

## The identity of the lichens *Siphula himalayensis* and *Lecanora teretiuscula*

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**Abstract:** OBERMAYER, W. & KANTVILAS, G. 2003. The identity of the lichens *Siphula himalayensis* and *Lecanora teretiuscula*. – Herzogia 16: 27–34.

The lichens *Siphula himalayensis* (Räsänen) Kantvilas and *Lecanora teretiuscula* Zahlbr., both recorded from the southeastern Himalayas and adjacent Tibetan regions, are regarded as conspecific with the widespread Arctic-alpine species *Lecanora geophila* (Th.Fr.) Poelt. The chemical constituents of this lichen include usnic acid, zeorin, traces of methylplacodiolic acid, some fatty acids and, frequently in Asian specimens, porphyritic acid. The development of a fruticose habit by normally crustose genera and species growing under extreme environmental conditions is discussed briefly.

**Zusammenfassung:** OBERMAYER, W. & KANTVILAS, G. 2003. Die Identität der Flechten *Siphula himalayensis* und *Lecanora teretiuscula*. – Herzogia 16: 27–34.

Die Flechtentaxa *Siphula himalayensis* (Räsänen) Kantvilas und *Lecanora teretiuscula* Zahlbr., die beide aus dem Südost-Himalaya und der angrenzenden tibetischen Region bekannt sind, werden als Synonyme von *Lecanora geophila* (Th.Fr.) Poelt angesehen, einer im arktisch-alpinen Raum weit verbreiteten Art. Die Flechte enthält Usninsäure, Zeorin, Spuren von Methylplacodiolsäure, einige Fettsäuren und (in vielen asiatischen Belegen) Porphyrilsäure. Die Entwicklung eines (bedingt durch extreme Umwelteinflüsse) ansatzweise strauchförmigen Habitus innerhalb normalerweise krustig wachsender Gattungen und Arten wird kurz diskutiert.

**Key words:** Taxonomy, lichenized Ascomycetes, *Lecanora geophila*, Tibet, Himalayas, lichen chemistry.

### Introduction

The lichen *Siphula ceratites* var. *himalayensis* was described by RÄSÄNEN (1950), based on a specimen from the alpine region of Sikkim in the eastern Himalaya. His description was very brief, noting the sterile, almost crustose, white to grey-white thallus with smooth, simple to sparingly branched, digitate ‘podetia’, and the absence of any colour reaction with potassium hydroxide (K), calcium hypochlorite (C) or paraphenylenediamine (P). The type specimen, held in the Botanical Museum of the University of Helsinki (H), is a very tiny fragment of thallus, and bears no obvious resemblance to the widespread, Arctic-alpine species, *S. ceratites* Fr.

During an investigation of the genus *Siphula* (KANTVILAS 2002), additional material of *S. ceratites* var. *himalayensis* from Tibet (collected by W. O. in 1994) was also examined. It became clear that this lichen was unrelated to *S. ceratites* s. str. and consequently the new combination *Siphula himalayensis* (Räsänen) Kantvilas was introduced. However, the unusual morphology suggested at best a very peripheral relationship with *Siphula* and the fragmentary nature of the material available prevented a thorough appreciation of the variation of the lichen and, in particular, of the root-like rhizines that characterise the genus. The species contained usnic acid, zeorin and traces of methylplacodiolic acids, sometimes associated with porphyritic acid. Although the first three substances are unknown in any other species of *Siphula*, porphyritic acid is a constant constituent of two austral taxa, *S. complanata* (Hook.f. & Taylor) R.Sant. and *S. georginae* Kantvilas (KANTVILAS 1996).

The seemingly unrelated lichen *Lecanora teretiuscula* Zahlbr. is another striking lichen in the eastern Himalayas and the Hengduan Shan (Southeast Tibetan Fringe Mountains), ranging in altitude from 4200 to 5400 m. This species was studied by POELT & GRUBE (1993a) who noted its partly fruticose habit, and its general similarity to the widespread Arctic-alpine lichen *Lecanora geophila* (Th.Fr.) Poelt.

In the course of field work in the southeast Tibetan area in 2000, one of us (W. O.) observed the startling resemblance between *Siphula himalayensis* and these species of *Lecanora*, all of which are yellowish, crustose to squamulose or placodioid, and sometimes form short, digitate lobules on the upper surface of the thallus. It is these projections, seen in isolation on specimens lacking both the characteristic lecanorine apothecia and the flat crustose thallus, that led to a confusion with the genus *Siphula*. Chemical analyses and a comparative morphological study of a wide selection of specimens confirm they are conspecific and consequently *S. himalayensis* and *L. teretiuscula* are consigned to synonymy with *L. geophila*.

## Methods

Chemical composition of all specimens was examined by thin-layer chromatography using standard methods (WHITE & JAMES 1985). Selected specimens were also analysed by Professor J. A. Elix, Canberra, using high-performance liquid chromatography (FEIGE et al. 1993). Photographs were taken with a Nikon Coolpix, models 995 and 5000. Twenty-nine reference specimens of *Lecanora geophila* and specimens labelled as *Siphula himalayensis* and *Lecanora teretiuscula* were examined; all are housed in GZU unless otherwise stated.

## Taxonomy

### *Lecanora geophila* (Th.Fr.) Poelt

International Journal of Mycology and Lichenology 3: 57 (1986). – Basionym: *Placodium geophilum* Th.Fr., Lichenes Arctoi: 85 (1860). – Type: Grönl. occidentalis, Ikkatok. J. Vahl (lectotype: UPS!, Ryan 1989: 244)

= *Siphula himalayensis* (Räsänen) Kantvilas, Bibliotheca Lichenologica 82: 44 (2002).

Basionym: *Siphula ceratites* var. *himalayensis* Räsänen, Archivum Societatis Zoologicae Botanicae Fennicae “Vanamo” 5: 26 (1950). – Type: Sikkim, East Himalaya, on soil amongst mosses, ±13 000 feet [4000 m], May 1947, D. D. Awasthi (holotype: H!).

= *Siphula nepalensis* R.Sant., nom. nud. in J. Santesson, Acta Chemica Scandinavica 21: 1835, 1836 (1967). – Intended type specimen: Nepal, Lamjung Himal, 14.VII.1954, Stainton, Sykes & Williams 6349 (BM!, GZU!, UPS).

= *Lecanora teretiuscula* Zahlbr., apud Handel-Mazzetti, Symbolae Sinicae 3: 173 (1930). – Type: [China], Prov. Yünnan bor.-occid., in lateris occid. montis Piepun ad austroorient. pagi Dschungdien (“Chungtien”) regione alpina, in glarea mobili. Subst. calcea; alt. s.m. ca. 4450 – 4650 m. leg. 11.VIII.1914, Dr. Heinr. Frh. v. Handel-Mazzetti, Nr. 4719 (lectotype: W!, Ryan 1989: 243 as ‘holotype’; isotype: WU!).

Annot.: Zahlbruckner’s protologue mirrors a German translation of the label text originally written in Latin.

= *Lecanora pachyhallina* Lyngé, Skrifter om Svalbard og Ishavet 81: 74 (1940). – Type: East Greenland, Landingsdalen, 21 July 1930, Scholander (holotype: O, not seen)

= *Lecanora superfluens* H. Magn., Acta Horti Gotoburgensis 19: 46 and plate I (1952). – Type: Canada, Baffin Island, head of Clyde Fiord, on wet soil near large boulder, 1950, M. E. Hale Jr. (holotype: UPS, not seen)

**Short description:** This species is characterised by the yellowish, crustose, squamulose to placodioid thallus, often with loboid projections or phyllidia (figs 1, 2), or sometimes consisting exclusively of terete lobes (fig. 3a), the occasional lecanorine apothecia in which the margin may almost disappear in older stages (figs 1c, d), the 8-spored asci with colourless ascospores,  $10\text{--}13 \times 5\text{--}7 \mu\text{m}$ , and the filiform spermatia (fide RYAN & NASH 1997). For more detailed descriptions see BRODO (1981), POELT (1958, 1966, 1986), POELT & GRUBE (1993a) and RYAN (1989).

**Chemistry:** Usnic acid, zeorin and traces of methylplacodiolic acid are present in all specimens examined; porphyritic acid is a major constituent in most himalayan-tibetan specimens (except in Obermayer 6658, 7733) but has not been detected in the type specimens of *Lecanora geophila* and *L. teretiuscula*. In addition, two or three fatty acids may also be present. High performance liquid chromatography of some specimens also detected occasional traces of pannaric acid. RYAN (1989) also mentions four other triterpenoids related to zeorin. Thallus K-, C-, KC+ yellow, P-, UV-.

**Distribution and ecology:** *Lecanora geophila* is recorded from the Arctic regions of North America, Eurasia and Greenland, from the Himalayan region and from the Tibetan Plateau (for the Tibetan locations see fig. 4). Exsiccata material has been distributed recently from the Taimyr Peninsula in Russia (OBERMAYER 2001a) and from the Hengduan Shan (=Tibetan fringe mountains) in China (OBERMAYER 2001b). There have also been new reports from the Russian Altai (ZHURBENKO & DAVYDOV 2000) and from the Khangai Upland in Mongolia (ZHURBENKO & BIAZROV 2003). ØVSTEDAL & LEWIS SMITH (2001) tentatively record this species from Antarctica, although the accompanying image (fig. 29) seems to show a different lichen. *Lecanora geophila* grows on the ground over and amongst bryophytes, humus and soil.

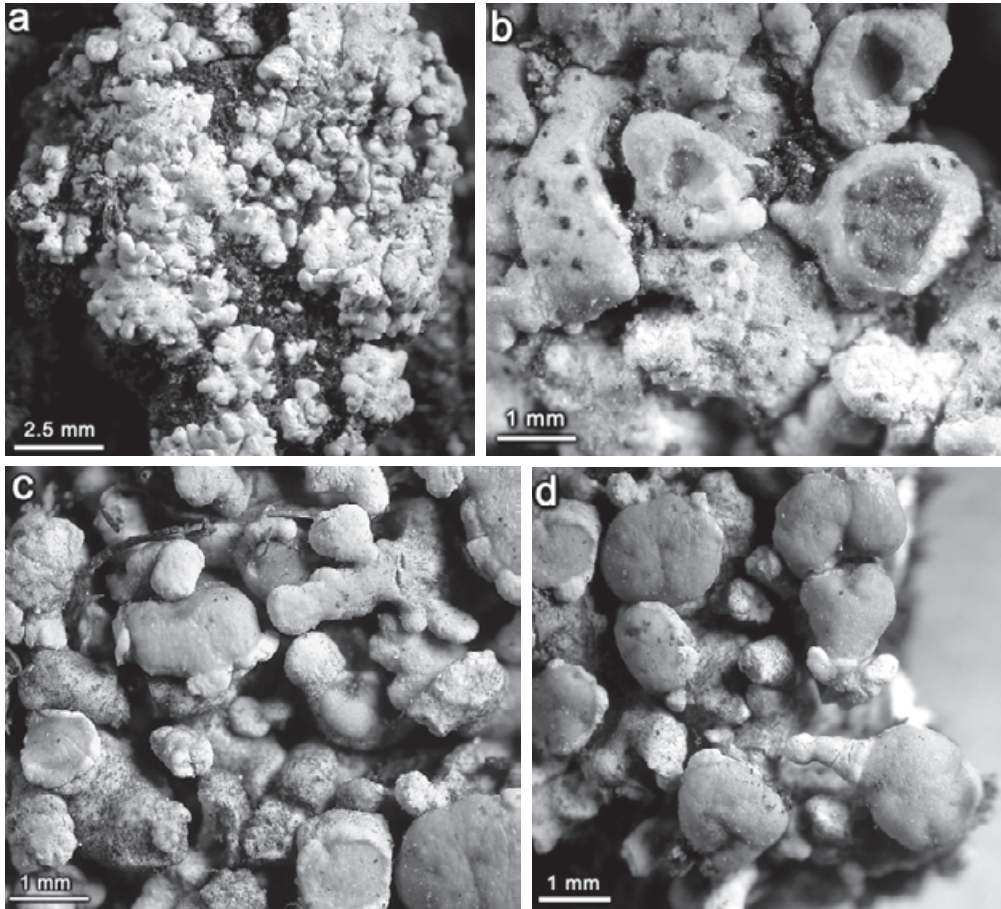
## Discussion

### *Lecanora pachythallina* and *L. superfluens*

The similarity between these taxa has been discussed by BRODO (1981), who brought Magnusson's *Lecanora superfluens* into synonymy with Lynge's *L. pachythallina*. He also provided excellent photographs of both species (fig. 4: holotype of *L. pachythallina*; fig. 5: isotype of *L. superfluens*) and a detailed description of the holotype of *L. pachythallina*, including chemical data (citing usnic acid and zeorin). We follow POELT (1986) who subsequently regarded these two taxa as conspecific with *L. geophila*.

### *Lecanora teretiuscula*

POELT & GRUBE (1993a) noted the close similarity between this species and *L. geophila*, regarding the main morphological difference as the more placodioid habit and presence of phyllidia in the latter. However, field observations suggest that on pure soil, thalli are more placodioid and develop phyllidia-like structures. In contrast, when the thalli are growing between bryophytes, primarily flattened phyllidia may extend into erect, terete thallus-segments, and develop a more fruticose habit. Indeed, the isotype material of *L. teretiuscula* shows both of these structures in the same specimen (figs 2c, d). Similarly RYAN & NASH (1997) found no differences other than "...quite divergent distributions...". Thus we presume that any putative

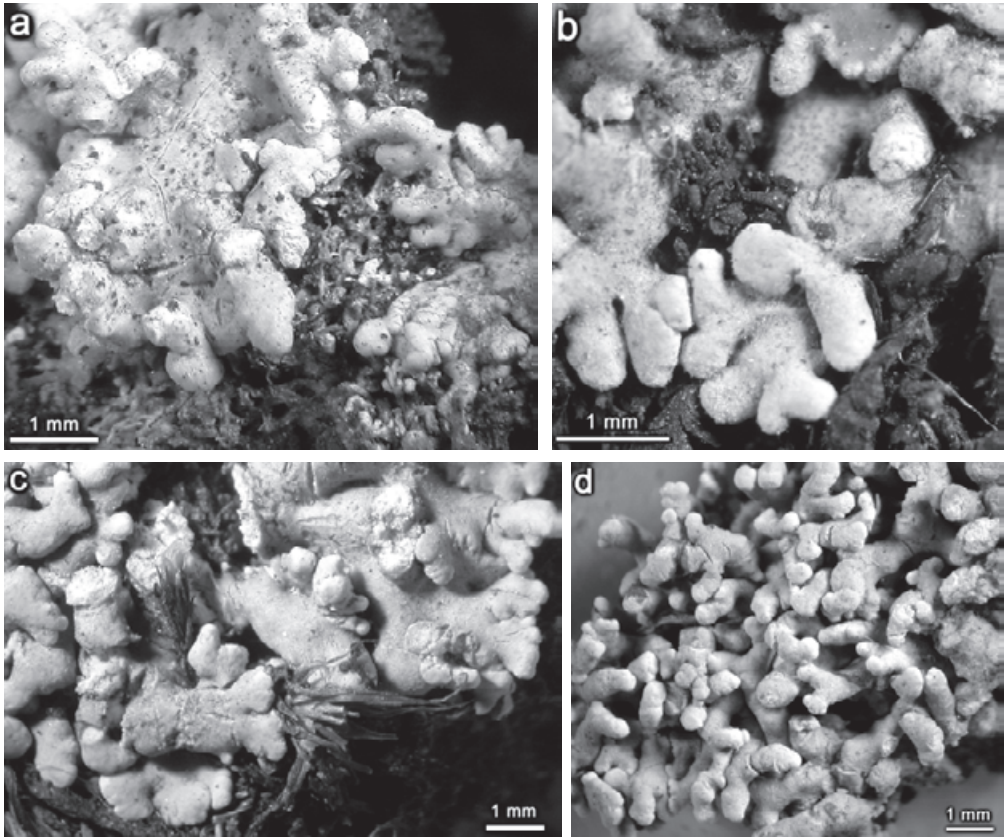


**Fig. 1:** Lectotype specimens of *Lecanora geophila* (a, b) and *Lecanora teretiuscula* (c, d). Black dots in b) on the Thallus and in the apothecium are infections with *Cercidospora* cf. *epipolytropha*.

differences between the two growth forms are environmentally induced. POELT & GRUBE (1993a) recorded the chemistry of *L. teretiuscula* as usnic acid, zeorin and an unknown substance (running 1–2/1–2/1–2) that appears to be porphyritic acid. Our analyses of many of their cited specimens found usnic acid, zeorin, methylplacodiolic acid (traces), porphyritic acid, and two fatty acids (4(–5)/4(–5)/4(–5); 3–4/3/4). A further fatty acid and a yellow pigment that is only seen in daylight before spraying (3–4/?/3) may additionally occur. Neither the lectotype nor isotype specimens of *Lecanora teretiuscula* contain any porphyritic acid.

### *Siphula nepalensis*

This name was introduced as a nomen nudum by Rolf Santesson (in J. SANTESSON 1967). It was based on a specimen from the herbarium UPS. Duplicates with the same collection number are also housed in the herbaria GZU and BM. The chemical composition of *Siphula nepalensis* was determined by SANTESSON (1967) as porphyritic acid. Our analyses also record usnic acid, zeorin and traces of methylplacodiolic acid.



**Fig. 2:** Marginal parts of the thallus in *Lecanora geophila*: Lectotype of *Placodium geophilum* in UPS (a), isotype of *Lecanora teretiuscula* in WU (b), ‘*Siphula nepalensis*’ in GZU (c, d).

### Development of subfruticose thalli in crustose lichens

The development of a subfruticose or peltate thallus by typically crustose lichens is not unusual in taxa growing under extreme climatic conditions. Excellent examples [e.g. *Acarospora convoluta* Darb., *Bacidia stipata* I.M.Lamb and *Catillaria corymbosa* (Hue) I.M.Lamb] are reported from the Antarctica (ØVSTEDAL & LEWIS SMITH 2001), as well as from the high mountain areas of the Himalayas [e.g. *Tephromela siphulodes* Poelt & Grube or *Bryonora stipitata* Poelt] and the European Alps (e.g. *Lecanora swartzii* ssp. *caulescens* (J.Steiner) Leuckert & Poelt]; the last three taxa are discussed and illustrated by POELT & GRUBE (1993b), POELT & OBERMAYER (1991) and POELT (1989) respectively.

Several examples in the past have shown that it may be difficult to establish the appropriate taxonomical rank for a lichen that simply develops its essentially two-dimensional, flattened thallus into a third dimension:

a) In Tasmania and south-eastern Australia, the alpine, terricolous lichen, *Toninia bullata* (Meyen & Flotow) Zahlbr., forms particularly elaborate, subfruticose nodules to such an extent that it was described under the name *Siphula muelleri* F.Wilson (fig. 3b).

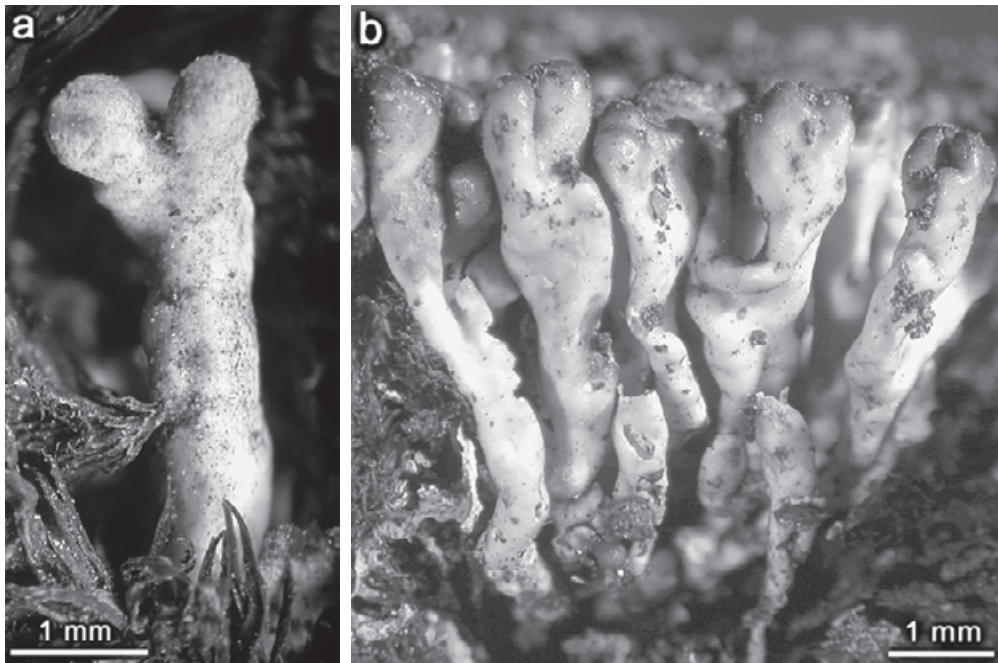


Fig. 3: Fruticose habit in a) *Lecanora geophila* (Miehe 2414 in GZU) and b) *Toninia bullata* (Kantvilas 351/02 in HO).

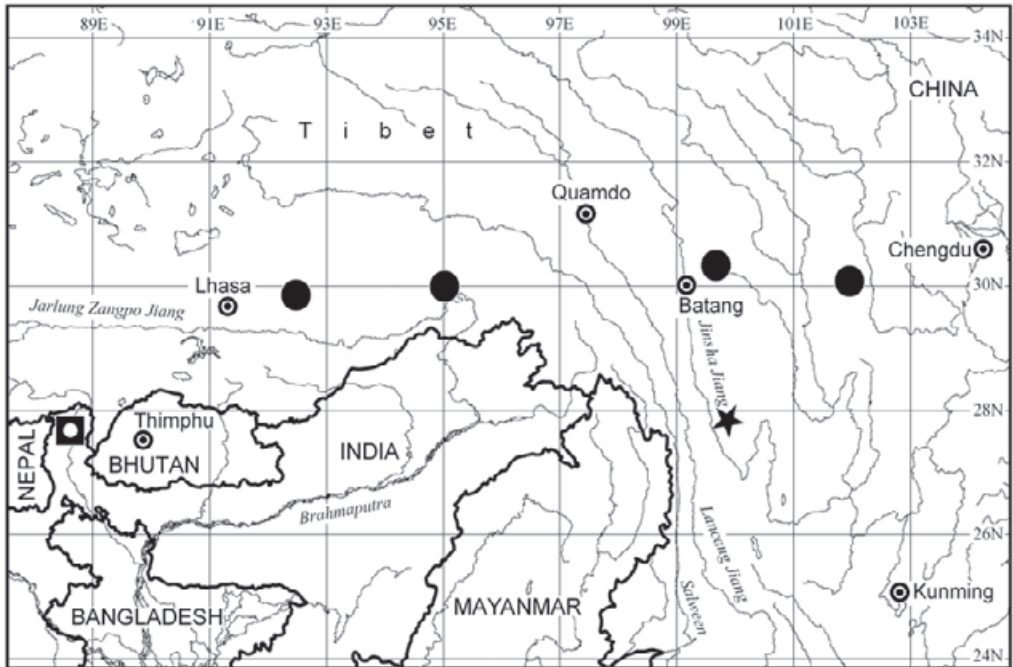
b) The peltate growth form of a *Tephromela atra*-like lichen from India led to the description of the new genus *Heppsora* Awasthi & K.Singh. This lichen (*Heppsora indica* Awasthi & K.Singh) was later synonymised with the usually crustose *Tephromela atra* (Huds.) Hafellner (RAMBOLD 1989).

c) A similar outcome, at least at genus rank, may await *Coronoplectrum namibicum* BRUSSE, characterized by POELT & GRUBE (1993b) as a "... fruticose descendant of the *Tephromela atra* group...".

Thus the oversight that saw *Lecanora geophila* described several times and (in its subfruticose development) even as a *Siphula* is not unique and it is fortunate that both the standard tools of lichen chemical analysis and the fact that there was enough material to demonstrate all the intermediate stages of development enabled this problem to be easily resolved.

### Specimens examined

**China, Tibet, Prov. Sichuan:** Tibetan fringe mountains (= Hengduan Shan), Shaluli Shan, 58 km NE of Batang, 30°17'58"N 99°33'07"E, 4500 m alt., boulder field (siliceous rocks) with *Potentilla* shrubs (30 cm height), on ground/mosses, 3.VIII.2000, W. O. 08138, 08367. – *ibid.*, 30°19'20"N 99°34'02"E, 4710 m alt., W-exposed alpine mats with outcrops, a few meters below a wind-exposed ridge, on ground, 3.VIII.2000, W. O. 08455, 08461. – *ibid.*, 60 km NE of Batang, 30°19'48"N 99°34'13"E, 4980–5000 m alt., wind ridge, on ground, 3.VIII.2000, W. O. 08935. – *ibid.*, 58 km NE of Batang, 30°17'58"N 99°33'11"E, 4500 m alt., big single boulders on alpine dwarf shrub heath near a lake, on ground, 4.VIII.2000, W. O. 08161. – *ibid.*, 150 km E of Litang, Daxue Shan, pass (Zhedou Shankou) between Xinduqiao and Kangding, 30°04'50"N 101°48'20"E, 4350–4450 m alt., S-facing steep slopes covered with dwarf



**Fig. 4:** Known distribution of *Lecanora geophila* in the SE-Tibetan area (specimens from Nepal are not included):  
 • location of specimens collected in 1994 and 2000  
 ★ location of the type material of *Lecanora teretiuscula*  
 ■ approximate location of the type material of *Siphula ceratites* var. *himalayensis* (given on the specimen label only as ‘...Sikkim...13.000 feet...’).

scrub and rock debris, on ground and bryophytes, 14.VIII.2000, W. O. 08162. – **China, Tibet, Prov. Xizang:** 360 km E of Lhasa, near the bend of the river Tsangpo, N-side of Gyala Peri, 10 km S of Tongjug village, W-side of the glacier, steep E-facing slopes and ridge area, 29°54'N 94°51'–52'E, 4500–4700 m alt., steep E-facing slopes and ridge area, on soil, 19.VIII.1994, W. O. 06658. – Nyainqentanglha Shan, 120 km E of Lhasa, Mila-Pass between Lhasa and Gongbo Gyamda, 29°51'N 92°21'E, 4950 m alt., alpine meadow, 2.IX.1994, W. O. 07733. – **China, Tibet, Prov. Yunnan:** bor.-occid., in lateris occid. montis Piepun ad austroorient. pagi Dschungdien (“Chungtien”) regione alpina, in glare mobili. Subst. calcea; alt. s.m. ca. 4450 – 4650 m. leg. 11.VIII.1914, Dr. Heinr. Frh. v. Handel-Mazzetti, Nr. 4719 (W, lectotype of *L. teretiuscula*; WU, isotype of *L. t.*). – **Sikkim:** East Himalaya, on soil amongst mosses, ±13 000 feet [4000 m], May 1947, D. D. Awasthi (H, holotype of *Siphula ceratites* var. *himalayensis*) – **Nepal:** Lamjung Himal, 15,000 ft., on peat overlaying rock, 14.VII.1954, Stainton, Sykes & Williams 6349 (BM, GZU, intended isotype specimens of *Siphula nepalensis*). – Ost-Nepal, Khumbu, Ngozumbu Gletscher adv. Cho Oyo Base camp, im Gletschervorfeld, 5380 m alt., 2.X.1982, Miehe 1120. The following specimens from Nepal, entirely cited in POELT & GRUBE (1993a), have been chemically reexamined: Miehe 2414; 4406; 5289; 6286; 6461; 7201a; 10711; Poelt N86-L282; N86-L298; Wraber 21.IX.1972. – **Russia:** Krasnoyarsk Territory (north of Central Siberia), center of Taimyr Peninsula, Byrranga Mts., southern extremity of Levinson-Lessing Lake, 74°24'N 98°49'E, 80–160 m alt., moribund mosses among rocks and big boulders, 30.VII.1995, M. Zhurbenko 95175. – Krasnoyarsk Territory, Taimyr Peninsula, Byrranga Mts., region of Lewinson-Lessing Lake, 74°32'N 98°33'E, 300 m alt., July-August 1994, M. Zhurbenko. – **Greenland:** N.E. Greenland, Fligely near Kuhn Ø, 74°49'N 20°45'W, on calciferous soil together with *Solorina bispora*, *Peltigera didactyla* and *Candelariella placodizans*, 28.VII.1988, E. S. Hansen, Lich. Groenl. Exs. 345. – N.E. Greenland, area near Zackenberg Elv., 74°31'N 20°20'W, on mineral soil in *Salix arctica* vegetation, 12.VIII.1994, E. S. Hansen, Lich. Groenl. Exs. 571. – W-Grönland, Umgebung des Flughafens Søndre Strømfjord, Umgebung des großen Salzsees, sandige Trockenvegetation, 100 m alt., 11.VIII.1983, J. Poelt. – Grön[andia] occidentalis, Ikkatok. J. Vahl (UPS, lectotype of *Placodium geophilum*).

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