1989, *Oberprieler 3598* (Herb. Oberprieler). in Atlantis majoris ditione Glaoua: in montis Agouti supra jugem Telouet, rupestribus arenaceis, 2700 m, [30°58′N, 8°28′W], 7 Jul 1924, *Maire* (MPU-AfN; P). Straße von Taroundannt zum Paß Tizi-n-Test, ca. 2000 m, Hänge mit *Quercus ilex* Beständen. [30°52′N, 8°22′W], 4 May 1994, *Kilian 3576* (Herb. Oberprieler). Djebel Amezdour, 7.500 ft. Moist turf in partshade of rocks, [30°45′N, 7°38′W], 8 Jun 1936, *Balls 2704* (K). Anti-Atlas, Djebel Lekst, E-side of Tizi-n-Tagounit along track 7056 between Tioulit and Tanalt, field margins c. 4.4 km E of pass, 1500 m, [29°48′N, 9°08′W], 15 May 1993, *Vogt 11766 & Oberprieler 6214* (B; G; K; RAB; RNG; SEV; MA; Herb. Oberprieler; Herb. Vogt). NW-side of Djebel Lekst near the summit of pass Tizi-n-Tagounit on track 7056 between Tioulit and Tanalt, garrigue, rocks, 1600-1700 m, [29°48′N, 9°08′W], 15 May 1993, *Vogt 11805 & Oberprieler 6253* (Herb. Oberprieler). In quercetis Montis Kest Anti-Atlantis, solo arenaceo, 1600 m, [29°42′N, 9°02′W], 17 Jun 1939, *Maire & Weiller 179* (MPU-AfN). In rupestribus arenaceis montis Kest Anti-Atlantis, 1600-1800 m, [29°42′N, 9°02′W], 8 Apr 1935, *Maire & Wilczek* (MPU-AfN; P). Dj. Ouensa, Montagnes au Sud-Ouest de la ville de Maroc, 187[?], *Ibrahim* (GOET). Djebel Touchka, Montagnes au Sud-Ouest de la ville de Maroc, 27 Jun 1876, *Ibrahim* (P; K). Dj. Ouensa ("Ouentae"), S.O. du Maroc, *Ibrahim* (GOET). Dj. Touchka, 1883, *Ibrahim* (MPU-AfN). Djebel Ouensa, Montagnes au Sud-Ouest de la ville de Maroc, 1879, *Ibrahim* (GOET). Dj. Touchka, Montagne ou Sud-Ouest de la ville de Maroc, 1870, *Ibrahim* (MPU-AfN; G). – [Taza] Djebel Berkane, suelos arenosos, sobre areniscas, 34°45'N, 3°44'W, 1600 m, 25 May 1994, *Valdés & al. 3240/94* (SEV). Moyen Atlas: Djebel Tazzeka, 11 km S Taza on road S 311 to Djebel Tazzeka, hillsides and banks of Oued, 745 m, 34°09'N, 4°01'W, 15 Jun 1992, *Vogt & Oberprieler 3901* (Herb. Oberprieler). 18km S Taza along road S 311 to Gouffe de Friovato and Djebel Tazzeka, W-facing limestone rocks under *Quercus ilex*, 1200 m, 34°08'N, 4°02'W, 15 Jun 1992, *Vogt 9468 & Oberprieler 3905* (B; G; Herb. Oberprieler; Herb. Vogt). Ras-el-Ma, Sidi Msbar, 34°08′N, 4°02'W,

1300-1350 m, cantiles calizos, encinar aclarado y glacis pedegroso, 13 Jun 1993, *Montserrat 3467/4 & al.* (SEV). vertiente meridional del Jbel Bou Messoud, 34°07'N, 4°04'W, 1350-1500 m, cantiles calizos, campos de cereal y matorrales degradados con *Chamaerops humilis*, 13 Jun 1993, *Montserrat 3638/5 & al.* (SEV). Djebel Tazzeka, 13 km SSW Taza, 23km from Taza on minor road /S 311) to Bab-Bou-Idir, S-facing sandy slopes and cultivated areas, 1420 m, 34°07'N, 4°03'W, 17 Jun 1992, *Vogt & Oberprieler 3945* (Herb. Oberprieler). Bab ou Idir, Maison forestier, 1600 m, [34°7'N, 4°3'W], 3 Jul 1939, *Métro & Sauvage* (MPU-Sauvage). around summit of Djebel Tazzeka, schistos, *Cedrus* forest, 1900 m, 34°05'N, 4°11'W, 16 Jun 1992, *Vogt 9487 & Oberprieler 3923* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). Djebel Tazzeka, 3 km from summit, schistos, 1780 m, 34°05'N, 4°10'W, 16 Jun 1992, *Vogt & Oberprieler 3937* (Herb. Oberprieler). Mont Tazzeka, alt. 1600 m, [34°04'N, 4°08'W], Jun 1925, *Humbert* (MPU-AfN). Tazzeka, 30 km from Taza on minor road, Bab-Bou-Idir, 34°04'N, 4°07'W, 1560 m, w-facing bank, 5 Jul 1993, *Jury 11792 & al.* (RNG; SEV). ibid., *Jury 11773 & al.* (RNG; SEV). In cedretis montis Tazzeka, solo siliceo, 1900 m, [34°04'N, 4°08'W], 29 Jun 1926, *Maire* (MPU-AfN; P). Djebel Tazzeka, pentes pierreuses boisées, sol silicieux, Alt. 1300-1600 m, [34°04'N, 4°08'W], May 1929, *Weiller, n° 2253* (MPU-AfN; P; G; BC 29641). In Atlantis Medii montibus supra urbem Taza: in cedretis montis Tazzeka, solo siliceo, 1800-1980 m, [34°04'N, 4°08'W], 18 Jun 1925, *Maire* (MPU-AfN; P). Djebel Tazzeka, forêts siliceuses, 1700 m, [34°04'N, 4°08'W], 4 Jun 1929, *Weiller 402* (MA 127039; G). Jbel Tazzeka, Bab el Ghlem, vertiente meridional, 34°04'14"N, 4°11'15"W, 1670-1730 m, encinar-robledal degradado a matorrales de *Cistus ladanifer*, 14 Jun 1993, *Montserrat 3660/5 & al.* (SEV). Djebel Tazzeka, 3 km from road S 311 on track to summit of Djebel Tazzeka, schistos with *Quercus canariensis,* 1605 m, 34°04'N, 4°10'W, 16 Jun 1992, *Vogt 9505 & Oberprieler 3941* (Herb. Oberprieler; Herb. Vogt). 42 km from Taza on road S 311 around Djebel Tazzeka, *Quercus suber* forest with *Pteridium aquilinum*, 1200 m, 34°03'N, 4°12'W, 15 Jun 1992, *Vogt 9476 & Oberprieler 3913* (B; G; Herb. Oberprieler; Herb. Vogt). ca. 25km SE Ahermoumou (Ribat-el-Kheyr) an der Straße zum J. Bou-Iblane (4803), N'Hang des Tizi n'Tiskrine, 1430-1550 m, 4°15'W, 33°42' N, 25 Jun 1989, *Podlech 46964* (MSB). Gegend um Taffert an der Straße von Ahermoumou (Ribat-el-Kheyr) zum J.Bou Iblane (4803), 1680 m, Kalkfelsen, 4°15'W, 33°40'N, 25 Jun 1989, *Oberprieler 1895* (B; Herb. Vogt; Herb. Oberprieler). ibid., *Oberprieler 1908* (B; Herb. Vogt; Herb. Oberprieler). ibid., *Oberprieler 1911* (Herb. Oberprieler). Jebel Bou Iblane, Umgebung des Refuge de Taffert nahe der Straße 4803, Zedernwald, 1830-1930 m, 4°10'W, 33°39'N, 25 Jun 1989, *Oberprieler 1928 (1728)* (B; Herb. Oberprieler). Jebel Bou Iblane, Nordhang, Paßstraße zum Tizi Bouzabel 2km oberhalb des Forsthauses, 2040 m, 4°10'W, 22°39'N, 26 Jun 1989, *Oberprieler 1967* (Herb. Vogt; Herb. Oberprieler). Jebel Bou Iblane, Umgebumg des Refuge de Taffert nahe der Straße 4803, Zedernwald, 1830-1930 m, 4°10'W, 33°39'N, 25 Jun 1989, *Oberprieler 1962 (1762)* (Herb. Oberprieler). In Atlantis Medii montibus Bou-Iblan: in silva Taffert, 1950 m, [33°39'N, 4°10'W], 19 Jun 1927, *Maire* (MPU-AfN). Jebel Bou Iblane, N'Hang, Paßstraße zum Tizi Bouzabel 2 km oberhalb des Forsthauses, 2040 m, steinige Hänge, 33°39'N, 4°10'W, 26 Jun 1989, *Podlech 47091* (MSB; G 378356; LIE; RAB). Jebel Bou Iblane, Nordhänge des Tizi Bouzabel, 2210 m, Kalkfelsen, 4°10'W, 33°39'N, 26 Jun 1989, *Oberprieler 1978* (Herb. Oberprieler; Herb. Vogt). Azrou, in quercetis calc. 1400-1700 m, [33°25'N, 5°14'W], 25 Jul 1921, *Maire* (MPU-AfN; P). Djebel Arekdi, 1440 m, pizarras, en matorrales, 26 May 1981, *Fernandez Casas 5134 & al.* (MA 444248). – [Tetouan] Djebel Darsa, Tetouan, [35°38'N, 5°25'W], 20 Apr 1903, *Herb. Joly* (MPU-AfN). In lapidosis calcareis montis Dersa supra Tetuan, 400-500 m, [35°38'N, 5°25'W], 20 Jun 1930, *Maire* (MPU-AfN). Dersa 450 m (Djebel Dersa, 450 m, 35°36'N, 5°24'W), 20 Jun 1930, *Font i Quer* (BC 808311). Jbel Soukna, Larache, brezel sobre arenisas, 1080 m, [35°07'N, 5°24'W], 5 May 1992, *Ojede* (SEV). Tetouan, Dj. Tiziren, au N. de Bab Berred, 35°01'N, 4°55'W, 1600-1850 m, cédraie, 20 May 1980, *Jacquemoud & Jeanmonod 1102* (MA 257672). – [Not located] Pentes rocailleuses près de Senoual vers 2000 m, Moyen Atlas, 28 Jun 1938, *ex Herb. Faurel* (MPU-Dubuis). In Anti-Atlante: Tachokeht, in lapidosis vulcanicis, 1900 m, 9 May 1932, *Maire* (MPU-AfN). Dj.

Aziwel, Maroc, 5 Aug 1884, *Ibrahim* (MPU-AfN; P). In cedertis faucium Akka-n-Ouyad, Atlantis Majoris, solo calcareo, 2000 m, 28 Jun 1939, *Maire & Weiller 721* (MPU-AfN). Dj. Mentaga (Maroc), 29 Jun 1888, *Ibrahim* (MPU-AfN; G; K; P). Atlas Magnum, in convalle fl. Imminen, in graminosis juxta flumen, c. 1300 m, 31 May 1929, *Lindberg 3224* (MPU-AfN). Pentes rocailleuses près de Senoual vers 2000 m, Moyen Atlas, 28 Jun 1938, *Herb. Faurel* (MPU-AfN). Djebel Bou Haeb Jel [?], *Herb. Battandier* (MPU-AfN). Eboulis des pentes nord du Dj. Stehoud vers 2000 m, Chènien Bondy, Moyen Atlas, 26 Jun 1938, *Herb. Faurel* (MPU-AfN). Azib de Tichka, 7.000 ft, Turf slopes & fine screes, 5 Jun 1936, *Balls 2580* (K). Meknes, prope diversiorum dictum Maison Forresière Mt. Senoual, ad 1600 m, in pratis siccis, solo calcareo, 3 Jun 1986, *Fernández Casas 9851 & al.* (BC 813002). Atlas Expedition, on Taurirt, 8-10000!, Jun 1888, *Thomson* (K). South Marocco. Greater Atlas, Int. Tezi, 7-9000 ft, May 1871, *Hooker* (K). Atlas magnum, in convalle fl. Imminen, in graminosis juxta flumen, c. 1300 m, 31 May 1926, *Lindberg 3226* (B; K). Djebel Ouensa, montagne au S.O. de la ville de Maroc, 20 Jun 1875, *Ibrahim* (P; K). Djebel Ouensa avec l'*A.tuberculata*, Montagnes au Sud-Ouest de la ville de Maroc, 22 Jun 1875, *Ibrahim* (P). Dj. Aziwel, Aït Adouyouz, 1883, *Ibrahim* (P). Moyen Atlas, Ari Hayan, rocailles calcaires, 2300 m, 26 Jun 1923, *Maire* (MPU-AfN; P). Rif SW: Massif calcaire central, vallon du Tasnoute, 8 Jun 1955, *Sauvage 13508 & al.* (MPU-Sauvage). Moyen Atlas: Ari Benij, rocailles calcaires des Forêts, 2200-2400 m, 29 Jun 1923, *Maire* (MPU-AfN; P). In pascuis lapidosis vulcanicis montis Amegdous Anti-Atlantis, 2500 m, 19 Jun 1939, *Maire & Weiller 271* (MPU-AfN). Bou Jerir, 1600 m, Moyen Atlas, Mar 1923, *Braun-Blanquet* (MPU-Braun-Blanquet). Djebel Ouensa, Montagnes au Sud Ouest de la ville de Maroc, 27 Jul 1876, *Ibrahim* (MPU-AfN; GOET; K; P). Djebel Ouensa, montagne au S.O. de la ville de Maroc, 22 Jun 1875, *Ibrahim* (G). Tahallati, Province de Demnat (Maroc), 1 Jul 1881, *Ibrahim* (P; G). Dj. Tagounit, 9 Jul 1884, *Ibrahim* (P; G). Dj. Lalla-Aziza (Maroc), 10 Ramadan 1884, *Ibrahim* (P). Dj. Ouensa, montagnes au S.O. de la ville de Maroc, Jun 1874, *Ibrahim* (P; G). South Marocco, Greater Atlas, Mt. Tezi, 7-9000 ft., May 1871, *Hooker* (P; G). Djebel Ouensa, Montagnes au Sud-Ouest de la ville de Maroc, 1876, *Ibrahim* (P).

21β. ***Anthemis pedunculata*** var. ***discoidea*** (Boiss.) Oberprieler, **comb. nov.** ≡ *A. tuberculata* var. *discoidea* Boiss., Voy. Bot. Espagne 2: 311 (1840) ≡ *A. tuberculata* f. *discoidea* (Boiss.) R. Fernandes in Anales Inst. Bot. Cavanilles 32: 1485 (1975). – Ind. loc.: "... legerunt amiciss. Haenseler et Prolongo in summis Sierra de la Nieve et in monte Cerro de San Cristoval suprà Grazalema. Alt. 5000'-6000'." – Lectotype (Burdet & al. 1983: 761): [Spain] "Cerro San Cristoval", (G!).

= *Anthemis montana* var. *tuberculata* Maire in Bull. Soc. Hist. Nat. Afrique N. 23: 190 (1932). – Ind. loc.: "Atlas rifain: Mont Tidighin! (Font-Quer)." – Lectotype (designated here): [Morocco] "in saxosis arenaceis montis Yebel Lerz (Atlante rhiphaeo)", 2200 m, 12 Jun 1927, *Font Quer, n° 663* (MPU-AfN!, isolectotypes: B!, BC 29537!, MA 127023!, G!).

Note. – The indication of the type locality in the protologue misleadingly suggests reference to a single collection made by Font Quer on Djebel Tidirhine (= Tidighin). However, the specimens collected by Font Quer in 1927 and distributed in his exsiccata were made on Djebel Lerz which is a neighbour mountain of Djebel Tidirine in the Central Rif. According to González Bueno (1988: 27), Font Quer visited Djebel Tidirine in June 1929 on a joint excursion with Emberger and Maire. The exclamation mark following "Mont Tidighin" in the protologue must therefore be interpreted as re-

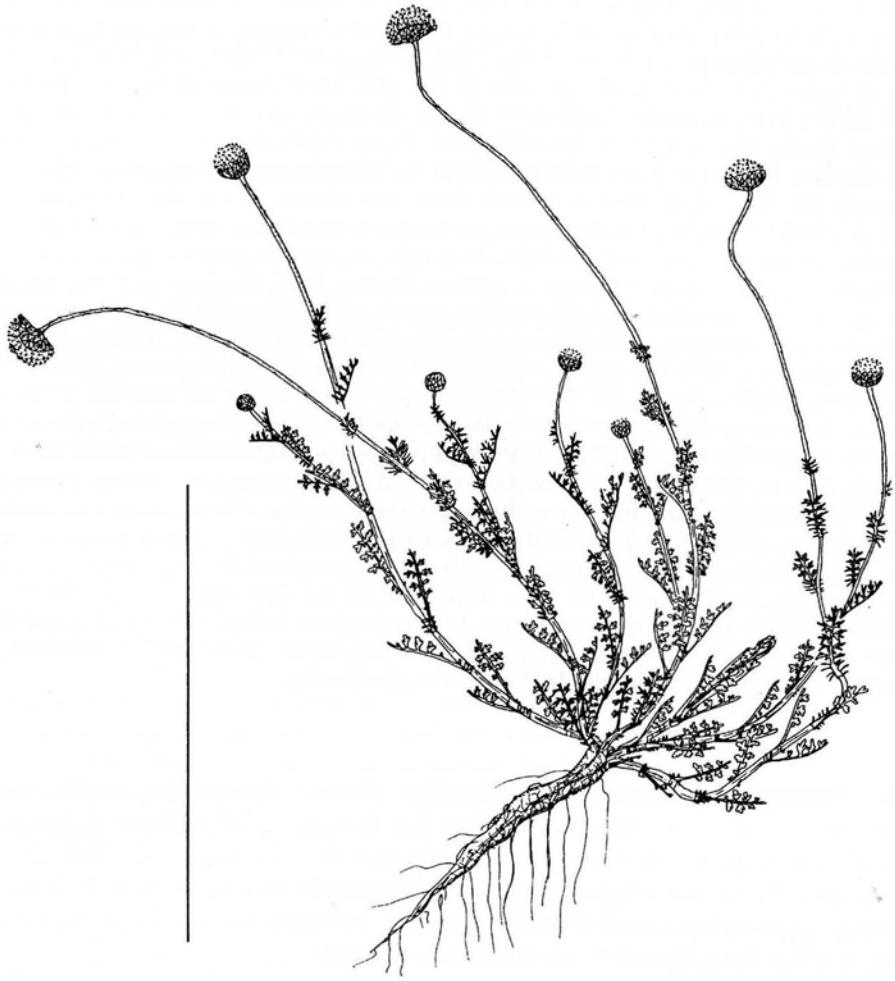


Fig. 157. *Anthemis pedunculata* var. *discoidea:* general habit *(Vogt 9576 & Oberprieler 4012).* – Scale bar = 10 cm.

lating to Maire's own collection ([Morocco] "In Atlante rifano: in rupestribus arenaceis ad cacumen montis Tidighin", 2450 m, 14 Jun 1929, *Maire*) while "(Font Quer)" relates to Font Quer's exsiccatum distributed in 1929. Maire's 1929 collection is in flower and does not show any mature achenes, and since Maire describes the new variety as having tuberculate achenes it is appropriate to designate Font Quer's collections with ripe achenes as lectotype.

= *Anthemis pedunculata* f. *discoidea* J. Vindt in Bull. Soc. Sci. Maroc 33: 26 (1953) – Ind. loc.: "Pied nord de l'irhil Igoudamen, 2200m (n° 29)." – Type: not seen.

– *Anthemis pedunculata* f. *eradiata* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 762 (1934), nom. nud.

- *Anthemis chrysocephala* auct. [non Boiss. & Reuter 1842]: Font Quer, Iter Marocc. 1927: n° 663.
- *Anthemis montana* var. *eu-chrysocephala* auct. [non Maire 1932, s.str.]: Maire in Bull. Soc. Hist. Afrique N. 23: 190 (1932); Maire in Jahandiez & Maire, Cat. Pl. Maroc: 761 (1934).

Exs.: Font Quer, Iter Marocc. 1927: n° 663 (sub *"Anthemis chrysocephala"*).

Rhizome up to 9 mm in diameter. Stems (14-)16-30(-45) cm long, basally 0.8-1.8(-2.7) mm in diameter, often unbranched and bearing a single capitulum, sometimes branched basally and with up to 5 capitula, glabrous to sparsely hairy with short medifixed hairs, usually tinged with red. Lower cauline leaves and leaves of non-flowering shoots 10-24 (-28) mm long and 4-12(-14) mm wide, elliptical or obovate in outline, petiolate; petiole 5-10(-14) mm long, base usually with 2-3 pairs of entire teeth; blade 1-2(-3)-pinnatisect, with 2-3 pairs of obovate primary lobes; ultimate segments elliptical or linear, 1.2-3.2 (-4.2) mm long and 0.6-1.1 mm wide, glabrous or sparsely hairy. Middle and upper cauline leaves (4-)6-18(-27) mm long and (2-)3-13(-18) mm wide, elliptical to broadly elliptical in outline, usually sessile, sometimes with an up to 6 mm long petiole; base with 1-3 pairs of entire teeth; lamina 1-2-pinnatisect, with 2-3 pairs of primary lobes; ultimate segments (0.9-)1.3-2.9(-3.8) mm long and 0.6-1.0 mm wide, elliptical or linear, glabrous or sparsely hairy. Peduncles (10-)50-130(-180) mm long and (0.7-)0.9-1.2 mm in diameter, glabrous to sparsely hairy. Capitula (6-)9-14 mm in diameter, homogamous, very rarely heterogamous with disc florets and minute ray florets. Involucre (6-)8-11 mm in diameter. Involucral bracts glabrous to sparsely hairy; the outermost ovate to narrowly ovate, 2.0-2.8(-3.2) mm long and 0.8-1.3(-1.6) mm wide, with laterally up to 0.2 mm wide, apically up to 0.7 mm wide, membranous margins; the middle ones narrowly ovate to narrowly elliptical, 2.9-3.6(-3.8) mm long and 1.1-1.5 mm wide, with laterally up to 0.3 mm wide, apically up to 0.9 mm wide, membranous margins; the innermost narrowly elliptical, (2.9-)3.2-3.7(-3.9) mm long and 1.0-1.4(-1.6) mm wide, with laterally up to 0.3 mm wide, apically up to 1.0 mm wide, membranous margins. Receptacle c. 3-4 mm in diameter and c. 2-3 mm high at maturity. Pales 2.9-3.4(-3.7) mm long and 0.3-0.7 mm wide, basally 0.2-0.5 mm wide. Disc florets 2.6-3.1(-3.3) mm long; the basal part 1.1-1.5 mm long and 0.7-1.0 mm wide. Achenes of disc florets 1.9-2.4(-2.6) mm long and 0.8-1.2 mm in diameter; corona a 0.2-0.4 mm long crenulate auricle.

Chromosome number. – $n = 9$; $2n = 18$ (see discussion in chapter 10).

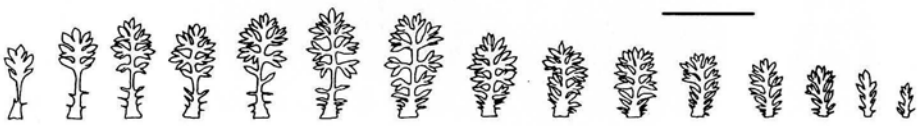


Fig. 158. *Anthemis pedunculata* var. *discoidea:* leaf spectrum *(Vogt 9576 & Oberprieler 4012).* – Scale bar = 2 cm.

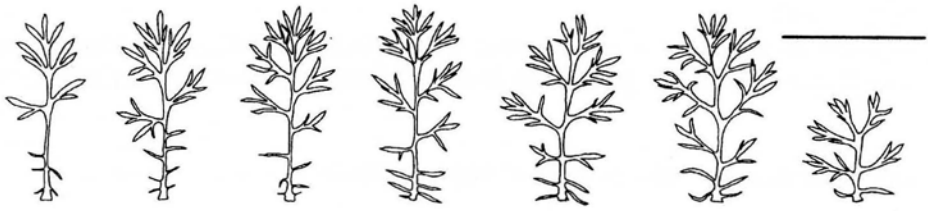


Fig. 159. *Anthemis pedunculata* var. *discoidea:* leaf spectrum *(Crane 120).* – Scale bar = 2 cm.

Distribution and habitat. – Endemic to the Betic-Rifanic arch and the High Atlas Mountains (Fig. 162). In Spain it is restricted to the W parts of the Sistema Penibético (Sierra de Grazalema, Sierra de las Nieves, Serranía de Ronda), in Morocco to the C and E Rif mountains (Djebel Tidirhine, Djebel Lerz, Djebel Azrou Akchar) and the C High Atlas mountains (Djebel Ghat, Ourika, Assif-n-Arous) where it grows at altitudes between 1700 and 2450 m (Rif) and around 2200-3000 m (High Atlas). On Djebel Tidirhine (C Rif), *Anthemis pedunculata* var. *discoidea* was found to grow near the summit in chamaephyte-rich Erinacetalia communities on schistous rocks and in scree with *Cerastium gibraltaricum* Boiss., *Genista tridentata* L., *Hieracium pseudopilosella* Ten., *Leucanthemopsis longipectinata* (Font Quer) Heywood, *Rhodanthemum gayanum* subsp. *demnatense* (Murb.) Maire, and *Viola munbyana* Boiss. & Reuter.

Variation and taxonomy. – This variety was described by Boissier (1840) from plants collected in the Sierra de las Nieves and the Sierra de Grazalema in S Spain. It is easily distinguished from *Anthemis pedunculata* var. *pedunculata* by its eradiate capitula. It has often been confused with *A. alpestris*, an eradiate member of the *A. cretica* complex endemic to the Iberian peninsula, from which it differs by its tuberculate achenes which are

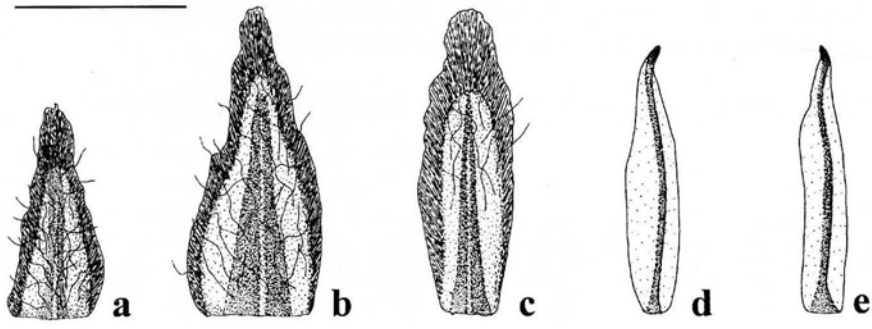


Fig. 160. *Anthemis pedunculata* var. *discoidea:* (a-c) involucral bracts (26 Jun 1926, *Maire*), (d-e) pales (d, *id.;* e, 12 Jul 1921, *Maire*). – Scale bar = 2 mm.

round in cross-section and its attenuate, not umbonate involucre. In some individuals from the High Atlas mountains (e.g. Ourika, 12 Jul 1921, *Maire*) minute ray florets, so-called hemiligules, are observed, usually hidden behind the inner involucral bracts. While plants from the N Moroccan Rif mountains resemble the Spanish ones by their small and glabrous leaves with short, elliptical ultimate segments, those from the High Atlas have larger, hairy leaves with narrowly elliptical to linear ultimate segments. This makes it likely that *A. pedunculata* var. *discoidea* is a polyphyletic taxon.

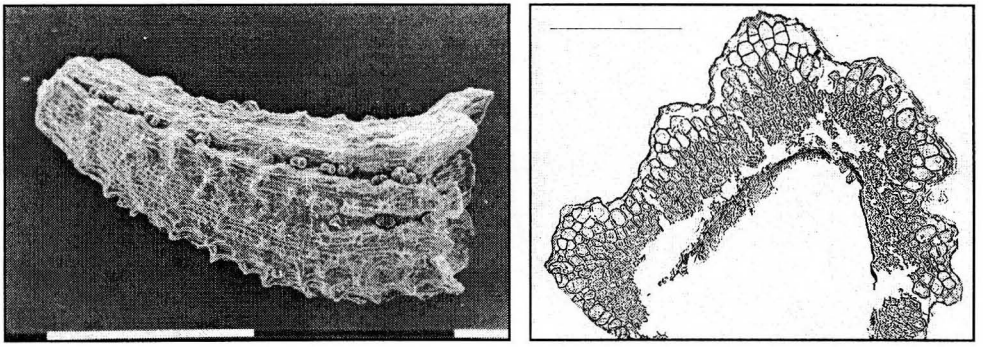


Fig. 161. Micrographs of achenes of disc florets of *Anthemis pedunculata* var. *discoidea (Deil 4867).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Specimens seen. – [Morocco, Al Hoceima] Nador, Chekran, entre el collado occidental y la cumbre de Jbel Chekrane, 34°57'30"N, 4°00'20"W, 1750-1930 m, matorrales muy degradados, repobalciones forestales y roquedos silíceos, sobre esquistos, 12 Jun 1993, *Montserrat 3400/1 & al.* (SEV). Tidigun, 2000 m (Tidighine, 2000 m, 34°51'N, 4°31'W), 6 Jun 1929, *Font i Quer* (BC 808320). Central Rif, Jbel Tidighine, 34°51'01"N, 4°32'02"W, 2100-2440 m, matorrales y pastizales oromediterráneos, 13 Jun 1995, *Romo 8680/4 & Boratynski* (SEV). In Atlante rifano: in rupibus arenaceis ad cacaumen montis Tidighin, 2450 m, [34°51′N, 4°30′W], 14 Jun 1929, *Maire* (MPU-AfN; P). Azila, Koudinat Tighighine, SW facing slopes in the Cedrus forest on schistos, 34°51'N, 4°32'W, 1850 m, 30 Jun 1993, *Mejías & Silvestre 125/93* (SEV). Rif central: Djebel Tidirhine, summit and W ridge of Djebel Tidirhine, *Cedrus* forest and schistous scree, 2200-2450 m, 34°52'N, 4°31'W, 20 Jun 1992, *Vogt 9576 & Oberprieler 4012* (B; G; K; Herb. Oberprieler; Herb. Vogt). In windgefegter Zwergstrauchgesellschaft über Schieferfels am Bab Bagla, Zentralrif, 2000 m, [34°51′N, 4°30′W], 8 Jun 1987, *Deil 2648* (Herb Bayreuth). im Sandsteinfels am Tidighin, Zentralrif, 2000 m, [34°51′N, 4°30′W], 10 Jul 1989, *Deil 4867* (Herb. Oberprieler). Hab. in saxosis arenaceis montis Yebel Lerz (Atlante rhiphaeo), 2200 m, [34°49′N, 4°26′W], 12 Jun 1927, *Font Quer, n° 663* (MPU-AfN; B; G; BC 29537; MA 127023). Azrú, 1800 (Djebel Azrou Akchar, 1800 m, 34°47'N, 3°50'W), 11 Jun 1929, *Font i Quer* (BC 808322). – [AZILAL] Grand Atlas de Demnate: pâturages écorchés calcairs du Dj. Ghat, 3000 m, [31°31′N, 6°46′W], 1 Jul 1931, *Emberger* (MPU-AfN). – [CHAOUÈN] Crête entre Bab Tizi-Manndon et Djebel Tissouka, 1800-1900 m, [35°7′N, 5°10′W], 10 Jul 1961, *Sauvage 16949* (MPU-Sauvage). – [Marrakech] Grand Atlas, Ourika: prairies sur les grès près Abersen, 2200 m, [31°15′N, 7°40′W], 12 Jul 1921, *Maire* (MPU-AfN; P). – [Ouarzazate] High Atlas, Assif-n-Arous, 6 km SSE of Ait Said, 2600 m, 31°34'N, 6°29'W, steep sided, deep gorge, 15 Aug 1975, *Crane 120* (RNG). – [Taza] In Atlante Rifano: in rupibus calcareis montis Azrou, 1800-1900 m, [34°58′N, 3°50′W], 26 Jun 1926, *Maire* (MPU-AfN; P). Aknoul, Jbel Azrou Akechar, 34°47'08"N, 3°51'11"W, 1750-1890 m, matorrales basófilos, en claros de encinar *(Quercus ballota)*, 16 Jun 1995, *Romo 8790/5 & Boratynski* (SEV).

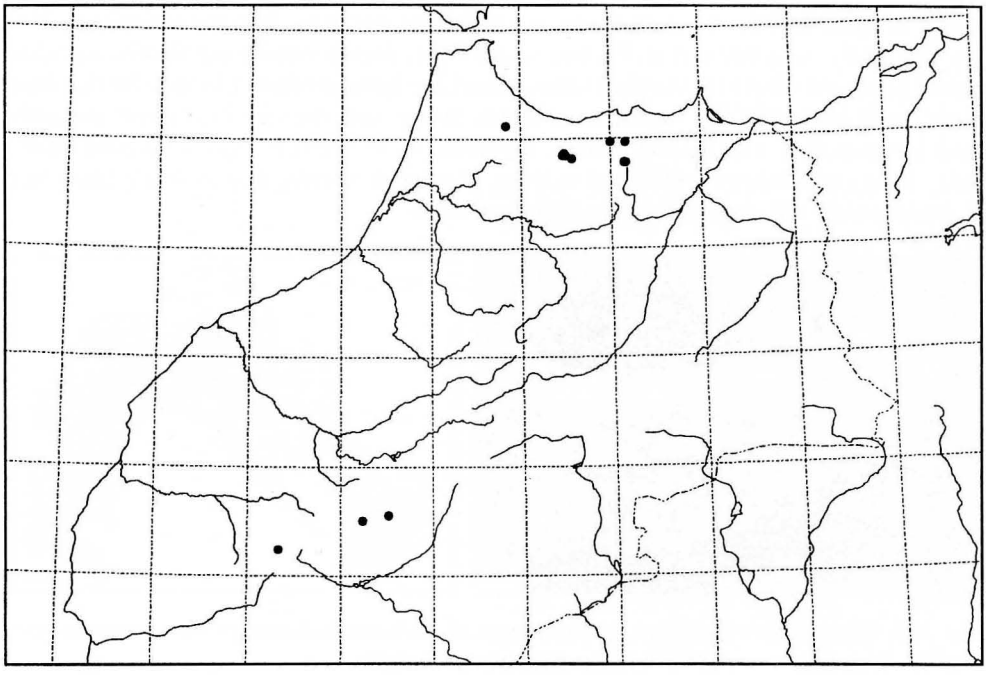


Fig. 162. N African distribution of *Anthemis pedunculata* var. *discoidea*.

21b. ***Anthemis pedunculata*** subsp. ***clausonis*** (Pomel) Oberprieler, **stat. nov.** ≡ *A. clausonis* Pomel, Nouv. Mat. Fl. Atl.: 50 (1874) ≡ *A. pedunculata* [unranked] *clausonis* (Pomel) Battand. in Battandier & Trabut, Fl. Algérie Tunisie: 182 (1905). – Ind. loc.: "Embouchure du Mazafran (Clauson)." – Lectotype (designated here): [Algeria] "Ismael, Castiglione = Bou-Ismael", *Clauson* (MPU-AfN!).
Note. – Battandier (in Battandier & Trabut 1888-1890: 455) mentions *Anthemis clausonis* as a species "très semblable à l'*A. pedunculata* dont elle est peut-être un variété". In Battandier & Trabut (1905: 182) he indicated "β *Clausonis*" along with "γ *decumbens* Cosson, *A. stiparum* Pomel" under *A. pedunculata* Desf. This must be considered as an unranked combination, because varieties are indicated as such in this work (e.g. "*A. montana* L., var. *numidica* Batt.") A few years later, Battandier (1910: 53) lists *A. clausonis* along with *A. granulata* under *A. pedunculata* as a distinct "petite espèce". No formal combination at subspecies rank is proposed in any of the above publications.

Exs.: De Retz, Soc. Franç. Éch. Pl. Vasc. 1947: n° 223.

Short- to long-lived perennial herb (sometimes flowering already in the first year). Root up to 8 mm in diameter. Stems (10-)20-43(-65) cm long, basally 1-3 mm in diameter, leafy throughout, often branched basally and giving rise to other stems, branched distally and

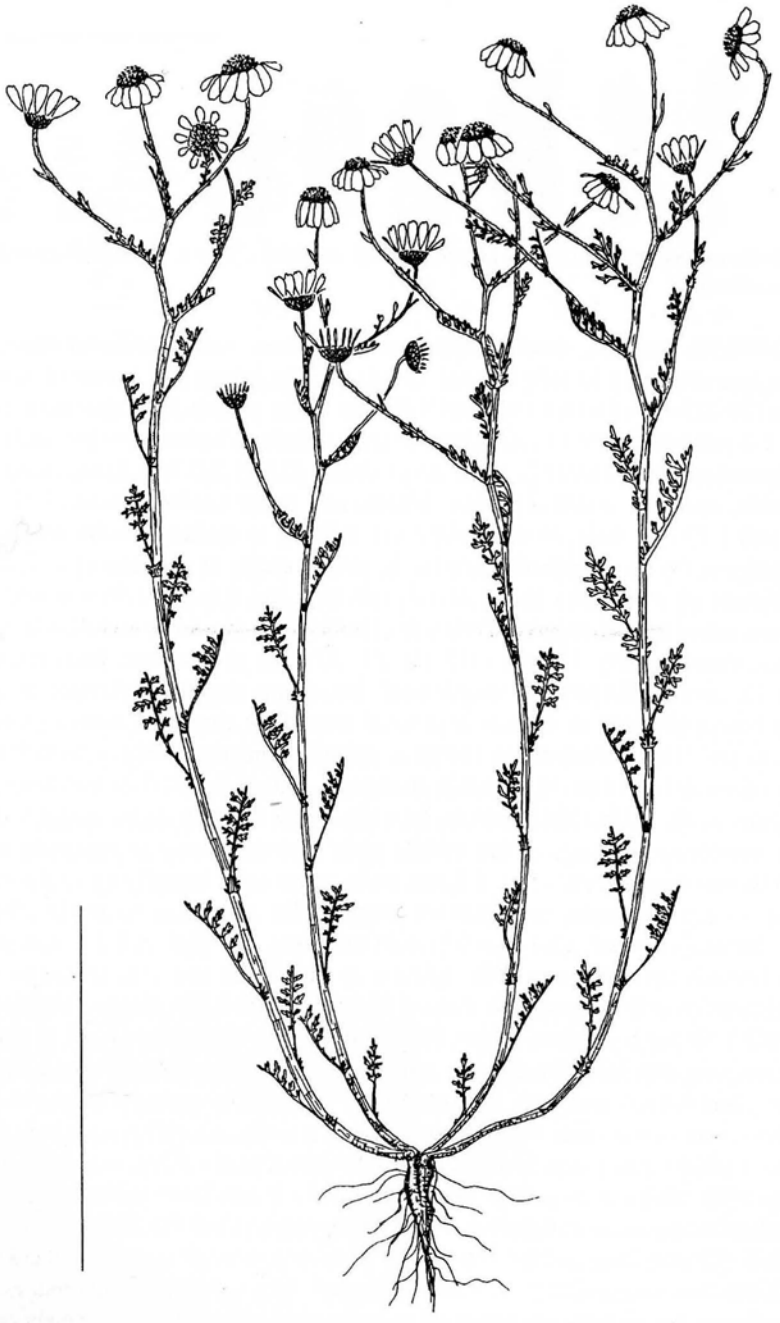


Fig. 163. *Anthemis pedunculata* subsp. *clausonis:* general habit (25 Apr 1873, *Joad*). – Scale bar = 10 cm.

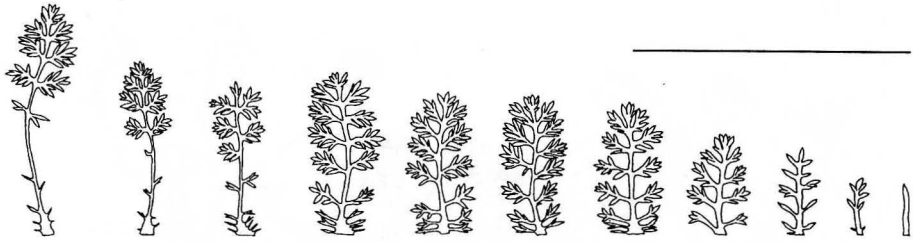


Fig. 164. *Anthemis pedunculata* subsp. *clausonis:* leaf spectrum (11 May 1947, *Dubuis & Faurel*). – Scale bar = 5 cm.

bearing 2-14(-30) capitula, densely appressed tomentose with medifixed hairs, basally sometimes sparsely hairy to subglabrous. Lower cauline leaves and leaves of non-flowering shoots (20-)25-40(-50) mm long and 9-12 mm wide; petiole 8-25 mm long; base usually with 2-3 pairs of entire to pinnatipartite teeth; blade 2-3-pinnatipartite; ultimate segments elliptical-ovate or narrowly elliptical or linear, (0.9-)1.2-2.2(-2.8) mm long and 0.5-1.0 mm wide, sparsely to densely hairy. Middle and upper cauline leaves (7-)11-25(-30) mm long and 1-15 mm wide, ovate to elliptical or linear in outline, usually sessile, basally with 1-4 pairs of entire to pinnatipartite teeth; lamina entire or pinnatisect to 2-3-pinnatipartite; ultimate segments (0.8-)1.0-2.4(-3.2) mm long and 0.6-1.0(-1.3) mm wide, elliptical or linear, sometimes triangular. Peduncles 15-65(-130) mm long and (0.6-)0.8-1.5 mm in diameter, densely hairy. Capitula (13-)16-24(-30) mm in diameter, heterogamous. Involucre 8-12 mm in diameter, hemispherical, becoming slightly umbonate at maturity. Involucral bracts glabrous to densely appressed tomentose abaxially, with a green, longitudinal strip and pale, membranous margins, apically sometimes tinged with brown; the outermost triangular or ovate to narrowly triangular, (1.6-)2.5-3.5(-3.7) mm long and 0.9-1.2 mm wide, acute, with rather narrow, laterally up to 0.2 mm wide, apically up to 0.8 mm wide, membranous margins; the middle ones narrowly ovate to narrowly elliptical, 3.0-4.1(-5.0) mm long and (0.9-)1.1-1.5 mm wide, acute, with laterally up to 0.3 mm wide, apically up to 1.2 mm wide, membranous margins; the innermost narrowly elliptical to narrowly elliptical-obovate, (3.1-)3.5-4.5(-4.8) mm long and (0.9-)1.1-1.4 mm wide, obtuse, with laterally up to 0.4 mm wide, apically up to 1.2 mm wide, membranous margins. Receptacle hemispherical at anthesis, conical at maturity (c. 4.5 in diam., c. 3.5 mm high). Ray florets 12-16 per capitulum, white, female, 6-10 mm long; limb elliptical [index 1.5-2.5], 5-8 mm long and 3.0-4.0 mm wide, apically 3-lobed; tube sparsely glandular, around 1.5 mm long and 0.6-0.8 mm wide. Pales narrowly elliptical to narrowly elliptical-obovate, 2.7-3.9(-5.5) mm long and 0.4-0.8 mm wide, usually apically tapering gradually (sometimes rapidly) into a concolourus (rarely brown-tinged) mucro, basally 0.3-0.5 mm wide, often with conspicuous glands. Disc florets 2.5-3.0 mm long; the basal part inflated, spongy and subtetragonous at maturity, 1.2-1.4 mm long and 0.6-0.7 mm wide. Achenes of ray florets c. 1.5 mm long and 0.5-0.6 mm in diameter; without corona. Achenes of disc florets 1.4-1.6 mm long and 0.6-1.0 mm in diameter; ribs moderately tuberculate; corona absent or (due to the apically protuding ribs) a crenulate rim; marginal achenes persistent, the inner ones readily falling off at maturity.

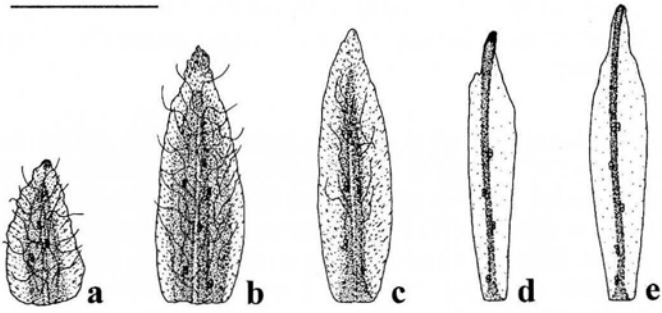


Fig. 165. *Anthemis pedunculata* subsp. *clausonis:* (a-c) involucral bracts, (d-e) pales (Castiglione, *Clauson*). – Scale bar = 2 mm.

Chromosome number. – Unknown. Pollen dimensions suggest a diploid number (see chapter 11).

Distribution and habitat. – Restricted to a small area around Zéralda and Bou Ismaïl in N Algeria (Fig. 156), where it is reported to grow in sandy littoral habitats of the Mediterranean coast.

Variation and taxonomy. – *Anthemis pedunculata* subsp. *clausonis* differs from the other N African subspecies of *A. pedunculata* by the pale (rather than light to dark brown) membranous margins of its involucral bracts. Similarities with *A. mauritiana,* a species from coastal habitats in NE Morocco, were discussed by Maire (1938) when describing *A. pedunculata* var. *faurei* (now considered a subspecies of *A. mauritiana*). *A. pedunculata* subsp. *clausonis* differs from *A. mauritiana* by its perennial habit, pales that persist at maturity, and homomorphic disc achenes. Intermediates between *A. pedunculata* subsp. *clausonis* and subsp. *pedunculata* occur in the vicinity of Alger and Blidah (N Algeria), which is why both are treated here as subspecies of a single species. However, the ecology

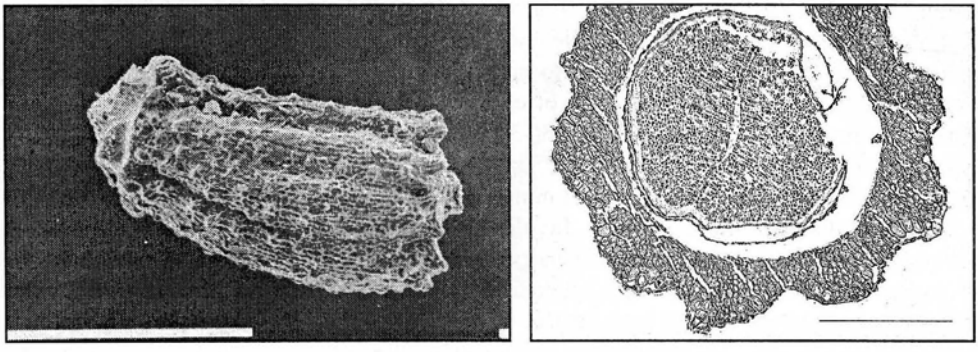


Fig. 166. Micrographs of achenes of disc florets of *Anthemis pedunculata* subsp. *clausonis* (Zeralda, *Herb. Battandier*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

of the maritime *A. pedunculata* subsp. *clausonis* strongly differs from that of the other subspecies of *A. pedunculata,* which are mountain plants. Further cytological and biosystematic studies based on more abundant material might eventually restore the specific distinctness of this taxon.

Specimens seen. – [Algeria, Alger] Staoueli, Algiers, [36°43′N, 2°50′E], May 1857, *Herb. Wolfe* (K). Zéralda, [36°43′N, 2°49′E], *Herb. Battandier* (MPU-AfN). Zeralda (Algérie), [36°43′N, 2°49′E], Jun 1900, *Battandier* (MPU-AfN). Dunes littorales près de Guyotville, [36°49′N, 2°55′E], 11 May 1947, *Dubuis & Faurel, n° 223* (MPU-Sauvage; K; G). Environs d'Alger, Guyotville, [36°49′N, 2°55′E], 1869, *Durando* (P). sables des dunes de Guyotville, [36°49′N, 2°55′E], 19 May 1929, *Maire* (MPU-AfN). Guyotville, [36°49′N, 2°55′E], Jun 1899, *Battandier* (P). Environs d'Alger [...], [36°47′N, 3°4′E], 1 May 1853, *Durando* (G). Algiers, Sidi Jerouch, [36°43′N, 2°49′E], 25 Apr 1873, *Joad* (K). – [Blidah] Castiglione = Bou-Ismaël, [36°39′N, 2°43′E], *Clauson* (MPU-AfN).

21c. ***Anthemis pedunculata*** subsp. ***atlantica*** (Pomel) Oberprieler, **comb. & stat. nov.** ≡ *A. atlantica* Pomel, Nouv. Mat. Fl. Atl.: 289 (1875). – Ind. loc.: "Collines rocheuses des haute plateaux: Khenchela." – Lectotype (designated here): [Algeria] "Khenchela; Khenchela, collines rocheuses", Jun 1874, *Pomel* (MPU-AfN!, isolectotype: P!).

Exs.: Choulette, Fragm. Fl. Alger. Exs. 1857: n° 246 (sub *"Anthemis pedunculata"*); Soc. Dauph. 1878: n° 1677 (sub *"Anthemis tuberculata"*); Reverchon, Pl. Algérie (Kabylie) 1898: n° 208 (sub *"Anthemis pedunculata"*).

Rhizome (1.2-)1.6-3.7(-5.2) mm in diameter. Stems (8-)15-31(-43) cm long, basally (0.9-)1.1-2.0(-3.1) mm in diameter, often unbranched and bearing a single capitulum, sometimes branched in the distal half and with 2-4(-9) capitula, sparsely to densely hairy with medifixed hairs. Lower cauline leaves and leaves of non-flowering shoots (19-)23-34(-40) mm long and (5-)6-11(-19) mm wide; petiole (10-)11-16(-19) mm long; base usually with 2-4 pairs of entire teeth; blade 2(-3)-pinnatipartite; ultimate segments elliptical or narrowly elliptical to linear, (1.0-)1.5-2.4(-3.2) mm long and (0.5-)0.6-0.9(-1.1) mm wide, sparsely to densely hairy. Middle and upper cauline leaves (5-)11-24(-32) mm long and (2-)5-11(-15) mm wide, elliptical to narrowly elliptical, sessile or with an up to 6-10 mm long petiole; base with 1-3 pairs of entire teeth; lamina (1-)2-pinnatipartite to -pinnatisect; ultimate segments (0.9-)1.4-2.3(-3.2) mm long and (0.5-)0.6-0.9(-1.2) mm wide, elliptical or narrowly elliptical to linear, sparsely to densely hairy. Peduncles (13-)45-95(-130) mm long and (0.7-)0.9-1.6(-2.0) mm in diameter, densely hairy. Capitula (20-)23-30(-37) mm in diameter, heterogamous. Involucre (9-)10-12(-14) mm in diameter. Involucral bracts in 2-3 rows, sparsely to densely hairy, with a green, longitudinal strip; the outermost triangular to narrowly triangular, 2.7-3.8(-5.1) mm long and 1.0-1.4(-1.6) mm wide, acute; membranous margins light to dark brown, laterally 0.2-0.5 mm wide, apically 0.5-1.2 mm wide; the middle ones narrowly ovate to narrowly elliptical, (3.0-)3.6-4.6(-5.2) mm long and (1.0-)1.2-1.8(-2.0) mm wide, acute, with laterally 0.3-0.7 mm wide, apically 0.5-1.7 mm wide, pale to brown membranous margins; the innermost obovate or narrowly

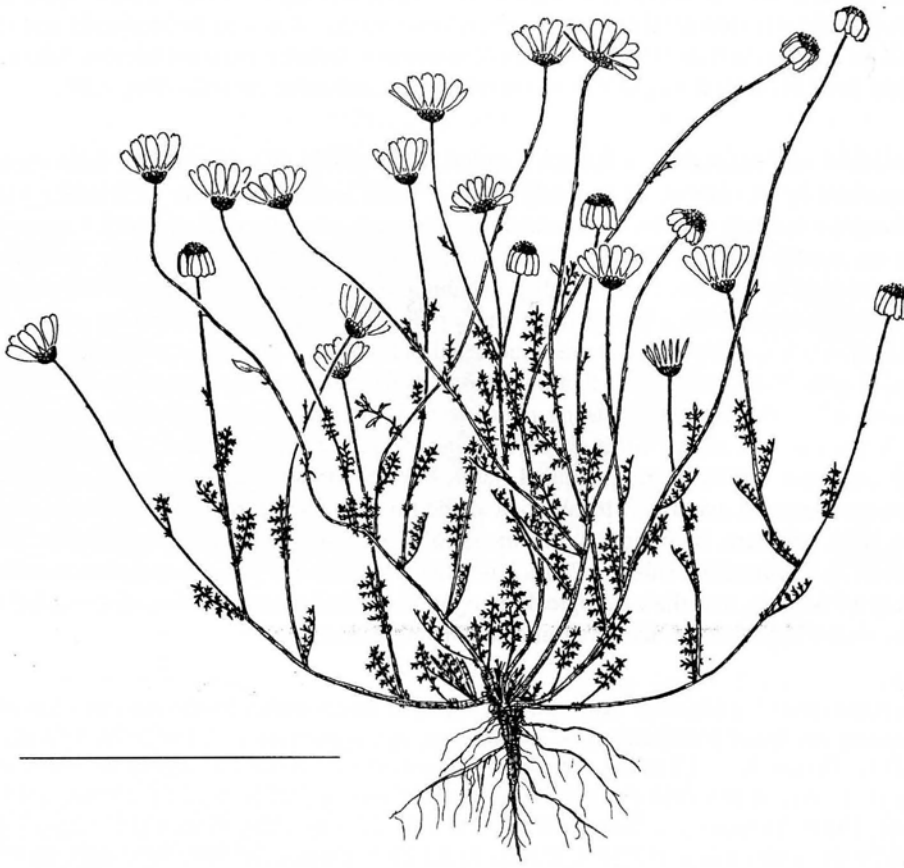


Fig. 167. *Anthemis pedunculata* subsp. *atlantica:* general habit *(Balansa n° 967).* – Scale bar = 10 cm.

elliptical to narrowly obovate, (3.7-)4.3-5.3(-6.0) mm long and 1.4-2.0(-2.5) mm wide, obtuse, with laterally 0.5-1.1 mm wide, apically 0.7-2.0 mm wide pale, membranous margins. Ray florets (8-)10-14(-18) per capitulum, (7.5-)9.2-12.9(-14.1) mm long; limb elliptical to narrowly elliptical [index 1.7-2.9], (6.5-)7.8-11.2(-12.3) mm long and (3.0-)3.3-4.9 (-5.8) mm wide; tube (1.0-)1.3-1.8(-2.1) mm long and 0.7-0.8 mm wide. Pales narrowly elliptical to narrowly obovate, (3.0-)3.5-4.3(-4.5) mm long and 0.7-1.0(-1.2) mm wide, apically abruptly acuminate or tridentate, tip usually tinged with black or brown; basally 0.3-0.5(-0.7) mm wide. Disc florets 2.7-3.2(-3.5) mm long; the basal part usually moderately inflated and spongy at maturity, 1.0-1.4(-1.7) mm long and 0.8-1.1 mm wide. Achenes of ray florets 2.0-2.3 mm long and 0.6-0.8 mm in diameter; corona absent. Achenes of disc florets (1.6-)1.8-2.1 mm long and (0.7-)0.8-1.0(-1.1) mm in diameter; ribs moderately to conspicuously tuberculate; corona absent or an up to 0.3(-0.5) mm long adaxial auricle; peripheral achenes often persistent, central ones readily falling off at maturity.

Chromosome number. – $n = 9$; $2n = 36$ (see discussion in chapter 10).

Distribution and habitat. – Restricted to the mountain ranges of NE Algeria, from the Petite Kabylie mountains (Djebel Babors) eastward to the Monts de la Medjerda and the Massif de l'Aurès, and N Tunisia (Dorsale Tunisienne). Usually in forest habitats between 700 and 2300 m, descending to 200 m. On calcareous and siliceous soils (Fig. 156).

Variation and taxonomy. – *Anthemis pedunculata* subsp. *atlantica* differs from subsp. *pedunculata* by its obovate to narrowly obovate inner involucral bracts with rather wide membranous margins and its pales which are narrowly obovate and abruptly acuminate into a mucronate to tricuspidate tip. While the membranous margins of the outer involucral bracts are light to dark brown as in subsp. *pedunculata,* those of the inner ones are usually pale or bicolourous, with a brown inner and a pale outer zone. *A. pedunculata* subsp. *atlantica* shares the shape of involucral bracts and pales with *A. punctata,* with which it co-occurs in part of the latter's distributional range. It differs from *A. punctata* by its smaller capitula and shorter leaves. A strong phenetic and presumably even phyletic link exists with *A. ubensis,* an annual from E Algeria and N Tunisia, from which *A. pedunculata* subsp. *atlantica* differs by its perennial habit, hemispherical receptacles, and peduncles remaining slender at maturity. Morphological and molecular data suggest a possible hybrid origin of *A. ubensis,* involving *A. pedunculata* and *A. secundiramea* (see chapter 13). However, *A. pedunculata* subsp. *atlantica* is largely restricted to the presently inaccessible territory of Algeria, and the cytological, cytogenetical, and molecular evidence needed to test the above hypothesis is therefore unavailable at present.

Specimens seen. – [Algeria, Annaba] La Calle, En petites masses isolées dans les clairierès sablonneuse des makis d'*Helianthemum halimifolium*, aux expositions [...], [36°54′N, 8°25′E], 6 May 1841, *Durieu* (K). – [Batna] Dans les boisements de chênes-verts du Djebel Bou-Arif, au-dessus de la maison forestière d'Aïn-Tisfrah, près de Batna, [35°36′N, 6°25′E], *Dubuis* (MPU-Dubuis). Djebel Tougour près Batna, [35°34′N, 6°3′E], 22 May 1859, *Cosson* (P). Sommet du Djebel-Tougour, près Batna, [35°34′N, 6°3′E], 10 Jul 1853, *Balansa, n° 967* (MPU-AfN; GOET;

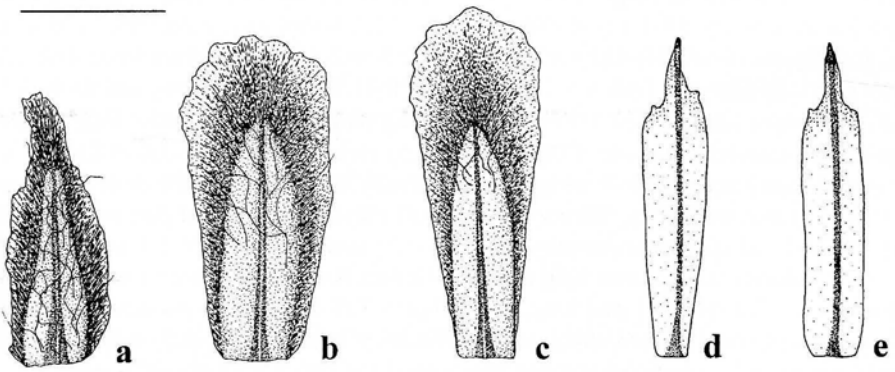


Fig. 168. *Anthemis pedunculata* var. *atlantica:* (a-c) involucral bracts *(Balansa n° 967),* (d-e) pales (d, *id.;* e, Jun 1874, *Pomel*). – Scale bar = 2 mm.

K; P; G). Djebel Tougour près Batna, [35°34′N, 6°3′E], 22 May 1853, *de la Perrandière* (MPU-AfN). Aurès, cèdraies de Sgag, calcaires Marneus et mariees, 1700 m, [35°23′N, 6°10′E], 3 Jul 1920, *Maire* (MPU-AfN; P). Djebel Mahmel, Mts. Aurès, [35°20′N, 6°10′E], 7 Jun 1853, *de la Perraudière* (BC 136276). Djebel Chéliah, Mts. Aurès, [35°19′N, 6°37′E], 11 Jun 1853, *de la Perrandière* (MPU-AfN; P). Aurès, cédraire et pâturages, rocailles gresseuses sur le Chélia, 1500-2300 m, [35°19′N, 6°37′E], 27 Jun 1920, *Maire* (MPU-AfN; P). Massif de l'Aurès, SE-Hänge des Dj. Chelia, NW von Bouhamama, 1900-2150 m, Mergel, Kalkfelsen; 35°18′N, 6°40′E, 7 Jun 1984, *Podlech 38760* (MSB). Mena, vallée de l'Oued-Abdi, Mts. Aurès, [35°10′N, 6°00′E], 4 Jun 1853, *Cosson* (P). – [Bejaïa] Monts Babors, lieux arides, sur le calcaire, 1700 m, [36°32′N, 5°06′E], Jun 1897, *Reverchon, n° 208* (MPU-AfN; P; G; B). Mont Babors, lieux incultes, sur le calcaire, 1700 m, [36°32′N, 5°06′E], Jun 1896, *Reverchon* (G). Djebel Babor, [36°32′N, 5°06′E], 20 Jun 1880, *Cosson* (K; P). Adghar Amellal, à l'Est du Chabet-el-Akra, [36°28′N, 5°20′E], Jul 1880, *Cosson* (P). – [Constantine] Kef Souma, Djebel Sgao, [36°35′N, 6°30′E], Aug 1880, *Reboud* (P). Constantine (Algérie): abonde dans les délaissés du Rhoumel, [36°30′N, 6°25′E], 10 May 1877, *Reboud, n° 1677* (MPU-AfN; K; P; G). 22 km SE Constantine, 3 km W Bou-Nouara, 650 m, 36°20'N, 6°45'E, limestone outcrops, *Sutton & Sutton 676 A* (RNG). Atterrissements du Rummel à Constantine, [36°16′N, 6°36′E], 28 May 1840, *Durieu de Maisonneuve* (P). Environs de Constantine, Aïn-el-Bey, [36°16′N, 6°36′E], May 1906, *Garrigues* (B). Constantine, [36°16′N, 6°36′E], 11 May 1840, *Durieu de Maisonneuve* (P). Coteux calcaires de la vallée du Rhummel supérieur, [36°13′N, 6°25′E], 27 May 1857, *Choulette, n° 246* (MPU-AfN; P; G; K). Constantine, Djebel El Hady Baba, May 1890, *Garrigues* (B). – [Guelma] Oued Zenati, [36°20′N, 7°10′E], 27 May 1911, *Clayé* (P). – [Oum El Bouaghi] Khenchela, collines rocheuses, [35°26′N, 7°08′E], Jun 1874, *Pomel* (MPU-AfN; P). – [Sétif] Petite Kabylie, SW des Djebel Babor an der Straße nach Tizi N'Béchar, 810 m; weiche silikatische Schiefer; 36°27′N, 5°23′E, 16 Jun 1984, *Podlech 39380* (MSB). Djebel Magris, lieux incultes, sur le calcaire, 1500 m, [36°19′N, 5°20′E], Jun 1898, *Reverchon, n° 208* (MPU-AfN; B; BC-Sennen 819944; MA 127032). Sétif, [36°11′N, 5°24′E], *Herb. Battandier* (MPU-AfN). – [Skikda] Dj. Gouffi, petite Kabylie, [36°58′N, 6°25′E], 10 Jul 1861, *Cosson* (P). Djebel Filfilla près Philippeville, [36°53′N, 7°08′E], 18 May 1874, *Pomel* (MPU-AfN). – [Not located] Sables de la Seybouse, Mondoai [?], Apr 1887, *Letourneux* (P). Dj. Bou-Chenak, Oct 1880, *Reboud* (P). – [Tunisia, Siliana] Guelaat El Harrert prope Souk El Djema, [35°58′N, 9°08′E], 28 May 1887, *Letourneux* (P). Sud du Camp de Souk-el-Djema au nord de Makter, [35°58′N, 9°08′E], 24 Jun 1883, *Cosson & al.* (P). Dorsale Tunisienne, Forêt de Kesra, track between Kesra and Djebel Ballouta, c. 6.6 km NE Kesra, limestone rocks, stony slopes and fields,

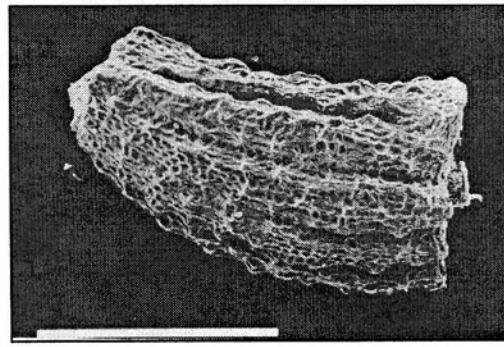


Fig. 169. SEM micrograph of achene of disc floret of *Anthemis pedunculata* subsp. *atlantica (Podlech 38760).* – Scale bar = 1 mm.

1040-1100 m, 35°50.826'N, 9°22.805'E, 18 May 1994, *Vogt 13523 & Oberprieler 7828* (B; G; K; RAB; RNG; Herb. Oberprieler; Herb. Vogt). Kessera, entre Kairouan et le Kef, [35°51'N, 9°23'E], 23 Jun 1883, *Cosson & al.* (P). Dorale Tunisienne, Forêt de Kesra, track n° 764 between Kesra and Djebel Ballouta, c. 3 km NE Kesra, limestone rocks and stony slopes, 1030-1100 m, 35°49.675'N, 9°21.470'E, 18 May 1994, *Vogt 13510 & Oberprieler 7815* (B; G; K; RAB; RNG; SEV; MA; JE; Herb. Oberprieler; Herb. Vogt). – [Kasserine] Dorsale Tunisienne, summit of Djebel Chambi W Kasserine, limestone, 1540 m, 35°12.356'N, 8°40.515'E, 7 May 1994, *Vogt 12606 & Oberprieler 6911* (B; G; K; Herb. Oberprieler, Herb. Vogt). – [Not located] Guelaa Teghara (Djebel Semata) ad rupes, 21 May 1887, *Letourneux* (P). Dj. Cheban, 20 May 1883, *Cosson & al.* (P). Kef Tella (Djebel Meghila) in [...], 16 May 1887, *Letourneux* (P).

22. ***Anthemis punctata*** Vahl, Symb. Bot. 2: 91, t. 46 (1791) ≡ *A. montana* var. *punctata* (Vahl) Battand. in Battandier & Trabut, Fl. Algérie: 454 (1889). – Ind. loc.: "Habitat in montibus Tunetanis haud frequens." – Lectotype (Benedí i González 1987: 273): [Tunisia:] "in summitate montis Plumbi Tunetani," *herb. Vahl* (C, microfiche!).
– *Anthemis punctata* var. *typica* Fiori in Fiori & Béguinot, Fl. Italia 3: 258 (1903); Maire in Bull. Soc. Hist. Nat. Afrique N. 22: 51 (1931), nom. inval. [Art. 24.3].

Perennial with annual shoots arising from a woody stock formed by the bases of primary and subsequent annual shoots. Rootstock woody, 2.5-11.0 mm in diameter. Stems herbaceous, basally lignified, ascending-erect to erect, 11-61 cm long, basally 1.6-5.1 mm in diameter, leafy in the lower half, often unbranched and bearing a single capitulum, sometimes branched in the distal half and with 2-7 capitula, sulcate, glabrous or sparsely to densely hairy with medifixed hairs, basally sometimes tinged with red. Lower cauline leaves and leaves of non-flowering shoots 29-115 mm long and 8-53 mm wide, elliptical to obovate or narrowly elliptical to narrowly obovate in outline, petiolate; petiole 14-60 mm long; base with 2-7 pairs of entire teeth; blade 1-2-pinnatipartite to 2-3-pinnatisect, with 2-4 pairs of ovate to elliptical primary lobes; ultimate segments triangular or elliptical to narrowly elliptical or linear, 1.4-9.0 mm long and 0.6-2.3 mm wide, mucronate, glabrous or sparsely to densely hairy, glandular-punctate. Middle and upper cauline leaves 12-58 mm long and 1-32 mm wide, ovate or elliptical to narrowly elliptical in outline, sessile or with an up to 16 mm long petiole; base with 1-4 pairs of entire teeth; lamina 1-2(-3)-pinnatipartite with 2-4 pairs of primary lobes; ultimate segments 1.2-4.8 mm long and 0.7-2.1 mm wide, triangular or elliptical to linear, mucronate, glabrous or sparsely to densely hairy, glandular-punctate. Peduncles 22-255 mm long and 1.0-3.4 mm in diameter, remaining slender or becoming slightly incrassate at maturity, sulcate, sparsely to densely hairy. Capitula 30-55 mm in diameter, heterogamous. Involucre (10-)14-22 mm in diameter, hemispherical, strongly umbonate at maturity. Involucral bracts in 2-3 rows, glabrous or sparsely to densely hairy, with a green longitudinal strip and dark brown to pale membranous margins; the outermost triangular to narrowly triangular, 3.2-5.6 mm long and 1.2-2.4 mm wide, acute, with laterally 0.2-0.6 mm wide, apically 0.3-1.5 mm wide, dark brown membranous margins; the middle ones narrowly elliptical to narrowly obovate, 3.9-7.2 mm long and 1.4-3.8 mm wide, acute or obtuse, with laterally 0.4-1.6 mm wide, apically 1.0-2.5 mm wide, dark brown or pale membranous margins; the innermost narrowly ellip-

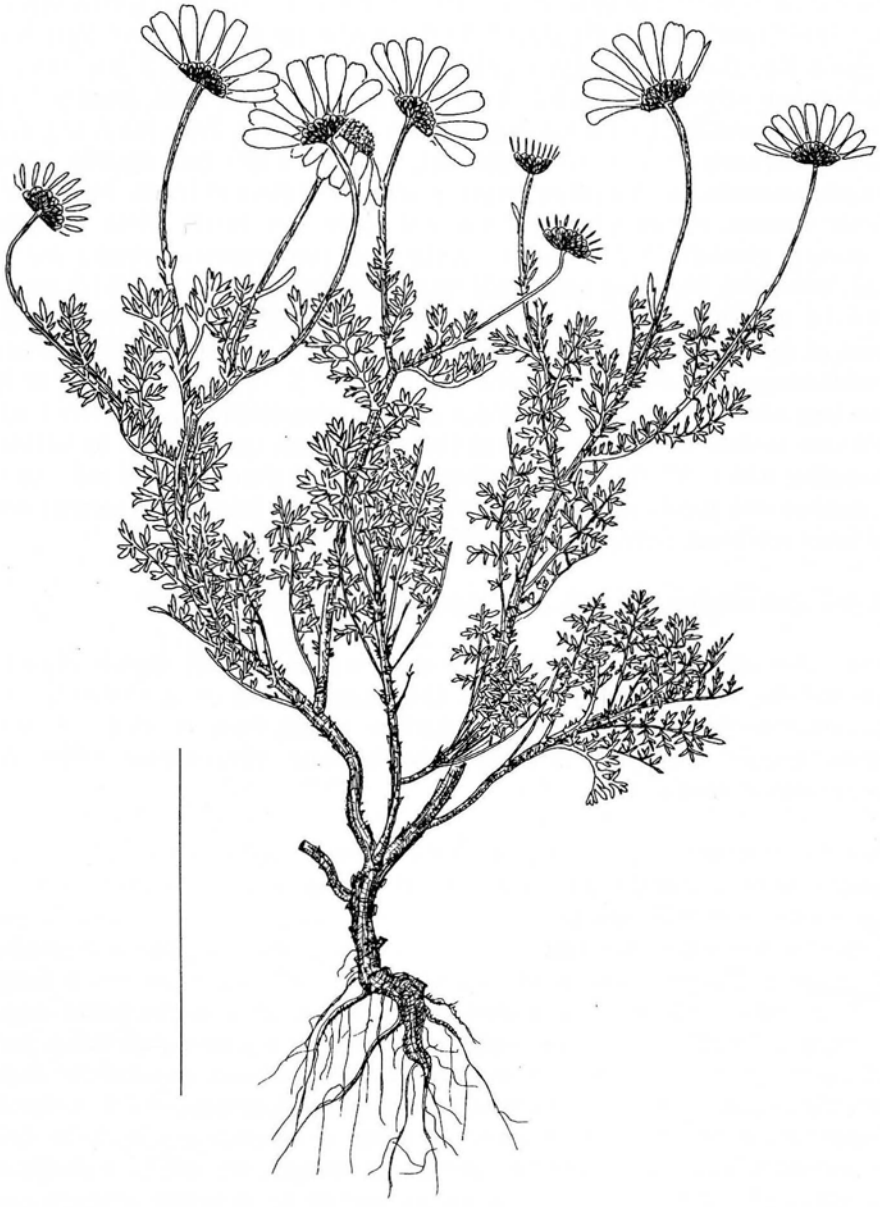


Fig. 170. *Anthemis punctata* subsp. *punctata:* general habit *(Vogt 12238 & Oberprieler 6543).* – Scale bar = 10 cm.

tical or narrowly obovate, 4.5-8.2 mm long and 1.3-4.0 mm wide, acute or obtuse, with laterally 0.4-1.7 mm wide, apically 0.8-3.3 mm wide brown or pale, membranous margins. Receptacle hemispherical at anthesis, 4-6 mm in diameter and 3-5 mm high; usually conical, sometimes hemispherical at maturity, 4.5-6 mm in diameter and 3-8 mm high, paleate throughout. Ray florets 12-23 per capitulum, white, female, 11.0-25.5 mm long; limb elliptical to narrowly elliptical, 9.5-23.0 mm long and 3.3-7.3 mm wide, apically 3-lobed; tube sparsely glandular, 1.4-2.8 mm long and 0.6-1.4 mm wide. Pales linear to narrowly elliptical or narrowly obovate, 3.7-5.7 mm long and 0.4-1.5 mm wide, apically gradually or abruptly acuminate to tricuspidate, mucro usually tinged black or brown, basally 0.3-1.0 mm wide, carinate, membranous; persistent at maturity. Disc florets yellow, hermaphrodite, sparsely glandular, 3.1-4.2 mm long; the basal part remaining slender and compressed, sometimes becoming moderately spongy-inflated at maturity, 1.0-1.8 mm long and 0.6-1.2 mm wide; the distal part funnel-shaped, apically 5-lobed; lobes triangular. Achenes of ray florets 2.3-3.8 mm long and 0.6-1.3 mm in diameter, fusiform, round to somewhat triangular in cross-section, adaxially bent; ribs 8-10; corona absent or an up to 1.0 mm long adaxial auricle. Achenes of disc florets ± homomorphic, 1.8-3.1 mm long and 0.8-1.6 mm in diameter, obconical to narrowly obconical, quadrangular to circular in cross-section, with c. 10 ribs; ribs smooth or tuberculate; tubercles tipped with mucilage cells; furrows with glands; corona absent or an up to 1.1 mm long adaxial auricle; peripheral achenes persistent, central ones readily falling off at maturity.

Chromosome number. – $n = 18$, $2n = 36$ (see discussion in chapter 10).

Distribution and habitat. – Endemic to the mountains of NE Algeria (Djurdjura, Grande Kabylie, Petite Kabylie, Monts de Constantine, Monts de la Medjerda) and N Tunisia (Dorsale Tunisienne). In mountain habitats, usually between 1000 and 1800 m, sometimes descending to c. 500 m. Preferably on limestone cliffs and steep stony slopes with calcareous scree (Fig. 174).

Variation and taxonomy. – Together with *Anthemis pedunculata* and *A. abylaea, A. punctata* forms a complex of perennial species characterised by achenes with 10 longitudinal, weakly to strongly tuberculate ribs and usually round in cross-section. Similar to *A. abylaea, A. punctata* differs from *A. pedunculata* by its showy capitula with involucres of 14-22 mm in diameter (5-14 mm in *A. pedunculata).* Whereas *A. abylaea* is morphologically uniform, *A. punctata* varies considerably throughout its distributional range, to some extent in parallel to patterns of variation observed in *A. pedunculata* subsp. *pedunculata* and subsp. *atlantica.* Two subspecies are distinguished here, based on the shape of the inner involucral bracts and pales. While both mentioned subspecies of *A. pedunculata* supposedly comprise diploid or tetraploid cytotypes, *A. punctata* appears to be consistently tetraploid. It also shows some morphological relations, not only to *A. pedunculata* and *A. abylaea* but also to the tetraploid Sicilian endemic *A. cupaniana,* similarly characterised by large and showy flower heads. Occasionally, as by Fernandes (1976), *A. punctata* and *A. cupaniana* are treated as subspecies of a single species. Fernandes (1975a: 1427) found the tuberculate achenes of *A. punctata* to be longer and more slender than in the smooth-fruited *A. cupaniana.* In addition, at least *A. punctata* subsp. *punctata* and *A. cupaniana* differ in the shape of their inner involucral bracts, which in *A. punctata*

subsp. *punctata* are obovate and have extremely wide, usually pale membranous margins, but in *A. cupaniana* are elliptical, with rather narrow and usually dark brown membranous margins. In this respect *A. cupaniana* approaches the N Algerian *A. punctata* subsp. *kabylica,* from which it differs by its smooth achenes. For the time being, I prefer to treat *A. punctata* and *A. cupaniana* as two closely related but independent species.

Key to subspecies

1. Inner involucral bracts narrowly obovate, with broad, pale or brown membranous margins; pales abruptly acuminate or tricuspidate, tips stramineous or tinged with brown ... . 22a. *A. punctata* subsp. *punctata*
– Inner involucral bracts narrowly elliptical, with narrow, brown membranous margins; pales gradually tapering into a tip tinged with brown .... 22b. *A. punctata* subsp. *kabylica*

22a. ***Anthemis punctata*** Vahl subsp. ***punctata***

= *Anthemis punctata* var. *baborensis* Battand. in Battandier & Trabut, Fl. Algérie, Suppl. Phan.: 53 (1910). – Ind. loc.: "Djebel Tamesguida, dans les Babors." – Lectotype (designated here): [Algeria] "Tamesguida, (Djebel Tamesguida, grès éocènes)", 1500 m, *Battandier* (P!; isolectotype: MPU-AfN!).

Exs.: Kralik, Pl. Tunet. 1854: n° 392; Kralik, Pl. Alger. Sel. 1861: n° 127.

Rhizome 2.5-11.0 mm in diameter. Stems (11-)18-40(-61) cm long, basally (1.6-)2.0-3.5(-5.1) mm in diameter, often unbranched and bearing a single capitulum, sometimes branched in the distal half and with 2-4(-7) capitula, sulcate, sparsely to densely hairy with medifixed hairs. Lower cauline leaves and leaves of non-flowering shoots (29-)37-66 (-115) mm long and (8-)12-26(-53) mm wide; petiole (14-)18-35(-50) mm long; base usually with 2-5 pairs of entire teeth; blade 1-2-pinnatipartite to 2-3-pinnatisect; ultimate segments triangular or elliptical to narrowly elliptical, (1.4-)1.7-4.5(-9.0) mm long and (0.6-)0.8-1.6(-2.3) mm wide, sparsely to densely hairy. Middle and upper cauline leaves (12-)16-38(-58) mm long and (1-)8-22(-32) mm wide, sessile or with an up to 16 mm long petiole; blade 1-2(-3)-pinnatipartite; ultimate segments (1.2-)1.6-3.3(-4.5) mm long and

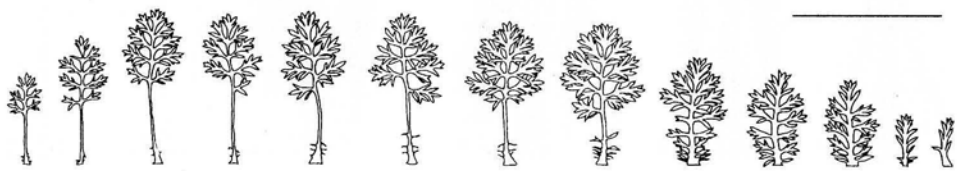


Fig. 171. *Anthemis punctata* subsp. *punctata:* leaf spectrum *(Vogt 12238 & Oberprieler 6543).* – Scale bar = 5 cm.

0.7-1.5(-2.1) mm wide, triangular or elliptical to linear, sparsely to densely hairy. Peduncles (22-)44-140(-255) mm long and (1.0-)1.3-2.0(-2.5) mm in diameter. Capitula (30-)35-47(-55) mm in diameter. Involucre (10-)14-17(-22) mm in diameter. Involucral bracts in 2-3 rows, sparsely to densely hairy; the outermost ovate or triangular to narrowly triangular, (3.2-)3.5-4.8(-5.6) mm long and (1.2-)1.4-2.0(-2.4) mm wide, acute, with laterally 0.2-0.6 mm wide, apically (0.3-)0.5-1.5 mm wide, dark brown membranous margins; the middle ones narrowly elliptical to narrowly obovate, (3.9-)4.6-6.3(-7.2) mm long and (1.4-)1.6-2.6(-3.8) mm wide, acute to obtuse, with laterally 0.5-1.2(-1.6) mm wide, apically 1.0-2.5 mm wide, dark brown to pale membranous margins; the innermost narrowly obovate, (4.5-)5.4-7.2(-8.2) mm long and (1.8-)2.0-3.2(-4.0) mm wide, obtuse, with laterally 0.5-1.3(-1.7) mm wide, apically 1.3-2.5(-3.3) mm wide, brown to pale membranous margins. Ray florets (12-)14-22 per capitulum, white, female, (11.0-)11.8-18.8(-25.5) mm long; limb elliptical to narrowly elliptical [index 2.0-4.2], (9.5-)10.0-16.6(-23.0) mm long and (3.3-)3.8-5.7(-7.0) mm wide; tube (1.4-)1.6-2.3(-2.8) mm long and 0.6-1.4 mm wide. Pales narrowly elliptical to narrowly obovate, (3.7-)4.2-5.0(-5.7) mm long and (0.75-)0.9-1.3(-1.5) mm wide, apically abruptly acuminate to tricuspidate, apex usually tinged with black or brown, basally 0.3-0.7(-1.0) mm wide. Disc florets 3.1-3.8(-4.2) mm long; the basal part 1.0-1.6(-1.8) mm long and 0.7-1.2 mm wide. Achenes of ray florets 2.3-3.0 mm long and 0.7-0.8 mm in diameter; corona absent or an up to 0.4 mm long adaxial auricle. Achenes of disc florets (1.8-)2.0-2.4(-2.8) mm long and 0.8-1.2(-1.5) mm in diameter; ribs smooth to moderately tuberculate; corona absent or an up to 0.7(-1.1) mm long adaxial auricle.

Chromosome number. – $n = 18$; $2n = 36$ (for discussion see chapter 10).

Distribution and habitat. – Endemic to the Petite Kabylie (Djebel Babors), the Monts de Constantine, and the Monts de la Medjerda in NE Algeria, and N Tunisia (Dorsale Tunisienne). In mountain habitats usually between 1000 m and 1800 m, descending to around 500 m in E Tunisia. Prefers N-exposed limestone cliffs and steep stony slopes with calcareous scree, where in N Tunisia (Djebel Goraa, Djebel Dyr, Djebel Zaghouan, Table

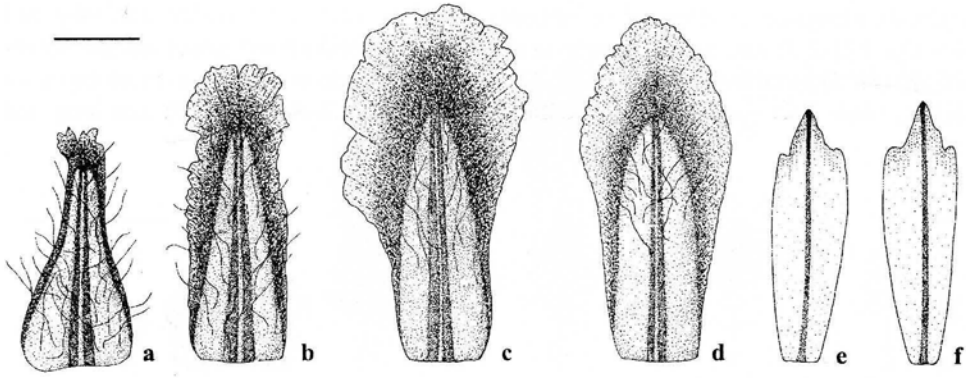


Fig. 172. *Anthemis punctata* subsp. *punctata:* (a-d) involucral bracts, (e-f) pales *(Vogt 12238 & Oberprieler 6543).* – Scale bar = 2 mm.

de Jugurtha) it was found growing together with *Asplenium ceterach* L., *Centaurea acaulis* subsp. *balansae* (Boiss. & Reuter) Maire, *Euphorbia dendroides* L., *Globularia alypum* L., *Hertia cheirifolia* (L.) Kuntze, *Jasminum fruticans* L., *Polypodium cambricum* L., *Sedum dasyphyllum* L., *S. sediforme* (Jacq.) Pau, and *S. album* L. In roadside habitats, heavily grazed mountain pastures and arable fields adjacent to the habitats of *Anthemis punctata* subsp. *punctata* the diploid annual *A. ubensis* is frequently encountered.

Variation and taxonomy. – *Anthemis punctata* subsp. *punctata* exhibits a considerable amount of phenetic plasticity throughout its distributional range, and clinal variation of some features of indumentum and achene morphology. Plants from N Tunisia usually have densely hairy stems and involucral bracts, those from the W part of the distributional area tend to have only sparsely hairy stems and sparsely hairy to glabrous involucral bracts. The latter include the type of *A. punctata* var. *baborensis,* from the Djebel Babor region, and are somewhat transitional to the more westerly *A. punctata* subsp. *kabylica,* characterised by glabrous involucral bracts. However, the plants from the Djebel Babor region still have pales with abruptly acuminate to tricuspidate tips; they are therefore assigned to subsp. *punctata*. The variation in indumentum density is paralleled to some extent by achene shape and ornamentation, and corona length: N Tunisian plants tend to have smooth to weakly tuberculate achenes with a comparatively long corona and a more rhombic outline in cross-section, while plants from NE Algeria usually have conspicuously tuberculate achenes with a short corona and are round in cross-section. Since the described pattern is continuous and punctuated by exceptions, no further subdivision of *A. punctata* subsp. *punctata* is proposed here.

The observed clinal variation within *A. punctata* subsp. *punctata* is perhaps due to its co-occurrence with *A. pedunculata* in the W parts of its distributional range, where hybridisation between the two taxa, especially on the tetraploid level may have led to character introgression. However, cytological and cytogenetical studies within the concerned populations in NE Algeria are unfeasible at present, so that these suggestions are solely based on the study of herbarium specimens.

Specimens seen. – [Algeria, Annaba] In fissuris rupium montis Edough, loco dicto Voile noire, [36°55′N, 7°38′E], May 1857, *Letourneux* (P; K). In fissuris rupium montis Debagh prope

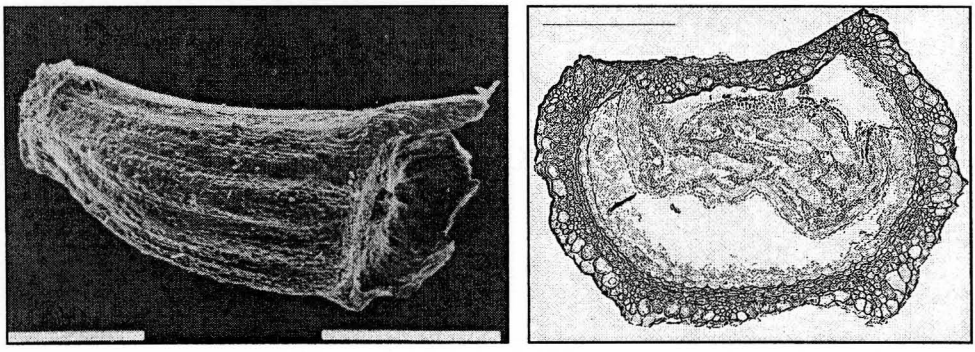


Fig. 173. Micrographs of achenes of disc florets of *Anthemis punctata* subsp. *punctata (Vogt 13823 & Oberprieler 8128).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Bone, [36°32′N, 7°18′E], 29 Apr 1861, *Letourneux, n° 127* (GOET; P; G; K). – [Constantine] Dj. Mecid Sidi Aïcha, Djebel Sgao, [36°38′N, 6°20′E], Aug 1880, *Reboud* (P). Kef Msid el Aïcha, [36°38′N, 6°20′E], *Herb. Battandier* (MPU-AfN). prairie d'Aioun Seba, Massif du Chettaba, [36°18′N, 6°25′E], May 1878, *Reboud* (P). Dj. Chettabah (Algérie) près Constantine, [36°18′N, 6°25′E], Jun 1889, *Girod* (G). – [Guelma] Voile noire in fissuris rupium, Djebel Thaya, [...], [36°32′N, 7°10′E], Apr/May 1857, *Letourneux* (P). Djebel Mahouna près Guelma, [36°26′N, 7°26′E], 4 Jun 1880, *Cosson* (P). Sommet du Dj. Nellid[?] (Ouled Messaoud), [36°22′N, 7°55′E], 31 May 1857, *Letourneux* (P). Djebel Tehaga, Djebel Debag, Kef el Haks, [36°21′N, 7°40′E], May 1857[?], *Letourneux* (P). Djebel Dekma, [36°13′N, 7°45′E], 27 Apr 1888, *Cosson & Duval* (P). – [Tunisia, Béja] Dorsale Tunisienne, Monts de Teboursouk, N-facing limestone cliffs of Djebel Goraa, 780 m, 36°29.422'N, 9°9.075'E, 3 May 1994, *Vogt 12238 & Oberprieler 6543* (B; G; K; RAB; RNG; SEV; Herb. Oberprieler; Herb. Vogt). – [Le Kef] Dorsale Tunisienne, Djebel Dyr, limstone cliffs and mountain pastures, 1000 m, 36°12.868'N, 8°44.637'E, 4 May 1994, *Vogt 12353 & Oberprieler 6658* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). Dorsale Tunisienne, Table de Jugurtha, limestone cliffs, stony slopes, 1200-1270 m, 35°44.804'N, 8°22.666'E, 5 May 1994, *Vogt 12466 & Oberprieler 6771* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). Guelaat Es Sname, ad rupes, [35°45′N, 8°23′E], 29 Jun 1884, *Letourneux* (P). Guelaat-es-Snam ad rupes septentrionem, [35°45′N, 8°23′E], 14 May 1886, *Letourneux* (P). – [Tunis] Dj. Bou-Kourneïn prope Hammam-El-Lif, [36°44′N, 10°20′E], 9 May 1883, *Cosson & al.* (P; K). Régence de Tunis, 1856, *Kralik* (P). – [Zaghouan] sommet du Djebel Ressas (Mons Plumbi), [36°38′N, 10°22′E], 20 Apr 1913, *Cuénod* (MPU-AfN). Sommet du Dj. Reças, [36°38′N, 10°22′E], 20 Apr 1912, *Cuénod* (G). Djebel Gardena = loco classico, [36°38′N, 10°22′E], *s.coll.* (MPU-AfN). Dj. Reças (ex ipsissimo loco Vahliano), Tunisie, [36°38′N, 10°22′E], 1874, *Doûmet-Adanson* (P). Dj. Zaghouan, [36°23′N, 10°09′E], 1 Jun 1883, *Cosson & al.* (G; K; P). Zaghouan (Porte optique), [36°23′N, 10°09′E], 3 Apr 1926, *Cuénod* (G). Djebel Zaghouan, [36°23′N, 10°09′E], *Kralik, n° 85* (K). Nordwestflanke des Djebel Zaghouan, Ostteil, unweit der Relaisstation, ca. 800 m, an steiler Felswand, [36°23′N, 10°09′E], 15 Apr 1968, *Wagenitz 1351* (B). In summis rupestribus Djebel Zaghouan, [36°23′N,

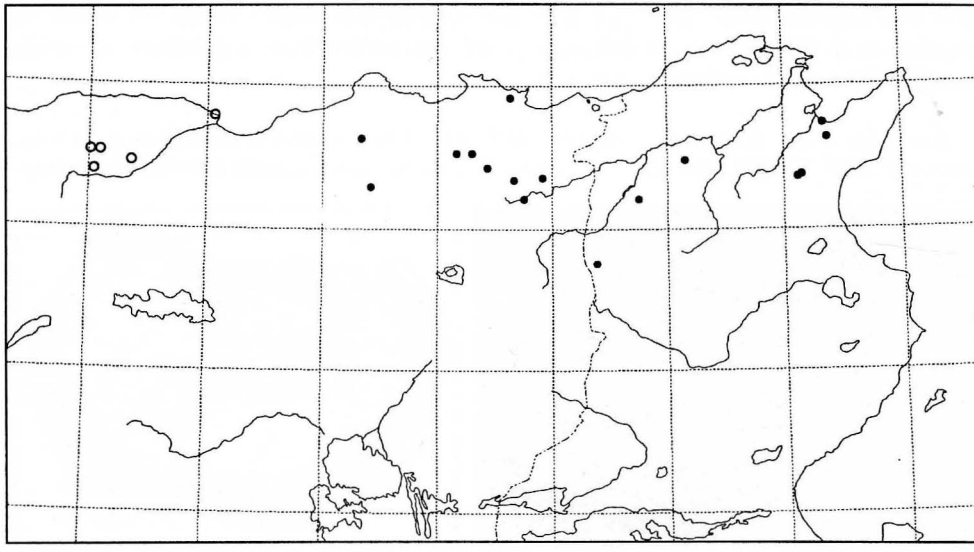


Fig. 174. Total distribution of *Anthemis punctata* (● subsp. *punctata*, ○ subsp. *kabylica*).

10°09′E], 13 Jul 1854, *Kralik, n° 392* (MPU-AfN; GOET; G; K). In summis rupestribus Djebel Zaghouan, [36°23′N, 10°09′E], 2 Jul 1854, *Kralik* (MPU-AfN; B). In fruticetis Djebel Zaghouan, [36°23′N, 10°09′E], 5 Jul 1854, *Kralik* (G; P). Zaghouan, [36°22′N, 10°07′E], May 1905, *Cuénod* (G). Dorsale Tunisienne, NW-facing slopes of Djebel Zaghouan, near track to transmitting installation, limestone cliffs and stony slopes, 750-850 m, 36°22.098'N, 10°7.325'E, 23 May 1994, *Vogt 13823 & Oberprieler 8128* (B; G; K; RAB; Herb. Oberprieler; Herb. Vogt). – [Not located] Barbarie, *Desfontaines* (P). Z[?]oudja, ad rupes, 1 Jun 1889, *Letourneux* (P). Berberia, *Desfontaines* (MA 127077). – [Cultivated specimens] Cult. Hort. Burdigal. e sem. Tunet. a Kralik lutis in monte Zaghouan, 31 May 1850, *Durieu de Maisonneuve* (P).

22b. ***Anthemis punctata*** subsp. ***kabylica*** (Battand.) Oberprieler, **stat. nov.** ≡ *A. montana* var. *kabylica* Battand. in Battandier & Trabut, Fl. Algérie: 454 (1889) ≡ *A. kabylica* (Battand.) Battand. in Bull. Soc. Bot. France 39: 33 (1892) ≡ *A. punctata* var. *kabylica* (Battand.) Battand., Fl. Algérie, Suppl. Phan.: 53 (1910) ≡ *A. cupaniana* var. *kabylica* (Battand.) Pau in Mem. Real Soc. Española Hist. Nat. 12: 343 (1924). – Ind. loc.: "Azrou-Tidjeur, route du col de Tirourda." – Lectotype (designated here): [Algeria] "Djurdjura oriental: Azrou - Tidjer près Tirourda, rochers calcaires", 1400-1500 m, Jun 1882, *Battandier* (MPU-AfN!, iso- P!).

Note. – A specimen labelled as "type" ([Algeria] Djurdjura: Azrou - Tidjer près Tirourda; Azrou Tidjer", Jul 1905, *Battandier*) was collected too late to be relevant to typification. The varietal rank of the basionym is not explicitly stated in the protologue, but is apparent from Battandier's preface (see Note under *A. granulata,* p. 258) which in this particular case is substantiated by a remark in the appendix of the cited work (Battandier & Trabut 1888-1890: xiii): "*Anthemis numidica* ... diffère de l'*A. montana* et surtout de la variéte *kabylica* ...". Later, Battandier (in Battandier & Trabut 1892: 33) wrote: "*A. kabylica* spec. nov.: *A. montana kabylica,* in *Flore de l'Algérie.*". Later still (Battandier 1910: 53), when *A. kabylica* was assigned to *A. punctata,* once again no explicit indication of rank was made, but varietal status is obvious because the following *A. baborensis,* listed in the same manner, was termed "var. nov.". In contrast, *A. granulata* and *A. clausonis,* under *A. pedunculata,* while listed in the same manner as *A. kabylica* and *A. baborensis* under *A. punctata,* were designated as "petites espèces" and not combined under *A. pedunculata.*

– *Anthemis cupaniana* auct. [non Tod. ex Nyman 1879]: Battandier in Bull. Soc. Bot. France 32: 340 (1885).

Rhizome up to 7 mm in diameter. Stems (17-)20-40(-50) cm long, basally (1.6-)1.8-3.3(-4.2) mm in diameter, unbranched and bearing a single capitulum, or sometimes branched in the distal half and with up to 4 capitula, glabrous to sparsely hairy with medifixed hairs. Lower cauline leaves and leaves of non-flowering shoots (30-)40-85(-100) mm long and (8-)11-32(-40) mm wide; petiole (15-)18-50(-60) mm long; base usually with 3-7 pairs of entire teeth; blade 1-2-pinnatifid to 2-3-pinnatipartite to -pinnatisect; ultimate segments elliptical to narrowly elliptical or linear, 1.5-5.7(-9.0) mm long and 0.6-1.5(-2.0) mm wide, glabrous to sparsely hairy above, sometimes densely hairy beneath. Middle and



Fig. 175. *Anthemis punctata* subsp. *kabylica:* general habit *(Davis 53190).* – Scale bar = 10 cm.

upper cauline leaves (13-)16-35(-46) mm long and 7-19(-26) mm wide, sessile or with an up to 15 mm long petiole; blade 1-2(-3)-pinnatipartite; ultimate segments (1.6-)2.2-3.9 (-4.8) mm long and 0.7-1.3(-1.7) mm wide, triangular or narrowly elliptical to linear. Peduncles (25-)53-122(-185) mm long and (1.0-)1.4-2.8(-3.4) mm in diameter. Capitula (33-)35-44(-47) mm in diameter. Involucre 13-20 mm in diameter. Involucral bracts in 2-3 rows, glabrous to very sparsely hairy; the outermost triangular to narrowly triangular, (3.2-)4.0-5.5 mm long and 1.2-1.7 mm wide, acute, with laterally 0.3-0.4 mm wide, apically 0.8-1.3 mm wide, dark brown membranous margins; the middle ones narrowly elliptical, (4.7-)5.2-6.2 mm long and 1.5-1.8(-2.0) mm wide, acute, with laterally 0.4-0.6 mm wide, apically 1.0-1.5 mm wide, dark brown membranous margins; the innermost narrowly elliptical, (5.0-)5.6-7.0 mm long and 1.3-1.7 mm wide, acute, with laterally 0.4-0.6 mm wide, apically 0.8-1.9 mm wide, brown membranous margins. Ray florets (13-)18-23 per capitulum (16.2-)16.5-18.7(-19.6) mm long; limb narrowly elliptical [index 2.4-3.4], 14.5-17.0(-18.0) mm long and 4.8-6.4(-7.3) mm wide; tube 1.5-2.2(-2.4) mm long and 0.6-1.3 mm wide. Pales narrowly elliptical to linear, (3.7-)4.1-5.0(-5.4) mm long and (0.4-)0.5-0.8(-1.1) mm wide, apically tapering gradually into an apex tinged with black, basally 0.3-0.6(-0.8) mm wide. Disc florets (3.1-)3.4-4.0 mm long; the basal part 1.0-1.5 (-1.7) mm long and 0.6-1.2 mm wide. Achenes of ray florets (2.5-)2.9-3.6(-3.8) mm long and 0.6-1.1(-1.3) mm in diameter; corona absent or an up to 0.5(-1.0) mm long adaxial auricle. Achenes of disc florets (2.0-)2.4-2.9(-3.1) mm long and 1.0-1.4(-1.6) mm in diameter; ribs smooth to strongly tuberculate; corona a (0.15-)0.4-1.0 mm long adaxial auricle.

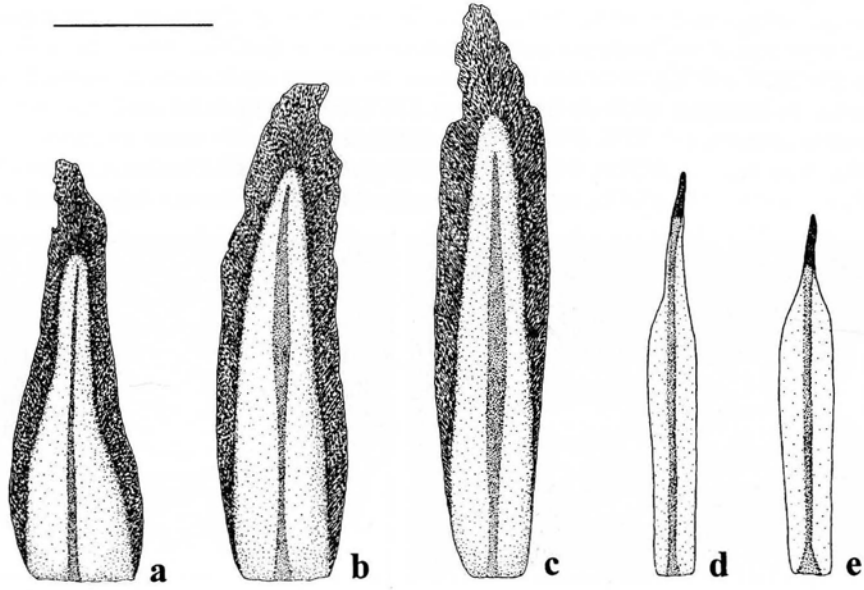


Fig. 176. *Anthemis punctata* subsp. *kabylica:* (a-c) involucral bracts, (d-e) pales *(Davis 53190).* – Scale bar = 2 mm.

Chromosome number. – Unknown. Pollen dimensions are mostly intermediate between values typical for diploids and those for tetraploids. In one population very small pollen grains were found, but a diploid nature of *A. punctata* subsp. *kabylica* is very unlikely.

Distribution and habitat. – Restricted to the Djurdjura massif in central N Algeria (Fig. 174). According to information given on specimen labels, *Anthemis punctata* subsp. *kabylica* grows on limestone cliffs and calcareous scree between 1000 m and 1800 m, and may descend to altitudes of c. 500 m.

Variation and taxonomy. – *Anthemis punctata* subsp. *kabylica* differs from subsp. *punctata* by its elliptical inner involucral bracts and its narrowly elliptical pales which taper gradually into a brown- or black-tinged tip. In the shape of involucral bracts and pales it shows some similarities to *A. abylaea* from the Tangier peninsula in NW Morocco, from which it differs by its coronate achenes and glabrous involucral bracts. Leaf indumentum appears to be rather variable in subsp. *kabylica,* from nearly lacking to densely sericeous. Leaf dissection is also extremely variable: in some specimens, including the lectotype, it is very weak, the leaves being 1-2-pinnatifid and resembling those of *Artemisia absinthum* L. (Battandier in Battandier & Trabut 1888-1890: 454; on the label of the designated lectotype Battandier notes: "foliis hibernis subintegris vix dentatis maximis"); other specimens (e.g. Aït bou Addou, 20 Jun 1888, *Letourneux*) have finely dissected, 2-3-pinnatisect leaves with rather narrow ultimate segments.

Specimens seen. – [Algeria, Bouira] Tizi-Boussouil, rochers calcairs, 1800 m (Djurdjura), [36°N, 4°E], 10 Jul 1914, *Maire* (MPU-AfN). – [Sétif] Le Gouraya de Bougie, lieux incultes sur le calcaire, 600 m, rare, [36°47′N, 5°03′E], Jun 1896, *Reverchon, n° 127* (B; P). – [Tizi Ouzou] Versant septentrional des montagnes du Djurdjura, territoire des Beni Bou Addou, cercle de Dra el Mizan, [36°32′N, 4°05′E], 25-27 Jun 1854, *Cosson* (P). versant septentrional du Djebel Tamgout, montagnes du Djurdjura, cercle de Dra-el-Mizan, [36°32′N, 4°00′E], 3 Jul 1854, *Cosson* (P). Aït bou Addou (Jurjura), [36°32′N, 4°5′E], 20 Jun 1888, *Letourneux* (P). route du col de Tirourda (Kabylie, prov. Alger), [36°28′N, 4°21′E], 9 Jul 1909, *Saint-Lager* (G). Djurdjura: Azerou - Tidjer près Tirourda, [36°28′N, 4°21′E], Jul 1905, *Battandier* (MPU-AfN). Azrou - Tidjeur, route du Col

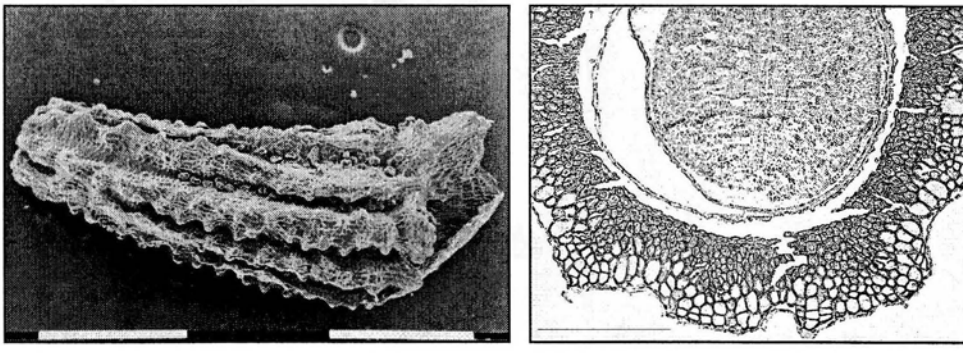


Fig. 177. Micrographs of achenes of disc florets of *Anthemis punctata* subsp. *kabylica* (left, Jul 1896, *Reverchon;* right, 9 Jul 1909, *Saint-Lager*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

de Tirourda, pelouses montagn., [36°28′N, 4°21′E], Jul 1896, *Reverchon* (G). Djurdjura oriental, Azrou - Tidjer près Tirourda, rocher calcaires, 1400-1500 m, [36°28′N, 4°21′E], Jun 1882, *Battandier* (MPU-AfN). Col de Tirourda (vers 1700 m), [36°28′N, 4°21′E], 10 Jun 1939, *Gombault* (P). Fissures des rochers dominant le chemin Lapie vers 1700 m, Massif de l'Aizer, Djurdjura, [36°24′N, 4°02′E], 6 Jul 1935, *Faurel* (MPU-Dubuis). N-side of Dj. Djurdjura, below Tala Guilef, 18 km above Boghni, 1150-1200 m, N. limestone cliffs, 5 Jun 1971, *Davis 53190* (RNG).

C. ***Anthemis*** sect. ***Maruta*** (Cass.) Griseb., Spicil. Fl. Rumel. 2: 205 (1845) ≡ *Anthemis* subg. *Maruta* Cass. in Bull. Sci. Soc. Philom. Paris 1818: 167 (1818) ≡ *Maruta* (Cass.) Gray, Nat. Arr. Brit. Pl. 2: 456 (1821) ≡ *Anthemis* subg. *Cotula* Rupr., Fl. Ingr.: 591 (1860), nom. illeg. ≡ *Anthemis* ser. *Cotula* Fedorov in Komarov, Fl. SSSR 26: 63 (1961). – Type: *Anthemis cotula* L.

Annuals. Stems procumbent, ascending-erect or erect, with usually several to many capitula in cymose capitulescences. Peduncles remaining slender or becoming moderately to strongly inflated at maturity. Capitula radiate. Receptacles hemispherical or conical to extremely elongate and narrowly conical, paleate throughout or only in the distal half. Ray florets female or sterile. Pales subulate. Achenes of disc florets homomorphic to conspicuously heteromorphic, the peripheral ones often conspicuously stouter than the central ones, circular in cross-section, with ± distinct, smooth to tuberculate ribs. Mesocarp usually with a continuous ring of sclerenchymatic tissue.

Basic chromosome number. – $x = 9$.
Ploidy level. – $2x$.

Taxonomy. – According to Yavin (1970), *Anthemis* sect. *Maruta* is characterised by subulate pales ending in a bristle or a sharp point, and comprises 14 species classified into two series, *A.* ser. *Cotula* and ser. *Microcephalae*. The section's phylogenetic relationships within the subgenus, especially its connections with *A.* sect. *Odonthostephanae* Eig with which it shares the apomorphic feature of subulate pales, remain unclear. The same is true for the taxonomic status of Yavin's two informal groups within *A.* ser. *Cotula*, the *A. galilaea* group with achenes easily falling off at maturity, and the *A. pseudocotula* group characterised by persistent achenes.

23. ***Anthemis cotula*** L., Sp. Pl.: 894 (1753) ≡ *Chamaemelum cotula* (L.) All., Fl. Pedem. 1: 168 (1785) ≡ *Maruta cotula* (L.) DC., Prodr. 6: 13 (1837) ≡ *Anthemis foetida* Lam., Fl. Franç. 2: 164 (1778), nom. illeg. [Art. 52.2] ≡ *Maruta foetida* Gray, Nat. Arr. Brit. Pl. 2: 456 (1821), nom. illeg. [Art. 52.2] ?≡ *Chamaemelum foetidum* Baumg., Enum. Stirp. Transsilv. 3: 144 (1816). – Ind. loc.: "Habitat in Europae ruderatis, praecipsie in Ukrainia." – Lectotype (Yavin 1970): Herb. Linn. No. 1016.16 (LINN, microfiche!).

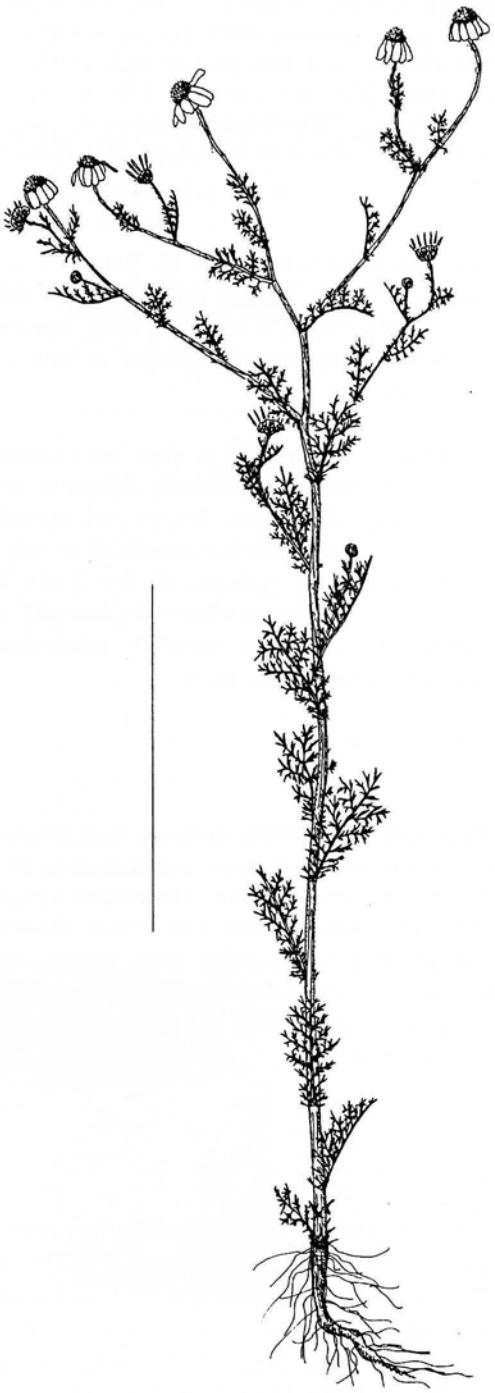


Fig. 178. *Anthemis cotula:* general habit (13 Jun 1928, *Maire*). – Scale bar = 10 cm.

= *Anthemis cotula* var. *microcephala* Willk. & Costa in Linnaea 30: 106 (1859). – Ind. loc.: "In campis aridis circa Balagner, Lérida, Tárragena et in ditionis Llano de Urjel". – Lectotype (Benedí i González 1987): "in COI-Wk (!)" [not seen].

= *Anthemis ramosa* Link ex Sprengel, Syst. Veg. (ed. 16) 3: 593 (1826) ≡ *A. cotula* var. *ramosa* (Link ex Sprengel) Nyman, Consp.: 363 (1879). – Ind. loc.: "Patria?". – Type: not traced.

= *Anthemis psorosperma* Ten., Syll. Pl. Fl. Neapol.: 555 (1831) ≡ *A. cotula* subsp. *psorosperma* (Ten.) Arcang., Comp. Fl. Ital. 358 (1882) ≡ *A. cotula* f. *psorosperma* (Ten.) Fiori in Fiori & Béguinot, Fl. Italia 3: 253 (1903) ≡ *A. cotula* var. *psorosperma* (Ten.) Fiori, Nuov. Fl. Italia 2: 640 (1927). – Ind. loc.: "In campis sterilibus apricis Aprutii: tra Turro ed il fiume Pescara." – Type: not traced.

= *Anthemis cotula* subsp. *gordieni* Sennen in Bol. Soc. Iber. Ci. Nat. 27: 183 (1928-1929). – Ind. loc.: not traced. – Lectotype (Benedí i González 1987): "in BC-Sennen (!)" [not seen].

– *Anthemis abyssinica* J. Gay ex A. Richard, Tent. Fl. Abyss. 1: 418 (1847), pro. syn.

– *Anthemis bourgeaui* auct. [non Boiss. & Reuter 1852]: Sennen & Mauricio, Cat. Fl. Rif Or.: 60 (1933).

Exs.: Sennen, Pl. Espagne 1933: n° 8817.

Annual, single-stemmed or branched from immediately above the ground and then few- to manny-stemmed. Stems usually erect, 15-90 cm tall, basally 2-5 mm in diameter, usually much branched in the upper half, with 5-40 capitula, green, sometimes tinged with red, sulcate, glabrous to sparsely hairy with rather short, appressed medifixed hairs and interspersed glands. Basal and lower cauline leaves 25-55 mm long and 15-30 mm wide, ovate to elliptical in outline, sessile or petiolate; petiole (if present) 10-25 mm long; base with 2-4 pairs of dissected teeth; blade 2-3-pinnatisect, with 3-5 pairs of ovate to elliptical primary lobes; ultimate segments usually linear, sometimes narrowly elliptical, (1.3-)1.9-4.9(-6.2) mm long and (0.3-)0.4-0.7 mm wide, mucronate (up to 0.2 mm), with sparse medifixed hairs, glandular-punctate. Upper cauline leaves 3-35 mm long and 1-20 mm wide, linear or ovate to elliptical in outline, usually sessile; base usually with 1-3 pairs of dissected or entire teeth; blade 2-3-pinnatisect, with 2-4 pairs of primary lobes; ultimate

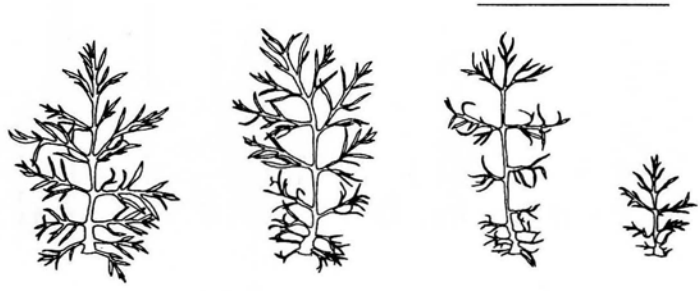


Fig. 179. *Anthemis cotula:* leaf spectrum (13 Jun 1928, *Maire*). – Scale bar = 3 cm.

segments 1.5-4.5 mm long and 0.3-0.6 mm wide, linear or narrowly elliptical. Peduncles (6-)15-50(-75) mm long and 0.5-1.2 mm in diameter, remaining slender or becoming only slightly inflated at maturity and then 1.0-1.5 mm in diameter, sulcate, sparsely to densely appressed tomentose with rather short medifixed hairs. Capitula 14-22 mm in diameter, heterogamous. Involucre 5-9 mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, abaxially appressed tomentose with rather thin, symmetrically to asymmetrically medifixed, sometimes basifixed hairs, with a brown or green longitudinal strip and rather wide, usually pale membranous margins; the outermost triangular to narrowly triangular, c. 2.0-3.0 mm long and 0.7-1.2 mm wide, acute, with laterally up to 0.5 mm, apically up to 0.7 mm wide margins; the middle ones narrowly elliptical, c. 2.0-4.0 mm long and 0.9-1.3 mm wide, acute to obtuse, with laterally up to 0.6 mm, apically up to 0.7 mm wide margins; the innermost narrowly elliptical to linear, c. 2.5-4.0 mm long and 0.9-1.2 mm wide, acute to obtuse, with laterally up to 0.6 mm, apically up to 0.7 mm wide margins. Receptacle globose to ovoid at anthesis (c. 2.0-2.5 mm in diam., c. 2.0-2.5 mm high), conical-ovoid to cylindrical-fusiform at maturity (c. 1.5-3.5 mm in diam., c. 4.0-6.5 mm high), with a spongy core, paleate only in the upper half. Ray florets (8-)12-13 per capitulum, white, sterile, c. 7.0-10.0 mm long; limb elliptical to narrowly elliptical [index 1.8-3.0], c. 5.0-8.0 mm long and c. 2.0-3.0 mm wide, apically 3-lobed, tube sparsely glandulose, c. 1.5-2.0 mm long and c. 0.4-0.7 mm wide. Pales subulate, c. 2.5-3.5 mm long and 0.2-0.3 mm, glandular. Disc florets yellow, hermaphrodite, fertile, sparsely glandular, 2.0-2.5 mm long; the basal part spongy and inflated at maturity, 0.8-1.2 mm long and 0.5-0.9 mm wide; the distal part fusiform, apically c. 0.5-0.9 mm in diameter, 5-lobed; lobes triangular, c. 0.4-0.5 mm long and 0.3-0.4 mm wide, with an up to 0.2 mm long dorsal appendage. Achenes of ray florets undeveloped. Achenes of disc florets homomorphic; 1.3-1.6 mm long and 0.7-1.0 mm in diameter, readily falling off at maturity, c. 10-ribbed; ribs strongly tuberculate, tubercles topped by mucilage cells; furrows with yellow glands; corona absent or a short, rim crenulate due to the apically somewhat protruding ribs.

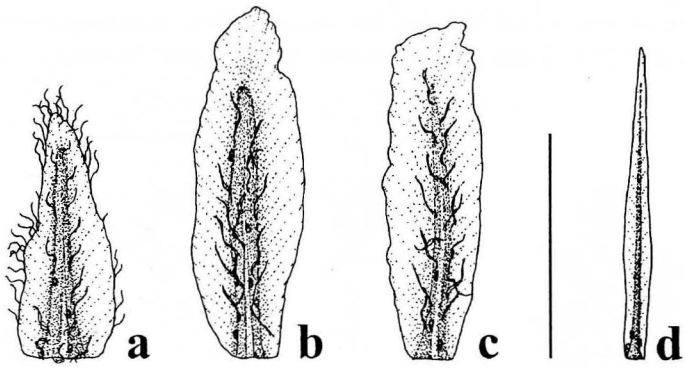


Fig. 180. *Anthemis cotula:* (a-c) involucral bracts, (d) pale *(Sennen 8817 & Mauricio).* – Scale bar = 2 mm.

Chromosome number. – $2n = 18$ (numerous counts, see Kuzmanov & al. 1981).

Distribution and habitat. – Distributed throughout Europe, SW Asia, N Africa, and Macaronesia. Introduced into N and S America, Australia, and New Zealand. In N Africa the species is restricted to N Morocco (Tangier Peninsula, Rif mountains, Melilla Peninsula), the vicinity of Oran (Algeria), Sfax, and Gabès (Tunisia). *Anthemis cotula* shows a broad ecological amplitude and tends to grow in disturbed, ruderal habitats. Benedí i González (1987) reports that on the Iberian Peninsula it grows from sea-level up to 1700 m. Rivera Nuñez & Obón de Castro (1996), reporting on archaeological macro-remains of *Compositae* in Europe, N Africa, and the Near East, indicate findings of *A. cotula,* dissociated from human settlements, already from the Palaeolithic-Mesolithic period, whereas the presence of the species in the vicinity of settlements is documented from the Iron Age onwards (Rivera Nuñez & Obón de Castro 1996).

Variation and taxonomy. – According to Yavin (1970), *Anthemis cotula* is a member of the *A. galilaea* group which, besides *A. cotula,* consists of *A. galilaea* Eig (a later synonym of *A. bornmuelleri* Stoj. & Acht.; see Feinbrun & Gruenberg-Fertig 1976 and Heller & Heyn 1993), *A. retusa* Delile, *A. corymbulosa* Boiss. & Hausskn., and *A. lithuanica* (DC.) Besser ex Trautv. The members of this informal group are characterised by achenes readily falling off at maturity, while in the *A. pseudocotula* group the achenes persist at maturity and the whole capitula act as dispersal units (synaptospermy). From *A. bornmuelleri* and *A. retusa, A. cotula* is distinguished by its ovoid to narrowly conical rather than hemispherical to broadly conical receptacle with pales restricted to the distal half. From the S Turkish endemic *A. corymbulosa, A. cotula* differs by its strongly tuberculate achenes devoid of an adaxial auricle, from *A. lithuanica,* sometimes considered as a mere form of *A. cotula,* by its leaves with broader ultimate segments and tuberculate achenes.

After exclusion of *Anthemis bormuelleri, A. cotula* is said to be very homogenous morphologically (Yavin 1970). Varieties of *A. cotula* described from Europe, e.g. var. *psorosperma* (Ten.) Fiori from Italy and Sicily, var. *brachyglossa* Candargy from the Aegean islands, or var. *microcephala* Willk. & Costa from Spain are considered by her as mere forms. Benedí i González(1987), in his revision of *Anthemis* on the Iberian peninsula,

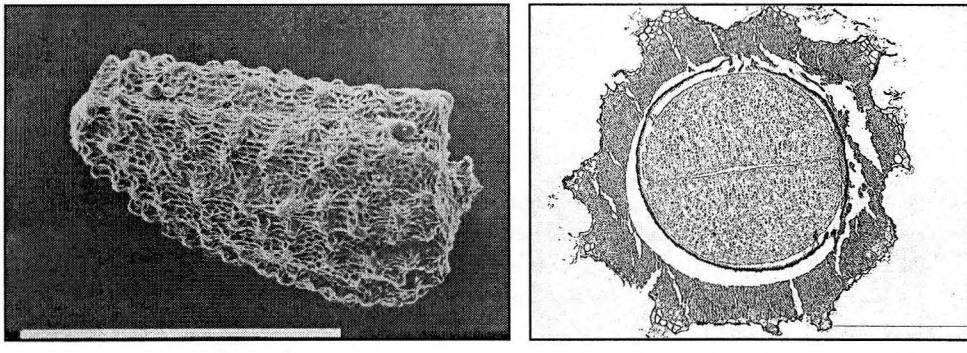


Fig. 181. Micrographs of achenes of disc florets of *Anthemis cotula* (left, *Sennen & Mauricio n° 8817;* right, *Sennen & Mauricio 200*). – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

also found no reasons to further subdivide this species, relegating var. *microcephala* and also *A. cotula* subsp. *gordieni* Sennen to synonymy. The N African specimens of *A. cotula* studied here fall within the normal range of variation of the species.

Specimens seen. – [Spain, Melilla] Melilla (Marruecos), *Aterido* (MA). Barranco de Nano (Melilla), 18 Jun 1915, *Caballero* (MA). Melilla ad Zifaur [?], *Atendi* (BC 29612). – [Morocco, Al Hoceima] Targuist, à Bab-Izugar, 1230 m, [34°58′N, 4°20′W], 20 Jun 1933, *Sennen & Mauricio* (BC-Sennen 819900). Atlas Rifain, Targuist, sol schisteux, 1230 m, [34°55′N, 4°17′W], 20 Jun 1933, *Sennen & Mauricio, n° 8817* (MPU-AfN; BC 136267; BC-Sennen 819899; G). In Atlante rifano: Imasinen, in ruderatis, 1700 m, 13 Jun 1929, *Maire* (MPU-AfN; P). – [Tetouan] Inter segetes ad pontem amnis Laou inter Tetouan et Chaouen, [35°9′N, 5°21′W], 13 Jun 1928, *Maire* (MPU-AfN; P). – [Not located] Daxar Riffien (Anyhera), 8 Apr 1926, *Vidal & Lopez 281* (BC 136278). – [Algeria, Alger] (Alger) Gordur d'Essai [?], [36°47′N, 3°3′E], Jun 1884, *Herb. Battandier* (MPU-AfN). (Alger) Hospital civil, [36°47′N, 3°3′E], Jun 1884, *Herb. Battandier* (MPU-AfN). – [Oran] Oran, [35°42′N, 0°38′W], 1847, *Herb. Schultz-Bip.* (P). in agris, Oran, [35°42′N, 0°38′W], Apr 1852, *s.coll.* (K). – [Tlemcen] Terni, [34°39′N, 1°31′W], 6 Jun 1847, *Havard* (P). – [Tunisia, Gabès] Guerrouch [Ghannouche near Gabès?], [33°55′N, 10°5′E], 21 Jul 1874, *Herb. Pomel* (MPU-AfN). In palmetis; Gabès, [33°54′N, 10°7′E], 24 Apr 1854, *Kralik* (P; G). – [Sfax] In incultis Sfax, [35°45′N, 10°45′E], 2 Jun 1854, *Kralik* (P).

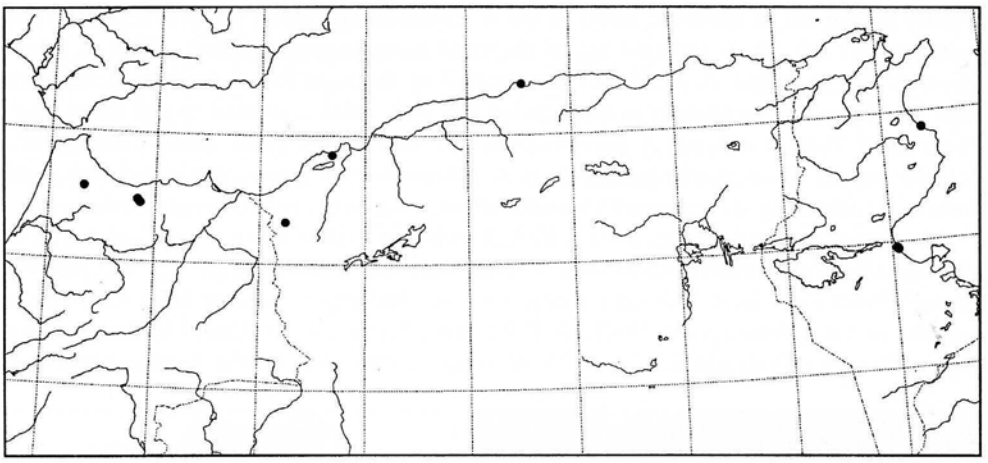


Fig. 182. N African distribution of *Anthemis cotula*.

24. ***Anthemis pseudocotula*** Boiss., Diagn. Pl. Orient. 6: 86 (1846). – Ind. loc.: [Iran] "prope urbem Schiraz et pago Dalechi et Gere, Kotschy 75". – Holotype: (Yavin 1970, Grierson & Yavin 1975): *Kotschy 75* (G-BOIS; isotype: K), not seen.

= *Anthemis pamphylica* Boiss. & Heldr. in Boissier, Fl. Orient. 3: 317 (1875). – Ind. loc.: "Hab. in herbidis inter frutices faucis Tsimbouck khan Pamphyliae (Heldr!), circa Anamour (Péronin!), in collibus Lyciae prope Elmalu (Bourg!)." – Type: not traced.

= *Anthemis rotata* Boiss., Fl. Orient. 3: 318 (1875) ≡ *A. pseudocotula* subsp. *rotata* (Boiss.) Eig in Palestine J. Bot., Jerusalem Ser. 1: 197 (1938) ≡ *A. pseudocotula* var.

rotata (Boiss.) Eig in Palestine J. Bot., Jerusalem Ser. 1: 197 (1938). – Ind. loc.: "Hab. in Arabiâ petreâ (Boiss.!), in Aegypto prope Alexandriam (Samar!), Cypro (Kotschy!)." – Type: not traced.

= *Anthemis pseudocotula* var. *radiata* Eig in Palestine J. Bot., Jerusalem Ser. 1: 197 (1938). – Ind. loc.: "Palestine: Coastal Plain: [...], Negeb: [...], Judean Desert: [...], Transjordania: Edom [...], Syria: [...]." – Lectotype (Yavin 1970): "Israel, Negev, about 10 km S of Be'er Sheva, loess covered by sand," 15 Apr 1928, *Eig & al.* (HUJ), not seen.

= *Anthemis pseudocotula* var. *rotundata* Eig in Palestine J. Bot., Jerusalem Ser. 1: 197 (1938). – Ind. loc.: "Palestine: Judean Desert: Wadi Sikieh (1930 FZ)." – Holotype: "Israel, Judean Desert, Wadi Siqiye", 29 Mar 1930, *Zohary & Feinbrun* (HUJ), not seen.

= *Anthemis pseudocotula* var. *massadensis* Yavin in Israel J. Bot. 19: 146 (1970). – Holotype: "Israel, Judean Desert, Arad - Mezada road, gravelly ground," 6 Apr 1966, *Yavin* (HUJ), not seen.

Annual, branched from immediately above the ground and then few- to many-stemmed, rarely single-stemmed. Stems erect or procumbent to ascending-erect, 5-35 cm tall, basally 0.5-5 mm in diameter, usually branched in the upper half, with 1-15 capitula, light green, sometimes tinged with red, sulcate, sparsely to densely hairy with rather thin, appressed, medifixed hairs. Basal and lower cauline leaves 20-60 mm long and 5-22 mm wide, obovate to narrowly obovate in outline, petiolate; petiole 4-20 mm long; base with 3-4 pairs of dissected teeth; blade 3-pinnatipartite to pinnatisect, with 3-6 pairs of ovate to elliptical primary lobes; ultimate segments linear or narrowly elliptical, 1.0-2.5 mm long and (0.3-)0.5-0.7 mm wide, mucronate (0.1-0.2 mm), with sparse medifixed hairs and glands. Upper cauline leaves 5-20 mm long and 2-8 mm wide, elliptical to narrowly elliptical in outline, sessile; base usually with 1-3 pairs of dissected or entire teeth; blade 1-3-pinnatipartite to pinnatisect, with 2-4 pairs of primary lobes; ultimate segments 0.4-1.5 mm long and 0.1-0.5 mm wide, linear or narrowly elliptical, sometimes triangular. Peduncles (12-)18-32(-40) mm long and 0.7-1.2 mm in diameter, becoming inflated at maturity

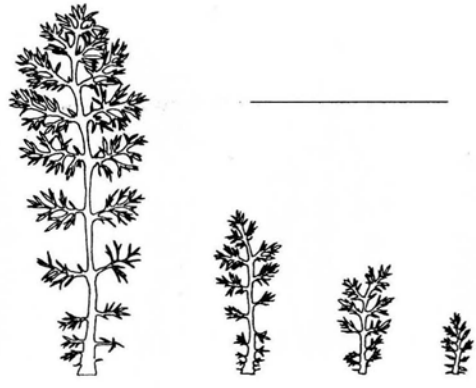


Fig. 183. *Anthemis pseudocotula:* leaf spectrum *(Davis 50308).* – Scale bar = 3 cm.

and then 1.2-2.0 mm in diameter, sulcate, glabrous or sparsely to densely appressed tomentose with rather short medifixed hairs. Capitula (15-)18-26(-30) mm in diameter, heterogamous. Involucre 7-9(-13) mm in diameter, hemispherical, not umbonate at maturity. Involucral bracts in 3 rows, abaxially appressed tomentose with symmetrically to asymmetrically medifixed, sometimes basifixed hairs, with a brown or green, longitudinal strip and rather wide, pale to light brown membranous margins; the outermost triangular-elliptical to narrowly triangular-elliptical, c. 2.5-4.0 mm long and 0.9-1.5 mm wide, acute, with laterally up to 0.5 mm, apically up to 1 mm wide margins; the middle ones narrowly elliptical to narrowly elliptical-obovate, c. 3.0-4.5 mm long and 1.3-1.8 mm wide, acute to obtuse, with laterally up to 0.7 mm, apically up to 1.2 mm wide margins; the innermost narrowly elliptical to narrowly obovate, c. 3.5-5.0 mm long and 0.9-1.5 mm wide, acute to obtuse, with laterally up to 0.5 mm, apically up to 1.5 mm wide margins. Receptacle globose to ovoid at anthesis (c. 2.5 mm in diam.), conical-ovoid to cylindrical at maturity (c. 2.5-3 mm in diam., c. 3.5-4 mm high), paleate only in the distal half. Ray florets 8-13 (-20) per capitulum, white, female, c. 9.0-12.0 mm long; limb elliptical to narrowly elliptical [index 2.1-3.3], c. 7.5-11.0 mm long and c. 3.2-4.5 mm wide, apically 3-lobed; tube sparsely glandular, c. 1.3-1.6 mm long and c. 0.3-0.5 mm wide. Pales subulate, c. 2.5-4.0 mm long and 0.2-0.3 mm, glandular. Disc florets yellow, hermaphrodite, sparsely glandular, 2.3-2.8 mm long; the basal part slender at maturity, 0.9-1.3 mm long and 0.2-0.3 mm wide; the distal part funnel-shaped, apically c. 0.5-0.8 mm in diameter and 5-lobed; lobes triangular, c. 0.4-0.5 mm long and 0.35-0.4 mm wide, with an up to 0.3 mm long dorsal appendage. Achenes of ray florets 1.0-1.2 mm long and 0.5-0.7 mm wide, obconical, transversely rhombic in cross-section, apically with a ± dentate, up to c. 0.1 mm long auricle, c. 8-10-ribbed; ribs smooth, with mucilage cells; furrows glandular. Achenes of disc florets heteromorphic; the peripheral ones 1.0-1.4 mm long and 0.8-1.1 mm in diameter, stout and subcylindrical or subtetragonous, persistent at maturity, c. 10-ribbed; ribs smooth to slightly tuberculate with several rows of mucilage cells; furrows with yellow glands; corona absent or a 0.1-0.2 mm long, adaxially protracted, crenulate rim; the central ones more slender than the peripheral ones, 1.0-1.3 mm long and 0.6-0.7 mm in diameter, narrowly obconical, subtetragonous, persistent at maturity, 10-ribbed; ribs

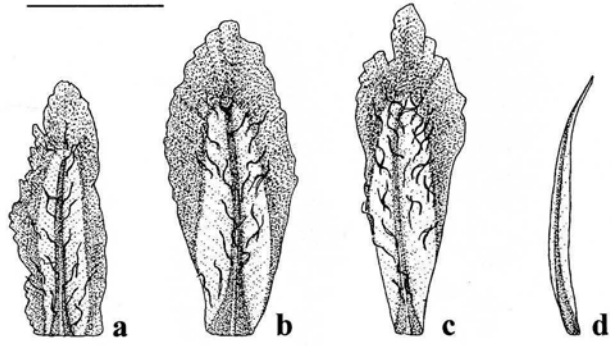


Fig. 184. *Anthemis pseudocotula:* (a-c) involucral bracts, (d) pale *(Pampanini 7970).* – Scale bar = 2 mm.

smooth to slightly tuberculate with rows of mucilage cells; furrows with yellow glands; corona abaxially absent, adaxially an up to 0.2 mm long crenulate rim; apex slanting from the abaxial to the adaxial side.

Chromosome number. – $n = 9$; $2n = 18 + 0\text{-}1$ B (see discussion in chapter 10).

Distribution and habitat. – Restricted to the E Mediterranean area and adjacent parts of the Middle East: SW Iran, Iraq, Syria, Libya, Egypt, Israel, Lebanon, Cyprus, Turkey (Yavin 1970), and SE Aegean islands (Karpathos, Greuter & al. 1983, Raus 1991, 1996). Rivera Nuñez & Obón de Castro (1996) mentioned mummified remains of *Anthemis pseudocotula* found in the Zoser pyramid (3rd dynasty, 2900 BC) and the Saqqara necropolis, Memphis (Egypt). In the region covered by the present revision, the species is found only in Cyrenaica (NE Libya) where it usually grows in sandy habitats, from sea-level up to c. 50-100 m (Fig. 186).

Variation and taxonomy. – According to Yavin (1970), *A. pseudocotula,* together with *A. parvifolia* Eig, *A. patentissima* Eig, *A. tripolitana* Boiss. & Blanche, *A. pungens* Yavin, *A. adonidifolia* Kotschy, and *A. fungosa* Boiss. & Hausskn., forms the so-called *A. pseudocotula* group, characterised by achenes persistent at maturity and whole capitula acting as dispersal units (synaptospermy). In most of the mentioned species peduncles tend to become conspicuously inflated at maturity, only in *A. parvifolia* and *A. fungosa* they remain slender. *A. pseudocotula* is distinguished from *A. adonidifolia* and *A. patentissima* by its narrowly conical receptacles, from *A. triploitana* by coronas less than half as long as the achene body or absent, and from *A. pungens* by its shorter pales which never exceed the disc florets in flowering capitula.

Eig (1938) and Yavin (1970) found the only noteworthy variation in *Anthemis pseudocotula* concerns the presence or absence of an auricle on the achene as well as its length and shape. Based on these differences, Eig (1938) distinguished two subspecies: *A. pseudocotula* subsp. *pseudocotula,* with auriculate achenes, and subsp. *rotata* (Boiss.) Eig, lacking auricles; the former he subdivided into two varieties: var. *pseudocotula* with long auricles and var. *radiata* with short, rim-like, obtusely lobed auricles; the latter he

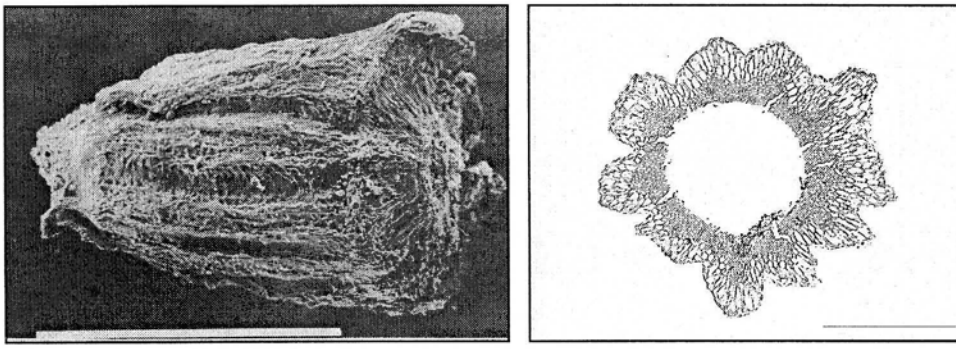


Fig. 185. Micrographs of achenes of disc florets of *Anthemis pseudocotula (Davis 50308).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

similarly subdivided into var. *rotata* (Boiss.) Eig (with achene apex oblique, slanting from the abaxial to the adaxial side) and var. *rotundata* Eig (with bald and apically rounded achenes). Eig (1938: 198) also found clinal geographical transitions between the subspecies, *A. pseudocotula* subsp. *pseudocotula* prevailing in N Palestine, subsp. *rotata* in the S parts of the country. Yavin (1970) added a fifth variety, *A. pseudocotula* var. *massadensis* Yavin, with extremely long-auriculate achenes, otherwise adopting Eig's (1938) taxonomy, although she noted co-occurrence of two varieties of the same (var. *pseudocotula* and var. *radiata*) or different subspecies (var. *radiata* and var. *rotata*) in the same population. This, together with the observation of at least three varieties of *A. pseudocotula* (var. *massadensis,* var. *rotata,* and var. *rotundata*) on Cyprus (Oberprieler & Vogt, in press) shows that the morphological differences have only a weak geographical and phylogenetic support.

The Libyan specimens studied show little variation in achene features. They correspond to *Anthemis pseudocotula* var. *rotata*. However, in line with our unpublished findings in Cyprus, no infraspecifical subdivisions of *A. pseudocotula* are recognised here.

Grierson & Yavin (1975: 180) stated that *Anthemis pseudocotula* usually has sterile ray florets (but on p. 209 considered ray florets to be "often fertile"). The Libyan plant material studied by me has consistently fertile ray florets.

According to Yavin (1970), *A. pseudocotula* is characterised by peduncles becoming strongly inflated and bent at maturity. In the Libyan representatives of the species, however, peduncles always remain straight at maturity.

Specimens seen. – [Libya, Darnah] Libya, Timimi to Omm Rezem, 5-50 m, sandy wadis (flooded last autumn), [32°25′N, 23°3′E], 30 Mar 1970, *Davis 50308* (RNG; K). Cyrenaica: in glareosis amnis ad orientem oppidi Tmimi, [32°18′N, 23°3′E], 24 Apr 1938, *Maire & Weiller 835* (MPU-AfN; P). – [Not located] Cirenaica, Trigh Enver Bei Bir Beirud, 25 Mar 1933, *Pampanini 7970* (G).

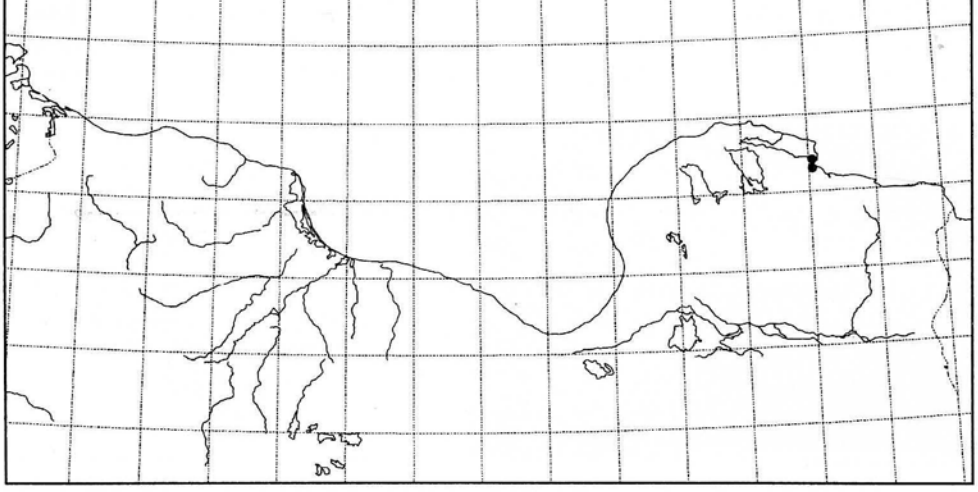


Fig. 186. N African distribution of *Anthemis pseudocotula*.

II. ***Anthemis*** subg. ***Cota*** (J. Gay) Rouy, Fl. France 8: 229 (1903) ≡ *Cota* J. Gay in Gussone, Fl. Sic. Syn. 2: 866 (1845) ≡ *Anthemis* sect. *Cota* (J. Gay) Rchb. f. in Reichenbach & Reichenbach, Icon. Fl. Germ. 16: 62 (1854). – Type (Fernandes 1975): *Anthemis altissima* L.

Annuals, biennials or short- to long-lived perennial herbs. Capitula radiate or discoid. Involucre attenuate to conspicuously umbonate. Receptacle hemispherical to subhemispherical, paleate throughout. Ray florets yellow or white. Pales narrowly elliptical to narrowly obovate, persistent at maturity. Basal part of disc florets usually not becoming spongy and inflated at maturity. Achenes dorso-ventrally compressed, obconical to obpyramidal, transversely rhombic in cross-section, with rather acute lateral angles, smooth or with inconspicuous to conspicuous, smooth ribs on both faces; epicarpic cells without or with single calcium-oxalate crystals.

Basic chromosome number. – $x = 9$.

Ploidy levels. – $2x$, $4x$.

Taxonomy. – *Anthemis* subg. *Cota* is characterised by disymmetrical, dorso-ventrally flattened achenes with two distinct, sharp-angled lateral ribs and 4-11 less distinct ones on each of the two faces. In contrast to members of *A.* subg. *Anthemis,* in which epicarp cells are filled with crystal sand, in *A.* subg. *Cota* epicarp cells either lack crystals or contain single, large calcium-oxalate crystals. Mainly based on life cycle, the subgenus is traditionally subdivided into two sections: *A.* sect. *Anthemaria,* comprising the perennial species, and *A.* sect. *Cota,* with annual to biennial herbs. Fedorov (1961) worked out an alternative taxonomy of the subgenus, with species classified into five (invalidely named) series. A cladistic study of the subgenus may help to decide on its taxonomic structure.

Anthemis sect. ***Cota*** (J. Gay) Rchb. f.

– *Anthemis* ser. *Altissimae* Fedorov in Komarov, Fl. SSSR 26: 58 (1961), nom. inval. [Art. 36.1].

Annuals or biennials. Capitula radiate. Involucre usually conspicuously umbonate. Receptacle hemispherical to subhemispherical, paleate throughout. Ray florets white. Achenes dorso-ventrally compressed, obconical to obpyramidal, transversely rhombic in cross-section, with usually 3-6, sometimes up to 11 inconspicuous to conspicuous ribs on both faces; epicarpic cells devoid of or containing single calcium-oxalate crystals.

Basic chromosome number. – $x = 9$.

Ploidy level. – $2x$, $4x$.

25. ***Anthemis austriaca*** Jacq., Fl. Austr. 5: 22 (1778). – Ind. loc.: "Crescit passim inter segetes & ad vias; in arvis restibilibus ita nonunquam abundans, ut sata videatur." – Lectotype (designated here): Jacquin, Fl. Austr.: t. 444 (1778).

Annual, single-stemmed. Stem erect, c. 25 cm tall, basally 4 mm in diameter, usually branched in the upper half, with c. 15 capitula, dull green, tinged with red, appressed tomentose with medifixed and basifixed hairs, and interspersed glands. Basal and lower cauline leaves c. 20-35 mm long and c. 15-20 mm, obovate to elliptical in outline, sessile or petiolate; petiole up to c. 10 mm; base with up to 4 pairs of pinnula-like teeth; blade 2-3-pinnatifid to -pinnatipartite, with 3-4 pairs of elliptical lobes and a few pinnules in-between; primary lobes with c. 4-6 pairs of secondary lobes; ultimate segments triangular or ovate to elliptical, 0.5-1.2 mm long and 0.3-0.7 mm wide, with a mucro up to 0.2 mm, sparsely hairy, glandular-punctate. Upper cauline leaves 5-15 mm long and (1-)4-16 mm wide, linear with entire or dentate margin, or circular to ovate in outline, sessile to shortly petiolate; base usually with 1-3 pairs of divided teeth; lamina 2-3-pinnatifid to -pinnatipartite, with 2-3 pairs of primary lobes, each with c. 5-8 secondary lobes. Peduncles 10-30 mm long and 0.7-1.2 mm in diameter, becoming moderately incrassate at maturity and then 1.5-2.5 mm in diameter, sulcate, densely ± appressed tomentose, with long, thin, predominantly basifixed hairs. Capitula 15-30 mm in diameter, heterogamous. Involucre 6-13 mm in diameter, obconical to hemispherical, not umbonate at maturity. Involucral bracts in 3-4 rows, abaxially densely appressed tomentose with basifixed hairs, with a green longitudinal strip at least in the distal half, an acute tip and rather narrow, laterally pale, apically light brown membranous margins; the outermost triangular to narrowly triangular, c. 3-4 mm long and 1.1-1.4 mm wide; the middle ones narrowly elliptical to narrowly elliptical-obovate, c. 4-5 mm long and c. 1.5 mm wide; the innermost narrowly elliptical to narrowly elliptical-obovate, c. 4-5 mm long and c. 1.5 mm wide. Receptacle flat to slightly convex at anthesis, convex to hemispherical at maturity (c. 4-5 mm in diameter, c. 2 mm high), paleate throughout. Ray florets 16-20 per capitulum, white, sterile (?), c. 10-12 mm long; limb narrowly elliptical [index 2.5-3.0], c. 8-10 mm long and c. 3-4 mm wide, apically 3-lobed; tube sparsely glandular, 1.5-2.0 mm long and 0.5-0.8 mm wide. Pales narrowly elliptical to narrowly ovate, c. 3.5-4.2 mm long and 0.8-1.2 mm wide, flat to slightly

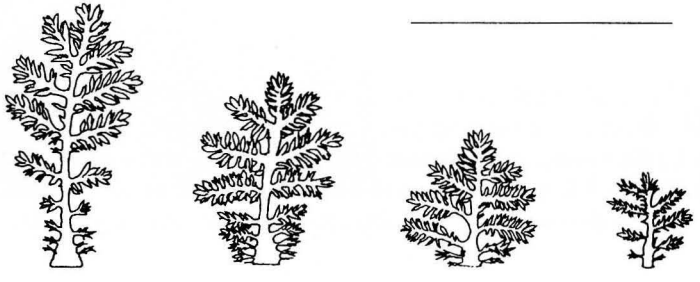


Fig. 187. *Anthemis austriaca:* leaf spectrum *(Vogt 13151 & Oberprieler 7456).* – Scale bar = 3 cm.

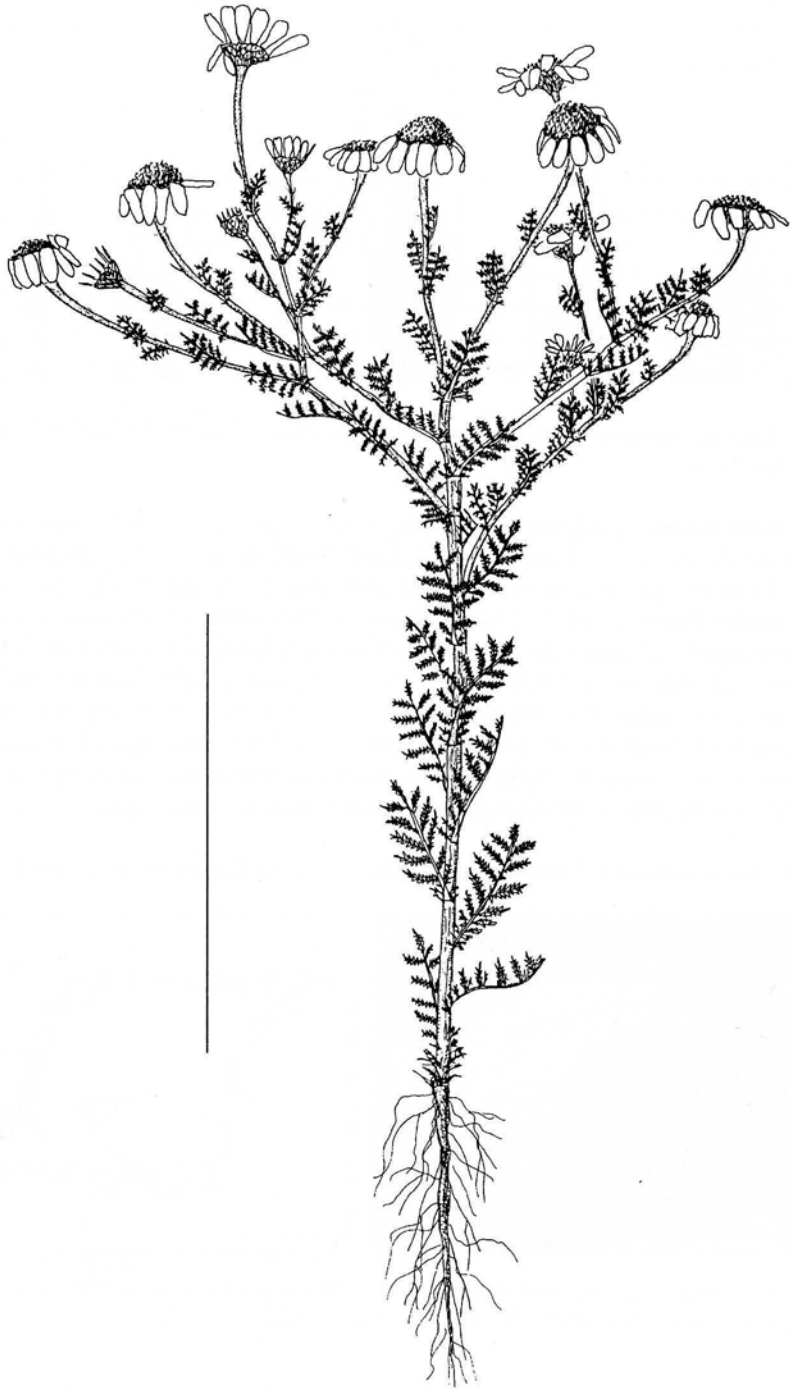


Fig. 188. *Anthemis austriaca:* general habit *(Vogt 13151 & Oberprieler 7456).* – Scale bar = 10 cm.

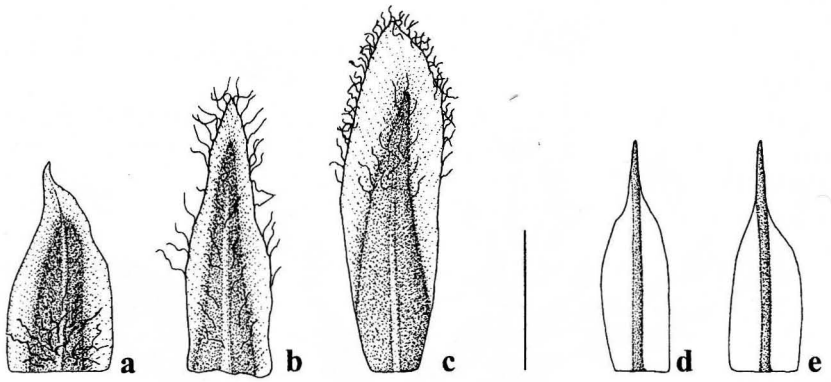


Fig. 189. *Anthemis austriaca:* (a-c) involucral bracts, (d-e) pales *(Vogt 13151 & Oberprieler 7456).* – Scale bar = 2 mm.

convex, membranous, gradually to abruptly tapering into a c. 0.8-1.3 mm long, rigid mucro. Disc florets yellow, hermaphrodite, sparsely glandular, 2.8-3.2 mm long, apically 5-lobed; lobes triangular with an up to 0.2 mm long dorsal appendage; the lower part dorso-ventrally flattened, 0.6-0.8(-1.0) mm long and 0.8-1.0 mm wide, somewhat winged, sometimes tinged with green. Achenes of ray florets sterile (?), c. 1.8 mm long and 0.8 mm wide, flat, light brown. Achenes of disc florets dorso-ventrally flattened, transversely rhombic in cross-section, with acute lateral angles, c. 1.6 mm long, c. 0.9 mm wide and c. 0.3-0.4 mm thick, readily falling off at maturity, with 3-5 adaxial and 3-5 abaxial, rather inconspicuous ribs, smooth, light brown, somewhat dotted due to visible crystals in epidermis cells; corona a c. 0.1-0.2 mm long auricle, lighter than achene.

Chromosome number. – $2n = 18$ (numerous counts, see Kuzmanov & al. 1981).

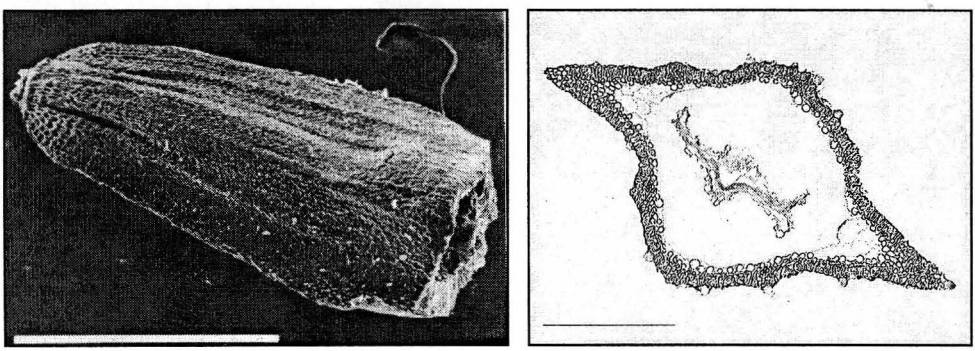


Fig. 190. Micrographs of achenes of disc florets of *Anthemis austriaca (Vogt 13151 & Oberprieler 7456).* – Scale bars = 1 mm (SEM, left) and 0.3 mm (LM, right).

Distribution and habitat. – *Anthemis austriaca* is found in the EC Europe, SE Europe (including the Crimea), and SW Asia (Turkey, Iraq, Iran). According to Meusel & Jäger (1992), the species is neosynanthropic in most of C Europe. From N Africa it has not been reported before. The only specimen from our area was collected in the Matamata mountains (S Tunisia) in 1994 (Fig. 191). As companion species, *Heteromera fuscata* (Desf.) Pomel, *Koelpinia linearis* Pallas, *Launaea angustifolia* (Desf.) Kuntze subsp. *angustifolia*, *L. nudicaulis* (L.) Hook.f., *L. fragilis* (Asso) Pau, *Phagnalon saxatile* (L.) Cass., and *Reichardia tingitana* (L.) Roth were recorded.

Variation and taxonomy. – The N African specimen, when compared to C and S European representatives of *Anthemis segetalis* Ten. and *A. austriaca*, resemble the latter species in its achenes being transversely rhombic in cross-section (quadrangular in *A. segetalis*) and only obsoletely striate on the adaxial and abaxial side (distinctly (3-)5-7-striate in *A. segetalis*). As the European representatives of *A. austriaca*, the N African

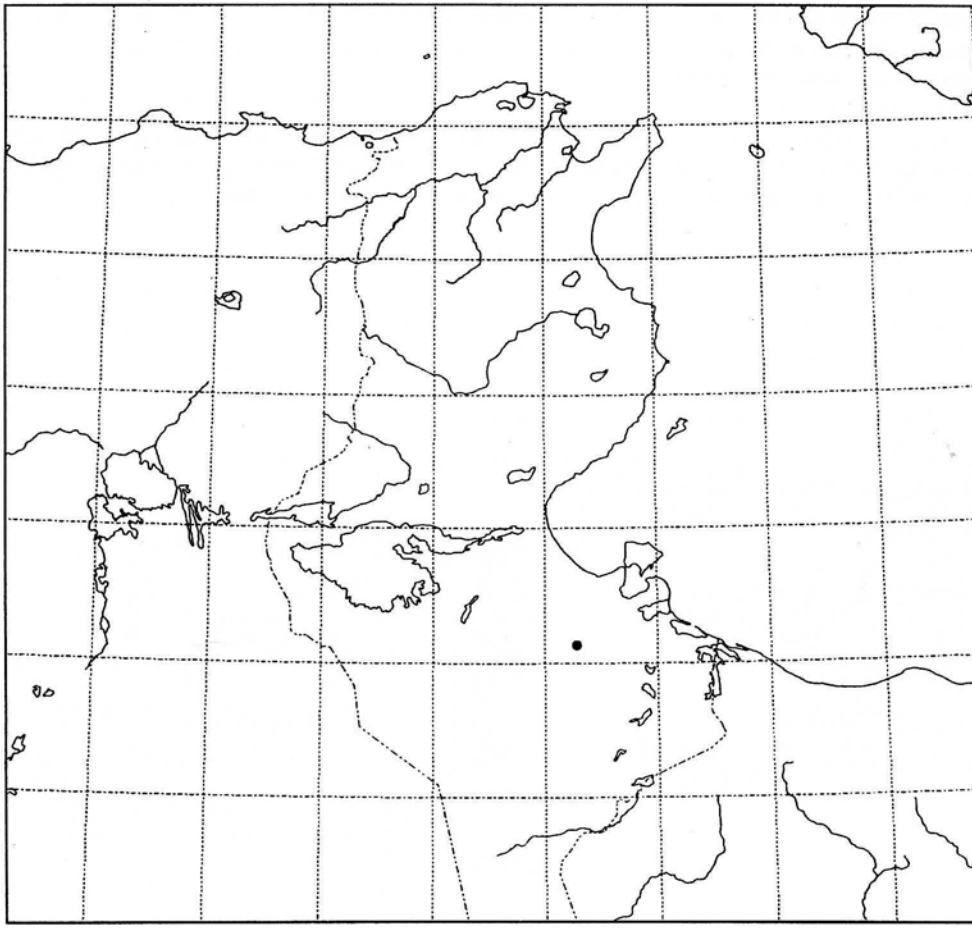


Fig. 191. N African distribution of *Anthemis austriaca*.

specimen possesses peduncles covered with long and comparatively thin hairs, whereas in *A. segetalis* the hairs are shorter and thicker. In plants from the European part of the distribution area the achenes were c. 2.4 mm long and 1.3 mm wide; the Tunisian plant had comparatively small achenes, not exceeding 1.6 mm in length and 0.9 mm in width.

According to Grierson & Yavin (1975) and Meusel & Jäger (1992), *Anthemis austriaca* is closely related with and very similar to the Macedonian, Anatolian, and N Iranian *A. coelepoda* Boiss. Fernandes (1976) distinguished the two species by their peduncles which usually remain slender or become only slightly thickened in *A. austriaca* but are strongly inflated at maturity in *A. coelopoda*. Grierson & Yavin (1975) described *A. austriaca* as a generally more slender plant with leaves less strongly dissected than in *A. coelopoda*. Iranshahr (1986) used the shape of the pales to distinguish the two species: in *A. coelopoda* the protruding midrib accounts for c. one half of the pale's total length, in *A. austriaca* it is much shorter, never exceeding one third of that length. However, when a large number of specimens is studied, many plants are found that are difficult to assign to the one or the other species, as they show overlap in most characters. The best diagnostic feature was found in achene anatomy: achenes of *A. austriaca* have single, large calcium oxalate crystals in the cells of the epicarp, in *A. coelopoda* crystals are restricted to the hypodermal layers of the pericarp.

Specimens seen. – [TUNISIA, TATAOUINE] Tunisie du Sud, Monts de Matmata, track C 207 between Ghomrassen and Beni Kheddache, c. 8 km N Ksar Hadada, stony slopes and rocks, 470 m, 33°8.407'N, 10°17.206'E, 14 May 1994, *Vogt 13151 & Oberprieler 7456* (B).

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Address of the author:
Dr Christoph Oberprieler, Institut für Spezielle Botanik, Friedrich-Schiller-Universität Jena, Philosophenweg 16, D-07743 Jena, Germany.

17. Index to scientific names

This index lists scientific names referring to *Anthemis* found in the taxonomic part of the present work. Accepted names of NW African *Anthemis* taxa are printed in bold face italics. Page numbers in bold face relate to the main entry of the taxon concerned. Asterisks denote figures and maps.

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