Flora of Mustang, Nepal

Edited by
Hideaki Ohba, Yu Iokawa,
Lokendra Raj Sharma

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Foreword

The Komeri Co. Ltd., Niigata, believes that the company needs the continuous support of communities. That belief was the raison d'être for the establishment of the company. One percent of our total profits are returned each year to conduct our voluntary social contribution. In 1966, the Komeri established the Midori Ikusei Zaidan Foundation to provide supports to valuable and innovative projects leading to safe and rich environments and communities in global level. Since the establishment of the Foundation, donations of approximately one hundred million yen have been provided to support 24 projects.

The research project to study the flora and horticultural resources in the Mustang region, central Nepal, 1998 to 2003, is the first international project supported by the Foundation. I heard that there are few roads for modern vehicles even now in the Mustang region because of the steepness of the slopes and the isolation policy of the Nepalese Government. Professor Ohba, the University of Tokyo (now Professor Emeritus), and his Japanese and Nepalese colleagues of the Society of Himalayan Botany have devoted all of their skills and experience to the fieldwork in such a situation without accident. I am grateful for their accomplishments.

The field research was carried out in cooperation with the Department of Plant Resources, the Government of Nepal. During the period, 1998 to 2003, the people of Nepal and their government were under severe stress both politically and economically. Despite such difficult circumstances, the Department made every effort to carry out the research program. I express my sincere thanks to the present Director General, Dr. Lokendra Raj Sharma, and to the former Directors General, Mr. M. S. Bista, Dr. U. R. Sharma and Mr. H. K. Sainju.

The results of the research project, *Flora of Mustang, Nepal*, will be published in 2008 as a special publication of the Midori Ikusei Zaidan Foundation. This year, 2008, marks the tenth anniversary of Komeri's decision to support this project financially. I hope the Flora will be a useful contribution to both lay people and scientists worldwide who have an interest in the plants of Mustang and Nepal.

On this occasion I would like express my sincere thanks to Mr. Toru Kondo, Chairman of Mustang Development Service Association (MDSA, International Non-Governmental Organization), Dr. Susumu Ishizawa (former Professor of Niigata University), Curator of the Niitsu Herbarium (Plant Laboratory in Snowy Area, Japan), and many persons who supported and assisted this project in various ways.

Ken'ichi Sasage,
Director of the Midori Ikusei Zaidan Foundation, Komeri Co., Ltd., Niigata

January 2008

Preface

The Nepal Himalaya is of immense interest to botanists due to its rich biodiversity. All global bioclimatic zones are juxtaposed along the slopes of the Nepalese mountains. Due to the physiographic complexity, there are many interesting places in Nepal for floristic studies. Mustang, which is situated in the northern part of Nepal, is a unique place for such study. It lies mainly in the trans-Himalayan zone and, due to its arid nature, its flora and vegetation are significantly different from other parts of the country. On the basis of altitude, Mustang is divided into two parts: Lower (2000–3000 m) and Upper Mustang (above 3000 m). It is a nearly treeless region and its flora and vegetation are Tibetan in character.

The Mustang region is of special interest for its aridity and high degree of floral endemism. Overgrazing of pastureland beyond the capacity of the land to regenerate and cutting of small trees and shrubs for firewood has contributed significantly to habitat change. Similarly, with the rise in temperatures, the impact of climate change is clearly visible. These threats to such an interesting flora have demand more detailed studies of Mustang's plant resources and their adaptive capabilities.

One of the mandates of the Department of Plant Resources (DPR), previously the Department of Medicinal Plants, is to explore the extensive plant resources of Nepal and to assist in national development through the rational use of natural resources. The country is benefited from the activities of the DPR through the dissemination of knowledge on these resources by the Department. The publications of the DPR on the flora and plant families reflect our knowledge on the plant resources of Nepal.

The Department of Plant Resources and the University of Tokyo have enjoyed a long history of collaborative research. The collaboration initiated by the late Professor Hiroshi Hara between scientists in the two countries continues to the present. It has been nearly five decades since the first jointly organized botanical expeditions to Nepal were initiated. Over the years, the joint expeditions have explored most parts of the country and have resulted in numerous publications. Our relationship has matured with the advancement of time. The present publication, the Flora of Mustang, Nepal, is the latest outcome of the joint work of these two institutions and is another step toward producing a comprehensive flora of Nepal in the near future.

We would like to record our thanks to the former Directors General of the Department of Plant Resources, Mr. M. S. Bista, Dr. U. R. Sharma and Mr. H. K. Sainju, for initiating and promoting the Flora of Mustang project. We also thank Dr. K. R. Rajbhandari for coordinating the project. Similarly, we wish to thank Dr. M. N. Subedi and Mr. R. K. Upreti for participating in the field research program. Thanks are also due to the members of the Society of Himalayan Botany, who have greatly contributed to the preparation of this Flora.

The Midori Ikusei Zaidan Foundation, Niigata, Japan, financially supported both the field research program and publication of the results. We are extremely grateful to Mr. Kin'ichi Sasage, representative of the Foundation for his support.

We hope that this work, jointly produced by the University of Tokyo and the Department of Plant Resources, will be of valuable in revealing the rich biodiversity of

the Mustang region and highly useful to those who continue in its study.

Lastly, we hope that this publication will further strengthen our mutual relationship and pave the way forward for many years to come.

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January 2008

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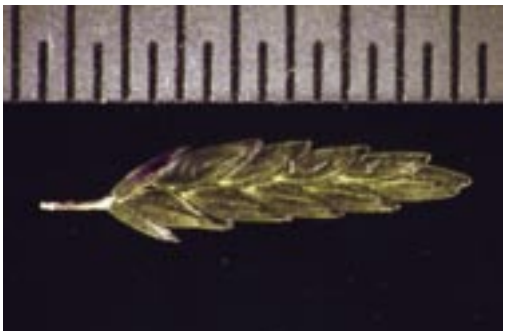
Contents

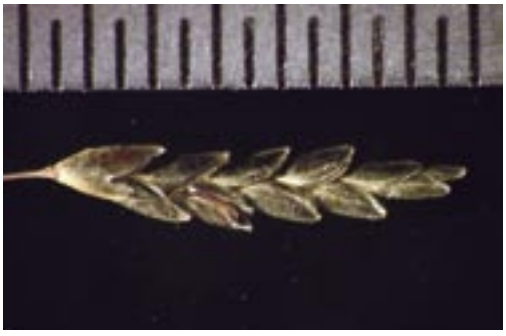
a. *Microula mustangensis*

b. *Salvia transhimalaica*

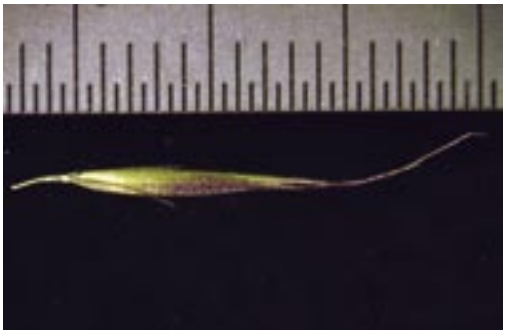
y. *Elymus nepalensis*



z. *Eragrostis minor*



aa. *Eragrostis papposa*



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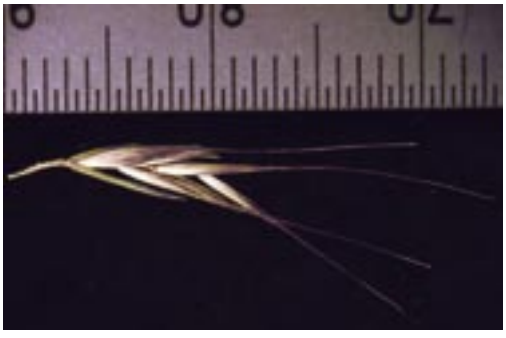
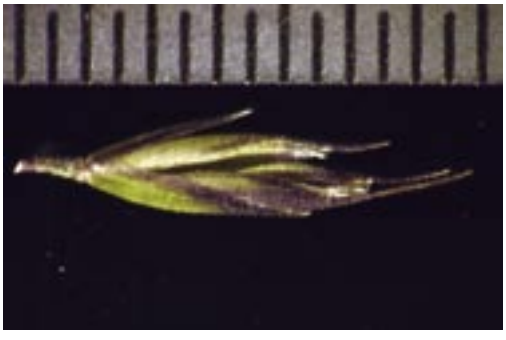


ac. *Festuca gigantea*

ad. *Festuca nitidula*



ae. *Festuca ovina*

af. *Festuca polycolea*

Plate 13. Map of Mustang District

1. Bistorta affinis (D.Don) Greene, Leafl. Bot. Observ. **1**: 21 (1904); Hara & Williams in Enum. Flow. Pl. Nepal **3**: 173 (1982); Grierson & Long in Fl. Bhutan **1**(1): 169 (1983); Polunin & Stainton, Flow. Himal.: 343, pl. 106 (1984); Ohba & Akiyama, Alp. Fl. Jaljale Himal: 8 (1992); Miyamoto in Ohba & Ikeda, Contr. Fl. Ganesh Himal: 20 (1999); Miyamoto in Ohba & Ikeda, Fl. Hinku Hunku Val.: 36 (2000); Yoshida, Himal. Pl. Ill.: 664, f. 1 (2005).

Polygonum affine D.Don, Prodr. Fl. Nepal.: 70 (1825); A.J.Li in Fl. Reipubl. Popularis Sin. **25**(1): 50, f. 11 (1998); A.J.Li & al. in Fl. China **5**: 299 (2003).

Subshrubs 8–10 cm tall. Rhizome creeping. Radical leaves sessile, oblanceolate to lanceolate, 5–8 × 1–1.5 cm, margin entire. Inflorescence terminal, racemes, 3–8 × 1–1.5 cm; perianth segments 5, oblong, 4–5 mm, red. Stamens 8; stigmas 3. **[**NEPAL**]** W to E Nepal. Open meadows, damp roadside banks, and open forests. **[**RANGE**]** Tibetan Plateau (Xizang), W to E Himalaya (Kashmir, Pakistan, India, Nepal, Sikkim, Bhutan).

SPECIMENS EXAMINED: [Lower Mustang**]** Around Yak Kharka, 4340 m (Suzuki & al. 8860926, 31 Aug. 1988, TI); around Ommang, 4330 m (Hoshino & al. 9410021, 1 Aug. 1996, TI), 4100 m (Hoshino & al. 9670100, 2 Aug. 1996, TI), 4510 m (Hoshino & al. 9670113, 3 Aug. 1996, TI); Phalyak – Sangda La, 4400 m (Miyamoto & al. 20210019, 9 Aug. 2002, TI).

2. Bistorta tenuifolia (H.W.Kung) Miyam. & H.Ohba in J. Jap. Bot. **80**: 280, f. 1–2 (2005). **[**Fig. 4**]**

Polygonum viviparum L. var. *tenuifolium* Y.L.Liu in J. Northw. Teacher's Coll., Nat. Sci. **3**: 45 (1985); A.J.Li in Fl. Reipubl. Popularis Sin. **25**(1): 38 (1998); A.J.Li & al. in Fl. China **5**: 294 (2003).

?Rhizome swollen bulbous, dark brown, covered with old leaf sheaths. Flowering stems 1 or 2(or 3), ascendant to decumbent, 3–22 cm, purple, partly pale green. Radical leaves 3–5, petiole 0.5–3 cm, pale green partly purple; blades 1–9 cm × 2–3 mm, linear, apex acute, base narrowly decurrent, margin entire, upper surface glabrous, pale green, lower surface covered with short white hairs and glandular hair or glabrous, pale green; stipule 0.5–3 cm, membranaceous, brown, apex acute. Cauline leaves 1–4; blade linear, 0.2–8 cm, apex acute, base narrowly decurrent, margin entire; stipule of lower leaves 0.5–2 cm, apex acute; stipule of uppermost leaf 0.1–0.3 cm, membranaceous, brown, tubed and apex truncate. Raceme solitary, cylindric, 1–3.5 × 0.5–0.8 cm, with proliferous flowers in lower part. Flowers white, solitary at each node of rachis; pedicel 2–3.5 mm, pale green; bracts lanceolate to oblong, membranaceous, apex acuminate to acute, pale brown, 1.3–3 × 0.3–0.6 mm; bracteoles membranaceous, lanceolate, apex acute, 0.8–1.8 × 0.2–0.4 mm. Perianth segments 5, oblong, 2–3 × 1.2–1.4 mm, apex rounded. Stamens 8; filaments 2.0–2.5 mm, white, anthers 0.4–0.6 × 0.2–0.3 mm, brown; nectary glands at base, brown. Pistil 2.5–3 mm; stigmas 3, 0.1–0.2 mm; styles 1.8–2 mm, white; ovary trigonous, 1.8–2 mm, pale green to purple. Bulbil 1.6–2 × 1–1.2 mm. **[**NEPAL**]** C Nepal. Exposed grassland slopes. **[**RANGE**]** Tibetan Plateau (Xizang, Qinghai), Nepal, China (Yunnan, Sichuan, Gansu, Shaanxi).

SPECIMENS EXAMINED: [Lower Mustang**]** Around Sangda La, 4570 m & 4550 m (Miyamto & al. 20210059 & 20210045, 11 Aug. 2002, TI); Pongio Kharka – Phalyak, 3870 m (Miyamoto & al. 20110101, 13 Aug. 2002, TI).

3. Bistorta vivipara (L.) Gray, Nat. Arr. Brit. Pl. **2**: 268 (1821); Hara & Williams in Enum. Flow. Pl. Nepal **3**: 173 (1982); Grierson & Long in Fl. Bhutan **1**(1): 168 (1983); Polunin & Stainton, Flow. Himal.: 345 (1984); Ohba & Akiyama, Alp. Fl. Jaljale Himal: 11 (1992); Miyamoto in Ohba & Ikeda, Contr. Fl. Ganesh Himal: 21 (1999); Miyamoto in Ohba & Ikeda, Fl. Hinku Hunku Val.: 39 (2000); Yoshida, Himal. Pl. Ill.: 662, f. 1 (2005). **[**Fig. 5**]**

Polygonum viviparum L., Sp. Pl.: 360 (1753); A.J.Li in Fl. Reipubl. Popularis Sin. **25**(1): 37

Fig. 4. *Bistorta tenuifolia* (H.W.Kung) Miyam. & H.Ohba (Miyamoto & al. 20210045). 1: Habit of plant. 2: Flower. 3: Perianth and stamens. 4: Pistil. 5: Ovary. 6: Bulbil. 7: Bract. 8: Bracteole. 9: Stipule of lower cauline leaf. 10: Stipule of upper cauline leaf. Scales: a (2 cm) for 1, 9 and 10; b (2 mm) for 2, 3, 4, 5 and 6; c (1 mm) for 7 and 8.

acuminate with a blackish tip, lanate on both surfaces, especially on lower surface, tapering at base, amplexicaul. Inflorescence corymb with 10–20 capitula; involucres broadly campanulate, 5–10 mm in diam., 8–10-seriate; phyllaries scarious, apex acute; outer ones ovate to narrowly ovate, 3–3.5 × 1–2 mm, pale brown; middle ones narrowly ovate to narrowly oblong, 4.5–6 × 1.5–2.5 mm, white except pale brown above clawed base; inner ones lanceolate to linear-lanceolate, 4–5 × 0.5–1.2 mm, white except pale brown above clawed base. Florets 40–60, female florets marginal, few; corolla 2.5–3 mm; pappus 2–3 mm. **[**Nepal**]** W to E Nepal. Moist pathsides or grassland slopes, 2000–2500 m. **[**Range**]** Afghanistan, Pakistan, Tibetan Plateau (S Tibet), W to E Himalaya (Kashmir to Bhutan), S China, Taiwan.

Specimens examined: [Lower Mustang**]** Kalopani – Tukuche, 2470 m (Suzuki & al. 8800593 & 8800601, 29 Aug. 1988, TI); Tukuche – Ghasa, 2480 m (Suzuki & al. 8830696, 2 Sep. 1988, TI).

var. **intermedia** (DC.) Airy Shaw in Bot. Mag. **158**: t. 9396 (1935); Kitamura in Kihara, Fauna & Fl. Nepal Himal.: 245 (1955); Chater in Enum. Flow. Pl. Nepal **3**: 11 (1982); Polunin & Stainton, Flow. Himal.: 187 (1984).

Flowering stems 5–30 cm tall; basal leaves usually present at anthesis, oblanceolate to spatulate, 2–8 cm × 3–8 mm, long petiolate, cauline leaves lanceolate to linear-lanceolate, 1–4 cm × 2–20 mm in lower ones, decrease in size towards top, base semi-amplexicaul or not. Inflorescence loose corymb with 2–8 capitula; involucres 7–17 mm in diam.; outer phyllaries narrowly ovate to lanceolate, 4–6 × 1–1.5 mm, pale brown except blackish brown above clawed base; middle ones narrowly ovate to lanceolate, 6–7 × 1.5–2 mm, white except blackish brown above clawed base; inner ones lanceolate to narrowly lanceolate, 5.5–6.5 × 1.5–2 mm, white except blackish brown above clawed base. Florets many (more than 100) in female capitula; corolla ca. 3 mm; pappus 3–3.5 mm. Ovaries long-ellipsoid, ca. 0.7 mm, papillate. **[**Nepal**]** W to E Nepal. Subalpine rocky grassland, 3500–4200 m. **[**Range**]** Afghanistan, Pakistan, Tibetan Plateau (S Tibet), Himalaya, W China.

Specimens examined: [Lower Mustang**]** Muktinath, 3650–4200 m (Iokawa & al. 20020232, 15 Jul. 2000, TI); Phalyak – Sangda La – Pongio Kharka, 3800 m (Miyamoto & al. 20220024, 9 Aug. 2002, TI); around Sangda La, Pongio Kharka, 4270 m (Miyamoto & al. 20240031, 11 Aug. 2002, TI); Pongio Kharka – Sangda La – Phalyak, 3870 m (Miyamoto & al. 20210093, 13 Aug. 2002, TI). **[**Upper Mustang**]** Samar, 3700–3880 m (Iokawa & al. 20020101, 11 Jul. 2000, TI); Syangboche – Chhunggar – Ghemi, 3620 m (Noshiro & al. 20104118, 5 Aug. 2001, TI); Ghemi – Charang, 3370 m (Noshiro & al. 20104123, 6 Aug. 2001, TI); Ghar Gompa – Lo-Manthang, 4120 m (Miyamoto & al. 20240130, 19 Aug. 2002, TI); Ghar Gompa – Marang La, 3809–4230 m (Miyamoto & al. 20230112, 19 Aug. 2002, TI).

5. **Arctium** L.

1. Arctium lappa L., Sp. Pl.: 816 (1753); Chater & Kitamura in Enum. Flow. Pl. Nepal **3**: 11 (1982); Grierson & Springate in Fl. Bhutan **2**(3): 1424 (2001).

Perennial herbs. Rhizomes elongate, thickened and unbranched. Stems well-branched, up to 1.5(–2) m tall. Cauline leaves widely ovate to cordiform, 7–30 × 8–20 cm, base truncate or cordate, apex obtuse, acuminate or acute; margin mostly entire, serrate or denticulate with mucronate teeth; lower surface densely tomentose with glands. Involucre spiny. Involucral phyllaries linear to narrowly lanceolate, apex hooked, green or light brown. **[**Nepal**]** C Nepal, 2000–3800 m. Temperate to subalpine zone, on south-facing slopes. **[**Range**]** Worldwide.

Specimens examined: [Lower Mustang**]** Kalopani – Tukuche, 2570–2680 m (Ohba & al. 8330575 & 8330592, 18 Jul. 1983, TI, sterile); Muktinath, 3660 m (Stainton & al. 1440, 26 Jun. 1954, A, sterile).

6. **Artemisia** L.

1. Central florets female-sterile; ovary less than 0.2 mm at anthesis, much smaller than that of

marginal florets (subgen. **Dracunculus**) 2
+ Central florets bisexual; ovary more than 0.4 mm at anthesis, as large as that of marginal florets (subgen. **Artemisia**) 5
2. Leaf segments filiform, up to 0.6 mm wide 3
+ Leaf segments lanceolate, more than 3 mm wide ..... **4. A. dubia**
3. Annual herbs with vertical taproot; stems solitary, erect or more commonly branched from base, diffuse ..... **1. A. stricta**
+ Small shrubs or subshrubs with woody stem; stems several 4
4. Heads ca. 3 × 3 mm, sparsely arranged in open panicles to 5 cm in diam.; florets 25–29 per head; branches stramineous ..... **2. A. wellbyi**
+ Heads 2.4–2.8 × 2.2–2.5 mm, ± densely arranged in narrower panicles; florets 10 or 11 per head; branches deep purplish ..... **3. A. mustangensis**
5. Receptacles densely hirsute (sect. **Absinthium**) 6
+ Receptacles glabrous (sect. **Artemisia**) 7
6. Annual or biennial robust herbs with vertical taproot; heads numerous in open panicle ..... **5. A. sieversiana**
+ Tufted perennial herbs 10–15 cm tall, with woody rhizome; heads few to several in raceme ..... **6. A. minor**
7. Annual herbs with vertical taproot ..... **7. A. hedinii**
+ Perennial herbs with woody rhizome or small shrubs 8
8. Shrubs, leaves 2 or 3 times pinnatisect, ultimate segments to 0.3 mm wide, acute, primary segments alternating with a few much smaller segments ..... **8. A. vestita**
+ Herbs or subshrubs; leaves once or twice pinnatifid, ultimate segments more than 0.5 mm wide, acute or obtuse; primary segments alternating with 1 smaller segment or smaller segments absent 9
9. Stems and upper surface of leaves, at least on veins, minutely glandular-viscid 10
+ Stems and upper surface of leaves without glandular hairs, often with sessile depressed glands on leaves 11
10. Moderate to robust herbs 1–1.5 m tall; primary segments of middle cauline leaves pinnatipartite to midrib; heads 2–3 mm in diam. ..... **9. A. myriantha** var. **pleiocephala**
+ Robust herbs more than 1.5 m tall; primary segments of middle cauline leaves deeply pinnatilobed but not incised to midrib; heads 3–4 mm in diam. ..... **10. A. thellungiana**
11. Robust herbs more than 1 m tall; leaves pinnatifid, primary segments 1–3 pairs ..... **11. A. tukuchaensis**
+ Small to medium-sized herbs less than 70 cm tall; leaves 2 or 3 times pinnatifid, primary segments 4–6 pairs 12
12. Upper surface of leaves sparsely to densely araneous; heads globose to hemiglobose, more than 2.8 mm in diam., rarely obovoid then more than 4 mm in diam. 13
+ Upper surface of leaves glabrous or rarely sparsely araneous on distal leaves; heads widely obovoid, less than 2.8 mm in diam. 15
13. Heads more than 4 mm in diam., white araneous, in well-grown plants ± sparsely arranged on elongate branches, forming open panicles ..... **12. A. wallichiana**
+ Heads less than 4 mm in diam., creamy-white or brownish araneous, ± densely arranged on branches, forming narrow panicles 14
14. Plants to 40 cm tall, often up to 10 cm; leaves twice pinnatisect, segments not or hardly falcate ..... **13. A. campbellii**
+ Plants more than 40 cm tall; leaves (2 or)3 times pinnatisect, segments conspicuously falcate ..... **14. A. nepalica**
15. Leaves 3 times pinnatisect, primary pinnae much divaricate, upper surface glabrous or sparsely araneous, without depressed glands ..... **15. A. roxburghiana**
+ Leaves simply or twice pinnatisect, primary pinnae ascending; upper surface with numerous depressed glands ..... **16. A. sp.**

1. Artemisia stricta Edgew. in Trans. Linn. Soc. London **20**: 73 (1846), non Heyne ex DC. (1836), nom. nud.; Kitamura in Fauna & Fl. Nepal Himal.: 247 (1955), in Enum. Flow. Pl. Nepal **3**: 13 (1982); Springate in Fl. Bhutan **2**(3): 1564, f. 132 f–g (2001).

Artemisia edgeworthii N.P.Balakr. in J. Bombay Nat. Hist. Soc. **63**(2): 329 (1967), nom. superfl.; Y.R.Ling in Fl. Xizangica **4**: 780, f. 339 8–16 (1985), in Fl. Reipubl. Popularis Sin. **76**(2): 222 (1991).

Artemisia stricta Edgew. f. *diffusa* Pamp. in Nuovo Giorn. Bot. Ital., n. s. **34**: 705 (1927).

Artemisia edgeworthii N.P.Balakr. var. *diffusa* (Pamp.) Y.R.Ling in Acta Phytotax. Sin. **18**: 509 (1980), in Fl. Xizangica **4**: 780 (1985), in Fl. Reipubl. Popularis Sin. **76**(2): 223 (1991).

Biennial herbs. Taproot thin, vertical. Stems several, much divaricate from base, 4–20 cm, rarely simple or branched from the very base, erect, to 1.5–40 cm tall, purplish, sparsely pubescent. Radical leaves rosulate, with wider pubescent segments but usually withered at anthesis. Cauline leaves elliptic-ovate, 5–27 × 4–20 mm, twice pinnatisect, segments filiform, to 0.3 mm wide, acuminate, sparsely to densely araneous, primary pinnae 3–5 pairs, basal 1 or 2 pairs at base of leaves, stipule-like. Flowers August to September. Heads solitary or few congested on short axillary branches forming narrow panicles. Heads erect, subsessile or rarely with petiole to 2 mm, ovoid, 1.8–2.1 × 1.3–1.6 mm, involucral bracts hyaline, often purplish, midrib green. Marginal florets 15–25, central ones much smaller, several. Fruit September. Achenes brown, obovoid, ca. 0.7 mm. **[**NEPAL**]** W to E Nepal, 2600–5000 m. Dry sandy or gravelly slopes. **[**RANGE**]** Tibetan Plateau, W to E Himalaya, E Asia (SW China), N Asia (S Xinjiang), C Asia.

SPECIMENS EXAMINED: [Lower Mustang**]** Tukuche, 2600 m (Nakao s. n., 26 Apr. 1953, KYO), 10000 ft (Stainton & al. 8188, 14 Oct. 1954, BM –photo); around Sangda La, a ridge of Jeula Danda, 4400–4600 m (Miyamoto & al. 20220116, 12 Aug. 2002, TI); vicinity of Jharkot (Mikage & al. 9964132, 19 Aug. 1999, KANP); Chabarbu – Jharkot, 3810 m (Mikage & Yonekura 9552489, 24 Sep. 1995, BM –photo, TI, TUS); ca. 4 km WNW of Thorung La, 4460 m (Mikage & Yonekura 9552481, 24 Sep. 1995, TI). **[**Upper Mustang**]** Ghemi – Samar, 3630 m (Miyamoto & al. 20240196, 25 Aug. 2002, TI); Dhakmar – Ghar Gompa, 4020 m (Miyamoto & al. 20240114, 18 Aug. 2002, TI); Ghar Gompa – Ghemi (Watanabe & al. LOM-SP020804(015), 4 Aug. 2002, TI); Lo La – Charang Khola, ca. 3500 m (Noshiro & al. 20106190, 14 Aug. 2001, TI); S of Lo-Manthang, 4050 m (Miehe & al. 01-058-06, 22 Aug. 2001, BM –photo); NE of Lo-Manthang, 4200–4600 m (Miyamoto & al. 20260151, 20 Aug. 2002, TI).

NOTE: Plants with tufted diffuse stem have been named as a distinct form or variety *Artemisia stricta* f. *diffusa* Pamp. (= *A. edgeworthii* var. *diffusa* (Pamp.) Y.R.Ling). Among Mustang specimens only Mikage & al. 9964132 (KANP) belongs to typical form and the other specimens are identified as f. *diffusa*. I think, however, f. *diffusa* is merely an ecotype adapted to heavily grazed habitats and is not worth recognizing as a distinct taxon. Ling (1991) also reported *A. demissa* Krasch. from Nepal, but it seems difficult to distinguish from the diffuse form of *A. stricta*.

Miyamoto & al. 20220116 & 20260151 (TI) have extraordinally sericeous leaves and heads but in other respects it is indistinguishable from the other specimens of *Artemisia stricta*.

2. Artemisia wellbyi Hemsl. & H.Pearson [ex Deasy, Tibet Chin. Turk.: 397 (1901), nom. nud.] in J. Linn. Soc., Bot. **35**: 183 (1902); Y.R.Ling in Fl. Xizangica **4**: 789, f. 345 8–14 (1985), in Fl. Reipubl. Popularis Sin. **76**(2): 204 (1991), in Bull. Bot. Res., Harbin **12**: 69 (1992); Springate in Fl. Bhutan **2**(3): 1564, f. 132 d–e (2001).

Artemisia salsoloides Willd. var. *wellbyi* (Hemsl. & H.Pearson) Ostenf. & Paulsen in Hedin, S. Tibet **6**(3): 40 (1922).

Artemisia salsoloides auct. non Willd.: Hooker in Fl. Brit. India **3**: 321 (1881), p. p.

Artemisia capillaris auct. non Thunb.: Kitamura in Enum. Flow. Pl. Nepal **3**: 12 (1982), p. p.

Small shrubs or subshrubs. Stems woody, erect, up to 10 cm tall, often subterranean; leaves tufted at apex of woody stem, green, 4–9 cm overall, petiolate; petiole 2.5–5 cm, wingless; blade 2.5–4 × 1.5–2.5 cm, twice pinnatisect, segments filiform, to 0.2 mm wide, acuminate, sparsely pubescent. Flowering stems several tufted, 8–22 cm tall, simple or branched, stramineous or brownish, glabrous or sparsely pubescent proximally. Leaves on flowering stem 1.5–3 × 1–2 cm, simply pinnatisect, segments 2 or 3 pairs, to

0.5 mm wide, basal 1 or 2 pairs at base of leaves, stipule-like. Flowers June to August. Inflorescences open panicle occupying 1/2–1/3 of flowering stem in height. branches widely divaricate; bracts linear but usually with 1-paired stipule-like smaller segments. Pedicel 1–10 mm, erect, with 1–3 small leaves. Heads globose or widely obovoid, ca. 3 × 3 mm, involucral bracts elliptic, hyaline, midrib wide, green. Marginal florets 8–11; central florets 15–21; corolla of central florets ca. 2 mm. Fruit September. Achenes black, narrowly obovoid, ca. 2 × 0.7 mm. **[**NEPAL**]** C Nepal (known only from Mustang so far), 3700–4500 m. Exposed gravelly places on drier areas, often found sandy floodplain of rivers and scree slopes. **[**RANGE**]** Tibetan Plateau (Xizang), W Himalaya?, C Himalaya, E Himalaya?

SPECIMENS EXAMINED: [Upper Mustang**]** Terrace Plateau N of Dhechyang Khola, 3700 m (Miehe & al. 01-038-03, 13 Aug. 2001, BM –photo); Chele – Syangboche (Watanabe & al. LOM-SP020729(017), 29 Jul. 2002, TI); Yamda La, 3960 m (Iokawa & al. 20320062, 28 Jun. 2003, TI); Syangboche – Ghemi (Iokawa & al. 20315051, 29 Jun. 2003, TI); Syangboche – Charang (Watanabe & al. LOM-SP020730(029), 30 Jul. 2002, TI); Charang – Lo-Manthang (Iokawa & al. 20340002, 1 Jul. 2003, TI); Lo-Manthang – Ghar Gompa (Watanabe & al. LOM-SP020804(006), 4 Aug. 2002, TI); Mustang, 13500 ft (Stainton & al. 2143, 8 Aug. 1954, BM –photo), 14000 ft (Stainton & al. 2387, 12 Aug. 1954, BM –photo); around Lo-Manthang, 3720 m (Miyamoto & al. 20240165, 23 Aug. 2002, TI); W suburb of Lo-Manthang, 3810 m (Iokawa & al. 20320191, 5 Jul. 2003, TI); a hill W of Makhchung, 4320 m & 4500 m (Iokawa & al. 20320149 & 20320153, 3 Jul. 2003, TI).

NOTE: This is the first record of *Artemisia wellbyi* from Nepal. Although Stainton & al. 2143 (BM) from Mustang (Lo-Manthang) was correctly determined by Y. R. Ling (IBSC) as *A. wellbyi*, this result was not included in Ling (1991, 1992). According to my observation in 2003, *A. wellbyi* is widely distributed in the Upper Mustang but lacking south from Samar, where replaced by the next new species, *A. mustangensis*.

3. Artemisia mustangensis Yonek., sp. nov.

Artemisiae wellbyi Hemsl. & H.Pearson affinis sed capitulis minoribus late ovoideis vel ellipsoideis 2.4–2.8 × 1.9–2.5 mm in dense anguste paniculi dispositis, flosculibus paucioribus 10–11, ramulis purpureotinctis differt. A *A. xigazeensis* Ling & Y.R.Ling segmentis foliorum filiformibus capitulis minoribus distinguitur.

Misapplied name: *Artemisia capillaris* auct. non Thunb.: Kitamura in Enum. Flow. Pl. Nepal **3**: 12 (1982), p. p.

Type: NEPAL: Dhaulagiri Zone, Mustang District, Marpha – Syang, 2550 m (M. Mikage & al. 9550344, 21 Sep. 1995, TUS –Holotype; KANP, KATH, TI –Isotypes).

Subshrubs. Stems woody, much branched. Leafy stems sometimes present, leaves congested near apex of leafy stem, 4–8 cm long overall; petiole 2.5–4 cm, stipule-like segments absent at base; blade 1.8–4 × 0.8–1.2 cm, twice pinnatisect, segments filiform, to 0.6 mm wide, acute, sparsely pubescent, primary pinnae 4 or 5 pairs. Flowering stems simple or branched from base, 20–35 cm tall, purplish especially when young, glabrous or sparsely pubescent proximally. Leaves on flowering stem 10–27 × 7–20 mm, twice pinnatisect, segments narrower, to 0.3 mm wide, acuminate, glabrous, primary pinnae 4–6 pairs, basal 1 or 2 pairs at base of leaves, stipule-like. Flowers July to September. Inflorescences ± open panicle but narrower than *A. wellbyi*, occupying 1/2–2/3 of flowering stem. Bracts linear but with 1- or 2-paired smaller segments at base. Pedicel 1–5 mm, leafless or with 1–4 small leaves. Heads erect, ovoid to ellipsoid, 2.4–2.8 × 1.9–2.5 mm, involucral bracts oblong, hyaline, midrib wide, green. Marginal florets 4 or 5, central florets 6, corolla of central florets 1.8–2 mm. **[**NEPAL**]** C Nepal, 2550–3170 m. Rocky or gravelly slopes, exposed dry places or floodplains of rivers. **[**RANGE**]** Endemic to Nepal (Mustang District).

SPECIMENS EXAMINED: [Lower Mustang**]** Tukuche – Jomosom (Ohba & al. 8330618 & 8350522, 19 Jul. 1983, KYO); Marpha – Syang, 2550 m (Mikage & al. 9550344, 21 Sep. 1995, TUS –Holotype); Jomosom, 2750 m (Ohba & al. 8330646, 20 Jul. 1983, KYO, TI; Ishizawa & al. 990908024, 8 Sep.

1999, TI); Ommang – Marpha, 2730 m (Hoshino & al. 9666162, 4 Aug. 1996, TI). [Upper Mustang] Chhusang – Samar, 2970–3700 m (Iokawa & al. 20020035, 10 Jul. 2000, TI); above Chele, 3140 m (Noshiro & al. 20104100, 4 Aug. 2001, TI), 3170 m (Iokawa & al. 20320048, 28 Jun. 2003, TI).

NOTE: This new species is very similar to *Artemisia wellbyi* Hemsl. & H.Pearson in Upper Mustang, but is clearly distinguished by purplish branches of flowering stem, narrower inflorescences, smaller heads and fewer florets. In these respects it is more similar to *A. xigazeensis* Ling & Y.R.Ling of central Tibet, which seems a good species but is unfortunately invalid because it lacked latin description or citation of single replaced name when published. I have not seen the specimens of *A. xigazeensis* but according to Ling (1985)'s description *A. xigazeensis* has more wider and shorter leaf segments and a little larger heads than the new species. Both species are also isolated geographically as the new species is confined in Kali Gandaki Valley southward from the Mustang Gate. Thus I name the new species *A. mustangensis* because it seems endemic to Mustang District.

Additionally there is an anomalous specimen from Upper Mustang (Marang (Chogo) La – Lo-Manthang, 3870 m: Miyamoto & al. 20240123, 19 Aug. 2002, TI). It is subshrubby small plants 7–16 cm tall with simple flowering stem stramineous but purplish proximally, with filiform leaf segments, narrowly paniculate inflorescences occupying less than 1/3 of flowering stem, smaller obovoid heads 2–2.3 × 1.8–2.1 mm ± nodding when mature. It might represent another undescribed species but the formal description is postponed until more adequate materials to be obtained.

4. Artemisia dubia Wall. ex Besser in Nouv. Mém. Soc. Imp. Naturalistes Moscou **3**: 39 (1834); Y.R.Ling in Kew Bull. **42**: 443, f. 1 g–k (1987), in Fl. Reipubl. Popularis Sin. **76**(2): 248 (1991).

Artemisia subdigitata Mattf. in Repert. Spec. Nov. Regni Veg. **22**: 244 (1926); Kitamura in Enum. Flow. Pl. Nepal **3**: 13 (1982).

var. **dubia**: Y.R.Ling in Kew Bull. **42**: 443 (1987), in Fl. Reipubl. Popularis Sin. **76**(2): 248, t. 34, f. 1–8 (1991).

Artemisia subdigitata Mattf. var. *thomsonii* (C.B.Clarke ex Pamp.) S.Y.Hu in Quart. J. Taiwan Mus. **18**: 263 (1965), nom. illeg.; Y.R.Ling in Fl. Xizangica **4**: 783 (1985).

Artemisia parviflora auct. non Roxb. ex D.Don: Kitamura in Kihara, Fauna & Fl. Nepal Himal.: 246 (1955), as "*parvifolia*."

Robust herbs. Stems erect, ridged, sparsely pubescent with appressed hairs. Leaves on basal part of panicles 10–11 × 6–8 cm, pinnatipartite, segments entire, terminal segment lanceolate, 4.5–6.5 × 0.6–1 cm, acuminate, lateral segments 2 pairs, smaller, outwardly curved, basal pair nearly free, inserted to 3 mm above base of leaves, often stipule-like, apical pair adnate to terminal segment, upper surface sparsely pubescent with antrorsely appressed hairs, lower surface grayish-tomentose. Leaves on branches simple or 3-lobed, smaller toward apex. Flowers August. Inflorescences terminal large open panicle, branches divaricate, to 50 cm. Pedicel 1–4 mm, filiform. Heads numerous, broadly ellipsoid or suborbicular, 1.3–1.6 mm, involucral bracts green. Marginal florets ca. 6; central florets few. [NEPAL] W & C Nepal, 2200–3200 m. Habitat not recorded on Mustang specimens, presumably waste places at pathsides. [RANGE] Tibetan Plateau (E Xizang), W & C Himalaya (Uttaranchal, Nepal), E Asia (W China). *Artemisia dubia* var. *subdigitata* (Mattf.) Y.R.Ling is widely distributed in E Asia.

SPECIMENS EXAMINED: [Lower Mustang] Lower Lete – Ghasa, 2255 m (Mikage & al. 9961312, 23 Aug. 1999, KANP).

NOTE: The name *Artemisia dubia* has been long misapplied to several different species until Y. R. Ling (1987) revealed its identity through his close observation of the isotype specimen in K-W. Kitamura (e.g. in Enum. Flow. Pl. Nepal **3**: 12, 1982)'s "*Artemisia dubia*" is actually the mixture of *A. myriantha* Wall. ex Besser, *A. verlotiorum* Lamotte, *A. codonocephala* Diels, *A. calophylla* Pamp., etc. Kitamura (1982) cited Stainton & al. 8199 (BM) from Taglung in Lower Mustang as *A. dubia*. I have not seen the specimen, but it must not be true *A. dubia*, probably but *A. myriantha*.

5. Artemisia sieversiana Willd., Sp. Pl. **3**: 1845 (1804); Kitamura in Fauna & Fl. Nepal

light brown. Utricles 3.5–4.5 × ca. 1.5 mm, biconvex, finely several veined, glabrous, shining, margins scabrous, long becked, beck ca. 2 mm, orifice short bidentate. Stigmas 2. **[**NEPAL**]** W & C Nepal. Habitat in Mustang unknown. **[**RANGE**]** W to E Himalaya (India, N Pakistan, Nepal, Bhutan).

SPECIMENS EXAMINED: [Lower Mustang**]** Kalopani – Tukuche, 2470 m (Suzuki & al. 8800577, 29 Aug. 1988, TI).

8. Carex delicata C.B.Clarke in Bull. Misc. Inform. Kew, Addit. Ser. **8**: 79 (1908); Egorova, Sedges Russia: 354 (1999). **[**Fig. 80**]**

Carex karoi Kukkonen in Fl. Iran. Lfg. no. 173: 236 (1998), non Freyn, in Fl. Pakistan no. 206: 217 (2001).

Cespitose perennial. Culms 20–40 cm. Basal sheaths light brown, fibrillose. Leaves ca. 1/4 of culm length, flat, 1–2 mm wide. Inflorescence lax, of 1-terminal male spike and 3–5 lateral female spikes below. Bracts shorter than peduncle, with sheath. Male spike ca. 1 cm, pedunculate, light brown. Female spikes linear, 1–2 cm × 2–2.5 mm, long pedunculate, erect or ascending. Female glumes ovate, equaling to utricle length, obtuse or mucronate, light brown to brown, midrib green. Utricles elliptic or ovate, ca. 2 mm, plano-convex or compressed trigonous, 2-veined, glabrous, short becked, greenish brown and shining at maturity. Stigmas 2 or 3. Nutlets elliptic, ca. 1.5 × 1 mm. **[**NEPAL**]** New to Nepal (Mustang). Wet shady place. **[**RANGE**]** W & C Himalaya (N Pakistan, Nepal), N Asia (Russia), C Asia, SW Asia (Afghanistan).

SPECIMENS EXAMINED: [Upper Mustang**]** Ghemi, 3520 m (Iokawa & al. 20330061, 30 Jun. 2003, TI).

9. Carex filicina Nees in Wight, Contr. Bot. India: 123 (1834); Clarke in Fl. Brit. India **6**: 717 (1894); Kükenthal in Pflanzenr. **38**: 274 (1909); Koyama in Enum. Flow. Pl. Nepal **1**: 102 (1978); Y.C.Yang in Fl. Xizangica **5**: 402, f. 227 (1987); Noltie in Fl. Bhutan **3**(1): 377 (1994); P.C.Li in W.T.Wang, Vasc. Pl. Hengduan Mts. **2**: 2367 (1994); Kukkonen in Fl. Iran.

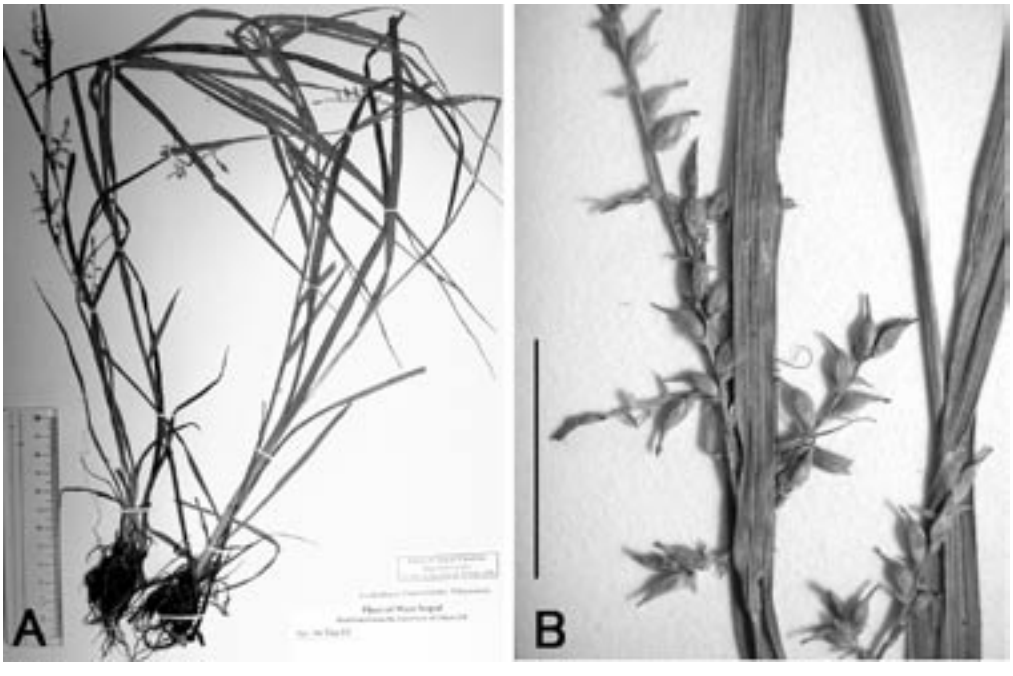


Fig. 81. *Carex filicina* Nees A: Specimen (Hoshino & al. 9670053, BM). Scale 12 cm. B: Partial inflorescence. Scale 1 cm.

Lfg. no. 173: 174 (1998), in Fl. Pakistan no. 206: 181 (2001); S.Yun Liang & al. in Fl. Reipubl. Popularis Sin. **12**: 75 (2000). **[**Fig. 81**]**

Loosely cespitose perennial. Rhizome short, thick, rigid. Culms 40–50 cm. Basal sheaths cream or reddish brown, not fibrillose. Leaves basal and cauline, flat, 5–7 mm wide. Inflorescence consisting of 3–5 lax partial panicles, partial panicles open, triangular in outline, 3–4 × 1.5–2.5 cm. Bracts equaling or longer than inflorescence. Prophylls utriculiform. Spikes 5–15 × 4–5 mm, androgynous, male section shorter than female section. Female glumes up to 1/2 of utricle length. Utricles 2.5–3 × ca. 1 mm, several veined, glabrous, shining, long becked, orifice oblique truncate, reflexed at maturity. Stigmas 3. **[**Nepal**]** W to E Nepal. Habitat in Mustang unknown. **[**Range**]** W to E Himalaya (India, N Pakistan, Nepal, Sikkim, Bhutan), E Asia (China, Taiwan), SE Asia.
Specimens examined: [Lower Mustang**]** Ghasa – Tukuche, 2200 m (Hoshino & al. 9670053, 29 Jul. 1996, TI, BM).

10. Carex myosurus Nees in Wight, Contr. Bot. India: 122 (1834); Clarke in Fl. Brit. India **6**: 723 (1894); Kükenthal in Pflanzenr. **38**: 258 (1909); Koyama in Enum. Flow. Pl. Nepal **1**: 104 (1978); Noltie in Fl. Bhutan **3**(1): 381 (1994); P.C.Li in W.T.Wang, Vasc. Pl. Hengduan Mts. **2**: 2367 (1994); S.Yun Liang & al. in Fl. Reipubl. Popularis Sin. **12**: 65 (2000); Kukkonen in Fl. Pakistan no. 206: 183 (2001). **[**Fig. 82**]**

Cespitose perennial. Rhizome short, thick, rigid. Culms 80–120 cm, stout. Basal sheaths reddish brown. Leaves about equaling to culm length, 6–10 mm wide. Inflorescence slender panicle, ca. 40 cm, 5–10 nodes. Partial inflorescence spiciform, of 10–20 spikes, erect. Bracts longer than partial inflorescence, with long sheath. Spikes cylindrical, 2–4 cm, androgynous, female part 1/3–1/2 of spike length. Specimens collected from Mustang are immature. **[**Nepal**]** W to E Nepal. Open slope. **[**Range**]** Deccan (Peninsular India), Tibetan Plateau (Xizang), W to E Himalaya (India, N Pakistan, Nepal, Sikkim,

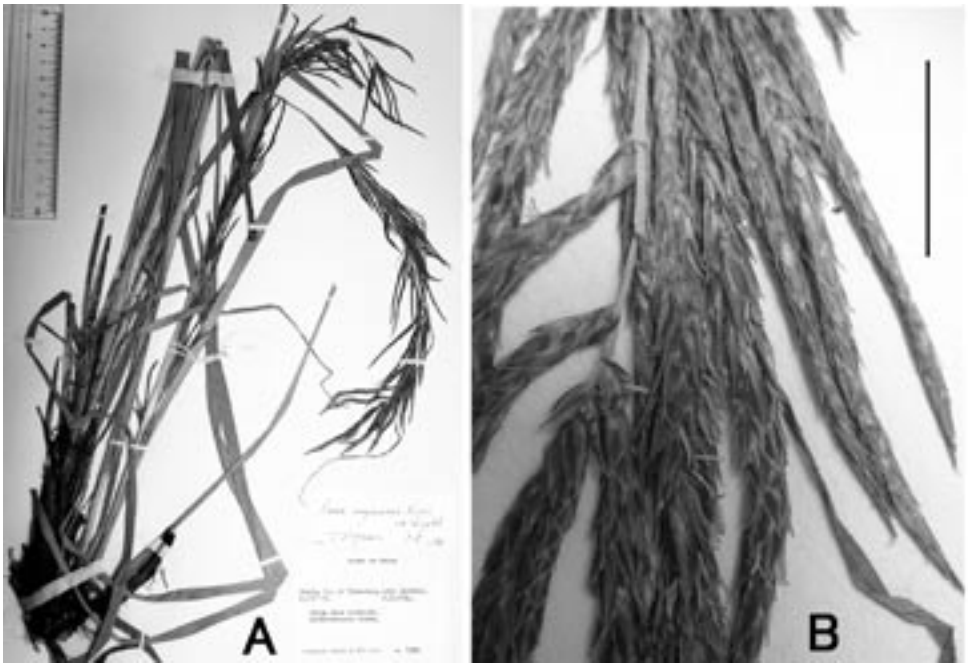


Fig. 82. *Carex myosurus* Nees A: Specimen (Stainton, Sykes & Williams 1955, BM). Scale 12 cm. B: Upper part of inflorescence. Scale 1 cm.

Bhutan), Assam-Burma (Myanmar), E Asia (Yunnan), SE Asia (Vietnam, Indonesia).
Specimens examined: [Lower Mustang] Ghasa (S of Tukuche), Kali Gandaki, 9500 ft (Stainton & al. 1955, 6 Jul. 1954, TI, BM).

11. Carex kumaonensis Kük. in Pflanzenr. **38**: 544 (1909); Koyama in Enum. Flow. Pl. Nepal **1**: 103 (1978). [Fig. 83]

Loosely cespitose perennial. Rhizome short, sometimes with short stolons. Culms 30–80 cm. Basal sheaths light brown. Leaves basal and 1–3 on culm, equaling or shorter than culm, 2–4 mm wide, flat. Inflorescence lax, 3–6 nodes, fascicle, with 2–5 unequal peduncles. Lower bracts with blade, shorter than inflorescence, with sheath, upper bracts setaceous. Spikes on longer peduncle androgynous, sometimes branched, those on short peduncle female, terminal fascicle with 2 or 3 male spikes. Male spikes 10–15 × ca. 2 mm. Female and androgynous spikes 10–15 × ca. 3 mm. Female glumes shorter than utricle, obtuse, mucronate, brownish, margins scarious. Utricles narrowly ovate, 3–3.5 × ca. 1 mm, trigonous, 2-veined, glabrous, greenish brown and shining at maturity, long becked, margins scabrous, orifice short bifid. Stigmas 3. Nutlets obovate, ca. 1.5 × 1 mm, trigonous, short stipitate. [Nepal] C Nepal (Mustang). Sunny moist slope. [Range] C & E Himalaya (Nepal, Sikkim, Bhutan).
Specimens examined: [Upper Mustang] Chhusang – Samar (Iokawa & al. 20020041, 10 Jul. 2000, TI); Chele – Syangboche (Iokawa & al. 20315049, 28 Jun. 2003, TI); Chele – Kyuten, N side of Ghyakar Khola, 3290 m (Iokawa & al. 20320052, 28 Jun. 2003, TI); near Samar, on the bank of Samarkyung Khola, 3400 m (Iokawa & al. 20330042, 28 Jun. 2003, TI).

12. Carex winterbottomii C.B.Clarke in Fl. Brit. India **6**: 727 (1894); Kükenthal in Pflanzenr. **38**: 544 (1909); Koyama in Enum. Flow. Pl. Nepal **1**: 105 (1978). [Fig. 84]

Densely cespitose perennial. Culms 15–25 cm. Basal sheaths brown, fibrillose. Leaves basal, 1/2–1/3 of culm length, flat, up to 2 mm wide. Inflorescence lax, 3–5 nodes, fascicle with 1–3 peduncles. Bracts with sheath, shorter than spike. Terminal spike male, 1–1.5

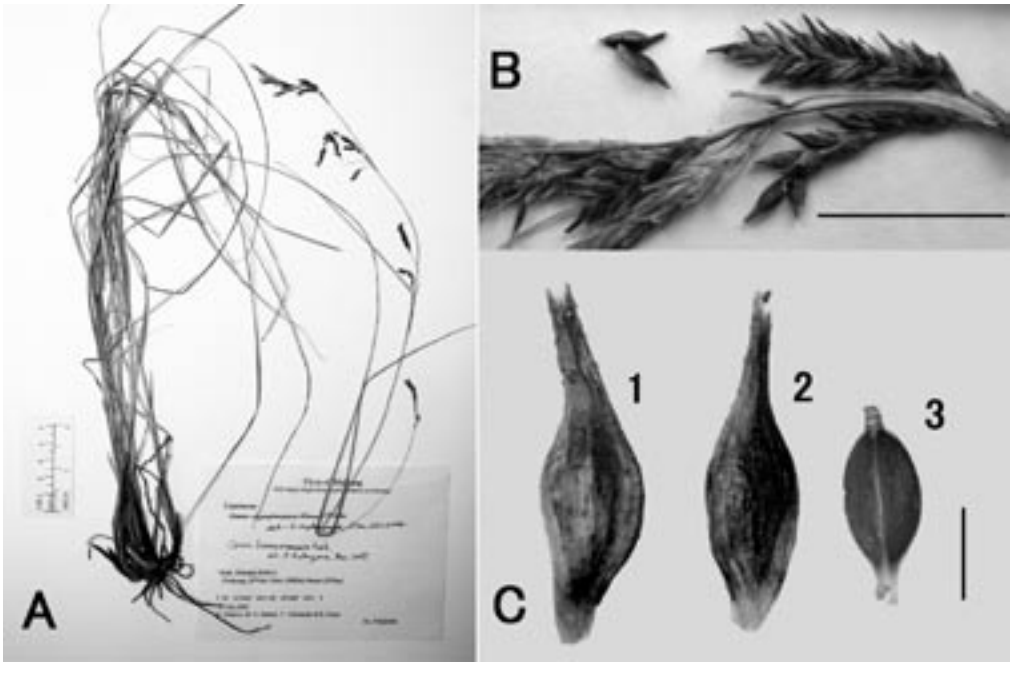


Fig. 83. *Carex kumaonensis* Kük. A: Specimen (Iokawa & al. 20020041, TI). Scale 5 cm. B: Upper part of inflorescence. Scale 1 cm. C: Utricle, 1: dorsal side, 2: ventral side, 3: nutlet. Scale 1 mm.

New Names and Combinations Appearing in Flora of Mustang, Nepal (2008)

1. **Artemisia mustangensis** Yonek., sp. nov. [p. 339]
2. **Artemisia nepalica** Yonek., sp. nov. [p. 346]
3. **Aster semiprostratus** (Grierson) H.Ikeda, comb. nov. [p. 351]
4. **Carex gandakiensis** Katsuyama, sp. nov. [p. 444]
5. **Clematis tibetana** Kuntze subsp. **brevipes** (Tamura) Yonek., comb. & stat. nov. [p. 73]
6. **Gentiana tetramerus** Miyam., sp. nov. [p. 221]
7. **Microula mustangensis** Yonek., sp. nov. [p. 244]
8. **Onosma wallichiana** (A.DC.) Benth. ex C.B.Clarke var. **egregia** (I.M.Johnst.) Yonek., comb. & stat. nov. [p. 240]
9. **Ranunculus membranaceus** Royle var. **stracheyanus** (Maxim.) Yonek., comb. nov. [p. 89]
10. **Ranunculus pulchellus** C.A.Mey. var. **tibeticus** (Maxim.) Yonek., comb. nov. [p. 90]
11. **Salix nepalensis** Yonek., sp. nov. [p. 14]
12. **Salvia transhimalaica** Yonek., sp. nov. [p. 265]