

The genus *Menegazzia* (*Parmeliaceae*, lichenized Ascomycetes) in the Tibetan region

by

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With 3 figures

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Abstract: Material of the genus *Menegazzia* from the Tibetan region was revised. Four species were recognized, viz. two fertile (primary) species (*M. neotropica* ssp. *rotundicarpa*, *M. primaria*) and two sorediate (secondary) species (*M. subsimilis*, *M. terebrata*). *Menegazzia neotropica* ssp. *rotundicarpa* is reported for the first time from outside the Neotropics, and *M. primaria* is reported for the first time from outside Taiwan, from a single locality near Yulong Shan. *Menegazzia subsimilis* is new to Tibet. The most common species is *M. terebrata*. Notes and illustrations of morphological variation, as well as a distribution map, are provided.

Key words: Taxonomy, lichens, *Parmeliaceae*, *Menegazzia*, China, Tibet, biogeography

Introduction

The knowledge of the lichens of the Tibetan region of China is relatively poor. The large area of highland plateaus, valleys and mountain chains influenced by Tibetan culture covers more than 2.5 million square kilometres, and lichen collecting activities have taken place only at scattered localities within this region (Obermayer 2004). The second author made extensive collections from the Tibetan region during two expeditions, one in 1994 and one in 2000. Based on these collections, numerous additions to the lichens of the Tibetan region have been published in a series of papers (see Obermayer 2004 for a list of papers). Sixty-one taxa of lichens and

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lichenicolous fungi were treated in the papers published between 1995 and 2003, whereas Obermayer (2004) treated 110 taxa, most of them not included in the previous papers, thus generating a total list of c. 160 taxa.

Numerous genera are still pending further revisions. One of these genera is *Menegazzia* A. Massal., a genus with its main centre of speciation in the Southern Hemisphere, but recent revisions have shown that further speciation of this taxon also takes place in East Asia (Aptroot et al. 2003, Bjerke 2004). Only scattered reports of *Menegazzia* exist from the mountain regions in Central East Asia. For example, Awasthi (1984) and Singh & Sinha (1994) reported one species, *M. terebrata* (Hoffm.) A. Massal., from the Indian part of the Himalayas, Nepal - confirmed also by Poelt (1990) - and Nagaland, whereas Aptroot & Feijen (2002) reported *M. terebrata* and *M. subsimilis* (H. Magn.) R. Sant. [as *M. dissecta* (Rass.) Hafellner] from Bhutan.

From areas further east there are also some reports of *M. asahinae* (Yasuda ex Asahina) R. Sant., for instance from the Hunan Province of China (Yan & Rikkinen 2000). However, as stated by Bjerke (2004), this species has been misinterpreted as a sorediate taxon by some authors, thus reports should be treated with caution.

Regarding the Tibetan Area, Hue (1899) reported *M. terebrata* [as *Parmelia pertusa* (L.) Schrank. nom. illeg.] and described the taxon *P. pertusa* f. *ventricosa* Hue from the south-easternmost part of the Tibetan Fringe Mountains (Hengduan Shan). Further reports of *M. terebrata* (in a broad sense) come from the Tibetan Kham Region (northernmost part of Yunnan and western part of Sichuan) (Zahlbruckner 1930, 1934) and from the province Xizang (Wei & Jiang 1986, including an image of *Menegazzia terebrata*).

In the present account, new data on distribution, ecology and morphological variation of the genus *Menegazzia* in the Tibetan region are presented.

Materials and methods

The Tibetan material studied is chiefly collected by the second author. Material from other areas of the World, including many type specimens, used for comparison, is housed in a number of other herbaria; see Bjerke (2004) for the most relevant specimens and herbaria. Acetone extracts of all specimens from the Tibetan region were analysed by standardized thin-layer chromatographic methods (Culberson 1972, Orange et al. 2001). In the lists of examined specimens, only brief locality descriptions are given. Additional location numbers are provided for Obermayer's collections (e.g. "2000-02.2"). See Obermayer (2004) for full information on these locations, including collection dates, latitude, longitude and altitude. The two or four first digits in the location numbers indicate year of collection. All listed examined specimens are housed in GZU, except for a few Nepalese specimens from G, thus unless stated 'G', the specimens are housed in GZU.

Results

The species

***Menegazzia neotropica* Bjerke ssp. *rotundicarpa* Bjerke & Sipman, Mycotaxon 91: 420. 2005.**

NOTES: These are the first reports of this taxon outside the Neotropics. Previously, it was only known from a few montane sites in Mexico, Costa Rica and Venezuela

(Bjerke et al. 2005). The nominal subspecies is only known from the northern parts of South America (Bjerke 2002). *M. neotropica* ssp. *rotundicarpa* is characterized by narrow lobes with few perforations, brownish-black lobe tips, small, circular apothecia (Fig. 1A), and large ascospores. The specimens from the south-eastern Tibetan Fringe Mountains have identical morphology and chemistry as the neotropical specimens. The only differences detected are that the Tibetan specimens tend to have underdeveloped or sterile asci, and that the largest spores are slightly larger, viz. to 88 μm long in the Tibetan specimens, as compared to 74 μm long in the neotropical specimens (Bjerke 2002, Bjerke et al. 2005). We do not find these minor differences sufficiently important for treating the Tibetan specimens as a separate taxon. It differs from the other primary species known from East Asia (*M. asahinae*, *M. anteforata* Aptroot, M.-J. Lai & Sparrius and *M. primaria* Aptroot, M.-J. Lai & Sparrius) by having less convex, narrower lobes, more brownish lobe tips, fewer perforations, smaller apothecia (compare Figs. 1A and 1C) and much larger spores.

The specimens were collected within a restricted area in the province Sichuan (Fig. 2) between 2180 m and 3240 m above sea level right east of the mountain Gongga Shan (7556 m). It grows on various phorophytes of the *Abies fabri* forest system, among others on *Betula utilis*, *Rhododendron* spp. and *Salix* spp.

The disjunctive distribution of this subspecies is peculiar. Few other lichens are known to have a similar, restricted type of distribution, but several species show a more continuous, pantropical distribution range, often preferring the wet slopes of the mountains in the Neotropics and the Palaeotropics (Sipman 2002). One such species is *Acrosyphus sphaerophoroides* L veill , which is known from Tibet, Bhutan, Nepal, Sikiang, Yunnan and Japan in Asia, and from a few, scattered localities along the mountain chains in the Americas, viz. from Canada, Mexico, Peru and Patagonia (Sato 1967, Tibell 1996, Aptroot & Feijen 2002). It is not unlikely that *M. neotropica* ssp. *rotundicarpa* also is more widespread than the available records suggest. Its habitat preferences in the Neotropics and in the Tibetan Fringe Mountains are quite similar. In both areas, it prefers humid, montane forests close to the tree line.

SPECIMENS EXAMINED: PROV. SICHUAN: SE-Tibetan Fringe Mountains (= Hengduan Shan), Daxue Shan, Gongga Shan, Hailougou glacier and forest park, W. Obermayer 08585 (loc. 2000-02.3), 08760, 08765 (loc. 2000-04.1), 08857, 08858, 08859, 08864 (loc. 2000-03.3). - SE-Tibetan Fringe Mountains (= Hengduan Shan), 68 km WSW of Ya'an, road from Tianquan to the Erlang Shan-tunnel, W of Xing Gou, W. Obermayer 08040 (loc. 2000-02.2).

Menegazzia primaria Aptroot, M.-J. Lai & Sparrius, *Bryologist* 106: 159. 2003.

NOTES: This recently described species is hitherto only known from Taiwan (Aptroot et al. 2003). One specimen belonging to this species from Yulong Shan, which is situated in the southernmost part of the Tibetan Fringe Mountains (=Hengduan Shan), 315 kilometres south-west of Gongga Shan (Fig. 2), was seen. The lobes of this specimen are of the "terebrata"-type (Fig. 1B), exactly as described by Aptroot et al. (2003). The apothecia (Fig. 1C) are larger than those illustrated by Aptroot et al. (2003), but they did not provide any size measurements of the apothecia. The spores fall well within the size ranges given by Aptroot et al. (2003). The description of the taxon *Parmelia pertusa* f. *ventricosa* (Hue 1899) corresponds well with the description of *M. primaria*, and that taxon may very well belong to this species.

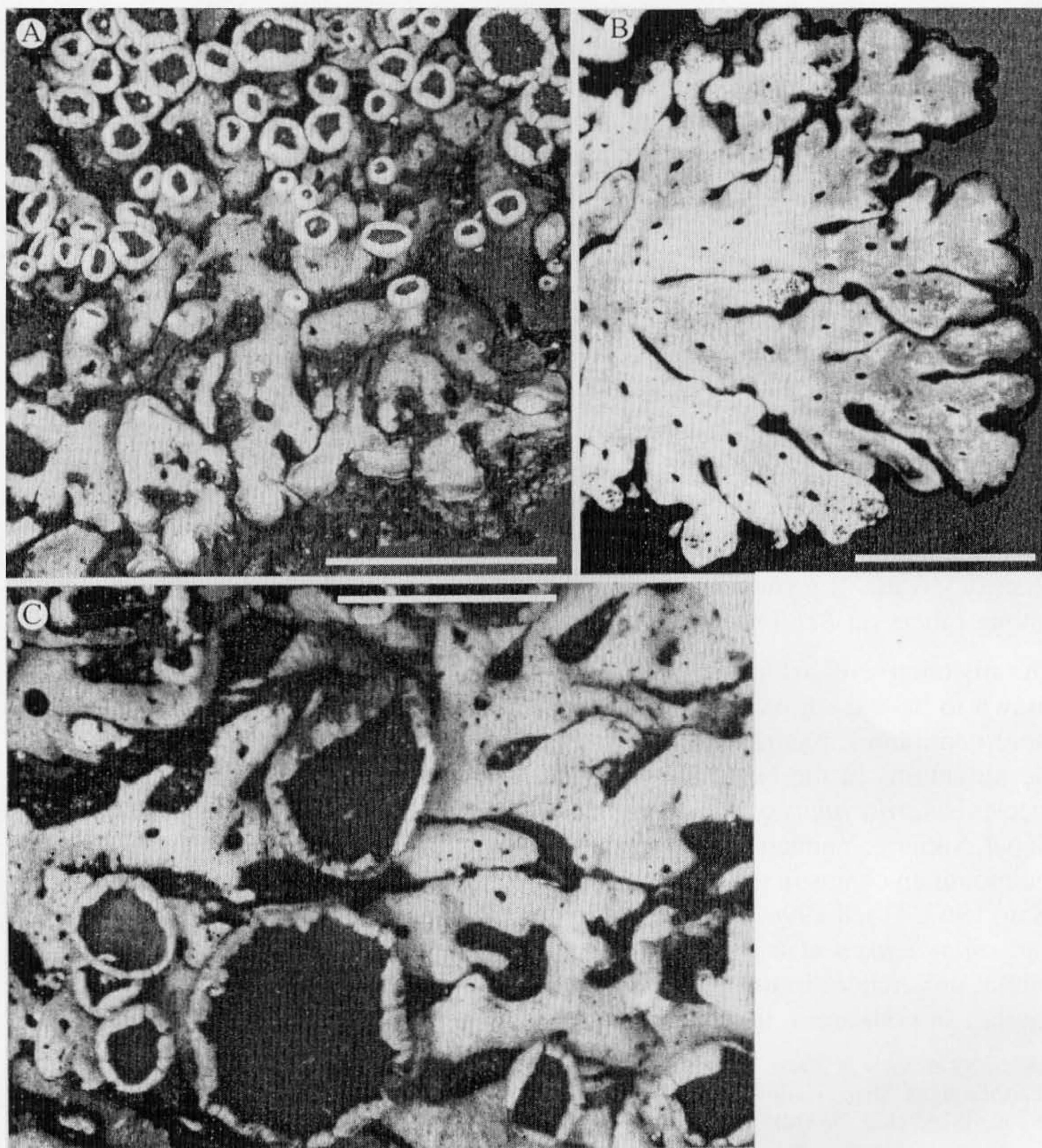


Fig. 1: The fertile species of *Menegazzia* in the Tibetan region. A. *Menegazzia neotropica* ssp. *rotundicarpa* (W. Obermayer 08857). B & C. *Menegazzia primaria* (J. Soják s.n.). B. Lobe tips. C. Central lobes with apothecia. Scale bars = 5 mm.

SPECIMEN EXAMINED: PROV. YUNNAN: Montes Yulong Shan, 30 km ad septentriones ab oppido Likiang, alt. 4000 m. Ad truncum arboris. 25.VII.1990, J. Soják s.n.

Menegazzia subsimilis (H. Magn.) R. Sant., Ark. Bot. 30A, 11: 13. 1942.

≡ *Parmelia subsimilis* H. Magn., Ark. Bot. 30B, 3: 5. 1941.

NOTES: This widespread species is reported here from a few localities within the Tibetan region. The westernmost localities are situated between 270 and 370 km

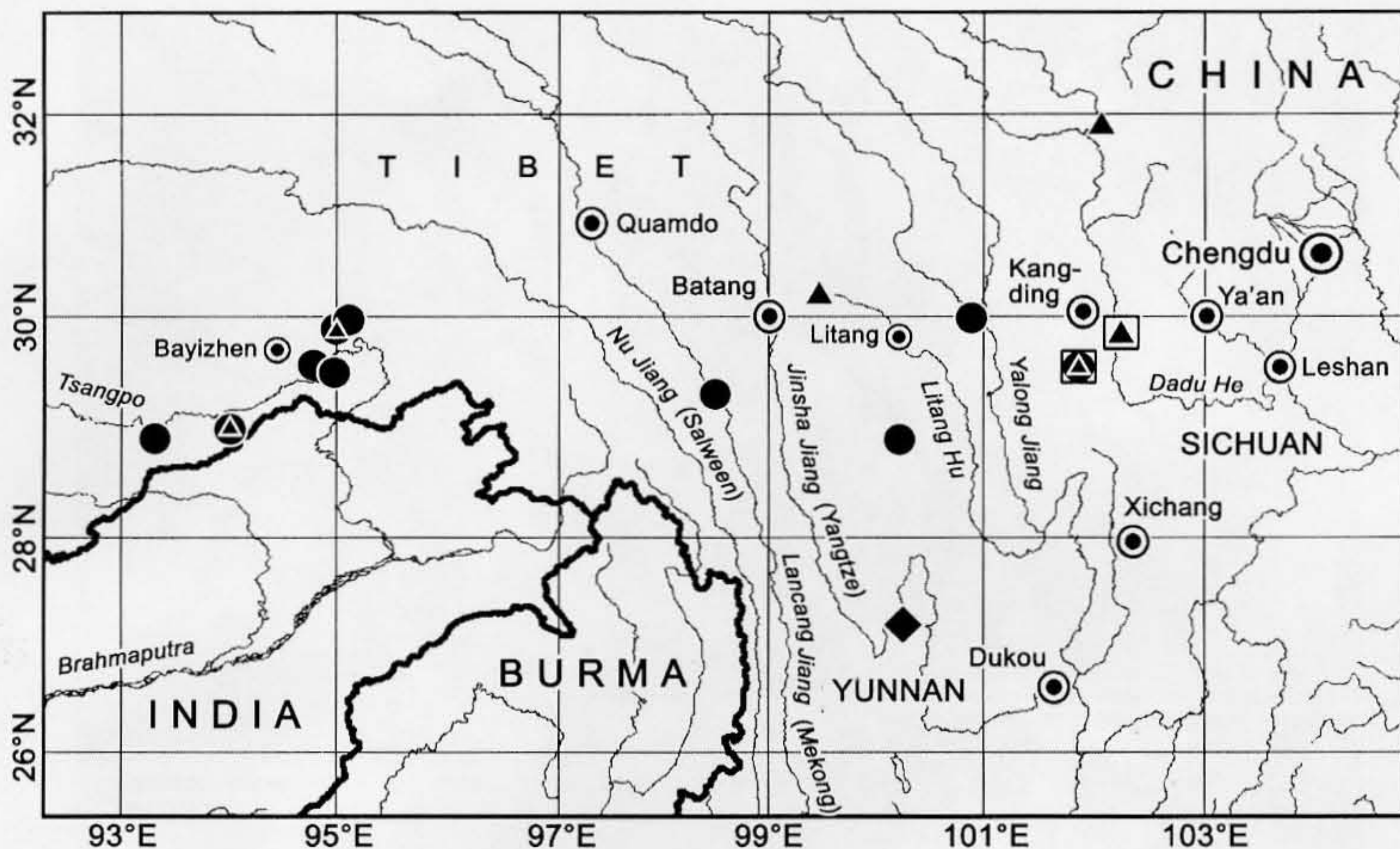


Fig. 2: Locations of examined specimens of *Menegazzia neotropica* ssp. *rotundicarpa* (□), *M. primaria* (◆), *M. subsimilis* (▲), and *M. terebrata* (●) in the Tibetan region.

east-south-east of Lhasa, whereas four specimens are from the north-western parts of the province Sichuan (Fig. 2). Two specimens (W. Obermayer 3358, 08817) differ from other examined specimens of *M. subsimilis* (cf. Bjerke 2003) by having glaucous-green, shining and rather broad lobes (Fig. 3A, B). The lobes are similar to those often seen in *M. asahinae* (see Bjerke 2004). Otherwise, one specimen (3558) is identical to *M. subsimilis* s. str. by having richly lacerate, maniciform soralia, whereas the other specimen has poorly developed soralia, which makes it quite similar to *M. terebrata*, but young soralia of *M. subsimilis* often resemble the soralia of *M. terebrata* (Bjerke 2003). This aberrant habit is here considered a growth modification. The restricted number of specimens does not allow us to distinguish this habit as a separate taxon. As stated by Obermayer & Kantvilas (2003) and Obermayer (2004), several species tend to have “morphological variants” developing in the Tibetan region.

Menegazzia subsimilis was collected at altitudes between 2500 m and 4150 m above sea level from trunks or twigs of *Quercus* sp., *Pinus* sp. and *Cupressus chengiana*.

SPECIMENS EXAMINED: TIBET, PROV. XIZANG: Himalaya Range, 275 km ESE of Lhasa, 60 km SW of Mainling, W. Obermayer 5797 (loc. 94-50). - Gyala Peri N, Bong Chu - Gyala Peri-N Glacier, 18.VIII.1994, G. Miehe 94-197-2D & U. Wündisch. - Nyainqêntanglha Shan, 370 km E of Lhasa, 55 km NNE of Nyinchi, W. Obermayer 6569, 6582 (loc. 94-57.1). - PROV. SICHUAN: Shalui Shan Mts., 30 km NNE of Batang, SSE of Yidun, W. Obermayer 3358 (loc. 94-06). - Upper Dadu He, Dajin Chuang, Gana - Barkam, G. Miehe, 2.X.1994, S. Miehe 94-473-23/01 & U. Wündisch. - SE-Tibetan Fringe Mountains (= Hengduan Shan), Daxue Shan, Gongga Shan, Hailougou glacier and forest park, W. Obermayer 08817 (loc. 2000-04.1). - SE-Tibetan Fringe Mountains (= Hengduan Shan), 70 km WSW of Ya'an, road from Tianquan to Luding, W. Obermayer 09993 (loc. 2000-21.1).

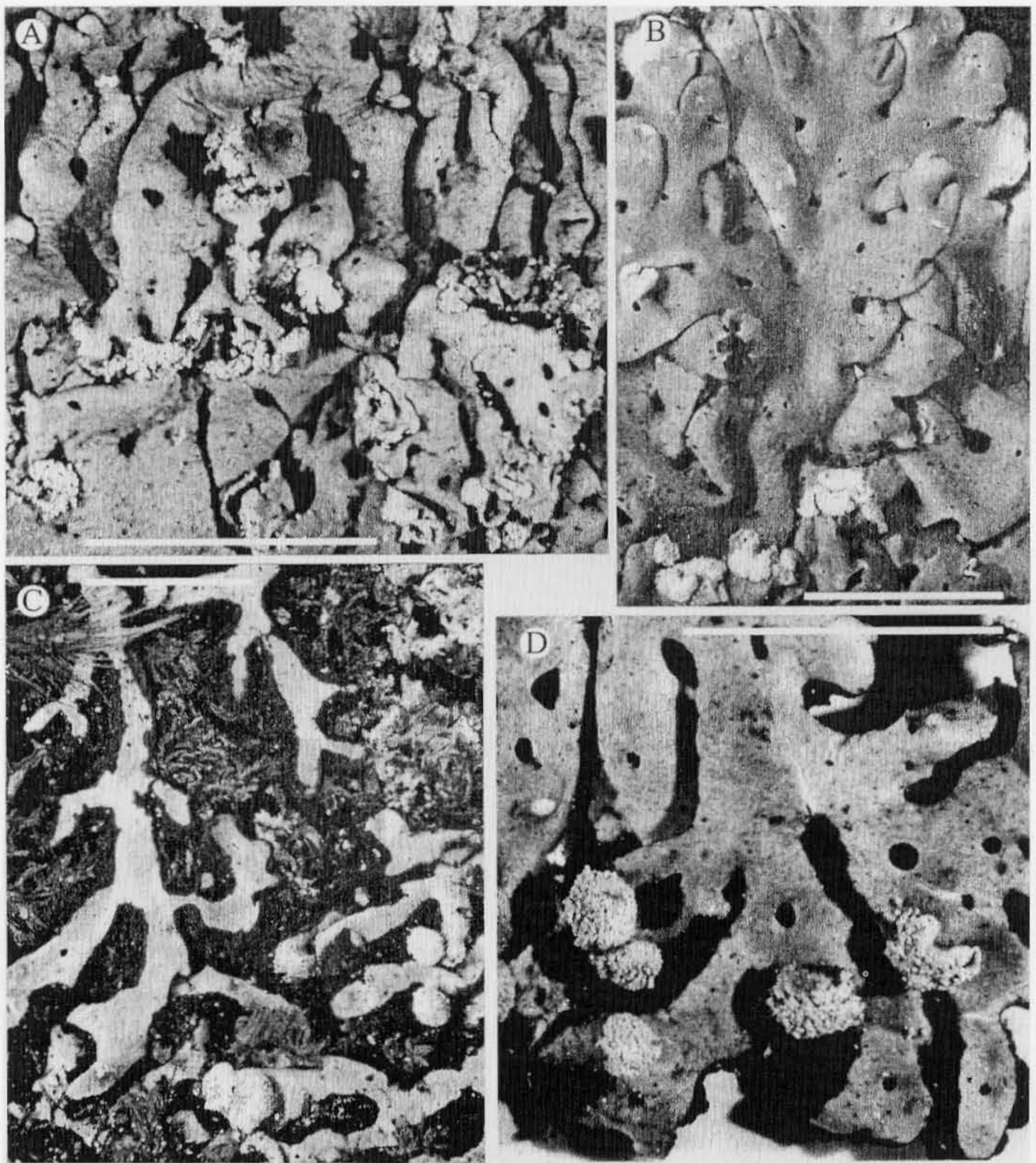


Fig. 3: Morphological variation within Tibetan material of the soresiate species. A. *Menegazzia subsimilis*, the most common habit with narrow, contiguous lobes (G. & S. Miehe 94-473-23/01). B. *Menegazzia subsimilis*, deviant habit with broader, more convex and less contiguous lobes (W. Obermayer 3358). C. *Menegazzia terebrata*, deviant habit with lax, separated lobes (G. Miehe 94-177-40/08 & U. Wündisch). D. *Menegazzia terebrata*, the most common habit with contiguous lobes. Scale bars = 5 mm.

Menegazzia terebrata (Hoffm.) A. Massal., Neagen. Lich.: 3. 1854.

≡ *Lobaria terebrata* Hoffm., Deutschl. Fl. 2, Cryptog.: 151. 1796.

NOTES: Based on the number of collections, *M. terebrata* is by far the most common and widespread species of the genus within the Tibetan region (Fig. 2). Some specimens from Nepal and Bhutan were also seen (included in the list below). It grows on a variety of phorophytes (for example on species of *Abies*, *Betula*, *Hippophaë*,

Juniperus, *Larix*, *Picea*, *Pinus*, *Populus*, *Prunus*, *Rhododendron*, *Salix* and *Sorbus*), and even also over mosses on soil. It has been collected at altitudes between 2180 m and 4300 m, at the latter altitude at the tree line of the *Abies* forest. A “morphological variant” of *M. terebrata* is evident. When competing with mosses for space on trunks, the lobes are separated, often with mosses growing among them, thus appearing very lax and slender (Fig. 3C). Two specimens with this habit were seen (G. Miehe 94-177-40/08, 94-215-42/08 & U. Wündisch). Otherwise, *M. terebrata* is quite uniform in the Tibetan region (Fig. 3D), occasionally also producing apothecia. The degree of blackening along the lobe margins varies slightly, sometimes protruding into the lateral parts of central lobes (e.g. W. Obermayer 6786). A few specimens are also slightly yellowish, but no other acetone-soluble substances than the regular ones were detected by TLC. One such specimen (W. Obermayer 7552) is heavily attacked by a lichenicolous fungus of the genus *Nesolechia*. It may be that the colour modification is due to the parasitic attack.

SELECTED SPECIMENS EXAMINED: TIBET, PROV. XIZANG: SW of Namchabarwa Feng, Village “Pei No. 4” to Nam La Co, 16.IX.1989, B. Dickoré L-20. - Gyala Peri N, above Gyala Peri-N Glacier, 21.VIII.1994, G. Miehe 94-215-42/08 & U. Wündisch. - Gyala Peri W, Upper Bong Chu (Lang Chu), E of Pass Nyingchi – Dongjuk, 26.VIII.1994, G. Miehe 94-233-33/07, 94-230-25/03 & U. Wündisch. - Tsangpo tributary, Nangxian – Mainling, eastern branch of Lilung Chu, 10-14.VIII.1994, G. Miehe 94-177-40/08, 94-160-1L & U. Wündisch. - Ningjing Shan Mts., 11 km W of Markam, W. Obermayer 3729 (loc. 94-12). - Himalaya Range, 230 km ESE of Lhasa, Tsangpo Valley, W. Obermayer 5491, 5500 (loc. 94-46.1), 5619 (loc. 94-47.1), 5689, 5700 (loc. 94-48). - Himalaya Range, 280 km ESE of Lhasa, 45 km SW of Mainling, W. Obermayer 6267 (loc. 94-55). - Nyainqêntanglha Shan, 350-370 km E of Lhasa, W. Obermayer 7539 (loc. 94-57.1), 6767 (loc. 59.2), 6786 (loc. 94-60.1), 6938 (loc. 94-62), 7076 (94-64), 7266, 7509 (loc. 94-65), 7475, 7552 (loc. 94-66), 7289 (loc. 94-68). - PROV. SICHUAN: E of Litang, W. Obermayer 3174 (loc. 94-04.1). - SE-Tibetan Fringe Mountains (= Hengduan Shan), Daxue Shan, Gongga Shan, Hailougou glacier and forest park, W. Obermayer 08726 (loc. 2000-04.1); 08835 (loc. 2000-03.1). - SE-Tibetan Fringe Mountains (= Hengduan Shan), Shaluli Shan, 50 km S of Litang, W. Obermayer 09649 (loc. 2000-13.1). - BHUTAN: Flor-Prov. N18 (Upper Mo Chu), Paro distr., Chomolari Chu, 5.VII.2000, G. & S. Miehe 00-159-10 (1)/11. Flor-Prov. N18 (Upper Mo Chu), Gasa distr., between Laya and Limithang, 9.VIII.2000, G. & S. Miehe 00-275-33/03. Flor-Prov. N19 (Upper Pho Chu), Gasa distr., between Tarina Lakes and Tarina Camp, 31.VIII.2000, G. & S. Miehe 00-339-03/07, 00-try-340/01. - NEPAL: Western Region, Gandaki Est de l’Annapurna, 1971, P. Ozenda CJ-29 (G-52545). - Central Region, Bagmati, 1971, P. Ozenda 8A (G-52544). - Eastern Region, Mechi, 1959, P. Dreux s.n. (G-52543). - Ost-Nepal, Khumbakarna-Himal, Dhankuta, 2.X.1972, T. Wraber s.n.; Dhorpatan, 31.III.1974, A. R. Vickery 385. - Langtang Area, Chisedang Lakh, 7.IX.1986, J. Poelt N86-L1188. - Langtang Area, Way from Lama Hotel to Gumnachok, 1.IX.1986, J. Poelt N86-L879.

Key to the species

Note: Thalli without either apothecia or soralia are in general very difficult to identify with certainty. Only *M. neotropica* ssp. *rotundicarpa* has a considerably different thallus morphology, which makes it distinguishable even when it is sterile.

1. Thallus without soralia. Apothecia common..... 2
1. Thallus with soralia. Apothecia absent or rare, margins of apothecia becoming sorediate..... 3
2. Apothecia large, to 9 mm wide. Spores small, to 40 µm long. Lobes greyish-green, not much blackened. Perforations numerous, regularly distributed..... *Menegazzia primaria*
2. Apothecia small, to 2 mm wide. Spores large, to 88 µm long. Lobes brown-black at margins and at centre. Perforations few, scattered..... *Menegazzia neotropica* ssp. *rotundicarpa*
3. Soralia elevated, lacerate, funnel-shaped, with flange-like margins..... *M. subsimilis*
3. Soralia convex, becoming perforated and maniciform at older lobes, never lacerate..... *M. terebrata*

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