

A new species and two new combinations of *Leontodon* (Asteraceae, Hypochoeridinae)

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Leontodon palisiae sp. nov. occurring in the Iberian Peninsula, Morocco and the Canary Islands is described and illustrated. Cytological data as well as some preliminary results of self-incompatibility tests in *L. palisiae* are presented. A comparative carpological study of *L. muelleri*, *L. palisiae* and *L. salzmannii* using the SEM is made, and an identification key of these three species is provided. Two new combinations, *L. muelleri* ssp. *trivialis* comb. nov., from Morocco, and *L. kralikii* comb. nov., from Libya and Tunisia, are proposed. All taxa belong to the series *Annui* of sect. *Kalbfussia* in subgenus *Oporinia*. The basic chromosome number $x=5$ is here reported for the first time within the genus.

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Introduction

When studying the populations of *L. salzmannii* (Schultz-Bip.) Ball from the SW Iberian Peninsula, as a part of a larger study on the genus *Leontodon* L. subgenus *Oporinia* (D. Don) Clapham, it became obvious that such populations differ clearly from the Moroccan ones on which the species was described.

A detailed study of the shape, ornamentation and pappus in the radial cypselae, in what Widder (1975) considered series *Annui* (Boiss.) Widder, confirmed the importance of these characters in order to discriminate the annual taxa within subgenus *Oporinia*. As a result of the study here presented, a new species is described and two new combinations are proposed.

Material and methods

Somatic chromosomes were examined using root tips of potted plants, previously transferred from the field to the greenhouse. Roots were pretreated in melting ice

for 12 to 24 hours, and fixed in 3:1 ethanol-acetic acid. The material was later hydrolyzed in 1 normal HCl for ca. 6 minutes and later stained with aceto-orcein, previously to squashing. Meiosis was studied in pollen mother cells, following the method described in Izuzquiza (1989).

Mature cypselae were mounted, sputter coated with gold-palladium (80:20), and examined with a Jeol JSM-T330A microscope.

Flower heads were bagged with a fine nylon netting before opening and throughout anthesis. Then the number of filled and empty cypselae per capitulum were counted.

Vouchers (number one superscript is used to indicate that the voucher was studied cytologically, number two indicate that it was studied under the SEM and number three when it was tested for self-incompatibility).

L. palisiae, Portugal, Alto Alentejo, Elvas, 18.III.1977, Guerra 1412 (MA 355009², holotype). Spain, Sevilla, El Ronquillo, entry of the road to the Minilla swamp, 29SQB47, 210 m, slopes, 29.I.1989, Izuzquiza 1724, Bayón & Nieto Feliner (MA 461978^{1,3}); ibidem, Castillo de las Guardas, Guadiamar river,

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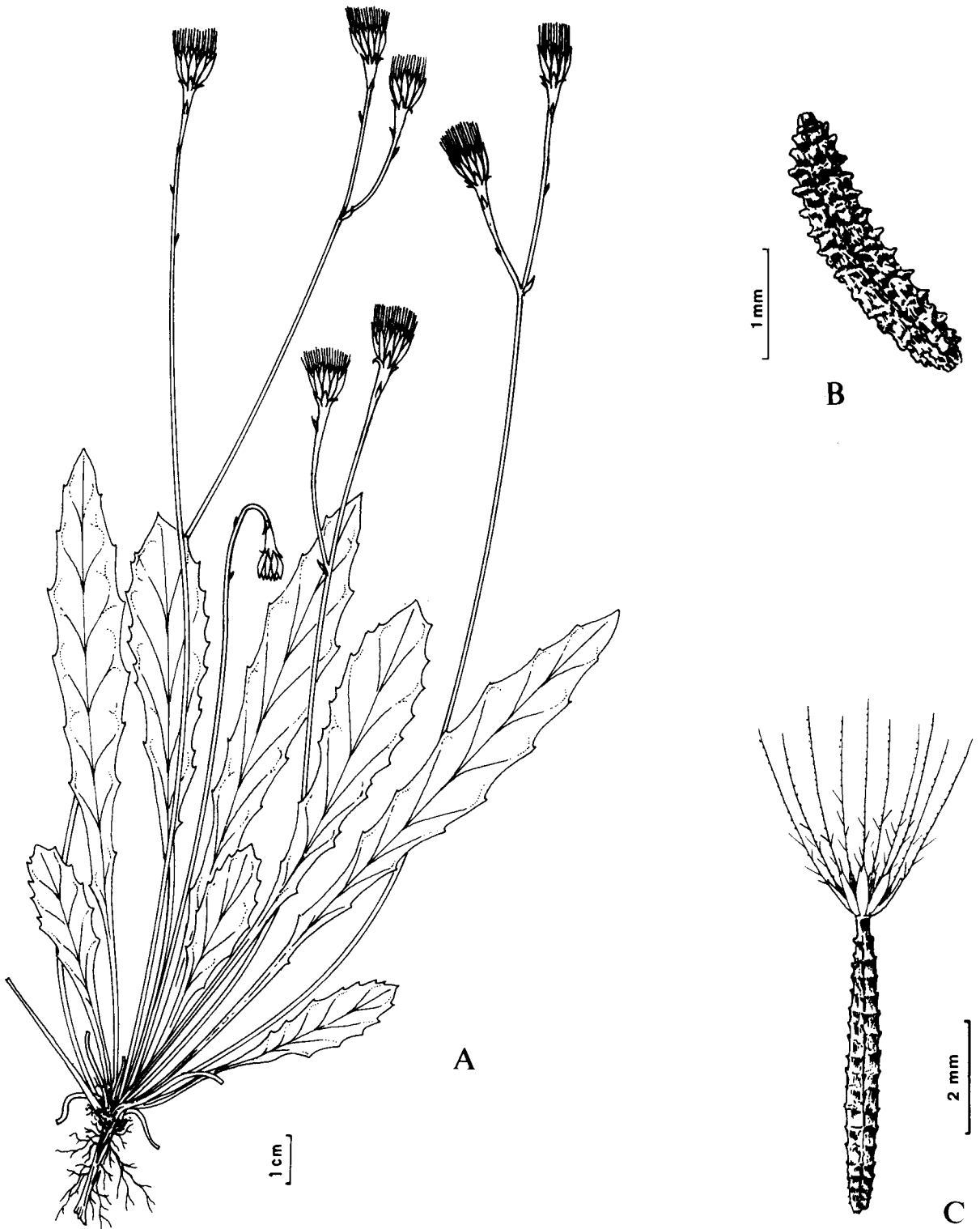


Fig. 1. *Leontodon palisiae*. – A: habit. – B: radial cypsela. – C: central cypsela. (All from the holotype).

Fig. 2. Map showing the world distribution of *Leontodon palisiae*. The bigger dot in the Canary Islands means two collections.



29SQB37, ca. 350 m, nitrophilous communities, sandy soil, 29.I.1989, Izuzquiza 1725, Bayón & Nieto Feliner (MA 465463^{1,2}).

L. muelleri, Spain, Almería, Tabernas, venta del Compadre, 30SWF5803, 460 m, 3.III.1989, Izuzquiza 1739 & Nieto Feliner (MA 461948²).

L. salzmännii, Morocco, Kenitra, Foret de la Mamora, 50 m, 27.III.1977, Guzmán, Luceño, Mtnez. Escribano & Vargas 2751 (MA 461908²).

For the treatment of supraespecific taxa, I followed the classification given by Widder (1975).

Taxonomy

Leontodon palisiae Izuzquiza sp. nov.

Kalbfussia salzmännii Schultz-Bip. var. *hispanica* Lange, Vid. Meddl. Dansk Naturh. Foren. Kjøbenhavn 1860: 96, 1862. – *Leontodon salzmännii* var. *hispanicus* (Lange) Coutinho, Fl. Portugal: 666, 1913. – *Leontodon salzmännii* auct., non (Schultz-Bip.) Ball. – Typus: in campis Extremadurae, Apr. 1798, Schousboe (C lectotypus and isolectotypus, here designated); ad margines fluv. Guadaya pr. Sevilla, in arenosis, 5 Mart. 1852, Lange (C, 2 sheets, syntypus).

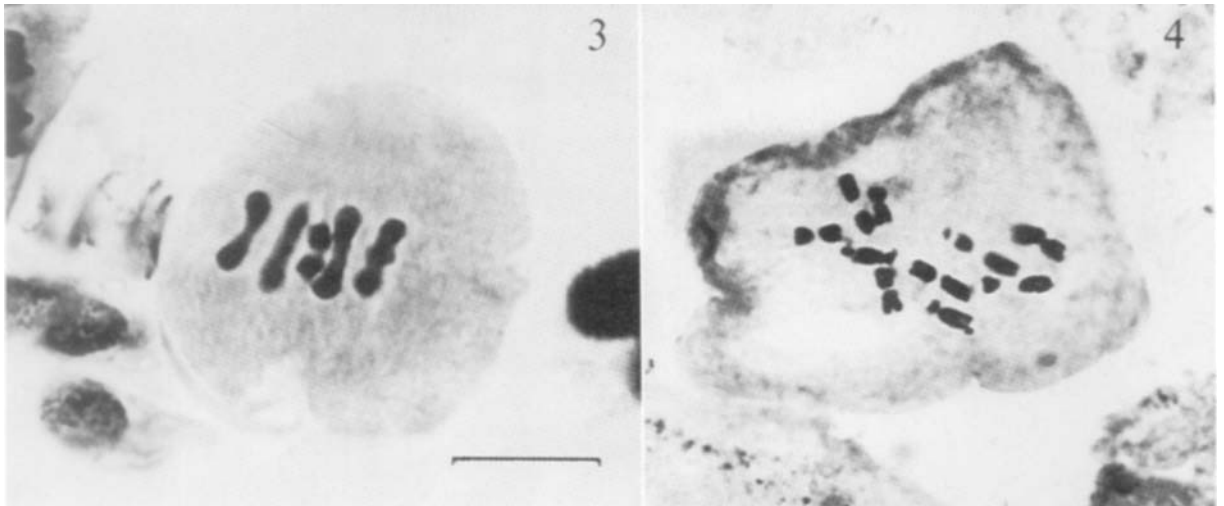
Speciebus *Leontodon salzmanii* (Schultz-Bip.) Ball et *L. muelleri* (Schultz-Bip.) Fiori similis. A prima differt lateralibus cypselis tuberculis squamoso-acutatis mun-

itis, nec rotundatis, pariter ac centralibus maioribus atque pappi squamis externis minoribus. A secunda rursum differt virgineis capitulis nutantibus, pappi inferne pilis tantum plumosis, ramis stylaribus nigricantibus, nec flavi, centralibus cypselis apice attenuatis, nec aperte rostratis, atque numero chromosomatum, $2n=10$, nec $2n=12$. – Fig. 1.

Typus: Elvas (Portugal, Alto Alentejo), pentes des vieilles murailles, 18 mars 1977. J. A. Guerra N° 1412. Soc. Ech. Pl. Vasc. Eur. Bass. Méd. n° 10864. 1983 (Holotypus MA 355009; Isotypi G 278606!, MA 378059!, MACB 30417!, MAF 120706!, SEV 111905 n.v.).

This species is dedicated to Paula Ibáñez de Aldecoa known as “Palis” by her friends.

Annual scapose herb with 1–14 stems. Basal leaves 2.1–27.5 × 0.3–6.6 cm, gradually narrowed into a petiole up to 10 cm, sinuate-dentate, pinnatisect or rarely pinnatifid, lobes acute; lanceolate to oblanceolate in outline; glabrous or with some sparse simple eglandular hairs, very rarely hirsute. Scapes up to 48 cm, nodding in bud, erect at anthesis, commonly curved at the base, with 1–14 capitula; glabrous to densely pubescent at the base; glabrous to sparsely pubescent below the capitulum. Peduncles generally thickened in the upper part, with 2–6 squamiform bracts 1.5–3.0 × 0.5–1.5 mm, with



Figs 3-4. *Leontodon palisiae*. – Fig. 3. Somatic metaphase ($2n=10$, Izuzquiza 1724 & al., MA 461978). – Fig. 4. Metaphase-I ($n=5$, Izuzquiza 1724 & al., MA 461978). – Scale: 10 μ m.

cordate base. Capitula 6.5–13.5 \times 6.5–15 mm, tubular-campanuliform, glabrous to sparsely tomentose. Outer involucre bracts 1.6–4.8 \times 0.7–1.6 mm, \pm triangular. Inner involucre bracts 6.0–12.0 \times 1.0–2.4 mm, oblong-lanceolate, with an internal pleat, enclosing the outer cypselae. Ligulate flowers 34–80 per capitulum, yellow, generally with a red colored stripe on the outer surface, pubescent in the basal half. Style branches black when dry, greyish-yellow in living plants. Cypselae dimorphic, chestnut to dark brown colored, those of the periphery 8–24 per capitulum, 2.8–4.5 mm long, fusiform, with transverse scales directed upwards, epappose, or less frequently with up to 1–3 pappus hairs. Inner cypselae 26–66 per capitulum, (4.4)5.2–9.1(9.4) mm long, transversely muricate, gradually tapering in the upper part. Pappus whitish-brown, of two sorts: the inner row with (8)9–11 hairs, (4.1)4.8–7.3(8.0) mm long, plumose and flattened at base, scabrid above; the outer row consisting of ca. 10 very short scales. Pollen diameter 29–36 μ m (31.53 ± 1.97) (Díez 1987). Flowering period: February to May.

Illustr.: Fig. 1; Talavera 1987: 102 (sub *L. salzmannii*).

Distribution and habitat. (Fig. 2) *L. palisiae* is fairly common in the SW of the Iberian Peninsula and it is also known from one locality in Morocco and from two in the Canary Islands (Tenerife). The record from Morocco is from a garden. In Spain and Portugal it generally occurs on sandy soils, waste lands, riversides and reservoirs, in open bushland, up to 350 m of elevation (625 m in the Canary Islands).

In the Canary Islands the only taxon within the genus reported up to now was *L. saxatilis* Lam. (Pitard & Proust 1909; Lid 1968; Hansen 1970; Kunkel 1977; Eriksson et al. 1979); this is also an annual hetero-

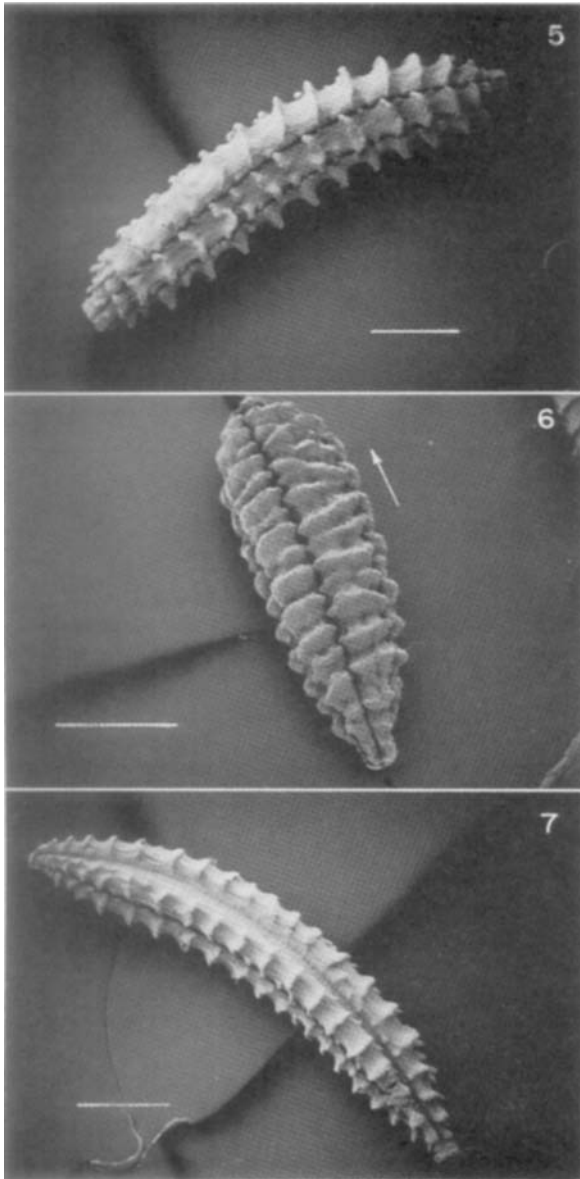
carpous species which, unlike *L. palisiae*, belongs to Sect. *Thrinchia* (Roth) Bentham & Hooker.

Chromosome number. Mitosis and meiosis in several individuals belonging to two different collections have been studied. *L. palisiae* was found to have always $n=5$ (Fig. 3), $2n=10$ (Fig. 4). Meiosis is regular, and in metaphase-I, five bivalents can be observed. Formation of chiasmata was not seen.

Previous to our counts, Wulff considered $2n=10$ the normal chromosome number for *L. saxatilis* (cf. Rousi, 1973: 208), but we agree with Taylor & Mulligan (1968: 117), who suggested that this number is due to an error. Therefore, the basic chromosome number, $x=5$, in this species is new, not only for subgenus *Oporinia* but for the whole genus. The basic chromosome numbers $x=4$, 7, and 11 for subgenus *Leontodon*, and $x=6$ for subgenus *Oporinia*, where the ones known up to now (Hobub 1977). The number $2n=14$ for *L. rilaensis* Hayek (cf. Moore 1982) and *L. croceus* Haenke (Stefanik 1975) needs further confirmation as is suggested by Favarger's (1959) count on the latter reporting $2n=24$.

The atypical chromosome number in *L. palisiae* confirms the trend towards the reduction in the basic chromosome number that Stebbins et al. (1953) pointed out for the tribe Lactuceae, and that Izuzquiza & Nieto Feliner (In press) suggested for the series *Annui* of the genus *Leontodon*.

Selected specimens (other than types and vouchers). Iberian Peninsula: Portugal, Elvas, junto a ermida de N. S.^a de Nazaré, 21.III.1989, Malato Beliz s.n. (seeds sent by Malato-Beliz). Spain. Badajoz: Campanario, 2.IV.1969, Fernández Casas s.n. (MA 420370); Córdoba: Almodóvar, río de la Cabrilla, 14.IV. 1981, Salmaral & Varela 1842/81 (SEV 71102); Huelva: Valdeflores-Higuera de la Sierra, arroyo de la Gamonilla, 24.II. 1976, Rivera 103R (G 211811, MA 355068, SEV 49149).



Figs 5–7. SEM photographs of radial cypselae. – Fig. 5. *Leontodon palisiae* (Guerra 1412, MA 355009 holotype). – Fig. 6. *L. salzmannii* (Vargas 2751 & al., MA 461908), apical part marked with an arrow. – Fig. 7. *L. muelleri* (Izuzquiza 1739 & Nieto Feliner, MA 465463). – Scales: 500 μ m.

Canary Islands: Tenerife, La Laguna, La Manzanilla, 29.III.1985, Del Arco s.n. (G 283490, 283500, 286881). Africa: Morocco. Rabat, in der Nähe des Königspalastes, 17.IV.1979, Möschl & Pittoni s.n. (W).

A complete list of specimens examined can be obtained from the author.

Key to separate *L. palisiae* from allied species

1. Capitula erect in bud, style branches yellow in fresh living

- plants, yellow to brown in dry specimens, central cypselae abruptly contracted into a long rostrum, pappus hairs generally plumose throughout. 2
1. Capitula nodding in bud, style branches green-yellow in living plants, black in dry specimens, central cypselae gradually narrowed towards the apex, pappus hairs plumose in the lower half, scabrid in the upper. 3
 2. At least some radial cypselae epappose, or with a pappus consisting of two or three hairs. *L. muelleri* ssp. *muelleri*
 2. Radial cypselae with a well developed pappus of ca. 10 hairs *L. muelleri* ssp. *trivialis*
 3. Radial cypselae (epappose ones) obovate, 2.0–2.5 mm long, with \pm rounded tubercles, central cypselae 3.7–5.5 mm long *L. salzmannii*
 3. Radial cypselae fusiform, 2.9–4.5 mm long, with scaly tubercles, central cypselae 4.4–9.0 mm long. *L. palisiae*

Leontodon muelleri ssp. *trivialis* (Ball) Izuzquiza comb. nov.

Basionym: *Leontodon trivialis* Ball, Journ. Bot. 11: 372, 1873. \equiv *Fidelia trivialis* (Ball) Pomel, Nouv. Mat. Fl. Atlantique 2: 270, 1875. *Fidelia reboudiana* Pomel, Nouv. Mat. Fl. Atlantique 2: 269; *Millinia reboudiana* Pomel, Nouv. Mat. Fl. Atlantique 2: 269; *Leontodon reboudianus* Pomel, Nouv. Mat. Fl. Atlantique 2: 269; *L. hispidulus* ssp. *reboudianus* (Pomel) Hirèche, Bull. Soc. Hist. Nat. Afr. Nord 28: 270, 1937.

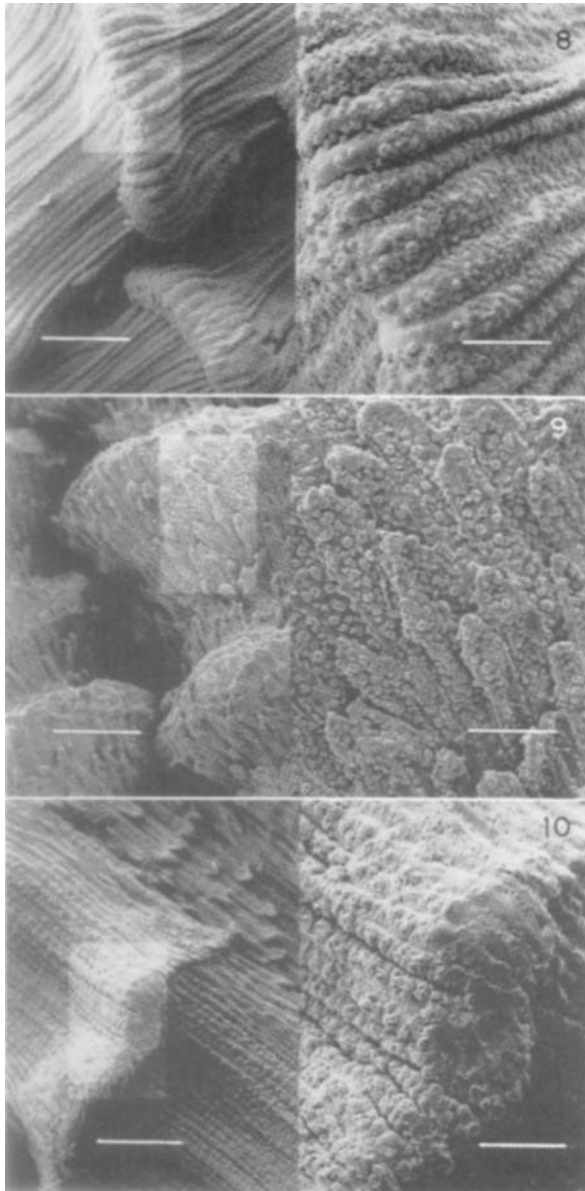
L. muelleri ssp. *trivialis* is very similar to ssp. *muelleri* but it is easily distinguished by its homomorphic cypselae and generally more profusely branched scapes. Five years after the publication of his new species, Ball (1878) considered it as a synonym of *L. hispidulus* (Del.) Boiss., a homocarpous species from Egypt. However, this criterion can be ruled out on the basis of the pubescence of the capitulum and the ornamentation of the cypselae.

Leontodon kralikii (Pomel) Izuzquiza comb. nov.

Basionym: *Kalbfussia kralikii* Pomel, Nouv. Mat. Fl. Atl.: 11, 1874. \equiv *Leontodon hispidulus* var. *kralikii* (Pomel) Hirèche, Bull. Soc. Hist. Nat. Afr. Nord 28: 287, 1937, comb. inval.

Schultz Bipontius (1833) described the new genus *Kalbfussia*, discriminating it from *Leontodon* on the basis of its heteromorphic cypselae and annual habit, and from *Thrinchia* by the absence of a scaly pappus in the radial cypselae. Among the annual species of subgenus *Oporinia*, there are homocarpous, *L. hispidulus*, *L. laciniatus* (Bertol.) Widder, as well as heterocarpous species, *L. muelleri*, *L. salzmannii* or *L. orarius* Maire. Intermediate between the two types, is *L. simplex* (Viv.) Widder, from Libya, characterized by the transition from homomorphic to heteromorphic cypselae. Therefore, there is no reason for segregating *Kalbfussia* from *Leontodon* and it is impossible to follow Schultz-Bipontius scheme, as Holub (1977) suggested.

L. kralikii, occurring in W Libya and Tunisia, resembles *L. simplex*, an endemic to the Cyrenaican region. While *L. kralikii* is always heterocarpous and with an clearly plumose pappus hairs, *L. simplex* has a preo-



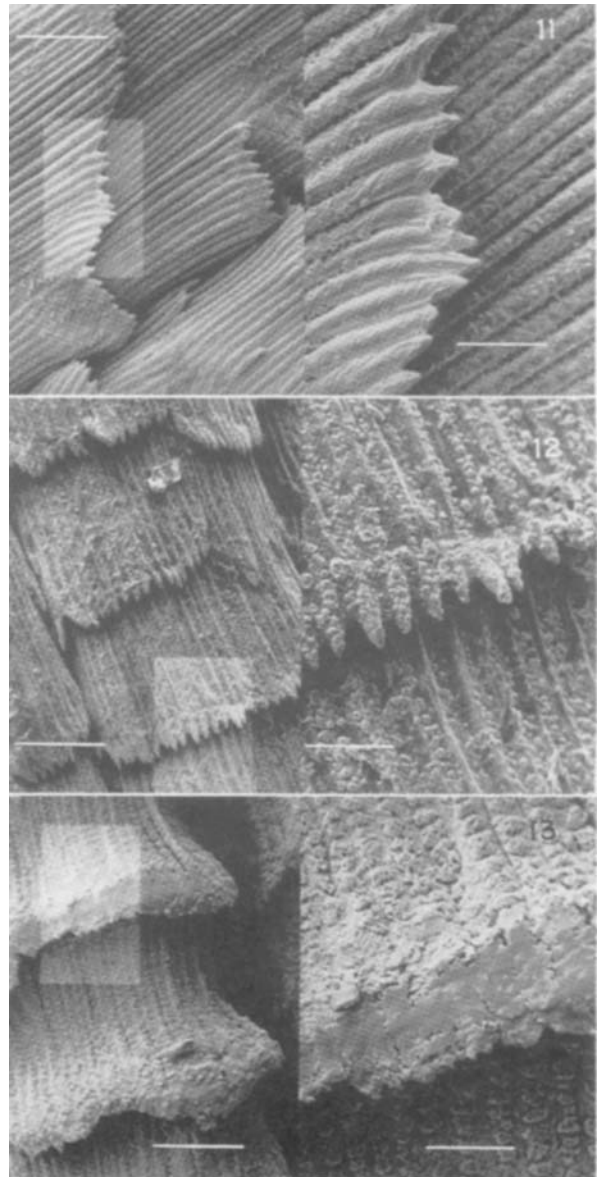
Figs 8–10. Ornamentation of radial cypselae. In these and subsequent figures each photograph is divided into two parts. The right one corresponds to a magnification ($\times 3$) of the lighter portion on the left. – Fig. 8. *Leontodon palisiae* (Guerra 1412, MA 355009, holotype). – Fig. 9. *L. salzmannii* (Vargas 2751 & al., MA 461908). – Fig. 10. *L. muelleri* (Izuzquiza 1739 & Nieto Feliner, MA 465463). – Left scales: 50 μm ; right scales: 150 μm .

ciously caducous pappus and a intermediate capitulum, between heterocarpy and homocarpy (Widder 1976). Alavi (1983), in his treatment for the genus *Leontodon* in Libya, inacuretely considered *L. simplex* and *L. muelleri* synonymous.

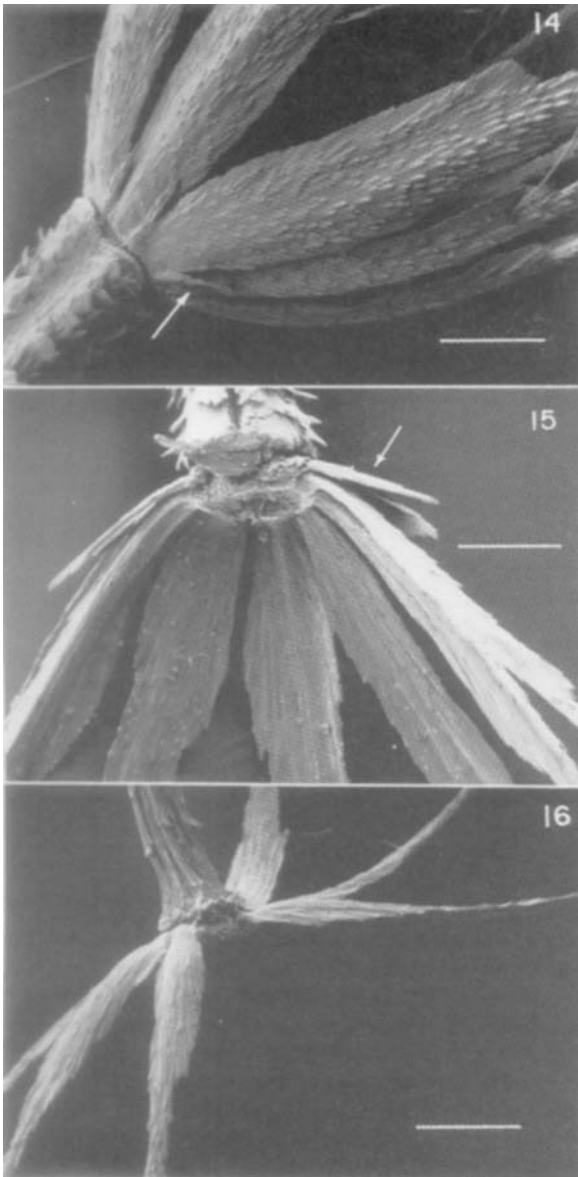
Discussion

The taxa

Lange (1862) described *Kalbfussia salzmannii* Schultz-Bip. var. *hispanica* (\equiv *Leontodon salzmannii* var. *hispanicus* (Lange) Coutinho) based on spanish material from Extremadura and Sevilla. In the protologue he compared his new variety with Algerian material (Oasis de Biskra, 20.IV.1853, B. Balansa 779, FI!, G!) which



Figs 11–13. Ornamentation of central cypselae. – Fig. 11. *Leontodon palisiae* (Guerra 1412, MA 355009, holotype). – Fig. 12. *L. salzmannii* (Vargas 2751 & al., MA 461908). – Fig. 13. *L. muelleri* (Izuzquiza 1739 & Nieto Feliner, MA 465463). – Left scales: 50 μm ; right scales: 150 μm .



Figs 14–16. Apical part of central cypselae showing the base of pappus hairs. – Fig. 14. *Leontodon palisiae* (Guerra 1412, MA 355009, MA 461908). – Fig. 15. *L. salzmannii* (Vargas 2751 & al., MA 461908). – Fig. 16. *L. muelleri* (Izuzquiza 1739 & Nieto Feliner, MA 461948). – The arrows indicate the outer row of the pappus. Scales: 200 μ m.

actually turned out to be *L. muelleri* (Schultz-Bip.) Fiori instead of typical *L. salzmannii*. For this reason, the diagnostic characters presented by Lange, dimensions of the capitula, rostrum of central cypselae and color of the pappus hairs, should be placed in the appropriate context.

There is an earlier homonym in the specific rank, *Leontodon hispanicus* (Willd.) Poiret, later transferred to *Picris* by Finch & Sell (1976). Therefore, a new

epithet is required to name Lange's variety. I consider appropriate to provide a more detailed description for this taxon, given the inadequacy of Lange's protologue, and to describe it as a new species.

Differentiation

Leontodon palisiae resembles *L. salzmannii* and *L. muelleri*. The color of the style branches, morphology of leaves and shape of inner cypselae is similar to *L. salzmannii*, a Moroccan endemic. However, it can be easily distinguished by the size, shape and ornamentation of radial cypselae.

The shape of marginal cypselae is similar to those of *L. muelleri*, a Western Mediterranean taxon, but the different color of the stigmata, shape of central cypselae and chromosome number – $2n=12$ in *L. muelleri* (Izuzquiza unpubl.) – separate both taxa.

The radial cypselae of *L. muelleri* and *L. palisiae* are fusiform, and the pericarp has upwardly directed scales (Figs 5 and 7); those of *L. salzmannii* are smaller, obovoid and with more or less rounded tubercles (Fig. 6). The ornamentation of the pericarp is also similar in the first two species, being longitudinally striate under high magnification (Figs 8 and 10), while that of *L. salzmannii* is papillose (Fig. 9).

A different situation becomes evident when comparing the shape and ornamentation of the inner cypselae instead of the radial ones. They are gradually attenuated in the upper part both in *L. palisiae* and *L. salzmannii*, while those in *L. muelleri* are clearly long-beaked. The pericarp ornamentation is longitudinally striate in the three species, but the final portion of the scales is similar to those of the radial cypselae in *L. muelleri* (Fig. 13), while in both *L. palisiae* and *L. salzmannii* is muricate (Figs 11–12).

There are also some differences in the outer row of the pappus. In *L. muelleri* this row can be absent (Fig. 16) or not; in the other two taxa it is always present, but it is much smaller in *L. palisiae* (Figs 14–15).

Self-incompatibility

A total of 14 capitula belonging to one collection (1724AI) were bagged. In 11 capitula no filled cypselae were formed, while in 3 of them – belonging to 2 individuals – relatively low percentages of filled cypselae were formed, namely 4.6% (3 out of 68), 14.6% (6/47) and 26.3% (10/48). These data indicate a relatively high self-incompatibility and suggest that the plant is predominantly outcrossed. Similar observations were made by Finch (1967) in wild British species, Rousi (1973) in *L. autumnalis* L., two subspecies of *L. saxatilis*, *L. ambiguus* Fleischer and *L. hispidus* L., while De Groot (1977) arrives to the same conclusions studying *L. hispidus* s.l.

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