

## **Studies in the genus *Lappula* (Boraginaceae)**

### **I. *Lappula* in the "Flora Iranica" region**

H. Riedl\*

#### **Abstract**

*Lappula rechingeri* RIEDL is described as a new species from Pakistan and its relationships within the genus are discussed. *L. semnanensis* RIEDL & IRANSHAHR is considered to be a synonym of *Microparacaryum intermedium* (DCNE.) HILGER & PODLECH. A revised key is offered for the species of *Lappula* in the "Flora Iranica" region, followed by notes on *L. occultata* and *L. squarrosa*.

**Key Words:** Flora Iranica; Boraginaceae, *Lappula*, *L. rechingeri* sp.n.

#### **Zusammenfassung**

*Lappula rechingeri* RIEDL wird als neue Art aus Pakistan beschrieben, ihre verwandtschaftlichen Beziehungen werden diskutiert. *L. semnanensis* RIEDL & IRANSHAHR wird als Synonym zu *Microparacaryum intermedium* (DCNE.) HILGER & PODLECH gestellt. Für die *Lappula*-Arten der "Flora Iranica"-Region wird ein revidierter Bestimmungsschlüssel geboten, gefolgt von kritischen Bemerkungen zu *L. occultata* und *L. squarrosa*.

#### **Introduction**

This is the first part of a treatment of the genus *Lappula*. It is concerned only with taxa occurring in the "Flora Iranica" region, as several changes and additions are necessary to the account in the "Flora" itself. In the second and final part, species of other regions will be discussed and some general conclusions on the phyletic structure of the genus will be drawn using data from such diverse fields as morphology, geographical distribution, ecology and cytology as far as they are available (RIEDL, in prep.).

#### ***Lappula rechingeri*, sp.n., with some notes on related species and the *L. microcarpa*-group**

The plants revised by the present author and afterwards by SADAT included a collection identified as *Lappula microcarpa* (LEDEB.) GUERKE; it showed a number of correlated differences which necessitate its separation as a new species.

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\* HR Univ.Doiz.Dr. Harald Riedl, Naturhistorisches Museum, Botanische Abteilung, Burgring 7, A-1014 Wien, Austria.

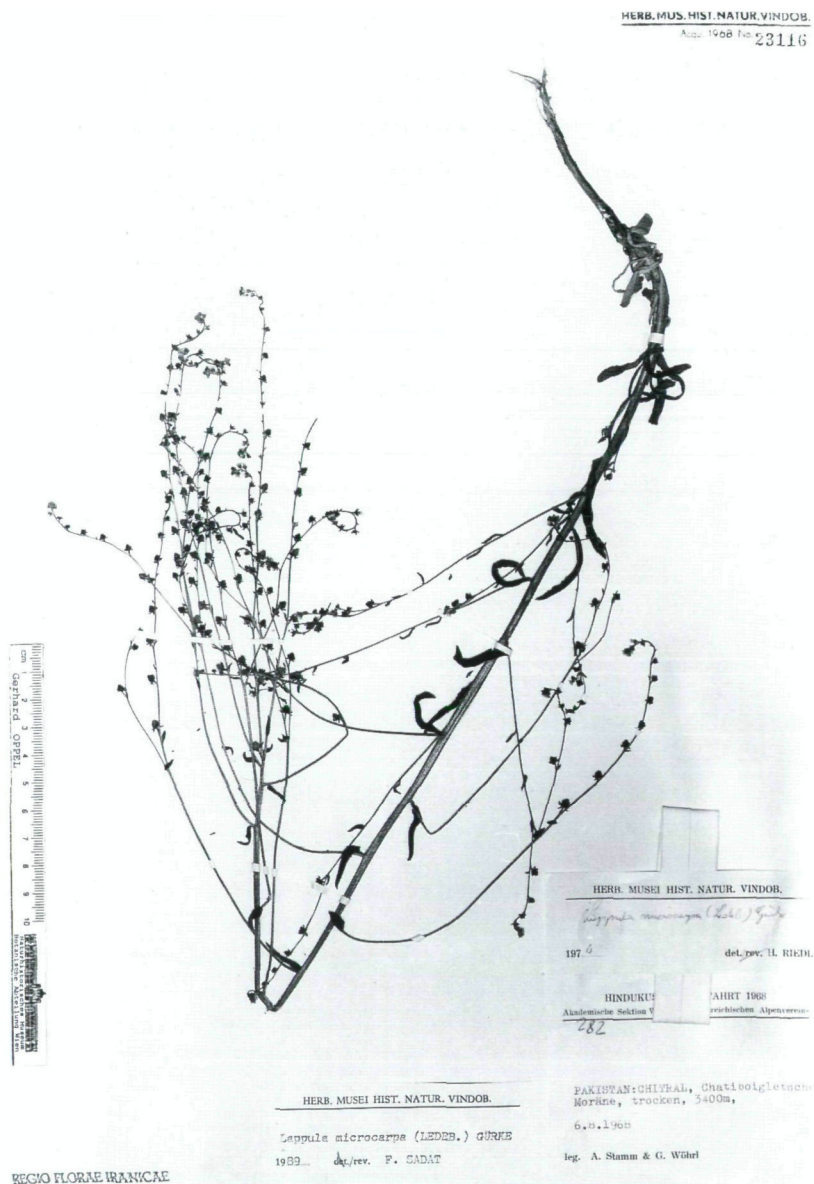


Fig. 1. *Lappula rechingeri* RIEDL, type-sheet in herb. W.

### *Lappula rechingeri* RIEDL, sp.n. (fig. 1, 2)

Species nova e serie *Echinatae* M. POPOV correlatione characterum sequentium insignis: Planta biennis (?), in omnibus partibus pilis densiusculis sub-patentibus obsita, caulis validus parte infima exclusa valde ramosus. Folia basalia in statu fructifero sicca, sed pro maxima parte haud evanida, inferiora longiuscule petiolata, lineari-spatulata, late



Fig. 2. *Lappula rechingeri* RIEDL, single fruit from type.

obtusa, media et superiora plerumque basi angustata sessilia, lineari-lanceolata, acuta. Rami inferiores subpatentes, foliis 0 - 2 diminutis, linearibus, rami superiores erectiusculi, virgati, omnes in dimidio superiore floriferi. Inflorescentiae minutissime bracteatae bracteis quam fructus brevioribus a pedicellis remotis. Pedicelli demum ad 3 mm longi, erecti. Calyces sub anthesi 1.5 mm longi laciniis sub fructu ad 1.8 - 2 mm elongatis. Corolla campanulata, tubo in calyce incluso, limbi lobis oblique erectis, nuculae circ. 2.2 mm longae disco e basi 0.5 mm lata sursum manifeste angustato, glochidiis in seriebus 2 instructis cincto, haud carinato, sed serie centrali glochidiarum breviorum ornato, praeter glochidias parce verrucoso, glochidiis interioribus longioribus 1 - 1.1 mm longis, 6 in eodem latere, exterioribus saepe vix dimidium longitudinis interiorum attingentibus, in facie exteriori praeter glochidias parce grosse tuberculatae, dimidio superiore haud laevi. Stylus brevis a nuculis occultatus.

Propter stylum brevem a nuculis occultatum, glochidias marginales regulariter biseriatas interiores longiores affinitati *L. microcarpae* haud adnumeranda.

Holotype: Pakistan, Chitral: Chatiboi-Gletscher, 3400 m s.m., 6. 8. 1968, A. Stamm & G. Wöhrle 282 [W].

A stout, probably biennial (or annual?) plant. Stem about 55 cm high, 4 - 4.5 mm in diameter, branched from about 10 cm above the ground, with longer and shorter, more or less spreading, in the upper part often also nearly appressed hairs with a minutely bulbous base. Lower branches subdivaricate, slightly shorter than the upper ones, with one or two or without leaves, upper branches more erect, simple or rarely with a single branch of second order, leafless. Basal leaves already dry, but still present at fruiting time, 3 - 5 cm long including petiole, shorter than the lowermost stem-leaves. Basal and lower stem-leaves spatulate to linear-spatulate, broadly rounded at apex, gradually passing into the petiole, up to 5 mm wide. Middle and upper stem-leaves sessile with narrow or slightly broadened base, 2 - 4 cm long, up to 4 mm wide, acute. Leaves of lateral branches linear, acute, 5 - 12 mm long, up to 1.5 mm wide. All densely covered with long, white, more or less spreading, stiff hairs, the longest on bulbous bases, in the basal and lowermost leaves also sometimes on small tubercles composed of mineralized cells. Branches naked in the lower half, bearing the inflorescence in the upper. Inflorescences neither particularly loose nor dense in the fruiting stage, with minute linear, acute bracts 1 - 4 mm long and removed from the pedicels. Pedicels less than 0.5 mm at flowering time, up to 2.5 - 3 mm in the lowermost flowers at fruiting time, slender, erect, hairy. Calyx cleft to the base, lobes 1.2 mm long in flower, lanceolate oblong, densely covered with stiff, antrorse hairs of equal length, elongated to 2 - 2.5 mm in fruit, spreading with more or less upturned tips. Corolla campanulate, glabrous, colour uncertain (white?), 2 - 2.5 mm long, tube shorter than calyx, limb 4 mm across when fully expanded, with 5 broadly rounded lobes 1 - 1.2 mm long, wider than long. Throat scales (fornices) about 0.6 mm long and wide at base, tapering gradually from base upwards, rounded. Anthers sessile, broadly ovate, 0.75 mm long, sessile between scales and reaching their base with utmost tips. Style about 1 mm long, stout, with cushion-shaped stigma. Fruits (fig. 2, not yet perfectly mature) ovate, about 2.5 mm long; nutlets 4, equal, disc from an ovate basal part more or less abruptly tapering into a narrowly elongate tip, surrounded by two rows of glochids, the inner row longer, about 1 - 1.1 mm long, with slightly flattened, widening basal part, 6 on each side, never confluent at base, but finally placed on a hard, lighter rim, the outer row half as long as the inner in average, not on a rim, one longitudinal row of glochids usually evolved in the centre of the disc, decreasing in length towards apex, shorter than inner marginal row, keel absent, disc slightly uneven on surface, probably sparsely tuberculate at maturity, outer surface likewise uneven. Style hidden by the nutlets or reaching the same length as apical glochids.

There is no doubt that the species has its closest links with the *L. myosotis*-group in the sense of POPOV's series *Echinatae*: there are two series of marginal glochids on the nutlets, the style is short and stout, hidden at maturity by the tips of the nutlets, the corolla is small and campanulate, not *Myosotis*-like. Being among the species with glochids of unequal length, the inner ones being longer than the outer, it is remarkable by its exceedingly small bracts and short calyx-lobes even in fruit [contrary, e.g., to *L. anisacantha* (TURCZ.) GUERKE and also to those specimens of *L. squarrosa* (DUM.) RETZ. often erroneously referred to as *L. heteracantha* (RIEDL 1967, KAZMI 1970, SADAT 1989, NAZIR 1989)], by the complete outer series of marginal glochids [contrary to *L. consanguinea* (LEDEB.) GUERKE, the most widespread species of the group], and by the longitudinal row of glochids in the centre of the disc not found in these species.

There are no other species in the group comparable to *Lappula rechingeri*. In general habit it is most similar to *Lappula microcarpa* (LEDEB.) GUERKE. It is worthwhile to discuss possible relationships here.

POPOV (1953) separated his series *Microcarpae*, to which also belong *L. barbata* (M.BIEB.) GUERKE and *L. kukalonica*, from series *Echinatae* by the long, slender style distinctly surpassing the nutlets and also their marginal glochids in length and by the *Myosotis*-like corolla with a more or less flat, explanate limb. SADAT (1989) contends that the variability of the species has been strongly underestimated. She gives a description based on a long list of specimens she has examined. It is odd that she maintains to have seen the lectotype at St. Petersburg, as her description shows that her interpretation of the species is incorrect in several ways. Specimens designated as "*Echinospermum microcarpum* nob." by LEDEBOUR himself in herb. W clearly show that the limb of the corolla is explanate, not funnel-shaped. Very often the shape of the corolla is not easily recognized in herbarium material due to preparation. True *Lappula microcarpa* always bears at least some older corollas with lobes slightly revolute from an explanate base. In younger corollas, the limb may well be funnel-shaped before it is fully expanded. The variability in the size and shape of the corolla and its parts indicated by SADAT is not displayed by any species of *Lappula* and clearly indicates a mixture. This can be proven by the fact that these characters are strictly correlated to others of the fruit and vegetative parts. When SADAT states that the style is most often hidden by the fruit, she is simply wrong. I was able to examine a great number of specimens myself - some of which had also been revised by SADAT - and never found the style hidden. In accordance with POPOV, I regard this character as the most reliable for the delimitation of the species. SADAT is correct, however, that there is usually more than one row of marginal glochids and that the description in RIEDL (1967) is erroneous in this regard. I also agree that *Lepechiniella albiflora* H.RIEDL is a synonym of *Lappula microcarpa* and that the colour of the corolla may vary. SADAT concentrated on collections from Afghanistan. While there are very typical specimens among the Afghan material available, others are less clear, especially those with broader leaves. POPOV (1953) had regarded Iranian plants as different from true *Lappula microcarpa* and proposed the name *L. rigida* (A.DC.) - a combination not yet validly published - for them. BOISSIER (1879) had already put *Echinospermum rigidum* A.DC. in the synonymy of *Echinospermum microcarpum* LEDEB., an interpretation I concur with.

Variable characters in *L. microcarpa* include, among others, leaf width, indument (especially the presence or absence of mineralized cells at the base of the hairs may vary with age of the leaves of one and the same individual), number, length and position of the marginal glochids of the nutlets, presence or absence of glochids on the disc - though I never saw a complete longitudinal series of glochids - and the colour of the corolla already mentioned.

The similarities between *L. rechingeri* and *L. microcarpa* are of a more superficial kind, especially the type of branching and general habit of the plants and the elongated inflorescences with very small bracts removed from the flowers. I did not see any specimens of *Lappula rechingeri* from Afghanistan, but hybridisation may have occurred in former times and contributed to variability.



According to my own results, the groups of species proposed by POPOV (1953) are natural. *L. rechingeri* and *L. microcarpa* are not closely related, and similarities are the result of convergent evolution.

### On the identity of *Lappula semnanensis* RIEDL & IRANSHAHR (1985)

*Lappula semnanensis* was described from material with juvenile fruits. What did not occur to us when we first included the collection by H. & I. Riedl & M. Iranshahr in the genus *Lappula* was the fact that the elongated pedicels of the most advanced fruits were curved downwards, a character never observed in the genus before and often used to separate *Lappula* from *Hackelia* in cases of doubt. A reexamination of the type revealed the true nature of the plants: the short marginal glochids are united with their bases to produce a narrow wing that is slightly, at the base more strongly curved inwards. This wing is recognizable in the young nutlets only as a zone free of glochids on the surface. All these characters are typical for what has formerly been called *Mattiastrum bungei* and is now known as one of the alternatives in fruit morphology of *Microparacaryum intermedium* (DCNE.) HILGER & PODLECH s.l. The genus *Microparacaryum* has been created by HILGER & PODLECH (1985) for species with just this kind of heterocarpy among individuals. I do not wholly agree with them in the question of specific delimitation: not only can involute wings of nutlets be different in many ways, but the number and size of fruits and relative length of pedicels are likewise different, while populations examined by the present authors in Iran (prov. Kerman) in 1977 at various places did not display any considerable degree of variability within themselves. The plants in the type collection of *Lappula semnanensis* are too young to be attributed to any particular infraspecific or specific taxon described earlier. There is no doubt, however, that they belong to the complex as a whole.

*Microparacaryum intermedium* (DCNE.) HILGER & PODLECH

Syn.: *Lappula semnanensis* RIEDL & IRANSHAHR, Linzer Biol.Beitr.(1985), syn.n.

### A revised key for *Lappula* in the "Flora Iranica" region with notes on particular species

In spite of recent arguments in favour of a separate genus *Sclerocaryopsis* raised by SADAT (1989) and HOFMANN (1994), the two species belonging there are treated here at least provisionally as members of *Lappula*. They certainly form a natural group, but it is preferred by the present author to assign to it the rank of subgenus following POPOV (1953). The detailed reasons for that will be given in a future paper when additional plants and literature have been studied.

- 1 Nutlets without a distinct rim, pyramidal or ovate pyramidal, grossly tuberculate or aculeate, sometimes with an elongated spine at each side of base, coherent to the gynobase in their whole length. Low, much branched herbs of desertic to semi-desertic habitats. .... 2
- 1\* Nutlets with a distinct rim bearing glochids, rarely smooth or tuberculate, not coherent to the gynobase for their full length. .... 3
- 2 Fruits pyramidal to ovate-pyramidal, with stout tubercles or spines of equal length or decreasing in length towards apex. .... *L. spinocarpos* (FORSS.) ASCH. ex KUNTZE

- 2\* Fruits pyramideate, nutlets with one elongated spine in each basal corner. .... *L. ceratophora* (M. POPOV) M. POPOV
- 3 Rim and ventral side of nutlets perfectly smooth. Stem and branches slender, more or less rigid. .... *L. occultata* M. POPOV
- 3\* Rim of nutlets with tubercles, spines or glochids, ventral side often tuberculate or with spines or glochids, sometimes nearly smooth. .... 4
- 4 Rim of nutlets tuberculate or with short spines, rarely a few glochids, often obscured by the dense, gross tubercles or short spines on the disc and ventral surface. Stems and branches often flexuous. .... *Lappula sinaica* (DC.) ASCHERS. ex SCHWEINF.
- 4\* Rim of nutlets glochidiate, not obscured by tubercles or spines on disc and ventral surface. .... 5
- 5 Flowers and fruits sessile. Fruits pyramideate. Marginal glochids on nutlets often confluent at base, forming a narrow wing. Branches especially near base rigid, divaricate. .... *Lappula sessiliflora* (BOISS.) GUERKE
- 5\* At least fruits with a short, but distinct pedicel. Glochids never forming a wing with their bases. Branching of various kinds. .... 6
- 6 Style distinctly longer than apical glochids of nutlets, not hidden. Corolla *Myosotis*-like, with explanate limb. Apart from the glochids on marginal rim of nutlets often a second, sometimes irregular row of glochids on the ventral surface. .... 7
- 6\* Style hidden by the nutlets or at least not longer than apical glochids. Corolla campanulate, limb not explanate. Glochids in one or more rows surrounding disc. .... 8
- 7 Nutlets 2 - 3 mm long, glochids usually less than 1 mm, the outer ones irregular, distinctly shorter than those of the inner row. Branches numerous, rigid, much elongated in fruit, suberect. .... *Lappula microcarpa* (LEDEB.) GUERKE
- 7\* Nutlets up to 4 mm long, glochids longer than 1 mm, the outer ones often as long as inner ones, in a regular row. Branches comparatively short even in fruit, confined to the upper part of the stem. .... *Lappula barbata* (M. BIEB.) GUERKE
- 8 Leaves either glabrous on the upper or on the lower side. Nutlets with one series of marginal glochids. .... 9
- 8\* Leaves hairy on both sides. Nutlets with one or more series of marginal glochids. .... 10
- 9 Leaves glabrous on the upper side. Usually stout plants either branched from the base or in the upper part only. .... *Lappula semiglabra* (LEDEB.) GUERKE
- 9\* Leaves glabrous or with a very few bristly hairs on the lower side. Slender plants branched from the base. .... *Lappula leonardii* RIEDL
- 10 Marginal glochids of nutlets slender, in one row only. Plants usually much branched from the base. .... *Lappula patula* (LEHM.) ASCHERS. ex GUERKE
- 10\* Marginal glochids of the nutlets in 2 rows, of equal length or those of outer row shorter. .... 11
- 11 Glochids at least of the inner row 2 - 3 mm long, disc keeled, keel verrucose, but without glochids. Upper branches usually divaricate. Throat scales usually longer than wide at base. .... *Lappula squarrosa* (DUM.) RETZ
- 11\* Glochids of inner row little more than 1 mm long, disc without keel, but with a longitudinal row of glochids. Upper branches more or less erect. Throat scales as long as wide at base. .... *Lappula rechingeri* RIEDL

## Notes

*Lappula occultata* M. POPOV: *L. laevimarginata* RIEDL (1967) is correctly cited as a synonym of this species by SADAT (1989). The drawing of the fruit in Fl. Tadzhik. SSR. 7, plate LXXII is incorrect, as is probably that of *Lappula sinaica*, as gross tubercles are depicted on the far too broad rim.

*Lappula squarrosa* (DUM.) RETZ.: *L. myosotis* MOENCH is a younger name than *Myosotis squarrosa* DUM. *Lappula heteracantha* (LEDEB.) GUERKE is quite different from it, contrary to my own earlier assumption (RIEDL 1967) and to KAZMI (1970), SADAT (1989), and NAZIR (1989). As SADAT claims to have seen Ledebour's specimen in herb. LE, it is difficult to understand that she overlooked the distinct winglike structure in the lower part of the nutlets produced by confluent bases of short glochids. What RIEDL (1967) and SADAT (1989) took for *Echinosperrum heteracanthum* LEDEB. is what BRAND (1931) called *L. myosotis* var. *b heteracantha* O. KUNTZE, a taxon that in fact should be regarded as a variety if recognized at all.

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