植物研究雑誌
J. Jpn. Bot.
70: 245–252 (1995)

Taxonomic Studies of the *Juncus himalensis* Group in Himalaya

Futoshi MIYAMOTO[a] and Hideaki OHBA[b]

[a]Plant Systematic Laboratory, Faculty of Agriculture, Tokyo University of Agriculture,
1-1-1 Sakuragaoka, Setagaya-ku, Tokyo, 156 JAPAN;
[b]Department of Botany, University Museum, University of Tokyo,
7-3-1 Hongo, Bunkyo-ku, Tokyo, 113 JAPAN

(Received on March 4, 1995)

A *Juncus* plant collected in the Ganesh Himal, Central Nepal, is judged to be a new species and named *Juncus ganeshii*. This is distinguished from similar species, *J. himalensis* Klotzsch, *J. sikkimensis* Hook. f. and *J. sphacelatus* Decne. in length of anthers and relative length between anthers and filaments.

The *Juncus himalensis* group, consisting of three species, *J. himalensis* Klotzsch, *J. sikkimensis* Hook. f. and *J. sphacelatus* Decne., is characterized by having composite head (from 1 to 5), cylindrical leaves, chestnut-coloured flowers and stamens shorter than perianths. The species all occur in Himalaya and grow on marshy places or by streams in high elevations more than 3500 m. During our study of Himalayan Junci we have noticed an unknown species belonging to the group (Fig. 1).

This *Juncus* was collected in Ganesh Himal, Central Nepal in 1994. It differs from the other species of the group in size of the floral parts (Table 1, Fig. 2). The principal component analysis using ten floral characters substantialize the differences among three species (Fig. 4). The new species has normal pollen grains cleary stained by Lactophenol blue solution.

Juncus ganeshii Miyam. et H. Ohba, sp. nov. [Fig. 1]

Speciebus gregis *Junci himalensis* (*J. himalensi* Klotz., *J. sikkimensi* Hook. f. et *J. sphacelati* Decne.) primo adspectu maxime similis, sed longitudine antheriorum (in perianthiis exterioribus 1.80±0.25 mm, interioribus 1.69±0.25 mm) et ratione inter antheras et perianthios exteriora 0.77±0.09 bene differt.

Rhizome short creeping with several short lateral shoots, 0.4–0.8 mm in width. Stems erect, terete (Fig. 1-9), 6–20 cm long, 0.5–0.8 mm wide, grass-green but basally yellowish green. Leaves terete with one groove (Fig. 1-10, 11), auricles rounded (Fig. 1-8), sheathing at base, grass-green; the cauline leaves solitary, linear, 2–6 cm long, 0.3–0.5 mm wide, shorter than stem; the basal leaves 1.5–5.0 cm long, 0.4–0.6 mm wide; leaf sheaths 1–4 cm long, light-brown. Inflorescence 1 or 2 (–3) capitate with several flowers, chestnut-brown; bract scarious, lanceolate, 4–6 mm long, 1.5–2 mm wide; sheathing bract on peduncle, membranous, lanceolate, 4–7 mm long (Fig. 1-7); lowest bracts longer than the flowers sometimes as long as flower, linear-lanceolate, 1–4 cm long, 1.5–3.0 mm wide, terete, grass-green, margin reddish brown (Fig. 1-2). Flowers 5–6 mm long, 1.0–1.5 mm wide, with pedicels 1–3 mm long. Perianth segments lanceolate, inner slightly shorter than outer (Fig. 1-4), 4.5–6 mm

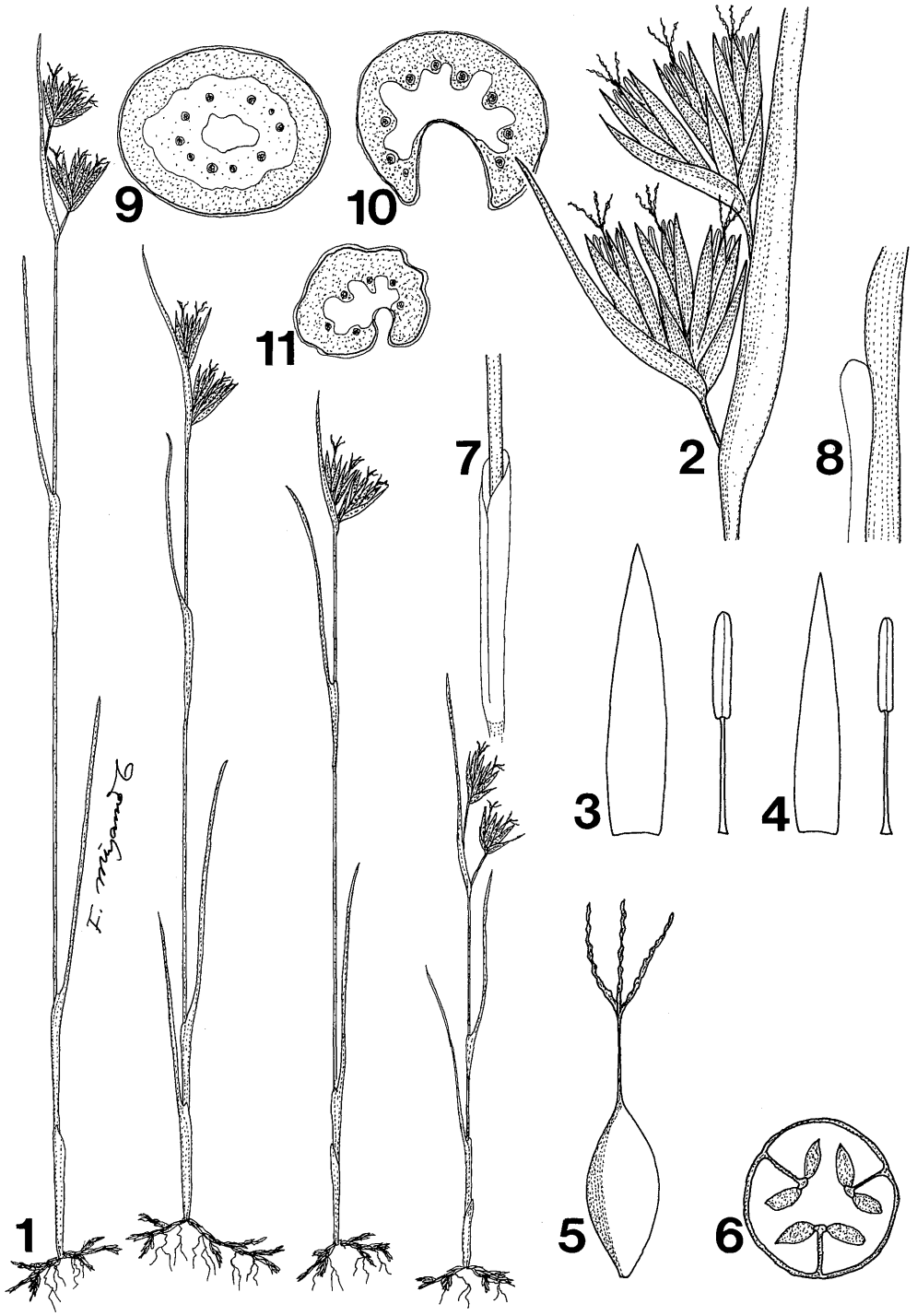

Fig. 1. *Juncus ganeshii* (holotype). 1: Habit (×1). 2: Inflorescence (×4). 3: Outer perianth and stamen (×7). 4: Inner perianth and stamen (×7). 5: Capsule (×7). 6: Cross section of capsule (×18). 7: Sheathing bract on peduncel (×4). 8: Leaf auricle (×4). 9: Cross section of lower part of stem (×30). 10: Cross section of basal leaf (×30). 11: Cross section of cauline leaf (×30).

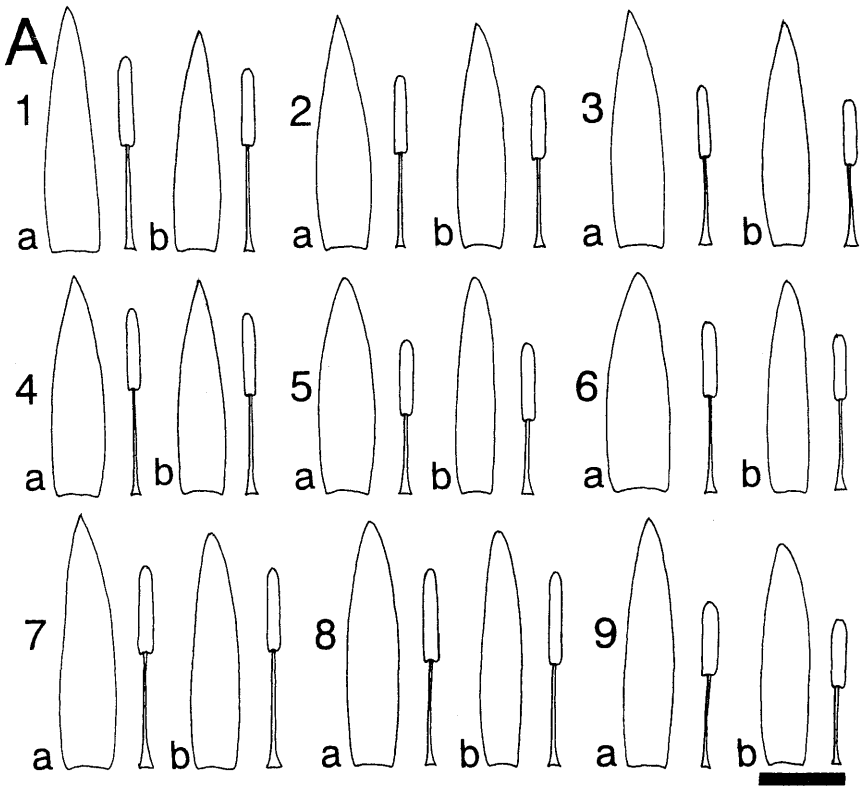

Fig. 2. Individual variation of floral characters. A: *Juncus ganeshii*. B: *J. himalensis*. C: *J. sikkimensis*. D: *J. sphacelatus*. a: Outer perianths and stamens. b: Inner ones. Bar is 1mm. Localities and specimens are shown in appendix.

long, 0.9–1.2 mm wide, outer 5–6 mm long, 1.0–1.6 mm wide (Fig. 1-3), chestnut-brown. Stamens 6, shorter than the perianth, outer ones 3.3–5.0 mm long, inner ones 3.0–5.0 mm long; filaments 1.9–2.8 mm long; anthers, linear elliptic, yellow, 1.4–2.2 mm long, shorter than filaments; Stigma 2–2.5 mm long; Style 1.8–2 mm long. Capsules ovoid-trigonous, triseptate, 3–4 mm long, 1–1.5 mm wide (Figs. 1-5, 6). Seed unknown.

Type: Central Nepal: Rasuwa District, Jaisuli Kund – Paldo Base Camp, alt. 4500 m, on marshy places by streams. 2 Aug. 1994, F. Miyamoto, K. R. Rajbhandari, S. Akiyama, M. Amano, H. Ikeda & H. Tsukaya 9410148 (TI-holo; KATH, A, BM-iso).

The individual variations of the floral features of *Juncus himalensis* group were investigated. The variation of perianths and stamens in these species were shown in Fig. 2. The length of stamens in young flower are variable, so we measured the mature flowers only. *Juncus ganeshii* is most similar to *J. sikkimensis*, but *J. sikkimensis* has long anthers (OAL: 2.93±0.27 mm) and has no cauline leaf. *Juncus ganeshii* is similar to the small plant of *J. sphacelatus* but differs in having round leaf auriculate (Fig. 3).

The size and relative rate of the floral characters of the species were measured and analysed by principal component analysis. The cumulative ratio of eigenvalues of the first to the second principal component amounts to 83%. The first component accounts for 54% of the total variance. Characters with heavy

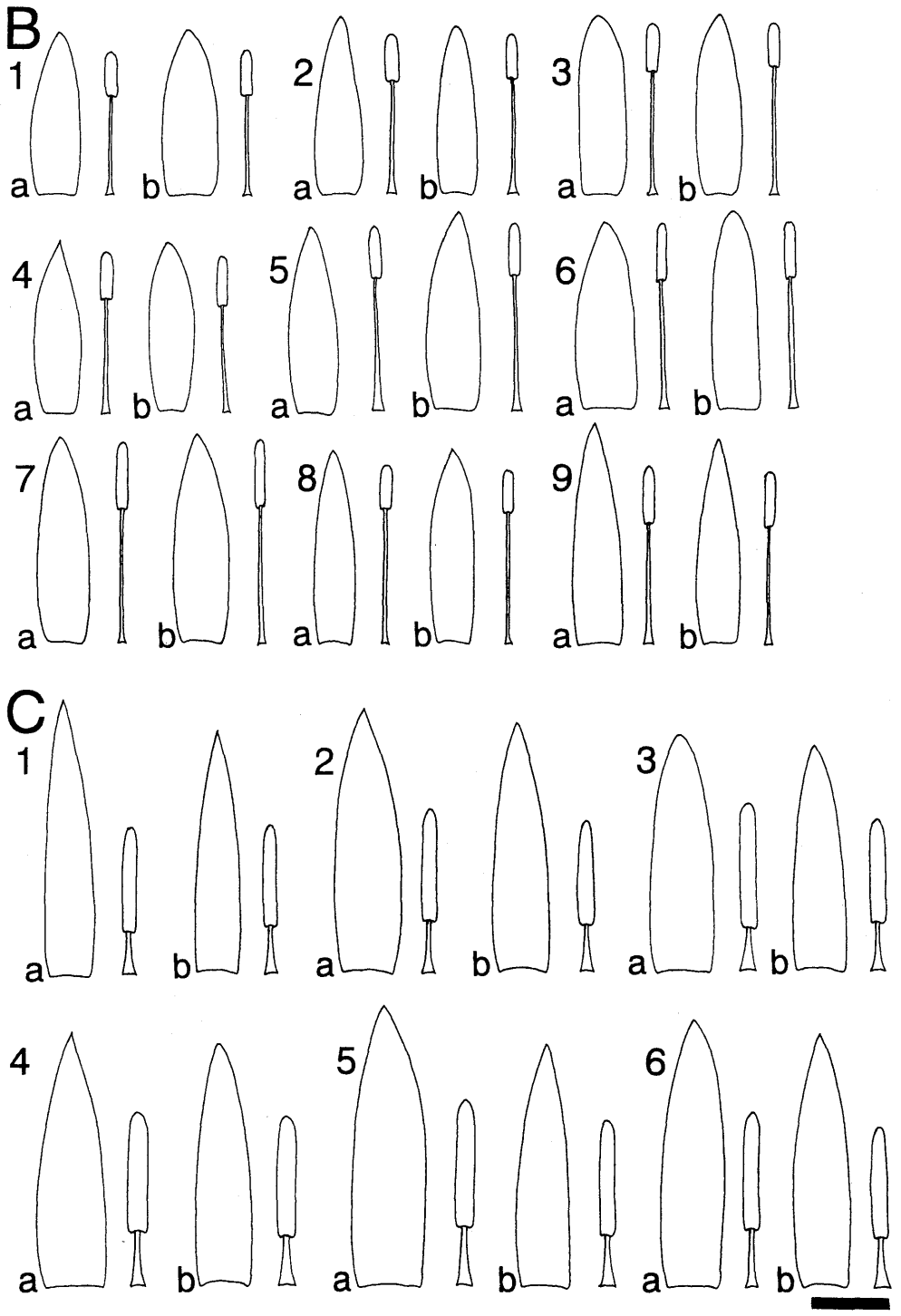

Fig. 2. Continued.

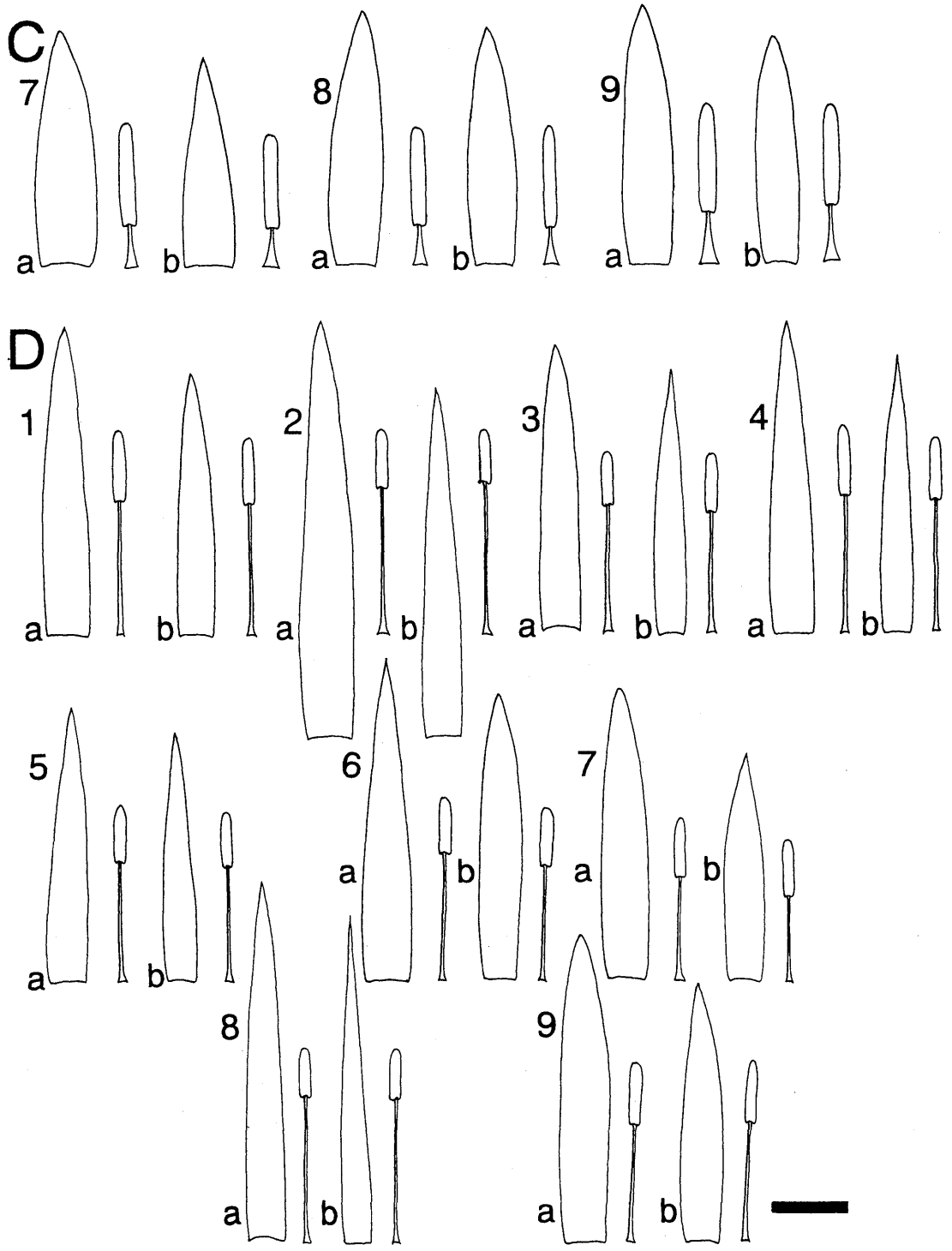

Fig. 2. Continued.

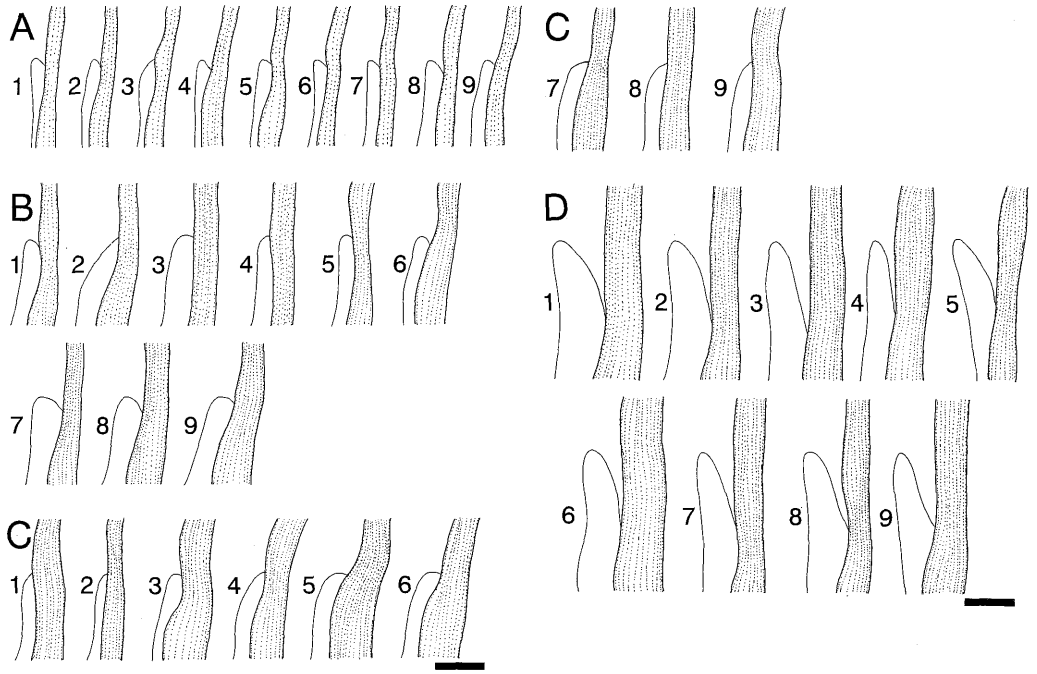

Fig. 3. Individual variation of leaf auricle. Abbreviations are indicated in Fig. 2. Bars are 1 mm.

Table 1. Size and relative ratio (mean±SD) between characters of the *Juncus himalensis* group

Species name/ characters	*J. ganeshii*	*J. himalensis*	*J. sikkimensis*	*J. sphacelatus*
OPL (mm)	5.40±0.28	4.87±0.45	6.81±0.70	8.69±1.69
OPW (mm)	1.35±0.12	1.46±0.19	1.84±0.30	1.38±0.14
OAL (mm)	1.80±0.25	1.39±0.16	2.93±0.27	1.65±0.24
OFL (mm)	2.32±0.25	3.11±0.34	1.30±0.13	3.54±0.38
IPL (mm)	5.07±0.23	4.74±0.38	6.04±0.35	7.54±1.03
IPW (mm)	1.08±0.10	1.33±0.15	1.51±0.13	1.07±0.13
IAL (mm)	1.69±0.25	1.38±0.14	2.67±0.13	1.56±0.24
IFL (mm)	2.14±0.41	3.55±0.32	1.26±0.17	3.49±0.46
OAL/OFL	0.77±0.09	0.45±0.04	2.24±0.19	0.47±0.08
OPL/OSL	1.32±0.12	1.08±0.06	1.61±0.16	1.67±0.16

Character's abbreviation: O: outer, I: inner, P: perianth, L: length, W: width, A: anther, F: filament, S: stamen.

loadings in the first component are OAL, IAL and OAL/OFL. The second component accounts for 29% of the total variations. OPL, IPL and OPL/OSL are heavy in the second component (Table 2). In the two-dimensional plots of the first principal component against the second, principal component analysis was applied in the Fig. 4. The plots of four species were scattered clearly four parts by the first and second

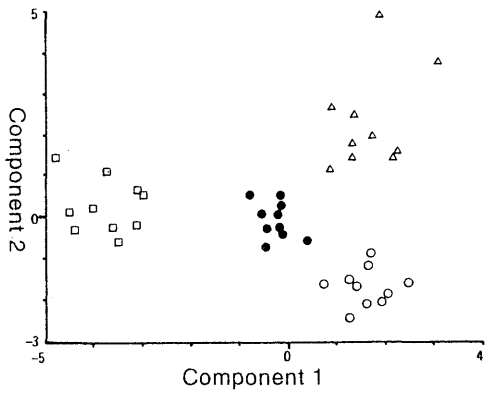

Fig. 4. Scatter diagram of the first principal component to the second principal component. ●: *J. ganeshii*, ○: *J. himalensis*, □: *J. sikkimensis*, △: *J. sphacelatus*.

Table 2. Cumulative variance of the first three principal components and the loadings of 10 characters on each principal component. Character's abbreviation is indicated in Table 1.

Cumulative variance / Character	C1 54%	C2 83%	C3 94%
OPL	–0.021	0.583	0.059
OPW	–0.324	0.030	0.541
OFL	0.379	0.172	0.331
OAL	–0.406	0.087	0.007
IPL	0.006	0.578	0.065
IPW	–0.300	–0.113	0.640
IFL	0.365	0.173	0.368
IAL	–0.404	0.069	–0.032
OAL/OFL	–0.422	0.020	–0.110
OPL/OSL	–0.147	0.490	–0.278

principal component. This new species and *J. himalensis* is plotted nearly in the scatter diagram of Fig. 4, however, there is no overlap in the variations.

Juncus ganeshii is distinguished from the three species by the characters of the anthers, OAL, IAL and OAL/OFL which are heavy roading in the first component. The character of OAL/OFL is divided clearly into four species. The character of length of perianths (OPL and IPL) distinguishes *J. ganeshii* from another species (Table 1).

This study was supported by Grants from the Monbusho International Scientific Research Program (Field Research), No. 06041030 (to H.O. in 1994).

References

Buchenau F. 1906. Juncaceae. *In*: Engler, Pfl.-reich IV-36, Ht. **25**: 221–237.

Appendix

List of the specimens used in Fig. 2. (All are deposited in TI.)

A (*Juncus ganeshii*): 1–9, Central Nepal, Rasuwa Distr., Jaisuli Kund – Paldo base camp, alt. 4500 m, 2 Aug. 1994, F. Miyamoto et al. (9410148-holotype).

B (*J. himalensis*): 1, East Nepal, Sankhuwa Sabha Distr., Khogma – Cha Ding Kharka, alt. 3820 m, 5 Aug. 1990, M. Minaki et al. (9020628). 2, E. Nepal. Sankuwa Sabha Distr., Around Cha Ding Kharka, alt. 4500 m, 7 Aug. 1990, M. Minaki et al. (9020695). 3, ibid., alt. 4100 m, 8 Aug. 1990, M. Minaki et al. (9020711). 4, Central Nepal, Rasuwa Distr., Langtrang Khola – Base Camp (near Yala Kharka), alt. 4020 m, 20 Jul. 1992, F. Miyamoto (9220292). 5, ibid. (9220307). 6, C. Nepal, Rasuwa Distr., Yala Kharka – Langtrang, alt. 3700 m, 22 Jul. 1992, H. Takayama et al. (9220348). 7, Bhutan, Wangdi Phodrang Distr., Tampetso – Tsonsothang, alt. 3900 m, 22 Sept. 1993, F. Miyamoto (9361631). 8, Bhutan, Wangdi Phodrang Distr., Tsonsothang, alt. 4100 m, 22 Sept. 1993, F. Miyamoto (9361647). 9, C. Nepal, Rasuwa Distr., Ganesh base camp – a Kharka, alt. 4180 m, 10 Aug. 1994, F. Miyamoto & M. Amano (9410253).

C (*J. sikkimensis*): 1, East Nepal, Sankhuwa Sabha Distr., Around Cha Ding Kharka, alt. 4200 m, 9 Aug. 1990, M. Minaki et al. (9020758). 2, E. Nepal, Sankhwa Sabha Distr., Around Cha Ding Kharka, alt. 4500 m, 9 Aug. 1990, M. Minaki et al. (9020774). 3, Central Nepal, Rasuwa Distr., Around Yala Kharka, alt. 4750 m, 15 Jul. 1992, H. Takayama et al. (9220204). 4, ibid., Around Base camp (near Yala Kharka), alt. 4920 m, 21 Aug. 1992, H. Takayama et al. (9220316). 5, ibid. (9220317). 6, C. Nepal, Rasuwa Distr., Yala Kharka – Base camp, alt. 4800 m, 16 Jul. 1992, H. Takayama et al. (9220220). 7, ibid., Yala Kharka – Langtrang, alt. 4850 m, 22 Jul. 1992, H. Takayama et al. (9220351). 8, C. Nepal, Rasuwa Distr., Ganesh base camp – a Kharka, alt. 4200 m, 10 Aug. 1994, F. Miyamoto et M. Amano (9410254). 9, Bhutan, Wangdi Phodrang Distr., South of Rinchenzo, alt. 4920 m, 23 Sept. 1993, F. Miyamoto (9361649).

D (*J. sphacelatus*): 1, East Nepal, Ramechhap Distr., Baula Pokhari – Chhu-Ningma, alt. 3960–4040 m, H. Ohba et al. (8570389). 2, E. Nepal, Ramechhap Distr., Botase Kharka – Koshing Kharka, alt. 4000–4500 m, 21 Jul. 1985, H. Ohba et al. (8570642). 3, E. Nepal, Ramechhap Distr., Jata Pokhari – Botase Kharka, alt. 4270 m, 20 Jul. 1985, H. Ohba et al. (8541107). 4, E. Nepal, Sankhuwa Sabha Distr., Around Cha Ding Kharka, alt. 3900 m, 10 Aug. 1990, M. Minaki et al. (9020782b). 5, E. Nepal, Sankhuwa Sabha Distr., Jaljale Himal, Jomle – Goja, alt. 4000–4130 m, H. Ohba et al. (9120224). 6, Central Nepal, Rasuw Distr., Base camp – Langtrang Khola, alt. 4000 m, 19 Jul. 1992, F. Miyamoto (9220283). 7, ibid., Yala

Khalka – Langtrang, alt. 4800 m, 22 Jul. 1992, H. Takayama et al. (9220347). 8, Bhutan, Wangdi Phodrang Distr., Tampetso – Tsonsothang, alt. 3900 m, 22 Sept. 1993, F. Miyamoto (9361628). 9, C. Nepal, Rasuwa Distr., Jaisuli Kund – Paldo base camp, alt. 4320 m, 2 Aug. 1994, F. Miyamoto et al. (9410147).

宮本 太，大場秀章：**ヒマラヤにおける *Juncus himalensis* グループの分類学的研究**

中央ネパール，ガネッシュ・ヒマールにおいて採集されたイグサ属植物より見いだされた1新種（*Juncus ganeshii*）について記載をおこなった．*J. ganeshii* は *J. himalensis, J. sikkimensis* および *J. sphacelatus* に近似するが，葯の長さおよび葯と花糸の比率により，これら3種より明かに区別できる．