(14) *Launaea fragilis*

Launaea fragilis (Asso) Pau in Bol. Soc. Aragonesa Ci. Nat. 16: 68. 1917 ≡ *Lactuca fragilis* Asso, Syn. Stirp. Aragon: 109. 1779. – Holotype: Spain, in monte Torrero, circà Epila, *Asso* (P?).

Note: This species is usually known as *Launaea resedifolia.* However, López González (1980) pointed out that the original material on which the basionym of *Launaea resedifolia*, i.e. *Scorzonera resedifolia* L., is based (Herb. Linnaeus no. 947.7, LINN), actually represents *Scorzonera laciniata* L., and that the name *Launaea resedifolia* is therefore incorrectly applied to this species. A proposal to conserve the name *Scorzonera resedifolia* with a conserved type according to its established use (Kilian 1994b) has been rejected by a majority of the Nomenclatural Committee (Brummitt 1996: 676). *Launaea fragilis* (Asso) Pau is therefore the correct name for this species.

Taxonomic delimitation and recognition of subspecies

Since plants of *Launaea fragilis* sometimes approach *L. mucronata* in appearance, e.g. those with auriculate cauline leaves, and since in certain areas somehow intermediate forms can be found (see below), both taxa have been treated as conspecific and only distinct at subspecific or varietal rank by various authors (Béguinot & Vaccari 1912: 70; Maire 1937: 366; Corti 1942: 268; Quézel & Santa 1963: 1076; Monod 1928: 104; Pottier-Alapetite 1981: 1112; Alavi 1983: 379, 382). Notwithstanding, both taxa are entirely different and by the following (so far rarely, if ever, employed) characters usually readily to distinguish: (1) plants perennial and always with a trailing shoot bearing root system in *L. fragilis* versus usually annual and with a simple taproot in *L. mucronata*; (2) inner achenes with distinct secondary ribs (except in *L. fragilis* subsp. *asirensis*, below) versus lacking secondary ribs in *L. mucronata*; (3) the subcentral faintly papillose-pubescent achenes with a diffuse indumentum in *L. fragilis* versus the papillae distinctly arranged in wrinkled transversal lines in *L. mucronata*; (4) innermost achenes with a distinctly 4-horned base in *L. fragilis* versus with a connate, ventricose base in *L. mucronata*; (5) mainly S Mediterranean (*L. fragilis* subsp. *fragilis*) and montane SW Arabian (*L. fragilis* subsp. *asirensis*) distribution versus Saharo-Arabian distribution in *L. mucronata*.

Complications can nevertheless arise in certain areas where *L. mucronata* and *L. fragilis* are sympatric: in S and SW Morocco intermediate achene character states, possibly due to hybridization between both, are found (see sub variability, below). In the Nile delta area in particular, and the further adjacent coastal areas in general, some populations habitually resemble *L. mucronata*, and the detected tetraploid cytotypes may indicate these intermediate forms to represents hybrids between both species (see sub variability, and chromosome number, below).

Sometimes *L. fragilis* is also confused with *L. pumila*, which is, however, readily distinguished by, e.g., its subglobose capitula nodding in bud, the very narrow outer involucral bract margin, and the (sub)homomorphic pappus (almost) lacking the shorter, downy rays. With respect to the differences involved, also the treatment of *L. pumila* as a subspecies of *L. fragilis* (Bolòs & Vigo 1989: 86), appears little appropriate.

Geographically isolated from the S Mediterranean populations of *L. fragilis* are populations occurring in the mountains of SW Arabia (see Figs 100, 102). The available, scarce material is fairly homogeneous compared with the S Mediterranean populations of *L. fragilis*, although the plants vary considerably with respect to height, number of flowering stems, leaf and capitula size. The plants align fairly well with *L. fragilis* since the values of the morphological features lie within its range, but a few peculiarities exist: in contrast to typical *L. fragilis* the innermost achenes lack differentiated secondary ribs (just as in the species around *L. mucronata*), and in several specimens the achenes are yellowish pale-brown ro reddish brown. Possibly, although the reliability of this feature is uncertain, the plants differ also by their light bluish-green colour. The SW Arabian populations are cautiously classified here at the rank of a subspecies of *L. fragilis*, since the differences detected between both taxa are not found to be sufficient for separation at species rank. In order not to merge the values for both taxa, each of them is provided with an individual full description.

Key to the subspecies of *Launaea fragilis*

1 Innermost mature achenes with well developed secondary ribs, pale to dark brown; S Mediterranean plants . . . . . subsp. ***fragilis***

– Innermost mature achenes without secondary ribs, yellowish pale-brown to reddish brown; plants of the mountains of the SW Arabian peninsula . . . . . subsp. ***asirensis***

(a) *Launaea fragilis* subsp. *fragilis*

Launaea fragilis subsp. *fragilis*

= *Sonchus chondrilloides* Desf., Fl. Atlant. 2: 226. 1799 ≡ *Zollikoferia chondrilloides* (Desf.) DC., Prodr. 7: 183. 1838 ≡ *Rhabdotheca chondrilloides* (Desf.) Webb in Hooker, Niger Fl.: 146. 1849 ≡ *Microrhynchus chondrilloides* (Desf.) C. B. Clarke, Compos. Ind.: 227. 1876, sensu typi, non sensu C. B. Clarke ≡ *Launaea chondrilloides* (Desf.) Hook. f., Fl. Brit. India 3: 415. 1881, sensu typi, non sensu Hook.f. – Holotype: Tunisia, in arvensis arenosis circa veterem Carthaginem, *Desfontaines* (P, isotype: FI-W!).

= *Scorzonera chondrilloides* Pourr. ex Willd., Sp. Pl. 3: 1505. 1803. – Holotype: Spain, *Pourret* (B-W 14517, 1-3!).

= *Sonchus candolleanus* Jaub. & Spach, Ill. Pl. Orient. 3: 110, fig. 279. 1848 ≡ *Atalanthus candolleanus* (Jaub. & Spach) Pomel in Bull. Soc. Climatol. Alger 11[Nouv. Mat. Fl. Atl. 1]: 8. 1874 ≡ *Rhabdotheca candolleana* (Jaub. & Spach) Pomel in Bull. Soc. Climatol. Alger 13 [Nouv. Mat. Fl. Atl. 2]: 263. 1875. – Syntypes: Egypt, [1803], *Delile* (P, not found; isosyntypes: BM!, G!, MPU!), ibid., *Bové* (P, not found; isosyntype: MPU!), [ibid., Manfalout, 6./7.3. 1848], *Kralik* (LY! [det. by Spach, ex herb. Rouy] = *L.* cf. *mucronata* subsp. *cassiana*); ibid., [Sinai], in regione Hauara Arabiae Petreae, 15.3.1835, *Schimper 208* (P! = *L. angustifolia*); [Saudi Arabia], Taifa [= Taïf], 1838, *Botta* (P! = *L. fragilis* subsp. *asirensis*), ibid., "Arabie pétrée", *Botta* (P! = *L. mucronata* subsp. *mucronata*); Iran, "Persia australis", *Aucher-Eloy* (P! = *L. mucronata* subsp. *mucronata*); ibid., ex Sinus Persici insula Korgo, *Kotschy 27.530* (P!; isosyntypi: A!, C!, E!, FI-W!, FR!, GH!, KIEL!, L!, W!, WU! = *L. mucronata* subsp. *mucronata*). – Lectotype (designated here): *Delile* (MPU!)

= *Launaea tenuiloba* (Boiss.) Kuntze, Revis. Gen. Pl. 1: 351. 1891 ≡ *Zollikoferia tenuiloba* Boiss., Diagn. Pl. Orient., ser. 2, 11: 50. 1849. – Syntypes: Gaza, in Arabia petraea Palaestina contermina, 4.1846, *Boissier* (G!, GH!, LE!, UPS!); Lebanon, prope Tyr, *Pestalozza* (G).

= *Launaea longiloba* (Boiss. & Reut.) Maire in Bull. Soc. Hist. Nat. Afrique N. 25: 308. 1934 ≡ *Zollikoferia longiloba* Boiss. & Reut., Pug. Pl. Afr. Bor. Hispan.: 70. 1852 ≡ *Atalanthus longilobus* (Boiss. & Reut.) Pomel in Bull. Soc. Climatol. Alger 11 [Nouv. Mat. Fl. Atl. 1]: 7. 1874 ≡ *Rhabdotheca longiloba* (Boiss. & Reut.) Pomel in Bull. Soc. Climatol. Alger 13 [Nouv. Mat. Fl. Atl. 2]: 263. 1875 ≡ *Zollikoferia resedifolia* var. *longiloba* (Boiss. & Reut.) Bonnet & Barratte, Expl. Sci. Tunisie, Cat. Pl.: 266. 1896 ≡ *Launaea resedifolia* subsp. *longiloba* (Boiss. & Reut.) Maire in Jahandiez & Maire, Cat. Pl. Maroc 3: 845. 1934 ≡ *Launaea resedifolia* var. *longiloba* (Boiss. & Reut.) Pamp. in

Arch. Bot. (Forlì) 12: 51. 1936. – Syntypes: Algeria, in arenosis maritimis circà Oran, 4.1849, *Reuter* (G!); ibid., inter la Stidia et Mostaganem, 4.1849, *Boissier & Reuter* (G!).

= *Zollikoferia resedifolia* var. *viminea* Lange in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn, ser. 2, 3: 99 [Pug. Pl. Hispan.: 149]. 1861 ≡ *Launaea fragilis* var. *viminea* (Lange) O. Bolòs & J. Vigo in Folia Bot. Misc. 6: 86. 1989. – Syntypes: Spain, prov. Murcia, Pozo de la Higuera, *Lange* (C!, G!); ibid., ad littora arenosa pres Almeria, *Lange* (C).

= *Zollikoferia resedifolia* var. *minor* Rouy in Rev. Sci. Nat. Montpellier, ser. 3, 2: [n.v.; = Excurs. Bot. Espagne 1881 et 1882: 73]. 1883. – Holotype: Spain, *Rouy* (LY, not traced in herb. Rouy).

= *Launaea resedifolia* var. *marmarica* Pamp. in Arch. Bot. (Forlì) 12: 51. 1936. – Holotype: Libya, Sidi Bu Amud tra Tobruk e Bardia, 23.3.1933, *Pampanini 9188* (FI!).

= *Zollikoferia resedifolia* var. *setacea* Batt., Fl. Algérie 1: 557. 1889 ≡ *Launaea resedifolia* var. *setacea* (Batt.) Pamp. in Arch. Bot. (Forlì) 12: 51. 1936. – Holotype: Algeria, Gada d'Entous, 19.5.1888, *Clary 311* (MPU!).

= *Zollikoferia mucronata* var. *latisecta* Bornm. in Verh. Zool.-Bot. Ges. Wien 48: 606. 1898. – Holotype: Palestina, Jaffa, in arenosis maritimis, 12.5.1897, *Bornmüller 984* (B!; isotypes: P!, W!).

[= *Scorzonera resedifolia* sensu auct. [non L., Sp. Pl.: 1198. 1753] ≡ *Zollikoferia resedifolia* sensu auct. [non (L.) Coss., Not. Pl. Crit.: 120. 1851 sensu typi] ≡ *Atalanthus resedifolius* sensu auct. [non (L.) Pomel in Bull. Soc. Climatol. Alger 13 [Nouv. Mat. Fl. Atl. 2]: 263. 1875 sensu typi] ≡ *Launaea resedifolia* sensu auct. [non (L.) Kuntze, Revis. Gen. Pl. 1: 351. 1891 sensu typi]. – See Lopez Gonzáles (1980), Kilian (1994b), and Brummitt (1996: 676)]

[= *Zollikoferia fontanesii* ["Boiss. & Reuter"] Balansa, Pl. d'Algérie 1851, no. 159, nom. nud.].

[= *Zollikoferia jaumei* Sennen, Plantes d'Espagne: [239]168. 1926, preprinted from Bol. Soc. Ibér. Ci. Nat. 28: 168. 1930, nom. nud. ≡ *Launaea jaumei* Sennen in sched. ibid., pro syn.].

Ic.: Figs 14f-j, 20b-c. – Candolle 1838b: fig. 18 sub *Zollikoferia chondrilloides* (habit, achene); Jaubert & Spach 1847-50: fig. 279 sub *Sonchus candolleanus* (habit, details); Cesati & al. 1867: fig. 72(1) sub *Z. chondrilloides* (capitula, flower, achene); Cadevall y Diars & Sallent y Gotés 1915: p. 462 sub *Z. resedaefolia* (flowering branch, capitulum); Bouloumoy 1930: fig. 252(1) sub *Z. tenuiloba* (specimen) &[?] (2) sub *Z. mucronata* (id.); Fiori & al. 1895-99: fig. 3885 ≡ Fiori 1933: fig. 3809 sub *L. resedifolia* (habit, details); Quézel & Santa 1963: fig. 3107 sub *L. resedifolia* (achene); Feinbrun-Dothan 1977: fig. 726 sub *L. resedifolia* (habit), fig. 727 sub *L. tenuiloba* (habit); Ozenda 1958 [ed. 2, 1977]: fig. 176 ≡ Pottier-Alapetite 1981: p. 1111, fig. 1608 ≡ Barry & Celles 1992: p. 64, fig. 9 sub *L. resedifolia* (habit); Pignatti 1982: p. 261 sub *L. resedifolia* (habit); Alavi 1983: fig. 103(D-F) sub *L. resedifolia* (habit, details); Mouterde 1984: fig. 341(2) sub *L. tenuiloba* (habit); Kunkel & Kunkel 1987: p. 135, fig. 102 sub *L. resedifolia* (habit); Sagredo 1987: p. 496 sub *L. resedifolia* (flowering

branch); Lippert & Podlech 1989: p. 117, fig. 3 sub *L. resedifolia* (habit); Viney 1994: p. 427, fig. 686 sub *L. resedifolia* (habit); Mateu & Güemes 1995: fig. 1(3), 2((1) (achenes).

Description (v.v.)

Polymorphic perennial herb with woody base when older, flowering (5)10-40(60) cm high, with one to several or many basally rosulate and also upwards ± leafy, branched flowering stems, with wide-trailing shoot bearing root system. *Caudical leaves* rosulate, very variable, 3-18 × 0.5-5 cm, in outline ± spathulate, usually pinnatifid to bipinnatifid with entire or sinuate-dentate segments strongly variable in width, more rarely (and then lamina often somewhat fleshy) undivided, ribbon-like, sinuate-dentate to subentire; lamina attenuate into a narrow, semiamplexicaule base. *Cauline leaves* smaller than caudical, pinnatifid, more rarely sub-bipinnatifid or entire, non-auriculate or ± auriculate; upper cauline leaves grading into cordate, ovate-acute bracts. *Peduncles* as the terminal segment of the flowering branches variable as these, (0.5-)2-6(-9) cm long, spreading-erect, with several bracts passing over into the outer involucral bracts. *Capitula* with c. 20-60 flowers. *Receptacle* at fruiting time 3.0-6.0 mm in diameter. *Involucre* at anthesis 9-14 mm long, prolonged after anthesis, finally up to 20(25) mm long, ± slender; at time of fruit dispersal involucral bracts spreading and their midrib in lower part swollen and hardened; involucral bracts with a scarious margin very variable in distinctness (sometimes even lacking) and width; outer involucral bracts c. 7-12, with the apex usually contracted into a white, ± cartilagineous, obtuse prickle, the outermost ovate-acute, 2-4 mm long, the following bracts gradually longer and ± lanceolate, the innermost lanceolate to linear-lanceolate reaching 2/3 and more of the length of the inner involucral bracts; inner involucral bracts 8-14, linear-lanceolate, at anthesis subequal, 9-14 × 1.5-3.5 mm, with the postfloral prolongation of involucre becoming different in length. *Flowers* with a ligule of (6-)8-12(-16) × 2.2-3.4(-4.0) mm, bright yellow (in marginal flowers dorsally greyish and with blackish veins), and a distinctly shorter tube; anthertube without appendages (2.2-)2.6-3.2(-4.0) mm long and usually somewhat longer in inner than in marginal flowers, apical appendages 0.3-0.4 mm, basal appendages 0.3-0.5 mm long; style branches 1.8-2.5 mm long, usually yellow with concolourous sweeping hairs. *Achenes* 3.9-8.2 × 0.5-0.7 mm, heteromorphic, the innermost with 4 main ribs each accompanied by 2 distinct secondary ribs, cylindrical, ± glabrous, brownish, base 4-horned due to the basally protruding, spreading main ribs; the subcentral achenes diffusely pubescent of hyaline papillae (not arranged in wrinkled lines), the following gradually densier papillose, somewhat compressed and curved; the outermost achenes with 5 main ribs each accompanied by 2 secondary ribs, somewhat compressed and curved, up to 1/3 shorter than the innermost, otherwise like the former. *Pappus* (7)10-12 mm long, persistent, dimorphic, of numerous downy and a smaller number of longer, setaceous inner rays.

Chromosome number: Several reports for *Launaea fragilis* have been published, all referable to subsp. *fragilis* (for full references and further counts in 16 origins from Morocco and Tunisia see Kilian & al. 1995: 280 sub *L. resedifolia*). Accord-

ing to these investigations *L. fragilis* usually has 2n = 16, like the other species of the section counted, but in material from the Nile delta around Alexandria twice the tetraploid number of 2n = 32 has been counted (Amin 1973: 505 sub *L. resedifolia* from Mariut, and Snogerup 1985: 727 sub *L. tenuiloba* from Rashid, *Snogerup 2630* LD!). It should be noticed that the diploid cytotype is reported from this area too (compare Amin 1973: 505 sub *L. tenuiloba*). For further notes see Variability, below.

Variability

Launaea fragilis subsp. *fragilis* shows considerable plasticity and variability in many characters. It may grow subacaulescent, with weak and ascending or with strictly erect, strong flowering stems, and it may have a single stem, several or many. A wide range of variability is also found in leaf shape: plants growing on saline substrate often have ± succulent, almost ribbonlike, subentire (cauline) leaves, otherwise they have (bi)pinnatifid leaves with (sub)filiform segments, and at the other extreme there are broad-leafy forms with the lamina less deeply incised and with broad, roundish segments. Between both extremes we find all transitions. Also the size, shape and incision of the ± auriculate base of the cauline leaves is strongly variable.

The size of the capitula, depending on the number of flowers per capitulum (and, correspondingly, the diameter of the receptacle), the number and size of the involucral bracts and the size of the flowers and achenes, also show considerable variability. The involucral bracts may have a very distinct scarious margin or almost none at all, even varying within a single plant. A surprisingly wide range also in anthertube length is found.

This conspicuous variability has challenged botanists and as a result, several names at specific or infraspecific rank have validly been published (some more are unpublished or invalidly published) in order to cope taxonomically with the variation observed. However, after studying many specimens, I came to the conclusion that the existing attempts to deal with this variation are not convincing at all.

At the species level, Boissier has established two taxa separate from *L. fragilis: L. longiloba* from the Algerian coast between Oran and Mostaganem and *L. tenuiloba* from Palestine and Lebanon. The rank of *L. longiloba* was already reduced to a subspecies by Maire and to a mere variety by Bonnet & Barratte (see synonymy). I find it simply naming particularly vigorous plants which are found in the relatively humid climate of this coastal area, but which are also found under suitable conditions in other areas.

L. tenuiloba has been maintained as a separate species by Feinbrun-Dothan (1977: 429f) in Flora Palaestina, distinguished from *L. fragilis* mainly by its ± filiform (versus borader) leaf segments and its inland (versus coastal) distribution. I could not detect further differences and the correlation between inland habitats and filiform leaf segments becomes weak if the specimens of the Lebanon (compare also Mouterde 1983: 535) and the Sinai coast are included. It can, moreover be observed, that the leaf segments everywhere in the distribution area of *L. fragilis* tend to be narrower in dry inland habitats. So I see no reason for keeping *L. tenuiloba* separate from *L. fragilis*.

The general plasticity of *L. fragilis* subsp. *fragilis* along with its considerable ecological amplitude and wide geographical distribution renders an understanding of eventual geographical or ecological differentiation fairly difficult. Examination of the various herbarium specimens revealed that much variation can be linked to ecological range, and I could not detect sufficient indications for the existence of some sort of geographical or ecogeographical differentiation because of a lack of somehow clearer discontinuities.

A particular problem that needs to be elucidated in further studies, is possible hybridization and introgession with *L. mucronata*. Two regions seem to me of particular interest, both due to partly overlapping distribution areas (compare Figs 102 and 107) of the otherwise ecogeographically separated species, and due to the occurrence of plants which show some sorts of intermediacies. In the Nile delta region (and partly in the further adjacent coastal areas) many *L. fragilis* plants are conspicuous due to their large capitula and *L. mucronata*-like broad, auriculate leaves. A hypothetical hybrid origin of these plants is suspected because of the occurrence of a tetraploid cytotype besides the usual diploid cytotype in this region. The second region of interest is NW Africa, where several specimens (e.g. from S and SW Morocco: *Podlech 40525* [G]; *Davis 53642* [BM, E]; *Lewalle 9419* [BM]; *Crane 85* [BM]) which, besides some resemblance with *L. mucronata* by their leaves and relatively small capitula, also deviate from typical *L. fragilis* by certain achene characters: the inner achenes are brown and with distinct secondary ribs but their base approaches the connate, ventricose condition found in *L. mucronate*, and the subcentral, papillose-pubescent achenes have the papillae arranged in such transversal, wrinkled lines otherwise not found in *L. fragilis* but typical for *L. mucronata*. Care should be taken with plants from those areas where both species meet. Recent cytological investigations in 16 NW African origins, however, did not lead to the detection of tetraploid forms (Kilian & al. 1995).

Distribution and ecology

Launaea fragilis subsp. *fragilis* is mainly distributed in the S Mediterranean, from N Spain to the Lebanon and Cyprus (see Fig. 101), but is absent from areas with a annual mean precipitation exceeding some 500 mm in NW Africa (i.e. W of El Hoceima, Morocco, and between Tenes, Algeria, and Bizerte, Tunisia). In Spain and NW Africa the species is found relatively far inland. For the partially similar distribution patterns of *L. pumila, L. lanifera* and *L. nudicaulis* in NW Africa and Spain compare the corresponding distribution maps.

The questionable occurrence of *L. fragilis* in the NW of Sicily is solely confirmed by a single specimen from "Palermo", *Todaro* (WU!), not quoted in literature, possibly from the botanical garden there. Pignatti (1982: 261 sub *L. resedifolia*) also mentions *L. fragilis* for the island of Pantelleria between Sicily and Tunisia. According to Borg (1927: 647 sub *L. resedifolia*) the species was collected by Gulia on Gozo, the neighbouring island of Malta, but has not been gathered there since (compare also Haslam & al. 1977: 361). Guinea (1949: 793 sub *L. resedifolia*) refers to *L. fragilis* for the Western Sahara; its occurrence there does not seem unlikely in the northern coastal areas, but I did not see specimens. The reports from Mauretania (see Barry & Celles 1992 sub *L. resedifolia*) and from the Hoggar Mts

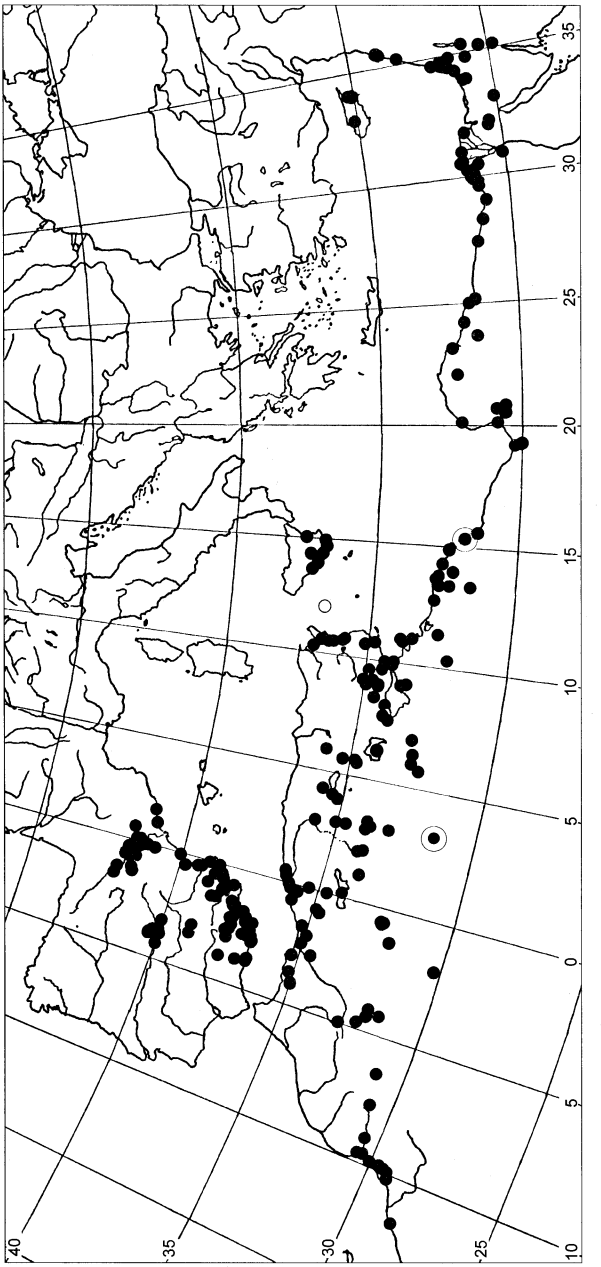

Fig. 101. Distribution of *Launaea fragilis* subsp. *fragilis*; empty circle: literature record, see text; encircled solid circles: collections without precise locality.

(Maire 1933: 220 sub *L. resedifolia*), on the other hand, are apparently erroneous, the latter due to confusion with the hitherto neglected *L. amal-aminae*.

Distribution maps of *L. fragilis* were given by Frankenberg & Klaus (1980: fig. 374 sub *L. resedifolia* for Saharian N Africa, based on literature records only) and by Zaffran (1967: 204, fig. 1C sub *L. resedifolia* for NW Africa). The former, due to confusion with *L. mucronata*, is useless, the latter, apart from the southern limits indicated, roughly matches my own results (see Fig. 101).

In coastal areas *L. fragilis* subsp. *fragilis* grows mainly on sandy plains and sand dunes. Its trailing root system gives rise to root born shoots (usually overlooked, if noticed, then misidentified as rhizomatous growth) making the species well adapted to such a subtrate. Furthermore, the species is found in open places on sandy soil, silt, gravelly ground and occasionally in cereal fields. Its occurrence in moderately saline substrates proves some salt tolerance. Where *L. fragilis* subsp. *fragilis* grows farther inland in Spain, it is typically found on dry, rather bare ground or in open vegetation types and preferably on gypsum (hills), on dry calcarous slopes, and also in vineyards. A preference for open vegetation types also holds true in NW African inland habitats, where it is found mainly in semidesert areas. In the southern part of the Atlas Mts the species has been collected at altitudes of up to 1500 m. Towards the foothills of the southern escarpments of the Atlas Mts, its distribution is very scattered (here found often in wadi beds and on sand dunes) and only closer to the Atlantic and Mediterranean coast it becomes more frequent again.

In contrast to *L. mucronata*, the species avoids true desert areas. This is confirmed by Le Houérou (1986: 120 sub *L. resedifolia)* who lists *L. fragilis* as one of the co-dominant species of the sandy *Artemisia campestris* steppe, a vegetation type belonging to the Arid Mediterranean zone, receiving an annual mean precipitation of 100-400 mm. Furthermore he characterizes *L. fragilis* as a species generally linked to ± fixed sandy soils and to early stages of natural stabilization of sand dunes (Le Houérou 1986: 133, 142).

The flowering and fruiting season of *L. fragilis* subsp. *fragilis* follows the winter rains and begins, earlier in the SE and later in the NW Mediterranean area, in March to May, lasting until May to August respectively.

Plants grown in cultivation developed linear-spathulate cotyledons, and about 2 months after germination a spreading-erect leaf rosette. The terminal bud soon produced an erect flowering stem reaching anthesis about 4 months after germination. Basal innovations were developed already contemporaneously with its flowering.

Specimens seen:

SPAIN: MADRID: Getafe, 5.1925, *Aterido* (MA); near Valdemoro, 30.5.1927, *Wilmott* (BM); ibid., 5.1912, *Vicioso & Beltrán* (MA); in gypsaceis prope Aranjuez, *Bourgeau* (W); ibid., 1876, *Hackel* (FI-W, W, WU); ibid., 3.5.1957 + 6.6.1964, *Stud. biol. Rheno-Trai. 1201, 64-936* (U); ibid., 4.1841, *Reuter* (FI, FI-W, G, LE, OXF); ibid., 12.6.1876, *M. Winkler* (JE, M, WU); ibid., 10.1837, *coll. ignotus* (G); ibid., 19.5.1896, *Gandoger* (E); ibid., 10.6.1883, *Rouy* (LY); ibid., 21.3.1852, *J. Lange 284* (C, G, GH, S, W); ibid., en los bordes de la Laguna de Ontígola, 29.5.1983, *Valle & al.* (MAF); ibid., 17.5.1924, *Gros & Font Quer 18* (MA); ibid., 2.6.1935, *Cuatrecasas & Figueiras 3453* (MAF); ibid., 21.6.1948, *Heywood & Davis 18* (BM, LIV); Castilla La Nueva, Gipshügel etwas SE Aranjuez an der

Ausfahrt Richtung Ontígola, c. 600 m, 19.5.1983, *Bayer & Grau BG1* (M); Ciempozuelos, *Cutanda* (MA); ibid., 8.6.1854, *Bourgeau 2228* (E, FI-W, G, JE, LD, LY, OXF, W); Vaciamadrid, 5.1912, *Vicioso* (MA); ibid., 5.1964, *Borja* (MA); 8 km from Chinchon on road to Aranjuez, 29.5.1967, *I.K. Ferguson 1805* (BM); Chinchón, 3.6.1976, *Fernández Diez* (MA); ibid., 26.5.1980, *Sáenz de Rivas & Rivas-Martinez* (GZU, M, MA); entre Colmenar de Oreja y Villarrubia de Santiago, frente al Rio Tajo, 25.5.1977, *Valdéz-Bermejo* (MA). – LA MANCHA: Toledo, Yepes, 17.5.1970, *Rivas Goday & Ladero Alvares* (MAF); ibid., Aroyo de las Salinas, 15.6.1981, *Aguila* (MAF); ibid., El Salobral, 10.5.1981, *Belmonte* (MAF); ibid., Borox, 580 m, 2.5.1982, *Laorga* (GZU, MAF); ibid., Ocaña, 6.1982, *Aguila & Sánchez-Mata* (GZU); ibid., Seseña Viejo, 3.6.1979, *Laorga* (MAF); ibid., 1 km SE Sesena Nuevo, 600 m, 4.6.1973, *Podlech & Lippert 24936* (M); c. 5 km N La Guardia, 25.5.1969, *Merxmüller & Lippert 25168* (M); Daimiel, 12.7.1883, *Nilsson 1440* (LD, UPS); Lagunas de Ruidera, 14.7.1883, *Nilsson 1440[b]* (UPS); Cerca de Tarancón, 21.7.1977, *G. López* (MA); Albacete, Agramon, desvio de Hellin a Agramon, 19.5.1983, *Bayon & al. 3510GF* (MA); Hellin, 15.6.1882, *Rouy* (LY); ibid., 14.5.1852, *Bourgeau 762* (E, FI, FI-W, G, LD, LIV, MA, OXF); ibid., 9.5.1928, *Cuatrecasas 2358* (MAF); an der Straße Albacete - Hellin vor Tobarra, c. 800 m, 20.5.1970, *Merxmüller & Gleißner 25774* (M); prope Castelserás, 11.6.1875, *Loscos 56* (BH, C, FI-W, FR, G, LE, LY, UPS, W). – ANDALUCIA: Almunecar, *Yges* (U); Jaén, Arroyo del Ayozar, 8.5.1982, *Fernández* (MA); Jaén, carretera de Larva, 15.7.1971, *Fernández Casas* (MA); Benamaurel, 24.7.1971, *Fernández Casas* (MA); circa Abderam (Adra), 1826, *Webb* (FI-W); Fiñana, 6.7.1908, *St. Lager* (G); ibid., 5.1902, *Gandoger* (LE, M); cerca de Baza, 8.6.1970, *Fernández Casas* (MA); entre Cullar y Baza, 27.5.1966, *Rivas Goday & Borja Carbonell* (MAF); ibid., 26.5.1851, *Bourgeau 1279* (B, E, FI-W, G, LD, LIV); entre Cullar de Baza et Margen de Arriba, 22.6.1894, *St. Lager* (A, G, K); Cullar de Baza, 6.7.1960, *Losa España & Rivas Goday* (MAF); ibid., 28.7.1981, *M.F. & S.G. Gardner 1509* (BM); Guardias Vieja, 13.10.1981, *Losa & al. 30SWF16* (MA); entre Gorafe y Baños de Alicúm de las Torres, 25.9.1971, *Fernández Casas* (MA); Roquetas de Mar, 6.6.1973, *Podlech & Lippert 25150a* (M); ibid., 26.4.1883, *Nilsson 394* (UPS); ibid., 5.4.1985, *Burgaz* (MA); entre Roquetas y Aguadulce, 15.4.1957, *Rivas Goday* (MAF); 8 km S of Huéscar, 850 m, 37°45′N, 2°35′W, 2.7.1979, *Reading Univ. Bot. Dept. Exped. 685* (BM); 10 km S of Huescar, Galera, 950 m, 37°44′N, 2°33′E, 30.6.1983, *Goyder 978* (BM); Sante Fe [nr.] Almeria, 26.3.1921, *Gros* (MA); circa opp. Gador, 25.5.1902, *Pau* (MA); 12 km N of Gador, 4.5.1951, *Alston 10890* (BM); Llanos de Almeria, 7.5.1960, *Glanville 363* (BM); Almeria, 25.5.1927, *Ellman & Helmes 318* (K); ibid., 21.4.1928, *Ellman & Sandwith 882* (K); ibid., 12.9.1851, *Bourgeau* (G); ibid., 4.1890, *Porta & Rigo 245* (B, BM, BR, FI, G, JE, K, W, WU); ibid., 13.4.1931, *Sennen & Mauricio* (BM); Tabernas - Almeria, cruce con la carretera a Granada, 330 m, 12.3.1984, *Navarro & al.* (MAF); Benahadix, 11.4.1921, *Gros* (MA); 10 km E of Tabernas, 520-550 m, 3.6.1967, *P.W. Ball & al. 176* (BM); de Rioja a Tabernas, 17.4.1957, *Rivas Goday* (MAF); ibid., 3.1971, *Fernandez Casas* (MA); bei Tabernas, 21.8.1966; *Merxmüller & Grau 21861* (M); ibid., 23.4.1961, *Stace 176* (BM); Baranco del Caballar, 12.1851, *J. Lange* (C); 7 km E El Alquian, 5 m, 7.6.1973, *Podlech & Lippert 25156* (M); entre el Alquian y Cabo de Gata, 22.4.1981, *Cátedra* (MAF); Cabo da Gata, 30.10.1966, *Galiano & al.* (B); ibid., 5.5.1951, *Alston 10937* (BM); ibid., 20.4.1980, *Reading M. Sc. Exped. 422* (BM); ibid., 3.6.1982, *Evrard 9469* (BR); ibid., 24.5.-14.6.1975, *Polatschek* (G, W); ibid., 9.1969, *Fernández Casas* (MA); ibid., 18.4.1987, *Charpin 20845* (G); ibid., 28.4.1965, *Greuter 6983* (LD, M, W, herb. Greuter); 3 km W of Sorbas, 500 m, 13.4.1982, *M.F. & S.G. Gardner 1639* (BM); 1 km NE of Los Castaños, 37°08′N, 2°02′W, 300 m, 22.4.1980, *Reading M. Sc. Exped. 496* (BM); ibid., 30.4.1970, *Fernández Casas* (MA); Velez-Rubio, 500 m, 5.1899, *Reverchon* (FI, G, JE, LD, LE, LY, GZU, M, W, WU, Z); ibid., 9.6. 1882, *Rouy* (LY); 1 km E Turre, Straße nach Mojacar, 40 m, 10.6.1973, *Podlech & Lippert 25324* (M); Puerto Rey, 8.4.1983, *W. Lang* (M); inter Vera + Sorbas, 19.4.1925, *Lacaita 48/25* (BM).

– ARAGON: Calalayud, 1909, *Vicioso 883* (B, E, FR, G, LY, M, W, WU, Z); inter Morés et Purroy, 6.1908, *Vicioso* (FR, M); ibid., 20.6.1909, *Vicioso* (BM, G, GZU, L, LY, S); ibid., 11.6.1911, *Vicioso* (B, G, LD, U); Purroy, 5.1911, *Vicioso* (G, W); ibid., 5.6.1903, *Vicioso* (BM); Borja, *Willkomm* (W); inter Borja et Alagon, 7.1850, *Willkomm 441* (BM, C, E, G, LE, M, W, WU); El Portal de Monegros, 17.6.1970, *Fernández Casas* (MA); Acampo Costa, W of Zaragoza, c. 200 m, 12.6.1957, *Sandwith 5072* (K); E of Zaragoza, N of Osera, 1.7.1956, *Sandwith 4565* (K); Zuera, 22.6.1980, *Segura Zubizarreta 280* (MA); Belchite, 350 m, 12.5.1973, *Segura Zubizarreta 12645* (M, MA); Bujaraloz, 21.5.1983, *Segura Zubizarreta* (MA); Zaragoza-Sariñena, 2 km despues de Villamayor, 250 m, 24.6.1986, *Catalán & al. 1477JP* (MA); 7 km ESE Caspe an der Straße nach Gandesa, c. 150 m, 3.6.1973, *Podlech & Lippert 24898* (M); N-Ufer des Embalse de Mequinenza N von Caspe, c. 200 m, 25.5.1983, *Scheuer* (GZU); Sierra Vizcuerno, Caspe, 30.7.1951, *Monasterio* (G); entre Candasnos et le Mas de Hungan, 230 m, 13.6.1985, *Charpin & al. 19506* (G); Candasnos, La Valcuerna, 230 m, 2.6.1979, *Montserrat 610/79* (B, BR, C, G, LD, M, MA, MAF); W von Fraga, 24.5.1969, *Merxmüller & Lippert 25141* (M); 4 km W Fraga, 250 m, 3.6.1973, *Podlech & Lippert 24846* (M); Fraga, 28.5.1976, *Segura Zubizarreta 220* (MA); 16 km S de Lerida, après Suñé, 100 m, 17.5.1972, *Charpin* (G); Urgel, 2.8.1858, *Balaguez* (LE). – CATALUNE: Salon, 14.7.1924, *Gonzalos* (BC); ibid., 8.5.1928, *Teodoro* (BC, BM); ibid., 11.4.1951, 26.5.1964, *Stud. Biol. Rheno-Trai. 416, 64-178* (U, Z); ibid., 10.1893, *Vayreda* (MA); Tarragona, 5.1918, *Sennen 3444* (BM, BC, G, LD, MA, S, Z), *3076* (G); Castelldefels, 14.6.1918, *Sennen* (BC, BM). – VALENCIA: Cabezo Redondo (Villena), 7.4.1957, *Rigual* (MA); Novelda, 14.5.1953, *Rigual* (MA); Monteagude de Novelda, 3.5.1959, *Rigual* (MA); Sera Grossa, *Martinez* (MA); W von Elche, 22.4.1967, *Scholz & Hiepko 445* (B); Rambla de Elche, 17.4.1884, *Lacaita 148* (BM); bei Chiva, 5.1844, *Willkomm* (BM); Segorbe, 6./7.1891, *Reverchon* (BM, E, G, LY, S, WU); ibid., 5.1895, *Pau* (B, LD, LY, WU, Z); Sierra de Segorbe, 350 m, 6.1891, *Reverchon 7264* (B, E, FR, GZU, L, LD, LE, LY, M, OXF, W, WU); Campello, 29.3.1977, *Bot. Excurs. 1977 23* (L); Albufera de Valencia, 11.6.1881, *Burnat* (LY); ibid., 13.6.1930, *Sennen* (BH, BM); ibid., 31.5.1962, *Stud. Biol. Rheno-Trai. 355, 364* (U); ibid., 6.1826, *Webb* (FI-W); ibid., 30.9.1983, *G. Mateo* (MA); ibid., 8.1850, *Willkomm 510* (BM, C, E, G, LE, M, W); ibid., 11.6.1881, *W. Barbey* (Z); ibid., 5.1931 + 6.1932, *Beltrán* (GH, JE, LE, M, S); ibid., 14.11.1926, *del Villar* (MAF); ibid., 11.6.1881, *Leresche* (FI, G); ibid., 12.6.1862, *Leresche* (C); Alicante, 7.5.1928, *Ellman & Sandwith 1064* (K); ibid., 10.5.1885, *Porta & Rigo* (WU); ibid., 21.+23.4.1957, *Stud. biol. Rheno-Trai. 263, 268, 512* (U); Busot, 1.5.1963, *Rigual* (MA); las playas de San Juan de Alicante, 3.4.1966, *Rivas Goday & J. Borja* (MAF); ibid., 27.11.1965, *Rivas Goday & Izco Sevillano* (C); ± 4 km t.Z. van Santa Pola, 2.6.1962, *Stud. biol. Rheno-Trai. 539, 564* (U); Guardamar de Segura, 17.4.1979, *Amich & al.* (MA); Seneta Negra (San Vicente del Karpeig), 23.10.1954, *Rigual* (MA); ibid., 10.5.1982, *Charpin & Defferard 16546* (G); Cullera, 8.5.1982, *G. López* (MA); Castellon de la Plana, 25.6.1852, *Bourgeau 1610* (E, FI-W, G, LE, LIV); Villajoyosa, 24.4.1935, *Martinez* (BM, M); Mte. Caberò, 100-300 m, 12.5.1891, *Porta & Rigo 61* (B, LD, LIV, M, W, WU); Oliva, 11.6.1966, *Verdcourt 4304* (K); Punto Lumbreras, 4.1961, *Delyosalle* (BR); ibid., 7.7.1882, *Rouy* (LY); Sierra Tercia pres Lorca, 400 m, 1.7.1929, *Sennen & Jeronimo* (BM); Lorca,, 3.5.1928, *Ellman & Sandwith 1012* (K); cerca de Zarzadilla de Totana, ad 900 m, 19.6.1975, *Fernández Casas* (MA); Yeseras de Alcantarilla, 14.4.1965, *Rivas Goday & Borja Carbonell* (MAF); Fortuna, Rambla Salada, 150 m, 12.4.1979, *Molina* (G, M, MAF); ibid., 4.1852, *Guirao* (C); Monte Agado, 2.6.1882, *Rouy* (LY); Manga de Mar Menor, im Ortsbereich von Punta de la Raja, 20.5.1983, *Bayer, Grau & Lopez* (M). – LOCALITY NOT FOUND: Le Pozo, 1500 m, 6.1905, *Reverchon* (BH, FR, LY, MA, WU).

Sicilia: S. loc., 1837, *Lehmann* (KIEL); ante 1833, *Philippi* (LE); 10.1841, *Parlatore* (G); *Huehne* (JE); [Bot. Gard.?] Palermo, *Todaro* (WU); Agrigento, at San Leone beach,

30.8.1964, *Davis 40235* (E); ibid., 13.4.1952, *Roessler 935* (M); ibid., 13.4.1952, *Merxmüller & Wiedmann 17651* (M); zwischen Cannatello und S.Leone, Primär- und Sekundärdünen, 21.4.-2.5.1978, *I.& H. Hertel 19148* (M); ibid., 24.4.1978, *G.& W. Sauer 22952* (M); Licata, 4.1882, *coll. illegible 577* (G, LD, LIV, LY, WU); c. 8 km E of Licata, 16.5.1979, *Davis & Sutton 63217* (BM, E); c. 16 km E von Gela, 0-50 m, 15.4.1965, *Merxmüller & Wiedmann 20104* (M); Caltagirone, 7.1893, *H. Ross* (LD); 15 km SW of Vittoria, 15.5.1979, *Davis & Sutton 63203* (BM, E); Vittoria (verso San Bartolo), 17.5.1873, *Sommier* (FI); Sampieri, 12.9.1912, *Lacaita 513/12* (BM); Lagunenränder vor Pozzallo, 1.-10.4.1970, *Merxmüller & Gleisner 25626* (M); 6 km W of Pachino, 13.5.1979, *Davis & Sutton 63037* (BM); Catania, 31.7.1846, *Cosson* (G, BR); ibid., Lido Plaia, 5.8.1956, *Höpflinger* (W); ibid., 11.6.1855, *E.& A. Huet du Pavillon* (G, K); chiaramonte al piano di Sperlinga, 1860, *Citarda 61* (JE); Terranova, *Todaro 896* (BM, COI, FI, JE, LE, S, WU).

Morocco: Qued Quaar, 10 m, Sand, 28°08′N, 11°51′W, 12.4.1986, *Podlech 40525* (G); Oued Chebeika, 30 km S of Tan-Tan-Plage, *Davis 53642* (BM, E); Goulmina, 9.9.1951, *Rauh 636* (M); Assaka, 1875, *Mardochée* (K, LE, LY, P); Distr. Tiznit, nr. mouth of Oued Massa, 5-10 m, 27.3.1972, *Davis 53759* (BM, E); ibid., c. 0.5 km E Sidi R'bat, 27.4.1994, *Kilian 3413* (B, herb. Kilian); near Tiznit plain, 17.3.1952, *Bannerman* (BM); 40 km S of Agadir, 5 m, 6.6.1974, *Reading Univ./BM Exped. 363* (BM); Agadir, 1.1935/1.-2.1936, *Trettewy 51,70* (K); ibid., 6.4.1936, *Samuelsson 6505* (S); ibid., 25.1.1970, *Kaae* (C); ibid., 3.4.1926, *J. Lid* (S); ibid., 1.1970, *Kaae* (C); ibid., 3.4.1926, *Maire* (MPU); Küste S von Agadir, 26.4.1994, *Kilian 3387* (B, herb. Kilian); in arenosis ad ostium fluminis Sous [S Agadir], 6.8.1926, *Maire* (MPU); 3 km SE Biougra, 30°13′N, 9°20′W, 20.4.1987, *Oberprieler & al. 2316* (herb. Oberprieler); Sous-Tal, Taroudant, 18.8.1951, *Rauh 613* (M); Midelt, 22.4.1920, *Nain* (MPU); Quarzazate, El Kelaa, 1600 m, 3.8.1980, *Lewalle 9419* (BM, BR); 1 km E Imiter, 31°22′N, 5°48′W, 1380 m, 17.4.1987, *Oberprieler & al. 2226* (herb. Oberprieler); le long de la piste de Midelt à Tounfit, 1700 m, 2.7.1934, *Chuly* (MPU); Rich - Erraridia, 1400 m, 9.7.1981, *Lewalle 10013* (BM); Ksar el Souk [= Er Rachida], 31.8.1950, *Guinet* (MPU); prope Massi-ben-Bernous inter Ksar-es-Souk et Bou-Denib, 3.5.1927, *Maire* (MPU); 7 km W of Rissani, *Crane 85* (BM); Bou Denib - Saheli, 17.4.1933, *Maire & Wilczek 404* (S); Bou Denib, 4.1923, *Humbert* (P); Arbaa de Taurit, 900 m, 28.5.1934, *Sennen & Mauricio* (BC, MAF); Rif, Gueznaia, plateau de Talamagrit, 28.5.1934, *Sennen & Mauricio* (BM, MPU); Tafersit, 4.1919, *Gandoger* (G); Rif, Straße von Al Hoceima nach Oujda S Beni-Bou-Ayach, Toboggan, ± 300 m, 7.4.1967, *Merxmüller & Oberwinkler 22134* (LD, M); Rif, Ulad Settut, à Muley-Rachid, coteaux, 22.5.1932, *Sennen & Mauricio 8449* (BM, G, MA, MPU); Berkane, 5.1928, *Faure* (S); 10 km ad occid. ab Oudjda, c. 600 m, 26.4.1936, *Samuelsson 7082* (S); Figuig, 900 m, 4.4.1910, *Schibler* (Z); ibid., 4.1924, *Humbert* (P); SW, Chtouka, 1875, *Mardochée* (G, K, LY); Oudjan (SW-Morocco), *Ball* (FI); Djebel Habibi, 1910-11, *Gandoger* (LD, W); Dar Kaid Tamri, 28.4.1941, *Peltier* (MPU); SW, Oued Debeny, 1875, *Mardochée* (K, LD, LY, MPU).

Algeria: Grand Erg occ., vers Ouarurout, 12.12.1949, *Guinet* (MPU); Coteuax à Lalla-Maghnia, 19.4.1869, *A. Warion* (GH); à Lalla Maghnia, 14.5.1856, *Bourgeau* (FI-W, G, JE, MPU); Ain Sefra, 25.4.1896, *Chabert* (FI); ibid., 5.1922, *d'Alleizette* (LD, Z); ibid., c. 1075 m, 20.4.1936, *Samuelsson 6989* (S); ibid., 1000 m, 1.5.1938, *Le Cesve 153* (BR, G, MPU); ibid., 4.1913, *Rothschild & Hartert* (BM); ibid., 31.5.1934, 11.5.1 938, *Faure* (BR, GH, MA, S, U); ibid., 1000 m, 20.4.1936, *E. Wall* (S); c. 10 km de Ain Sefra, c. 1150 m, 24.5.1901, *Hochreutiner 417* (G); circa Fontem Flavam (Ain Sefra), 28.4.1934, *Weiller* (MPU); Ain Sefra près du Ksar, 1050 m, 30.5.1901, *Hochreutiner 529* (G, Z); gare de Tiout, 1000 m, 17.4.1906, *Romieux 851* (G); entre Tabia et Chanzy, 18.5.1924, *Faure* (LD, M); Prov. Oran, coteaux argillo-calcaires, 4.-5.1851, *Durando* (FI-W, W); El Auçon, plage des Andalouses, 6.1884, *Debeaux* (JE, MPU, W); circa Oran, 1849, *Boissier & Reuter* (C, LE, UPS);

ibid., 3.4.1888, *Garriques* (BM); ibid., 1909, *Gandoger* (FI); ibid., 5.1849, *Munby* (GH, LE); ibid., 1892, *Debeaux* (FI); Taleon près Oran, 31.5.1929, *Faure* (W); environs d' Aïn-Cindamine, 900 m, 17.6.1930, *Faure* (B, Z); Saint Denis du Sig, 5.1914, *Colleizette* (G, LD); 3 miles W of G. Clemenceau (W of Mostaganem), 5.5.1937, *Alston & Simpson 431* (BM); in silva Guetaraia prope Mercier-Lacombe [= Sfizef], 600-700 m, 26.5.1933, *Maire* (MPU); environs de Mascara, 600 m, 27.5.1930, *Faure* (B, BM, Z); Mostaganem versus le Djebel Diss, 1.5.1936, *Faure* (FI, JE); La Macta, 16.4.1936, *E. Wall 792* (S); ibid., 2.10.1915, *Maire* (MPU); ibid., 5.1883, *Debeaux* (KIEL, LD, MPU); ibid., 6.1909, *Faure* (G); Mostaganem, 15.5.1851, *Balansa 159* (B, BM, BR, E, FI, FI-W, G, W); ibid., 5.1922, *d'Alleizette* (BR, LD, MA); ibid., 18.4.1922, *Faure* (L, LD, M, S, W); ibid., 1.5.1936, *id.* (BR, E); 5 miles from Picard Mostaganem - Tenes road, 6.5.1937, *Simpson 37.1292* (BM); 38 miles from Mostaganem to Tenes, 50-100 m, 30.4.1971, *Davis 51819* (BM); Le Kreider, c. 950 m, 11.5.1901. *Hochreutiner 158* (G, Z); ibid., 28.5.1888, *Bousquet* (LY); inter locus Chott M'Jour et Chott-Eins'ilt (Segnia), 35°51′N, 4°10′E, 860 m, 12.5.1870, *Paris 478* (FI, G, JE, LD, MPU); bords du Chott-el-Cherqin à Sidi Khalifa, [Uzele?] de Saida, 29.5.1852, *Cosson* (FI-W, G, GH); Geryville [= El Bayadh], 7.1897, *Doumergue* (LY); Djebel Amour, Ain Berber, 12.6.1880, *A. Roux* (JE); ibid., gorges de L'Oued Ouarea, 18.6.1880, *Roux* (MPU); ibid., 2 km NW of Aflou, 1450-1500 m, 2.6.1975, *Davis 58595* (BM, E); Boughzoul, 22.5.1968, *Rodin & Kalenow 2211* (LE); 40-50 km from Laghouat to Aflou, 1000 m, 3.6.1975, *Davis 58673* (BM, E); bei Hassi Babah, c. 50 km NNW von Djelfa, c. 800-900 m, 11.10.1929, *Zerny* (W); 3 km S of Hassi Bahbah, 800 m, 7.6.1971, *Davis 53285* (BM, E); 5 km N Laghouat an der Straße nach Djelfa, 750 m, 33°52′N, 2°53′E, 12.4.1982, *Podlech 37136* (M); Miloh, au NE de Lagouate, 25.3.1900, *Joly* (MPU); Laghouat, 4.5.1854, *Reboud 276* (G, MA); ibid., Oued el Mzi basin, 9.4.1937, *Simpson 37087* (BM); ibid., in arenis inter Laya, 4.1899, *Chevallier* (W); ibid., ad ripas "O[ued] Mzi", 14.4.1899, *Chevallier 64a* (FI, LD); N d'el Golea, 2.3.1890, *Dybovski 86* (LY); 10 km SW of Djelfa, 1250 m, 8.6.1971, *Davis 53319* (BM); 38 km SSE Laghouat an der Straße nach Gardaia, 850 m, 33°33′N, 2°58′E, 12.4.1982, *Podlech 37119* (G, M); Bou Saada, 5.1882, *Letourneux* (FI); ibid., 12.4.1937, *Alston & Simpson 37156* (BM); Msilie [= M'Sila] - Bou Saada, à 20 km de Bou Saada, 3.6.1954, *Chevassut* (MPU); Biskra, 20.4.1892, *Rouy* (LY); ibid., 11.4.1912, *Thellung* (Z); ibid., am Dschebel bu Regel, 1914, *O. Renner* (M); ibid., 9.5.1896, *Chevallier 64* (BM, FI, G, JE, LD, MPU, W, WU); ibid., 3.1887, *Bousquet 378* (LY); ibid., 11.4.1896, *Chabert* (FI); ibid., 11.5.1852, *Jamin 261* (BM, E, FI, FI-W, G, LY, W); ibid., 2.3.1901, *Kuegler 123* (JE); Oued Biskra, 14.4.1937, *Alston & Simpson 37242* (BM, K); ibid., 30.4.1853, *Balansa 791* (B, BM, BR, C, E, G, LE); El Antaia, 27.5.1853, *Perraudiere* (MPU); plaine de M'lila, prov. Constantine, 17.5.1853, *Perraudiere* (MPU); 43 km S von Touggourt an der Straße nach Ouargla, 110 m, 32°47′N, 5°52′E, 8.4.1980, *Podlech 34128* (G, M); Chott Melrir, 4.1899, *Dettner* (JE); an der Straße von Ouargle nach Toggourt, c. 40 km vor Touggourt, c. 100 m, 7.5.1971, *J. Schneller 96* (Z); 2 km E Oumez Zbed, c. 110 m, 33°08′N, 6°21′E, 31.3.1981, *Podlech 35593* (G, M); entre Dzioua et Touggourt, 28.3.1965, *Faurel 5726* (BR, L); van El-Qued nij km 145 aan de weg naar Biskra, -20 m, 4.10.1974, *K.U.& M. Kramer 5277* (U, Z); 3 km SW El Oued, 85 m, 33°20′N, 6°50′E, 31.3.1981, *Podlech 35602* (M); El Oued, 15.5.1968, *Rodin & Miroschnitschenko 2118* (LE); Djebel el Kondia, 4.5.1968, *Rodin & Kalenow 939* (LE); Haute-Plateaux, Itima, 27.5.1860, *Pomel* (MPU); Kettama, 16.4.1963, M. *Couteaux 63T88* (BR); Tadmit, 5.1952, *Chevassut* (MPU); Prov. de Oran, collin de Bordj Chalabj, 2.5.1850, *Durnado 80* (G); Ain Sidi Younés près Cassaigne, 17.5.1875, *Cosson* (G); sables à Metilfa, 13.1.1857, *Marés 8* (MPU); Ayata (Oued Rhir'), 4.5.1904, *Chevallier 595* (B, FI, JE, LD, LY, W, WU); sables sur l'oued Abid au Dafua? (prov.Oran), 16.5.1871, *Warion* (FI); O. Kurouba, *Pomel* (MPU); 4 km S von Mrhaier, 8.5.1971, *J. Schneller 97* (Z); Gada d'Enfour, 19.5.1888, *Clary 311* (MPU); Mamourah, Dj. Attar, 7./8.1894, *Doumergue* (LY).

TUNISIA: Nefta, 9.4.1912, *Humbert* (P); ibid., 25.3.1925, *E. Wall* (S); entre Bir el asli et Nefta, 5.1889, *Chabert* (FI); inter Birklada[?] et Nefta, 26.4.1889, *Letourneux* (C); Redeyef, 600 m, 4.4.1977, *Davis 61323* (E); Tozeur, 4.1909, *Pitard 2099* (G); 3 km W Tozeur, 45 m, 9.4.1980, *Podlech 34158* (G, M); El Hammma de Tozeur, 18.4.1909, *Hibon* (P); Metlaoin, 4.1911, *Bussary* (G); Gafsa, 4.1910, *Pitard 1508* (G); ibid., 22.4.1924, *Buxbaum & Schussnig* (W, WU); ibid., 4.1910, *Pitard 1855* (G); ibid., 3.1908, *Pitard 431* (G, L, LY); 14 km NE Gafsa, 340 m, 34°24′N, 8°53′E, 10.4.1980, *Podlech 34226* (G, M); 37 km NW Gafsa, c. 650 m, 34°41′N, 8°33′E, 1.4.1981, *Podlech 35669* (M); c. 52 km from Gafsa NW to Feriana, 710 m, calcareous, 5.5.1975, *Davis & Lamond 57345* (BM, E); c. 46 km NE Gafsa, an der Straße Kairouan - Gafsa, 350 m, flache, felsige Hänge, Halfa-Steppe, 17.4.1968, *Wagenitz 1254* (B); between Kasserine and Sbeitla, c. 600 m, 4.5.1975, *Davis & Lamond 57227* (E); Ben On (SE von Sbeitla) an der Straße nach Gafsa, 14.6.1976, *Möschl & Pittoni* (GZU); Ouled M'hamed, 20.1.1971, *Röthlioberger* (G); 18 km NNE von Bir El Afey, 35°04′N, 9°17′E, 10.4.1980, *Podlech 34286* (G, M); nr. the El Hamma - Tozeur track, 3.4.1938, *Simpson 38117* (BM); El Djerid, between Kebili and Mansoura oases, 18.9.1968, *Davis 48104* (E); zwischen Douz und Kebili, 21.4.1976, *Möschl & Pittoni* (M, GZU); 1 km N of Feriana, 750 m, 5.5.1975, *Davis & Lamond 57336* (BM, E); Maknazzi, 28.1.1908, *Murbeck* (LD); Gabes, 13.4.1854, *Kralik 263* (G, W); ibid., 16.4.1924, *Wilczek* (G); ibid., 11.4.1854, *Kralik* (FI-W); ibid., 2.1907, *Pitard 179* (G, L, MA); ibid., 8.5.1911, *Gysperger* (JE, MA, W); ibid., 28.3.1896, *Murbeck* (WU); ibid., 1909, *Pitard* (B, BM, L); ibid., 10.3.1968, *R. Gauthier 11729* (G); ibid., 19.3.1925, *E. Wall* (S); ibid., 3./6.1854, *Kralik* (FI-W, UPS); ibid., *Battandier* (MPU); ibid., 27.4.1854, *Kralik 268a* (B, E, FI-W, G, S); ibid., 4.1907 *Pitard* (BM, G); ibid. 3.1907, id. 181 (E, G, L, LY); ibid., 12.4.1978, *Hautzinger* (W); El Hamdou de Gabes, 1913, *Pitard* (G); around Ae Nouha oasis (c. 20 miles NW of Gabes), 4.1968, *R. Young 80, 84* (BM); Graiba, 11.4.1904, *Romieux 116* (G); entre Sfax et Bir-Ali-Ben-Khalifa, 14 km avant le village, 30-50 m, 10.5.1988, *Raffaeli & Ricceri* (FI); route El Djem à Sfax, *Pomel* (MPU); circa veterem Carthaginem, 23.8.1854, *Kralik 268* (BM, E, FI, G, LE, S, W); ibid., *Desfontaines* (FI-W); 26 km from Nabeul to Grombalia, c. 200 m, 11.4.1977, *Davis 61321* (E); Hammamet, 5.1.1967, *A. Hansen* (C); ibid., 10.5.1984, *Davis 70169B, 70163* (E); ibid., 30.3.1969, *Kaae* (C); ibid., 9.1907, *Gandoger 93* (C, G, LE, W, Z); ibid., 10.1907, *id. 186* (C, G); Sebkhet-Er-Piana, Strand, 6.2.1971, *Röthlioberger* (G); Nabeul, 5.1910, *Pitard 2391* (G); ibid., 9.1907, *Gandoger 52* (G, W, Z); spiaggia N di Sousse, 10 km prima di Hergla, 14.4.1986, *Raffaeli & Ricceri* (FI); 4 km S de Hergla, dunes maritimes, 23.3.1980, *Charpin 15970* (G); Sousse, 31.12.1966, *A. Hansen* (C); ibid., 12.1980, *Döring 30* (FR); between Sousse and Monastir, 9.9.1968, *Davis 48024* (E); Sfax, 17.4.1919, *Cuénod* (G); ibid., 1856, *Ducouret* (L); ibid., 8.1856, *Kralik* (FI-W); ibid., 2.5.1886, *Robert* (FI, G, K, LE, LY, Z); c. 80 km N Sfax, 8.4.1968, *Leippert 7240* (B); Djerba, 31.5.1977 + 29.3.1978, *Vanden Berghen* (BR); ibid., Küstendünen bei Houmt Souk, 29.12.1982, *Pittoni* (GZU); im NE der Insel, 27.2.1974, *Pittoni* (GZU); Zarzis, 2.1908, *Pitard 430* (BM, E, G, L, MA, MPU); fra Kelibia e El-Haouria, 30 m, 13.4.1986, *Raffaeli & Ricceri* (FI); N de Hammam-Sousa, 4.6.1883, *Cosson & al.* (K); Sidi Boul Baba, 9.5.[1854], *Kralik* (FI-W); Radés, 6.1893, *Le Grand* (LY); Radés, 6.1893, *A. Félix* (BR); Oudsef, 2./3.1909, *Pitard* (E,G); Madour(?), 24.5.[1854], *Kralik* (FI-W); Gammarth, 50-100 m, 26.4.1975, *Davis 56736* (BM, E); Djebel Sidi Khalif (S Faid), 330 m, 15.5.-8.6.1982, *Malicky* (W); Bir Agareb, 8.4.1924, *Wilczek* (G); station de Ain Ghrasesia, 3.4.1924, *Wilczek* (G); Ferdjane, 5.11.1923, *G. Babault* (P).

LIBYA: Fra Nalut e Sinauen, 10.4.1930, *Bagagli-Petrucci* (FI); El Assa Exclosure, 500′, 12.12.1957, *Park 100* (K); Sabratha, 13.5.1966, *Townsend 66/20* (K, LE); Ain Zara, 70′, 9.4.1958, *H.G. Keith 244* (G, K, LE); Azizia, 28.4.1933, *Bornmüller 804* (B, GH, JE, Z); Tripolis, 10.12.1882, *Ruhmer* (G, LD); ibid., 26.12.1951, *Guichard KG/Lib/31* (BM); ibid., 1 mile S of suburbs, *Scott Elliot 3172* (BM); ibid., Sidi El-Masri, 18.4.1967, *Boulos 1700* (LD,

herb. Greuter); ibid., près Ain Sah'ra, 24.3.1887 *Taubert 105* (G); ibid., 7.4.1886, *Letourneux* (P); ibid., *Dickson 1827* (FI-W); ibid., 14.4.1938, *Maire & Weiller 992* (MPU); ibid., 12.3.1970, *Davis 49490* (E); ibid., *ignotus 3A* (L); ibid., prope Gangaresh, 29.4.1933, *Bornmüller 797, 809* (B), *803* (BM, GH, S, Z); ibid., 20.4.1933, *Bornmüller 798* (B, BM, S, Z); ibid., 21.4.1933, *Bornmüller 800* (B); ad Tadjura, 19.4.1933, *Bornmüller 799* (BM, GH, JE, K, S); ibid., 1.5.1933, *Bornmüller 801* (B, GH); ibid., 15.4.1938, *Maire & Weiller 991* (MPU); ibid., 22.3.1931, *Zodda* (FI); Zanzur [c. 15 km SSE Tripolis], 23.2.1913, *Pampanini 206* (FI); Castel Verde, 30 miles ESE of Tripolis, 29.3.1946, *E.S.Brown* (K); im südlichen Vorland des Djabal Nefusa 27 km S Mizda, etwa 500 m, 29.5.1955, *Jany 97* (B); colline ad E di Kasr Tarhuna, 28.3.1913, *Pampanini 1793* (FI); 22 km W Khoms, 25.4.1967, *Boulos 1800* (B); Leptis Magna, 18.4.1932, *Bargagli-Petrucci* (FI); ibid., 26.4.1967, *Boulos 1840* (G); ibid., 11.4.1933, *Bornmüller 802* (B); ibid., 14.6.1966, *Townsend 66/41* (K); W of Misurata, 19.2.1966, *Archibald 913* (E); Wadi Shedjam I, Syrtica, 29.3.1939, *Simpson 391255* (BM); between Misurata and Bu-Gren, 20 m, 23.3.1970, *P.H. Davis 49827* (E, K); Bouerat [= Al Buyarat], 16.4.1938, *Maire & Weiller 994* (MPU); El Agheila, 15.3.1933, *Pampanini 9168* (FI); ibid., 22.3.1937, *Serv. Agr. Ciren. 211* (FI); Uadi Faregh, Maaten Giofer [= Ma'tan al Gafr], 13.3.1933, *Pampanini 9171* (BR, FI, W); tra El-Agheila e Maaten Giofer, 15.3.1933, *Pampanini 9169* (FI); fra l'oasi di Marada e l'uadi Faregh, 16 km a S di Maaten Giofar, 13.3.1932, *Krüger* (FI); tra Agedabia ed el-Agheila Melch en Nogra, 15.3.1933, *Pampanini 9170* (FI, G); es-Zuetina a NE di Agedabia, 11.4.1934, *Pampanini & Pichi-Sermolli 9182* (FI); Saniet el-Hamar a SE di Agedàbia, 12.3.1933, *Pampanini 9167* (FI); tra Agedabia e Antelat [c. 31°N, 20°40′E], 10.4.1934, *Pampanini & Pichi-Sermolli 9181* (FI); Maaten Risàm [c. 30°N, 21°E] e Gasr es Sahabi, 20.4.1938, *Krüger* (FI); Benghasi, 1884, *Petrovich* (WU); ibid., 20.3.1916, *Zanon 588* (FI); ibid., 5.4.1913, *Vaccari 230* (FI); ibid., Sidi Califa, 28.4.1922, *Mangini* (FI, K); ibid., Djuliana, 4.3.1883, *Ruhmer 220* (BR, G, JE, LD, LE); el-Mechili [= Al Mukayli] - Gara el Gafsa, 28.3.1933, *Pampanini 9174* (FI); el-Mechili: Uadi Ramla, 27.3.1933, *Pampanini 9173* (FI); Bomba, 12.3.1934, *Pampanini & Pichi-Sermolli 9184* (FI); ibid., 4.6.1887, *P. Taubert 696* (G); ibid., El-Gefar, 17.4.1934, *Pampanini & Pichi-Sermolli 9184* (FI); Bir Acheim [= Bir Hacheìm, c. 31°30′N, 23°30′E] - Bir Belamed, 26.3.1933, *Pampanini 9172bis* (FI); Tobruk, 18.4.1912, *Vaccari 198* (FI); Sidi Bu Amud tra Tobruk e Bardia, 23.3.1933, *Pampanini 9188* (FI); Porto Bardia, 29.3.1937, *Serv. Agr. Ciren. 91* (FI); Amseat a S di Bardia, 24.3.1933, *Pampanini 9172* (BM, FI, S); Oued el Kebir (Trip.), 16.4.1938, *Maire & Weiller 995* (MPU); Magnae Syrteus prope Casa Ristoso, 29.4.1938, *Maire & Weiller 996* (MPU).

E G Y P T: Solum, 13.5.1933, *Palmey* (K); Kasr el Romani W of Mersa Matruh, 14.4.1948, *Täckholm* (S); Marsa Matruh, 14.4.1948, *E. Wall 792* (S); Fuka, 6.3.1961, *A. Abbas* (MA); El Alamein, 15.3.1962, *El Hadidi* (LD); Mariut - Burg el Arab, 14.3.1944, *P.H. Davis 6491B* (E, K); ibid., 27.3.1968, *Romée* (LD); ibid., 21.4.1962, *Botschantzev* (LE); ibid., El Hawaria, 3.1978, *Merxmüller 33202* (M); Amria, 15.3.1945, *P.H. Davis 8368* (E); ad occasum lacus Mareotici prope stationem Amria, 13.4.1908, *Bornmüller 10825* (B); Mariout, 14.3., *Scott Elliot 3748* (BM, E); ibid., 26.1.1948, *E. Wall* (S); ibid., 19.3.1887, *Ascherson 230* (B, W); Mariut - Abu Sir, 14.3.1944, *P.H. Davis 6490B* (E); Mex, 4.1894, *Sickenberger* (G, Z); Umgebung von Alexandria E bis Abukir, W bis Mex, 15.2.-15.4.1909, *Blumencron* (WU); Agami, W of Alexandria, 1.5.1967, *Romée* (LD); road Alexandria - Marsa Matruh, 22 km from Alexandria, 9.3.1969, *Wanntorp & Sjödin 2103* (S); prope Alexandriam, 4.1857, *Samaritani 3149* (BR, FI, G, L, M, S, WU, W); Alessandria, *Figari* (FI); ibid., 3.1965, *Maitland* (G, K); ibid., *Kotschy 738* (W); ibid., 1820-1826, *Ehrenberg* (BR, LD, LE, W); ibid., 1830, *C. de Montbret 101* (FI-W); ibid., ad Sidi-Gaber, 8.4.1908, *Bornmüller 10826* (B, WU); Ramleh, 4.1872, *du Parquet* (BM); ibid., 4.1876 + 7.1877, *Letourneux* (BM, C, S); ibid., 5.6.1933, *E. Wall* (S); ibid., 9.4.1871, *du Parquet 451* (BM); ibid., 1881, *Massie-Blomfield* (E); ibid., 5.1871, *du Par-*

quet 453 (LE); ibid., 3.1898, *Marchesetti* (FI); Ramleh - Mandarah, 23.4.1883, *Deflers* (MPU); entre Ramleh et le Canal Mahmoudieh, 13.2.1871, *du Parquet 274* (BM, LE); prope El-Mandara, 11.4.1908, *Bornmüller 10827* (B, BM, E, G, W); Abu Sir [= Abu Qir], 14.3.1944, *P.H. Davis 6515B* (E); ibid., 2.3.1913, *A. Kaiser* (G); ibid., 15.2.1960, *Baehni* (G); Rosetta, 21.4.1973, *Ibrahim & al.* (LD, LE); c. 5 km NNW of Rashid (Rosetta), 16.4.1983, *Snogerup & al. 2630* (et cult.) (LD); NE of Baltim, c. 1 km S of the seashore, 7.11.1986, *S. & B. Snogerup 4845* (LD); Kairo - Alexandria, 60 km from Alexandria, 20.4.1962, *Botschantzev* (LE); Kairo, ad pyramides (prope Giseh), 3.5.1908, *Bornmüller 10828* (B, BM, E, G, LD, W, WU, Z); Damiette, 1820-1826, *Ehrenberg* (L, LE); Mit el Nassara, Damietta, 11.4.1922, *Simpson 981* (K); Salehieh, im N des Wadi Tumilat, 8.5.1880, *Schweinfurth 273* (BR, W); Ismailia, 4.1887, *Ascherson* (LD); between El Areesh and El Kantara, 3.10.1891, *Sickenberger* (Z); Sinai, Mitla pass, sand over soft limestone, 13.4.1945, *P.H. Davis 10465* (E, K); El Arish, 31.3.1960, *H.& E. Walter 184* (B); ibid., 16.3.1927, *Dinsmore* (S, Z); ibid., 6./11.5.1887, *Ascherson 238, 244* (W); ibid., 3.1928, *Meinertzhagen* (BM); Bir Lehfen S of El Arish, 4.4.1939, *Drar* (S); Wadi Heridin S of El Arish, 4.4.1939, *Drar* (S); El Gradi, 11.5.1887, *Ascherson 246* (W); desert del'istme, oasis d'el Qatieh, 26.3.1891, *Deflers 49* (MPU); Qatich, Ghab, 30.4.1887, *Ascherson* (K); Oasis Katieh, 22.3.1880, *W. Barbey 566* (G, Z); Chatieh, 29.4.1887, *Ascherson 255* (B, W); El Gels, 20.5.1887, *Ascherson 249* (B, W); El Omaied, 9.3.1930, Gauba 390 (W); Schech Saîd, am Salzsee, 12.5.1887, *Ascherson 237* (W); Bir el Aled, 2.5.1887, *Ascherson 240* (B, LD, LE, W); westliche Küstenzone, Ras el Hikma, 6.3.1960, *H.& E. Walter 140* (B).

PALESTINE / ISRAEL: Rafiah, 27.3.1942, *Zohary* (S, U); ibid, 4. 25, id. (LE); ibid., 4.6.1945, *P.H. Davis* (E, K); Khan Junis, 8.4.1933, *Samuelsson 3040* (K, LD, S); ibid., 8.4.1933, *E. Wall* (LD); Deir el Balagh, 8.4.1930, *E. Wall* (LD); ibid., 8.4.1933, *Samuelsson 3072* (LD); Gaza, 4.1846, *Boissier* (G, GH, UPS); 5-6 km SW Gaza, 10.5.1985, *Liston 7-85-325/1* (BR, E, M); Ashdod, 2.4.1974, *Zohary 786* (U, Z); N von Telamim, Nature Reserve Be-er Mash'abbim, 350 m, 26.4.1983, *Bierkamp & Zinth 1843* (BSB); Beit Eshel, 2.4.1946, *Zohary* (G); Jaffa [Tel Aviv], 12./13.5.1897, *Bornmüller 984* (BR, G, J, LE, WU); ibid., 26.4.1912, *Meyers & Dinsmore 3364* (G, LD, S); ibid., 29.4.1909, *Dinsmore 1364* (E, K, L, LD); ibid., 15.4.1969, *Hepper 3424* (K); zw. Jaffa un der Colonie Sarona, 16.9.1880, *Sintenis* (LD); Beersheva, 27.3.1952, *D'Angelis & Grizi 588* (B, BH, BM, BR, C, COI, E, G, GH, K, L, LD, LE, M, OXF, S, U, UPS, W, WU, Z); ibid., Ashij, 350 m, 7.4.1933, *E. Wall* (S); ibid., 28.3.1985, *Hepper 8507* (K); ibid., c. 10 km S, 15.4.1928, *Eig & al.* (A, MA, herb. Greuter); c. 16 km S of Beersheba, 9.4.1970, *W.J. Dress & A. Witzlam* (BH); Shefela, SW of Banei Suela, 27.3.1942, *Zohary* (M); S de Boker, 5.3.1979, *Zohary* (Z); Wadi Hadeira 10 km N of Sofi, -300 m, 3.12.1982, *J. Jones 12* (E).

JORDAN: 2 km NNE Umm Mithla c. 100 m, 30.3.1987, *Baierle & Todt 87-133* (herb. Baierle); Maan distr., Gweira police station, 13.8.1955, *Kasapligil 2210* (W).

LEBANON: Tyr, 20.2.1957, *Pabot* (G); Beyrouth, 21.-25.3.1933, *Meinertzhagen* (BM); ibid., 4./8.5.1910, *J.& F. Bornmüller 12057* (B, BM, G, JE, LD, LE, W, WU); ibid., 8.4.1889, *Vincent* (MPU); ibid., 26.4.1903, *Kuegler* (JE); ibid., 30.4.1833, *Gaillardot* (JE); ibid., 19.3.1955, *Mouterde* (G); ibid., SW de, 30.4.1893, *Mants? 638* (W); sables vers l'aeroport, 11.5.1964, *Mouterde 12.787* (G); NahGhadir (aeroport de Beyrouth); 25.3.1936, *Pabot 4746* (G); Gadir, 20.4.1879 + 3.5.188, *Peyron 350* (G); ibid., 19.3.1935, *Pabot 3581* (G); Khaldi (S Beyrouth), 26.3.1954, *Pabot* (G); ibid., 30.4.1932, *Gombauld 5684* (P); au S de Alousay, 5.3.1932, *Gombault 5682* (P); St. Elie, 23.3.1933, *Gombault 5681* (P); coast below Choneifat, 23.3.1943, *P.H. Davis 5477* (E, K).

CYPRUS: Agia Irini nr. Morphou, 11.3.1941, *P.H. Davis 2548* (E); ibid., sea level, 31.3.1936, *Syngrassides 1038* (K); ibid., 26.3.1962, *Meikle 2379* (C, K); Trikomo,

20.3.+27.3.1970, *Kaae* (C); Salamis, 11.4.1905, *Holmboe 455* (S); ibid., 4.1928+ 4.1930, *Druce* (OXF); Famagusta, 22.3.1970, *Kaae* (C); ibid., 9.7.1939, *H. Lindberg* (K, LD, S); sand dunes near Agios Memmon, 1.5.1948, *Mavromoustakis* (K).

Use

Arnold-Apostolides (1991: 1535 sub *L. resedifolia*) reports from Cyprus that "les feuilles ... sont consommées en salade condite à l'huile et au vinaigre". Guichard (1952 in sched. KG/Lib/31) states from Libya, Tripoli that "locals chew the root which is gathered after flowering. Said to taste like chewing gum." The plant is called there "Artheeda".

(b) *Launaea fragilis* subsp. *asirensis*

Launaea fragilis subsp. *asirensis* N. Kilian, **subsp. nova** – Holotype: Yemen, about 4 km from Shelaan towards Shibam, c. 2500 m, on a bare gravelly hillside, 13.6.1975, *Wood Y/75/315* (BM!; isotype C!) – Fig. 103.

A proxima *Launaea fragilis* subsp. *fragilis* characteribus sequentibus distinguitur: achaenia intima sine costis secundariis prominentibus, stramineo-brunnea usque ad rufescentia (versus pallide brunnea usque ad atrobrunnea) et distributio geographica in parte regionis montanis Arabiae peninsulae austro-occidentalis (versus in parte regionis mediterraneae australis).

Ic.: Figs 14k-m, 102.

Description (v.v.)

Perennial herb, flowering 4-60 cm high, with a woody, sometimes even tuft-like base, (probably) with shoot bearing roots, flowering stems usually a few to several, already basally branched, leafy in lower half, becoming leafless higher up. *Basal leaves* often (sub)rosulate, *basal and lower cauline leaves* up to 14 × 3 cm, in outline (± narrowly) spathulate, attenuate into a narrow base, sinuate-dentate to ± deeply pinnatifid with rather long, lanceolate, acute segments (to sub-bipinnatifid) and the terminal segment ± long-acuminate; lamina bluish-green, margin ± denticulate; higher up the stem cauline leaves with amplexicaule, subauriculate base, smaller and in outline lanceolate, with smaller segments, finally sinuate-dentate or even subentire, and passing over into lanceolate to narrowly ovate-acute bracts. *Synflorescence* of a flowering stem subdivaricately branched, with several repeatedly branched flowering axes overtopping the terminal capitulum of the main axis. *Peduncles* as the terminal segment of the flowering axes 1-7.5 cm long, with a few bracts passing over into the outer involucral bracts. *Capitula* with c. 30-60 flowers. *Receptacle* at fruiting time 3-4 mm in diameter. *Involucre* at anthesis (7)9-12 mm long, slender clubshaped, prolonged after anthesis and finally 12-16 mm long, slender cylindrical; at time of fruit dispersal involucral bracts spreading and their midrib swollen and hardened in lower part; outer involucral bracts 6-8, with apex contracted into an acute, white-cartilagineous prickle and ± without scarious margin, the outermost ovate-acute, 1.5-2.5 mm long, the

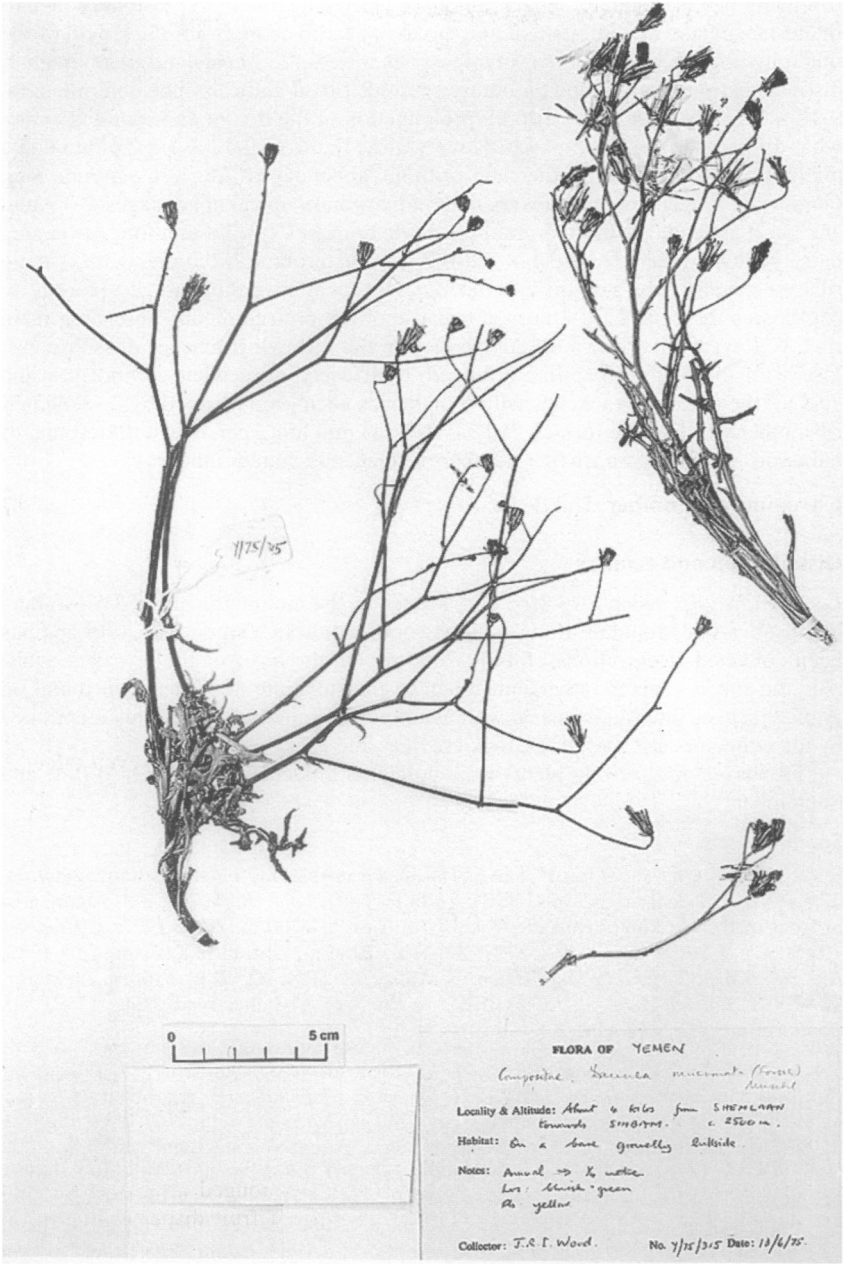

Fig. 102. *Launaea fragilis* subsp. *asirensis* (holotype specimen, BM).

following bracts gradually longer and more lanceolate, the innermost lanceolate to linear-lanceolate, at anthesis reaching up to 3/4 (or even more) of the length of the inner involucral bracts; inner involucral bracts 8-12, linear-lanceolate, with ± distinct scarious margin and an obtuse scarious tip, at anthesis subequal in length, 9-10 × 1-2 mm, with the postfloral prolongation of the involucre becoming somewhat different in length. *Flowers* with a yellow ligule of 9-12 × 2.2-2.6 mm and a distinctly shorter tube; anthertube without appendages 2.8-3.8(4.2) mm long (somewhat longer in inner flowers than in marginal), apical appendages ± 0.3 mm and basal appendages 0.4-0.5 mm long; style branches 1.8-2.8 mm long, sweeping hairs yellow. *Achenes* 3.9-6.1 × 0.5-0.9 mm, heteromorphic, inner with 4 main ribs, secondary ribs not differentiated, cylindrical to columnar, ± glabrous to papillose-pubescent, base 4-horned because of the protruding and spreading main ribs, yellowish pale brown to reddish brown; the following achenes densier papillose with the hyaline papillae arranged ± diffusely, somewhat compressed and curved; the outermost achenes with 5 main ribs each accompanied by 2 secondary ribs, otherwise like the former. *Pappus* 7-9(11) mm long, persistent, dimorphic, of numerous downy and a smaller number of setaceous, longer inner rays.

Chromosome number: Unknown.

Distribution and ecology

Launaea fragilis subsp. *asirensis* is restricted to the mountains of the SW Arabian Peninsula (Asir Mountain Range and its continuation in Yemen, Fig. 100) and has been collected at elevations of 1450-2800 m. On the basis of the few data available the species seems rather indifferent to the substrate as it has been found on granite, schist, limesandstone as well as on volcanic material. Habitats mentioned by the collectors are wadi beds, rock crevices and rocky slopes.

Flowering and fruiting plants were collected in December, March to June and September.

Specimens seen:

SAUDI ARABIA: 30 km N Taïf, 1450 m, Granitblöcke, Felsenspaltenvegetation, 22.3.1982, *Baierle & al. 82-564* (BSB); Taifa [= Taïf], 1838, *Botta* (P); wet marshy area in front of the old king's palace c. 8 km N of Taïf, c. 1700 m, 29.12.1977, *J. Humbles 10038* (E); 2 km W Sha'ar, 18°27′N, 42°27′E, 2050 m, Abflußrinne/Wadi, 13.4.1982, *Baierle & al. 82-1611* (BSB); 15 km N Abha, 18°21′N, 42°29′E, 2200 m, Schiefer, 12.4.1982, *Baierle & al. 82-1573* (BSB); 15 km S of Al-Baha, Wadi Bida, 17.5.1980, *Boulos & Ads 13927* (CAIM, K).

YEMEN: S. loc., 1937, *C. Rathjens 37/143* (BM); above Sanaa, 22.6.1977, *Chaudhary* (K); near Sana'a, Wadi Daher, 15.12.1977, *S.A. & Z. Chaudhary* (E, K); 11 km N Sana'a nahe der Straße nach Alram, Djebel Serir, 2240 m, Kalksandstein, 29.9.1981, *Podlech 35947* (M); Jabal Shamsan, 15 km NNE of Sanaa, recent volcanic cone, rainfall c. 200 mm, 2450 m, 14.9.1977, *Lavranos & Newton 15842* (E); Sana'a, sur le revers O. du Gebel Nugum, 2200 m, 28.5.1887, *Deflers 456* (P); Djebel Hadida, 26.9.1931, *C. Rathjens 42* (BM); Telhán, 14°22′N, 44°26′E, 2540 m, 8.9.1982, *Bisset 168a* (K); Jabal Isbil, 14°31′51″N, 44°42′28″E, c. 2800 m, rocky slopes, 11.4.1997, *Kilian 4888* (B, etc.); 3 km S of the turn-off to Al Bayda from Mukayras, 13°57′N, 45°40′E, 2150 m, rocky outcrops, 25.3.197, *Kilian 4571 & Al-Gifri* (B).