

# The genus *Juncus* (Tourn.) L. in East Sikkim (India) with special reference to Pangolakha Wildlife Sanctuary

S.R. Lepcha<sup>1</sup>, Geetamani Chhetri<sup>2</sup> and A.P. Das

Department of Botany, University of North Bengal, Siliguri 734013, Darjeeling, WB, India

<sup>1</sup>Department of Science & Technology, Development area, Gangtok, 737101, Sikkim, India

<sup>2</sup>Botanical Survey of India, Sikkim Himalayan Circle, Gangtok 737103, Sikkim, India

## Abstract

Juncaceae is one of the important families of flowering plants in alpine and sub-alpine zones of Sikkim Himalaya including Pangolakha Wildlife Sanctuary. As such, there is no available record on floristic account *hitherto* being made by botanists on the Sanctuary area. The present paper is a contribution to the Flora of this Sanctuary and enumerated 16 species (out of 37 species in Sikkim and 32 species in East District) of *Juncus* (Tourn.) L. In addition, 18 closely associated plants of the genus *Juncus* were also recorded.

## INTRODUCTION

The family Juncaceae is represented by 10 genera and more than 325 species in the world. In India, it is represented by 2 genera viz. *Juncus* (Tourn.) L. (44 spp.) and *Luzula* DC. (9 spp.) (Karthikeyan *et al.* 1989). Hooker (1892) reported 26 species of *Juncus* for the flora of British India, of these 15 is from Sikkim. Noltie (1994) reported 34 species and Mandal (1996) enumerated 27 species from the state. Srivastava (1996) described 6 species of *Juncus* from Sikkim as new additions to the Flora of India and Shukla *et al.* (2000) described 34 species from Sikkim. In the present state of our knowledge Sikkim represents 37 species of which East District alone harbors 32 species of *Juncus*.

Through the scrutiny of different literatures it is revealed that though work on the Juncaceae of Sikkim has been carried out since Hooker's period but, so far, no record is available on this family for any protected area of the State. This would be a first attempt towards the contribution to the *Juncus* flora of a particular protected area in Sikkim.

## STUDY AREA

Pangolakha Wildlife Sanctuary (PWS), which is the biggest Sanctuary of Sikkim, was come into existence through the notification NO/WL/ F/ 89 dated 07.11.2000. It falls under the IBA site Code no IN-SK-09 and situated in eastern flank of the East District of Sikkim. With the total area of 128 sq km i.e. of  $\pm 29,424,53$  Hectares, it is situated in between 27° 08' 03" N latitude near *Phusrey* in southern tip to 27° 21' 59" N latitude in northern tip near *Jeplepla* and extended from 88° 55' 23" E longitude near *Batangla* to 88° 41' 28" E longitude at *Simane Khola* near *Aritar*. The lowest point of the Sanctuary falls at 27° 11' 35" N latitude and 88° 43' 43" E longitude at *Chukha* river in between *Rigu* and *Sangha* river, where as the highest elevation points falls on 27° 21' 01" N latitude and 88° 53' 16" E longitude.

The map of the Sanctuary is somewhat looks like human footprint. The Northern boundary of the Sanctuary shares with the China. As such, the southern boundary is demarcated on the international boundary with Kingdom of Bhutan up to Neora Valley National Park in West Bengal. However, the eastern border of the Sanctuary is sharing international boundaries of China and Bhutan. The western border of the Sanctuary is common with the boundary of East District of Sikkim. The vicinity of the Sanctuary is partially inhabited by Border Security Force (BSF), Indian Army and by few *Sherpa* and *Bhutia* tribe who sustain the Indian army in the form of labourers, suppliers etc.

The PWS is one of the Hotspots of biodiversity and is located well inside the IUCN recognized ‘Himalaya Hotspot’. It upholds typical alpine, temperate and subtropical vegetation and supports a huge repository of Rhododendrons, Silver firs, Juniper forest and several other herbs, moss-filled oak forests with dense bamboo thickets etc. It provide ideal habitat for various rare and endangered plants viz. *Panax pseudoginseng*, *Aconite spp.*, *Podophyllum hexandrum*, *Nardostachys jatamansii*, *Dactylorhiza*, *Taxus wallichii*, *Paris polyphylla*, *Rheum nobile*, *Picrorhiza koorua* etc. The entire region, crossing along the international borders between Sikkim, China, and Bhutan, is harboring the virgin forests and alpine pastures. It provides contiguous intact belt of habitat for many carnivores and ungulates along the borders of Bhutan and West Bengal. The Sanctuary also support a huge number of migratory water-birds including Eurosean Woodcock (*Scolopax rusticola*) and Wood Snipe (*Gallinago nemoricola*), globally threatened species (Birdlife International 2001) and Tibetan Eared Pheasant (*Crossoptilon harmani*), a near threatened species has also been reported from *Bidang tsho* (Kupup Lake) (Lachungpa 2003).



**Fig. 1. Location map of PWS**



**Fig. 2. Detail map of PWS**

### MATERIAL AND METHODS

The study area (PWS) was explored thoroughly covering different seasons especially in flowering and fruiting seasons during 2004 to 2006. During field study, different species of *Juncus* were observed and collected along with their phenology, morphological and reproductive characters etc. are recorded in a field note book. Specimens were dried, poisoned and mounted on standard herbarium sheets following conventional techniques (Jain & Rao 1977), and then identified consulting literature and matched at BSHC, CAL and NBU. Different associated plants of the genus *Juncus* were also recorded and identified in the similar manner.

### ENUMERATION

The 16 species of *Juncus* (Tourn.) L. has been recorded from PWS are enumerated below along with on dichotomous identification key, protogue and other references, local Lepcha (Lep.) names, flowering and fruiting periods, distribution, references to voucher specimens (*Exsiccatius*), etc.

Key to the species of *Juncus* (Tourn.) L. in Pangolakha Wildlife Sanctuary, East Sikkim:

- 1a. Stem leaves absent; bracts in continuation with stem ..... *J. inflexus*
- 1b. Stem leaves present; bracts not in continuation with stem ..... 2
- 2a. Leaf blades flat, grass like, non-tubular or unchannelled ..... 3
- 2b. Leaf blades filiform, not grass like, tubular or channeled ..... 4
- 3a. Tepals dark reddish-brown; anthers sub-equaling filaments ..... *J. amplifolius*

- 3b. Tepals pale straw coloured; anthers much shorter than filaments ..... *J. clarkei*  
 4a. Inflorescences of fertile flowers; bracts not golden yellow ..... 5  
 4b. Inflorescences of sterile flowers; bracts golden yellow ..... *J. ochraceus*  
 5a. Tepals white, creamy or pale straw coloured ..... 6  
 5b. Tepals non white, brown or greenish ..... 11  
 6a. Lowest bract non-foliaceous, brown or chestnut colored ..... 7  
 6b. Lowest bract foliaceous, green ..... 9  
 7a. Scale leaves loosely encircling stem, not shiny ..... 8  
 7b. Scale leaves tightly encircling stem, shiny ..... *J. leucanthus*  
 8a. Upper stem leaf present; leaves unitubular; septa visible externally ... *J. allioides*  
 8b. Upper stem leaf absent; leaves pluritubular; septa not visible externally ... *J. thomsonii*  
 9a. Leaves aseptate or obscurely septate; septa not visible externally ... 10  
 9b. Leaves prominently septate; septa visible externally ..... *J. grisebachii*  
 10a. Leaves 2-3; bitubular in cross-section ..... *J. benghalensis*  
 10b. Leaf single, X or Y shaped in cross-section ..... *J. khasiensis*  
 11a. Tepals greenish, seeds without tail ..... 12  
 11b. Tepals brownish to reddish-brown or blackish, seeds tailed ..... 13  
 12a. Annuals; stamens 6; capitula 1-flowered ..... *J. bufonius*  
 12b. Perennials; stamens 3; capitula 3- to 10-flowered ..... *J. wallichianus*  
 13a. Inflorescences unbranched; capitulum single ..... 14  
 13b. Inflorescences branched; capitula in pair or more ..... 15  
 14a. Capitulum 2-5-flowered; anthers shorter than filaments ..... *J. triglumis*  
 14b. Capitulum 1-flowered anthers longer than filaments ..... *J. uniflorus*  
 15a. Capitula 3 or more; tepals reddish brown; capsules longer than tepals .... *J. himalensis*  
 15b. Capitula 2; tepals chestnut or blackish-brown; capsules shorter or equalling tepals  
 ..... *J. sikkimensis*

***Juncus allioides*** Franchet in Nouv. Arch. Mus. Hist. Nat. Paris Ser. 2, **10**: 99. 1887; Noltie in Fl. Bhutan **3**(1): 262. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 172. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 469. 2000.

**Local name:** *Mung-chyit-muntsan* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Kashmir, Meghalaya, Sikkim, BHUTAN, CHINA, NEPAL.

**Exsiccatus:** Kupup, 3800 m, 08.08.2004, T.M. Hynniewta & G.M. Chhetri 27551; Kupup Lake surrounding, 3900 m, 24.07.2005, T. M. Hynniewta & G. M. Chhetri 30115; *ibid.*, S.R. Lepcha 30916, 30963 & 30967; Lampokhari to Bhimbase 27.07.2005, S.R. Lepcha 31418; Premlakha 22.10.2004, S.R. Lepcha 32935; Premlakha to Pangolakha 28.10.2004, S.R. Lepcha 32955 & 32960 (BSHC).

***Juncus amplifolius*** A. Camus in Not. Syst. **1**(10): 281. 1910; Noltie, in Fl. Bhutan **3**(1): 261. 1994; Shukla *et al.* in Indian J. Forest. **23**(4): 469. 2000.

**Local name:** *Mung-chyit-syel* (Lep.)

**Flowers & Fruits:** May - Aug.

**Distribution:** INDIA: Sikkim; BHUTAN, CHINA, NEPAL, MYANMAR, TIBET.

**Exsiccatus:** Zuluk 8.06.2006 T.M. Hynniewta & G.M. Chhetri 30048 (BSHC).

***Juncus benghalensis*** Kunth, Enum. Pl. **3**: 360. 1841; Noltie in Fl. Bhutan **3**(1): 267. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 172. 1996; Shukla *et al.* in Indian J. Forest. **23**(4): 470. 2000.

**Local name:** *Mung-chyit-dyep* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Arunachal Pradesh, Jammu & Kashmir, Sikkim, West Bengal, BHUTAN, CHINA, NEPAL.

*Exsiccatus*: Kupup, 4000 m, 08.08.2004, *T. M. Hynniewta & G. M. Chhetri* 27553; Premlakha to Pangolakha 28.10.2004, *S.R. Lepcha* 32995 (BSHC).

*Juncus bufonius* L., Sp. Pl. 328.1753; Hook. f., Fl. Brit. India **6**: 392.1892; Noltie in Fl. Bhutan **3**(1): 252. 1994; Shukla *et al.*, in Indian J. Forest. **23**(4): 471.2000.

**Local name**: *Mung-chyit-gung* (Lep.)

**Flowers & Fruits**: May – September

**Distribution**: INDIA: Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Kerala, Madhya Pradesh, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh; AFGHANISTAN, AUSTRALIA, BHUTAN, CHINA, EUROPE, JAPAN, KAZAKHSTAN, KOREA, MONGOLIA, NEPAL, PAKISTAN, RUSSIA, SRI-LANKA, THAILAND, VIETNAM, N & S AMERICA, S-W ASIA.

*Exsiccatus*: Hatichirey to Tal-kharka 8.10.2004 *S.R. Lepcha* 20227 (BSHC).

*Juncus clarkei* Buchenau in Engler Bot. Jahrb. **6**: 210. 1885; Hook. f., Fl. Brit. India **6**: 400. 1892; Noltie in Fl. Bhutan **3**(1): 260. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 174.1996; Shukla *et al.* in Indian J. Forest. **23**(4): 473. 2000.

**Local name**: *Mung-chyit-mundel* (Lep.)

**Flowers & Fruits**: July – October

**Distribution**: INDIA: Assam, Manipur, Nagaland, Sikkim, Uttar Pradesh, West Bengal; BHUTAN, CHINA, EUROPE, NEPAL.

*Exsiccatus*: Pangolakha to Rachel 2.10.2004, *S.R. Lepcha* 31052; *ibid*, 29.10.2004, *S.R. Lepcha* 32977 & 32986 (BSHC).

*Juncus grisebachii* Buchenan in Abh. Naturwiss. Vereine Bremen **3**: 295. 1872; Hook. f., Fl. Brit. India **6**: 394. 1892; Noltie in Fl. Bhutan **3**(1): 257. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 174. 1996; Shukla *et al.* in Indian J. Forest. **23**(4): 476. 2000.

**Local name**: *Mung-chyit-gyel* (Lep.)

**Flowers & Fruits**: July - October

**Distribution**: INDIA: Arunachal Pradesh, Sikkim, Uttar Pradesh, West Bengal, BHUTAN, CHINA, NEPAL.

*Exsiccatus*: Kupup to Gnathang, 24.07.2005, *S.R. Lepcha* 30969; Pangolakha to Rachel 2.10.2004, *S.R. Lepcha* 31068 (BSHC).

*Juncus himalensis* Klotzsch in Klotzsch & Garcke, Bot. Reise Pr. Waldemar 60, t. 97. 1862; Hook. f., Fl. Brit. India **6**: 398. 1892; Noltie in Fl. Bhutan **3**(1): 255. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 174. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 477. 2000.

**Local name**: *Mung-chyit-lhosa* (Lep.)

**Flowers & Fruits**: June – August

**Distribution**: INDIA: Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttar Pradesh; BHUTAN, CHINA, NEPAL, PAKISTAN, TIBET, E. ASIA.

*Exsiccatus*: Kupup Lake surrounding, 3900 m, 24.07.2005, *T. M. Hynniewta & G. M. Chhetri* 30117 (BSHC).

*Juncus inflexus* L., Sp. Pl. 326. 1753; Noltie, Fl. Bhutan **3**(1): 252. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 174. 1996; Shukla *et al.* in Indian J. Forest. **23**(4): 478. 2000.

**Local name**: *Mung-chyit-dyem* (Lep.)

**Flowers & Fruits**: April – September.

**Distribution**: INDIA: Assam, Himachal Pradesh, Jammu & Kashmir, Kerala, Meghalaya, Manipur, Maharashtra, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh; AFRICA, BHUTAN, BURMA, INDONESIA, MALAYSIA, NEPAL, PAKISTAN, PHILIPPINE ISLAND, SRI LANKA.

*Exsiccatus*: Hatichiray to Tal-kharka, 8.10.2004, *S.R. Lepcha* 27781 (BSHC).

*Juncus khasiensis* Buchenau in Engler Bot. Jahrb. Syst. **12**: 407. 1890; Hook. f., Fl. Brit. India **6**: 399. 1892; Noltie in Fl. Bhutan **3**(1): 260. 1994; Shukla *et al.* in Indian J. Forest. **23**(4): 478. 2000.

**Local name:** *Mung-chyit-nok* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Assam, Meghalaya, Nagaland, Sikkim, Uttarakhand; BANGLADESH, BHUTAN.

**Exsiccatus:** Kupup to Gnathang, 24.07.2005, S.R. Lepcha 30909 (BSHC).

***Juncus leucanthus*** Royle ex D.Don in Trans. Linn. Soc. London **18**: 318. 1840; Hook. f., Fl. Brit. India **6**: 397. 1892; Noltie in Fl. Bhutan **3**(1): 264. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 175. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 480.

**Local name:** *Mung-chyit-kaak* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttar Pradesh; BHUTAN, CHINA, NEPAL.

**Exsiccatus:** Kupup, 4000 m, 08.08.2004, T. M. Hynniewta & G. M. Chhetri 27552 & 27560; Kupup lake surrounding, 3920 m, 24.07.2005, T. M. Hynniewta & G. M. Chhetri 30118 (BSHC).

***Juncus ochraceus*** Buchenau in Abh. Naturwiss. Vereine Bremen **3**: 262. 1872; Hook. f., Fl. Brit. India **6**: 394. 1892; Noltie in Fl. Bhutan **3**(1): 253.1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 176. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 481. 2000.

**Local name:** *Mung-chyit-dangsa* (Lep.)

**Flowers & Fruits:** September - May

**Distribution:** INDIA: Arunachal Pradesh, Assam, Sikkim, West Bengal; BHUTAN, CHINA, NEPAL.

**Exsiccatus:** Rachel, 6.10.2004, S.R. Lepcha 30294; Zuluk to Premlakha 27.10.2004, S.R. Lepcha 32886 (BSHC).

***Juncus sikkimensis*** Hook. f., Fl. Brit. India **6**: 399.1892; Noltie in Fl. Bhutan **3**(1): 256.1994 & Edinb. J. Bot. **51**(2): 134.1994; Shukla *et al.* in Indian J. Forest. **23**(4): 483. 2000.

**Local name:** *Mung-chyit-mungyal* (Lep.)

**Flowers & Fruits:** June – October

**Distribution:** INDIA: Arunachal Pradesh, Sikkim; BHUTAN, CHINA, NEPAL, TIBET

**Exsiccatus:** Kupup, 3900 m, 24.07.2005, T. M. Hynniewta and G. M. Chhetri 30106 (BSHC).

***Juncus thomsonii*** Buchenau in Bot. Zeit. **25**: 148. 1867 & in Engler Pflanzenr. **25**: 224. 1906; Noltie in Fl. Bhutan **3**(1): 268.1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 177. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 484. 2000.

**Local name:** *Mung-chyit-mundok* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Himachal Pradesh, Jammu & Kashmir, Sikkim; BHUTAN, BURMA, CHINA, NEPAL, PAKISTAN, C-ASIA.

**Exsiccatus:** Kupup (Bhimbase), 24.07.2005, S.R. Lepcha 30905 (BSHC).

***Juncus triglumis*** L., Sp. Pl. 328. 1753; Hook. f. Fl. Brit. India **6**: 396. 1892; Noltie in Fl. Bhutan **3**(1): 269. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 178. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 484. 2000.

**Local name:** *Mung-chyit-matsam* (Lep.)

**Flowers & Fruits:** June – September

**Distribution:** INDIA: Himachal Pradesh, Jammu & Kashmir, Sikkim, West Bengal; BHUTAN, CHINA, JAPAN, KOREA, MONGLIA, N.AMERICA, RUSSIA, EUROPE.

**Exsiccatus:** Kupup Lake surrounding, 3900 m, 24.07.2005, T. M. Hynniewta & G. M. Chhetri 30116; *ibid*, S.R. Lepcha 30961 (BSHC).

***Juncus uniflorus*** W.W. Smith in Rec. Bot. Surv. India **6**: 104. 1914; Noltie in Fl. Bhutan **3**(1): 270. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim **1**: 178. 1996; Shukla *et al.*, in Indian J. Forest **23**(4): 485. 2000.

**Local name:** *Mung-chyit-mungkaat* (Lep.)

*Flowers & Fruits:* June – October

*Distribution:* INDIA: Sikkim; BHUTAN, NEPAL, S.E TIBET.

*Exsiccatu:* Kupup Lake surrounding 3900 m, 24.07.2005. *T. M. Hynniewta & G. M. Chhetri* 30113 (BSHC).

*Juncus wallichianus* Laharpe, Monogr. Junc. 139. 1827; Noltie in Fl. Bhutan **3**(1): 231. 1994; Mandal in Hajra & Verma, Fl. Sikkim **1**: 178. 1996; Shukla *et al.*, in Indian J. Forest. **23**(4): 485. 2000.

**Local name:** *Mung-chyit-vaalik* (Lep.)

*Flowers & Fruits:* May – October

*Distribution:* INDIA: Arunachal Pradesh, Assam, Sikkim, West Bengal; BHUTAN, CHINA, JAPAN, KOREA, NEPAL, RUSSIA (SIBERIA), SRI LANKA.

*Exsiccatu:* Lampokhari to Bhimbase 24.07.2005, *S.R. Lepcha* 31100 (BSHC).

## DISCUSSION

The rich bio-diversity of Sikkim is the source of a number of commodities like food, fodder, fuel, fiber, timber, medicine, etc. East district of the state is equally very rich in its temperate and alpine flora. While studying *Juncus* flora in particular, it revealed that this part of the state is very rich in *Juncus* representing 86% of the total species recorded from Sikkim. So far, 16 species of the genus have been collected from PWS, being located in East district it is likely to possess those species occurring in E. Sikkim which are so far not been able to collect from the Sanctuary. *Juncus sikkimensis* an endangered species (Nayar & Sastry 1990) is collected from the Sanctuary. However, *Juncus amplifolius*, *J. clarkei*, *J. inflexus*, and *J. ochraceus* are rare in occurrence within the sanctuary. Table – 1 presents the distribution pattern of different *Juncus* species in the state of Sikkim, East District of Sikkim and in PWS. Further explorations might result in addition of some more species from the Sanctuary. It is also known from the study that these small herbs are playing a vital role in balancing ecosystem and achieving socioeconomic development of the area, special mention can be related to the conservation of wildlife diversity, as all the species act as fodder, and nesting materials to the different species of Wildlife. Yak rearing being one of the important occupation of the people residing in the vicinity of the sanctuary, it along with other domestic animals of alpine region of Sikkim including wild animals depend on *Juncus* as source of fodder.

During the survey 18 species of common associated plants of *Juncus* has been recognized from the study area. Those are *Ainsliaea aptera*, *Anaphalis contorta*, *Anaphalis triplinervis*, *Bistorta amplexicaulis*, *Bistorta macrophylla*, *Carex nubigena*, *Cerastium glomeratum*, *Elsholtzia strobelifera*, *Epilobium wallichianum*, *Fragaria nubicola*, *Gaultheria nummularioides*, *Gaultheria trichophylla*, *Hemiphragma heterophyllum*, *Impatiens radiata*, *Potentilla peduncularis*, *Primula sikkimensis*, *Prunella vulgaris* and *Selinum wallichianum*.

**Table – 1:** Distribution of different species of *Juncus* in Sikkim, East Sikkim and Pangolakha Wildlife Sanctuary.

Sl.No.	Species from Sikkim	Species from		Availability
		East Sikkim	P.W.S	Status
1.	<i>Juncus allioides</i>	+	+	C
2	<i>J. amplifolius</i>	+	+	R
3	<i>J. benghalensis</i>	+	+	C
4	<i>J. brachystigma</i>	+	-	-
5	<i>J. bryophilus</i>	-	-	-
6	<i>J. bufonius</i>	+	+	C
7	<i>J. cephalostigma</i>	+	-	-
8	<i>J. chrysocarpus</i>	+	-	-
9	<i>J. clarkei</i>	+	+	R
10	<i>J. concinnus</i>	+	-	-

11	<i>J. effusus</i>	+	-	-
12	<i>J. glaucoturgidus</i>	-	-	-
13	<i>J. gracilicaulis</i>	+	-	-
14	<i>J. grisebachii</i>	+	+	C
15	<i>J. harae</i>	+	-	-
16	<i>J. himalensis</i>	+	+	C
17	<i>J. hydrophilus</i>	-	-	-
18	<i>J. inflexus</i>	+	+	R
19	<i>J. khasiensis</i>	+	+	C
20	<i>J. kingii</i>	+	-	-
21	<i>J. leucanthus</i>	+	+	C
22	<i>J. leucomelas</i>	-	-	-
23	<i>J. membranaceus</i>	-	-	-
24	<i>J. minimus</i>	+	-	-
25	<i>J. nepalicus</i>	+	-	-
26	<i>J. ochraceus</i>	+	+	R
27	<i>J. perpusillus</i>	+	-	-
28	<i>J. prismatocarpus</i>	+	-	-
29	<i>J. rohtangensis</i>	+	-	-
30	<i>J. sherei</i>	+	-	-
31	<i>J. sikkimensis</i>	+	+	R
32	<i>J. sphacelatus</i>	+	-	-
33	<i>J. thomsonii</i>	+	+	C
34	<i>J. trichophyllus</i>	+	-	-
35	<i>J. triglumis</i>	+	+	C
36	<i>J. uniflorus</i>	+	+	C
37	<i>J. wallichianus</i>	+	+	C

+ Present, - absent. C- Common, R- Rare.

Since, the alpine region of the East Sikkim including Pangolakha range is one extremely sensitive spot for both India and China from the defense point of view. Most recently, the Government of Sikkim under the patronage of the central government has reinitiated the international trade route with China. As such, the Government initiated to extend various structures including widening of major roads. Also the Army settlement and their frequent shifting of camps in these border areas exert much impact on the diversity of both fauna and flora. Therefore, proper attention for biodiversity conservation is needed in such sensitive and vulnerable spots including Pangolakha Wildlife Sanctuary.

#### Acknowledgement

Authors are thankful to the Director, BSI, Kolkata & Joint Director, BSI, Gangtok for encouragements and facilities. To Dr. T.M. Hynniewta Joint Director, BSI, Shillong for his support during field trips. We are also thankful to Department of Forest, Govt. of Sikkim for the granting permission to visit the Sanctuary and to the Head, Department of Botany, North Bengal University and Secretary, Department of Science & Technology, Gangtok for their kind support.

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