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# A Floristic Study of Vascular Plants on the Island of Daikoku, Eastern Hokkaido

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## ABSTRACT

A list of vascular plants (ferns, fern allies and seed plants) of the island of Daikoku, Akkeshi town, eastern Hokkaido has been compiled from seven fieldworks done during 2005–2007. It included 189 plant species with one infraspecific taxon. In contrast to the flora of entire Akkeshi town to which Daikoku belongs administratively, there is notable absence of gymnosperms, Salicaceae, Ericaceae and Orchidaceae on the island. Such absence may be due to the barrier caused by the strait, between the island and the mainland Hokkaido, to the migration of these plants from the mainland and also the scarcity of habitats suitable for them on the island. It has been ascertained that *Cochlearia officinalis* (Brassicaceae) grows on the sea cliffs at the eastern coast of the island. This “re-discovery” gives new data on the western distribution limit of this boreal and sea-cliff species within Hokkaido.

**Keywords:** Akkeshi, *Cochlearia officinalis*, Daikoku, Flora

## INTRODUCTION

Akkeshi to which the island of Daikoku belongs administratively, is one of the main and historic towns in Hokkaido. Akkeshi town is located in the eastern part of Hokkaido, at about 38 km east of Kushiro city. The island of Daikoku lies at the eastern side of the mouth of Akkeshi Bay, about 2.3 km south of the mainland Hokkaido. It is elongate in a northeast-southwest direction, with an area of  $2.2 \times 0.9$  km, and is composed of abrasion sea terrace with a height of about 100 m above sea level (the highest peak is at 105 m). It is almost fully surrounded by sea-cliffs except for a long cusped foreland at the northern tip and two deep valleys facing the southeast. Although the lighthouse keepers and fishermen lived on Daikoku formerly, the island is uninhabited at present.

Tatewaki [1] listed 96 species with four infraspecific taxa for the island in 1953. Shinsho [2] analyzed mainly the meadow vegetation and enumerated 83 species in text and tables in 1981. In this paper, I list 189 species of vascular plants counted on the island, and emphasize the “re-discovery” of *Cochlearia officinalis*.

## RESEARCH METHODOLOGY

Seven botanical explorations were carried out during three consecutive years (2005–2007). Ordered with time/season, the dates of the fieldworks were as follows: May 25 of 2005, June 29 of 2007, July 15 of 2005, August 2 of 2006, August 24 of 2007, August 31 of 2006, and September 21 of 2007. Each fieldwork on the island was participated by two or three botanists and lasted for 3–6 hours.

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We tried to cover all habitats on the island as far as possible. Those habitats include sandy beach, rocky cliffs, grasslands and herbaceous vegetation on terrace, forests and scrubs along valleys. Forests composed of mainly *Betula ermanii* are found in valleys, especially at their head; grasslands of *Artemisia montana*, *Calamagrostis langsdorffii*, *Miscanthus sinensis*, and so forth on terrace; and tall herbaceous vegetation such as *Urtica platyphylla*, *Reynoutria sachalinensis*, *Petasites japonicus* subsp. *giganteus* on the moist slopes on terrace. A small stream flows through the valley, but the island has essentially no persistent ponds and mires. The disturbed areas around lighthouse and small wharfs, and abandoned houses of fishermen are suitable for the growth of naturalized plants.

All vascular plant species only ascertained by voucher specimens are listed in Appendix. The circumscription and order of families in the list follows Melchior [3], and the species are ordered alphabetically within the family. Plant taxa and the literature from which their scientific names were adopted are as follows: ferns and fern allies [4], dicotyledons [5–9], monocotyledons [10] except for Poaceae [11] and Cyperaceae [12]. For the definition of naturalized plants in Japan I followed Shimizu [13]. Author names in the species names follow the list by Brummitt and Powell [14]. The floristic composition was compared with that of Akkeshi town [15]. Akkeshi town flora was partly modified by my additional new data.

## RESULTS AND DISCUSSION

### Number of species

With our recent study (2005–2007), the total

number of vascular plant species collected so far has reached 189. The number of species counted was 73 after the first visit, but increased to 124, mostly double at the second visit. But the number of additional species new to the island became fewer and culminating species number got gradually saturated (Fig. 1). We could not discover the following 14 species which Tatewaki listed about 50 years ago [1]: *Dianthus superbus* L., *Stellaria fenzlii* Regel, *Actaea asiatica* H. Hara, *Fragaria iinumae* Makino, *Vicia cracca* L., *Geranium yesoense* Franch. et Sav., *Bupleurum longiradiatum* Turcz., *Galium trifloriforme* Kom., *Rubia jesoensis* (Miq.) Miyabe et Miyake, *Veronica persica* Poir., *Breia setosa* (M. Bieb.) Kitam., *Matricaria matricarioides* (Less.) Porter, *Senecio vulgaris* L., *Siegesbeckia orientalis* L. subsp. *pubescens* (Makino) H. Koyama. We may be able to find these species on the island in future, but it is also possible that these species disappeared during the past 50 years. In the Tatewaki's list [1], *Rumex aquaticus* L. shall be misidentification of *R. longifolius* DC. (as shown in Ref. 5), and *Carex vesicaria* L. shall be misidentification of *C. sordida* Van Herurck et Muell. Arg. Although not all of the species listed in the tables of vegetation study by Shinsho [2] may be considered uncritically, the growth of *Primula modesta* Bisset et Moore var. *fauriei* (Fr.) Takeda and *Orchis aristata* Fisch, which were listed by Shinsho, may not be denied. Furthermore we could find *Saxifraga fortunei* Hook. f. var. *alpina* (Matsum. et Nakai) Nakai at the upper part of rocky cliffs, although this species is not listed here because of the absence of voucher specimens. Considering these circumstances, I estimate that the number of the vascular plant species is likely to reach to ca. 210 at most for the island of Daikoku.

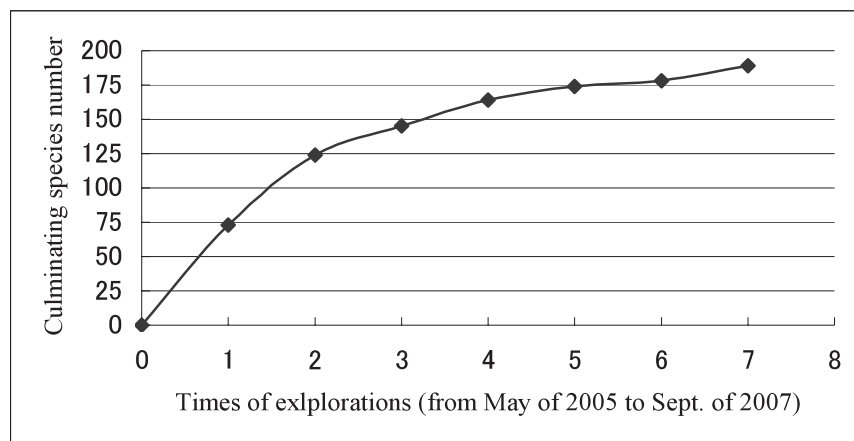


Fig. 1 Culminating species number of vascular plants achieved after each of the seven field explorations on Daikoku.

### Naturalized plants

The number of species of naturalized plants/all (naturalized plus native) plants is estimated as 69/689 or 10.0% for entire Akkeshi town and 17/189 or 9.0% for the island of Daikoku. The percentage of naturalized plant species to total plant species on Daikoku is a bit lower than that of Akkeshi town, but in comparison with the average for Japan it is not so low. The percentage of naturalized plant species is around 10% (5.3–12.7 %) at the scale of a prefecture in Honshu [13]. This shows that the island of Daikoku is never an untouched or completely isolated island; instead, plants have been frequently brought to Daikoku from the mainland. The families with naturalized plant species on the island are as follows (number of species of naturalized/all plants): Poaceae (4/23), Polygonaceae (3/9), Fabaceae (3/5), Asteraceae (3/25), Brassicaceae (2/10), Onagraceae (1/3), and Lamiaceae (1/6). Naturalized plants were found in disturbed areas; especially on the place to dry seaweed *Laminaria* around abandoned houses of fishermen at the northern part of the island.

### Composition of vascular plant families

Dominant families of the flora of entire Akkeshi town and that of the island of Daikoku were compared in Table 1. Of course the order of dominant families disagrees with each other, but the ten dominant families of Daikoku are also found in the thirteen dominant families of entire Akkeshi town (Table 1). On the other hand, the lacking of gymnosperms, families Salicaceae, Ericaceae and Orchidaceae is distinct for only the island of Daikoku. The island

may be scarce of environment suitable for trees and shrubs such as gymnosperms, Salicaceae, and Ericaceae. Also, the strait between the island and mainland Hokkaido most likely works as the barrier to the migration of the vascular plants. Interestingly the seeds are dispersed by wind in Salicaceae, Orchidaceae, and some species of Ericaceae. Possibly the seed dispersal by wind does not work effectively from the mainland Hokkaido to Daikoku.

### *Cochlearia officinalis*

This species was once mentioned by Tatewaki in the postscript of his paper [1], but the voucher specimens had not been confirmed in the Herbarium of Hokkaido University (SAPS) until our field studies. We discovered this species growing on rocky sea-



**Fig. 2** Map showing the distribution of *Cochlearia officinalis* (Brassicaceae) in Hokkaido. The most western dot indicates the Island of Daikoku, Akkeshi town.

**Table 1** Comparison of dominant families between entire Akkeshi town and the island of Daikoku.

| Order | Akkeshi Town<br>Family | No. of spp. | Isalnd of Daikoku<br>Family | No. of spp. |
|-------|------------------------|-------------|-----------------------------|-------------|
| 1     | Cyperaceae             | 72          | Asteraceae                  | 25          |
| 2     | Asteraceae             | 61          | Poaceae                     | 23          |
| 3     | Poaceae                | 57          | Rosaceae                    | 10          |
| 4     | Rosaceae               | 32          | Liliaceae                   | 10          |
| 5     | Liliaceae              | 24          | Brassicaceae                | 10          |
| 6     | Polygonaceae           | 23          | Polygonaceae                | 9           |
| 7     | Caryophyllaceae        | 23          | Cyperaceae                  | 9           |
| 8     | Ranunculaceae          | 23          | Apiaceae                    | 8           |
| 9     | Orchidaceae            | 23          | Caryophyllaceae             | 7           |
| 10    | Brassicaceae           | 22          | Lamiaceae                   | 6           |
| 11    | Apiaceae               | 19          | Woodsiaceae                 | 5           |
| 12    | Lamiaceae              | 18          | Saxifragaceae               | 5           |
| 13    | Fabaceae               | 15          | Fabaceae                    | 5           |

cliffs at the eastern coast of the island. Based on the herbarium specimens deposited in SAPS, the present “re-discovery” indicates the western distribution limit of this boreal and sea-cliff species within Hokkaido (Fig. 2).

## ACKNOWLEDGMENTS

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- ## Appendix
- List of vascular plants of the Island of Daikoku, Akkeshi town, eastern Hokkaido. Representative specimens are cited in parentheses. Abbreviations of collectors: HS- Hiroyuki Sato, HT- Hideki Takahashi, KI- Ken Iwasaki, MM- Maki Murakami, SM- Seiji Miyazawa, and TI- Takeshi Izawa.
- EQUISETACEAE:** *Equisetum arvense* L. (HT 31697, HT31730, HT33277, HT33630)
- DRYOPTERIDACEAE:** *Dryopteris crassirhizoma* Nakai (HT33651); *Dryopteris expansa* (C. Presl) Fraser-Jenk. et Jerm. (HT31737, HT31958); *Polystichum braunii* (Spenn.) Fée (HT31960, HT32980)
- THELYPTERIDACEAE:** *Thelypteris phegopteris* (L.) Sloss. (HT31727, HT33637)
- WOODSIACEAE:** *Athyrium brevifrons* Nakai ex Kitag. (HT32984); *Athyrium melanolepis* (Franch. et Sav.) H. Christ (HT33660); *Deparia pycnosora* (H. Christ) M. Kato (HT33641, HT33642, HT33645); *Matteuccia struthiopteris* (L.) Tod. (HT31717, HT31964); *Onoclea sensibilis* L. var. *interrupta* Maxim. (HT31933)
- BETULACEAE:** *Alnus viridis* (Chaix) Lam. et DC. subsp. *maximowiczii* (Callier ex C.K. Schneid.) H. Ohba (HT 31743, HT33002, HT33242, HT33664); *Betula ermanii* Cham. (HT 31955, HT33246, HT33640)
- FAGACEAE:** *Quercus crispula* Blume (HT32979, HT33247, HT33650)
- URTICACEAE:** *Pilea hamaoi* Makino (HT33262, HT33908); *Urtica platyphylla* Wedd. (HT31908, HT32995)
- POLYGONACEAE:** *Persicaria lapathifolia* (L.) Delarbre var. *incana* (Roth) H. Hara (HS0572); *Persicaria longiseta* (Bruijn) Kitag. (HT33255); *Persicaria nepalensis* (Meisn.) H. Gross (HT34101); *Persicaria thunbergii* (Siebold et Zucc.) H. Gross (HT33263, HT33275, HT33648); *Polygonum aviculare* L. subsp. *aviculare* (HT33272, HT34112); *Polygonum aviculare* L. subsp. *depressum* (Meisn.) Arcang.- naturalized! (HT33304, HT34113); *Reynoutria sachalinensis* (F. Schmidt) Ronse Decr. (HT31683); *Rumex acetosella* L. subsp. *pyrenaeicus* (Poult. ex Lapeyr.) Akeroyd- naturalized! (HT31755); *Rumex crispus* L.- naturalized! (HT31913); *Rumex japonicus* Houtt. (HT33270, HT33898); *Rumex longifolius* DC. (HT33904, HT34130)
- PORTULACACEAE:** *Montia fontana* L. (HT31931, HT32985)
- CARYOPHYLLACEAE:** *Cerastium fontanum* Baumg. subsp. *triviale* (Link) Jalas var. *angustifolium* (Franch.) H. Hara (HT31742, HT31749, HT31922, HT33672); *Honkenya peploides* (L.) Ehrh. var. *major* Hook. (SM710, SM1042); *Moehringia lateriflora* (L.) Fenzl (HT31957, HT33629); *Sagina japonica* (Sw.) Ohwi (HT33254); *Sagina maxima* A. Gray f. *crassicaulis* (S. Watson) M. Mizush. (HT32958, HT32986, HT33905, HT34129); *Stellaria longifolia* Muhl. ex Willd. var. *legitima* Regel (HT31937, HT33644); *Stellaria media* (L.) Vill. (HT31744, HT31897, HT31909, HT31924, HT33649)
- CHENOPODIACEAE:** *Atriplex subcordata* Kitag. (HT31686, HT33296, HT34125); *Chenopodium album* L. (HT32961, HT33299, HT33893); *Salsola komarovii* Iljin (HT33302, SM760)
- SCHISANDRACEAE:** *Schisandra chinensis* (Turcz.) Baill. (HT32973)
- RANUNCULACEAE:** *Anemone debilis* Fisch. ex Turcz. (HT31725, HT31731, HT33678); *Cimicifuga simplex* (DC.) Turcz. (HT31733, HT31950, HT33281, HT33623); *Thalictrum minus* L. var. *hypoleucum* (Siebold et Zucc.) Miq. (HT31718, HT32972)



- ACTINIDIACEAE:** *Actinidia kolomikta* (Maxim. et Rupr.) Maxim. (HT33638, HT33655)
- HYPERICACEAE:** *Hypericum erectum* Thunb. (HT33887); *Hypericum yezoense* Maxim. (HT32963, HT32966, HT32975)
- PAPAVERACEAE:** *Corydalis ambigua* Cham. et Schltdl. (HT31694, HT31705, HT31714)
- BRASSICACEAE:** *Arabidopsis lyrata* (L.) O'kane et Al-Shehbaz subsp. *kamtschatica* (Fisch. ex DC.) O'kane et Al-Shehbaz (HT31754); *Arabis serrata* Franch. et Sav. (HT31926); *Arabis stelleri* DC. (HT31702, HT32954); *Barbarea orthoceras* Ledeb. (SM720, HT33257); *Barbarea vulgaris* R. Br. naturalized! (TI116); *Brassica juncea* (L.) Czern. et Coss. naturalized! (HT31896, HT31925, HT33899); *Capsella bursa-pastoris* (L.) Medik. (HT31895, HT32945, HT33266, HT33675); *Cardamine leucantha* (Tausch) O.E. Schulz (HT33668); *Cochlearia officinalis* L. (SM664, SM722, HT33903); *Draba borealis* DC. (HT34109)
- CRASSULACEAE:** *Hylotelephium verticillatum* (L.) H. Ohba (HT33652); *Rhodiola rosea* L. (HT31695, HT31927); *Pedicularis aizoon* (L.) 't Hart var. *floribundus* (Nakai) H. Ohba (HT31690, HT332950)
- SAXIFRAGACEAE:** *Chrysosplenium flagelliferum* F. Schmidt (HT33283, HT33662); *Chrysosplenium kamtschaticum* Fisch. ex Ser. (HT31723, HT33661); *Hydrangea paniculata* Siebold (HT33245, HT33673); *Ribes latifolium* Jancz. (HT33659); *Saxifraga fusca* Maxim. var. *fusca* (HT33647)
- ROSACEAE:** *Agrimonia pilosa* Ledeb. var. *pilosa* (HT32967, HT33253); *Aruncus dioicus* (Walter) Fernald var. *kamtschaticus* (Maxim.) H. Hara (HT31748, HT31944); *Filipendula glaberrima* Nakai (HT32981, HT33000); *Fragaria nipponica* Makino (HT31707, HT31753, HT33646); *Geum aleppicum* Jacq. (HT31918, HT32942, HT32993, HT33279); *Potentilla sprengeliana* Lehm. (HT31713); *Rosa rugosa* Thunb. (SM567); *Rubus idaeus* L. (HT32976, HT33626, HT33667); *Sanguisorba tenuifolia* Fisch. ex Link var. *tenuifolia* (HT33282, HT33895)
- FABACEAE:** *Lathyrus japonicus* Willd. (MM7004); *Lespedeza bicolor* Turcz. (HT31952, HT33289); *Medicago lupulina* L. naturalized! (HT34121); *Trifolium pratense* L. naturalized! (HT34122); *Trifolium repens* L. naturalized! (HT31905, HT33271)
- GERANIACEAE:** *Geranium sibiricum* L. (HT32943, HT33293)
- RUTACEAE:** *Phellodendron amurense* Rupr. var. *amurense* (HT33654)
- ANACARDIACEAE:** *Rhus ambigua* Lavallée ex Dippel (SM704)
- ACERACEAE:** *Acer pictum* Thunb. subsp. *mono* (Maxim.) H. Ohashi (HT32977)
- BALSAMINACEAE:** *Impatiens noli-tangere* L. (HT31940, HT32968, HT33004)
- CELASTRACEAE:** *Celastrus orbiculatus* Thunb. (HT31948, HT33243); *Euonymus sieboldianus* Blume (HT33003, HT33244, HT34096)
- VITACEAE:** *Vitis coignetiae* Pulliat ex Planch. (HT33656)
- VIOLACEAE:** *Viola sachalinensis* H. Boissieu (HT31712); *Viola mandshurica* W. Becker (HT34120); *Viola verecunda* A. Gray (HT31920)
- ONAGRACEAE:** *Circaea alpina* L. (HT31911, HT31961); *Epilobium amurense* Hausskn. subsp. *cephalostigma* (Hausskn.) Chen et al. (HT32944, HT32994, HT33888); *Oenothera biennis* L. naturalized! (HT33280, HT34127)
- ARALIACEAE:** *Aralia cordata* Thunb. (HT31685, HT33264)
- APIACEAE:** *Aegopodium alpestre* Ledeb. (HT31899, HT33665); *Angelica anomala* Avé-Lall. subsp. *sachalinensis* (Maxim.) H. Ohba (HT31954, HT33627); *Angelica genuflexa* Nutt. ex Torr. et A. Gray (HT33663); *Coelopleurum gmelinii* (DC.) Ledeb. (HT34111); *Conioselinum kamtschaticum* Rupr. (HT31710, HT33294); *Heracleum sphondylium* L. subsp. *montanum* (Schleich. ex Gaudin) Briq. (HT31688, HT31902, HT33625); *Ligusticum hultenii* Fernald (HT31689, HT31929, HT32951, HT34107, HT34110); *Pleurospermum austriacum* Hoffm. subsp. *uralense* (Hoffm.) Sommer (HT31953, HT33624)
- PRIMULACEAE:** *Trientalis europaea* L. (HT31956, HT33634)
- OLEACEAE:** *Fraxinus lanuginosa* Koidz. (HT32990, HT33669, HT33670, HT33671)
- GENTIANACEAE:** *Gentiana zollingeri* Fawc. (HT31752)
- RUBIACEAE:** *Galium pseudo-asprellum* Makino (HT32997, HT33249, HT33911); *Galium verum* L. (HT31708, HT32940, HT32964, HT32965)
- BORAGINACEAE:** *Mertensia maritima* (L.) S. F. Gray subsp. *asiatica* Takeda (HT33301)
- LAMIACEAE:** *Clinopodium chinense* (Benth.) O. Kuntze (HT33292); *Elsholtzia ciliata* (Thunb.) Hyl. (HT34114); *Galeopsis bifida* Boenn. naturalized! (HT32956, HT32978, HT33258); *Lamium album* L. var. *barbatum* (Siebold et Zucc.) Franch. et Sav. (HT31745, HT31910, HT33259, HT33269); *Mentha arvensis* L. var. *piperascens* (Malinv.) H. Hara (HT33260); *Scutellaria strigillosa* Hemsl. (HT32957, HT34103)
- SCROPHULARIACEAE:** *Pseudolysimachion schmidtianum* (Regel) Yamazaki (HT34102, HT34117); *Scrophularia grayana* Maxim. ex Kom. (HT31691, HT31930)
- PLANTAGINACEAE:** *Plantago asiatica* L. (HT33273); *Plantago camtschatica* Cham. ex Link (HT31703, HT32953, HT34105)
- CAPRIFOLIACEAE:** *Sambucus racemosa* L. subsp. *kamtschatica* (E. Wolf) Hultén (HT31721, HT31962, HT33001)
- ADOXACEAE:** *Adoxa moschatellina* L. (HT31687, HT31739)
- CAMPANULACEAE:** *Adenophora triphylla* (Thunb.) A. DC. var. *japonica* (Regel) H. Hara (HT31747, HT33291, HT33894)
- ASTERACEAE:** *Achillea alpina* L. subsp. *japonica* (Heimerl) Kitam. (HT33265, HT33285); *Achillea millefolium* L. naturalized! (HT34123); *Anaphalis margaritacea* (L.) Benth. et Hook. f. (HT32970, HT33635); *Artemisia japonica* Thunb. (HT34100, HT34104); *Artemisia montana* (Nakai) Pamp. (HT31698); *Aster glehni* F. Schmidt var. *glehni* (HT33256); *Cirsium kamtschaticum* Ledeb. ex DC. (HT31912, HT32996); *Dendranthema arcticum* (L.) Tzvelev subsp. *maekawanum* (Kitam.) H. Koyama (HT32952, HT34106, HT34108); *Ixeris repens* (L.) A. Gray (SM721); *Ligularia hodgsonii* Hook. f. (HT31716, HT31947, HT32969); *Matricaria tetragonosperma* (F. Schmidt) H. Hara et Kitam. (HT32959, HT34119); *Parasenecio auriculatus* (DC.) H. Koyama var. *kamtschaticus* (Maxim.) H. Koyama (HT31736); *Parasenecio hastatus* (L.) H. Koyama subsp. *orientalis* (Kitam.) H. Koyama var. *orientalis* (HT31722, HT32999, HT33900); *Petasites japonicus* (Siebold et Zucc.) Maxim. subsp. *giganteus* (F. Schmidt ex Trautv.) Kitam. (HT31684, HT31701); *Picris hieracioides* L. (HT31934, HT32946, HT33286); *Senecio cannabifolius* Less. (SM1013); *Senecio nemorensis* L. (HT31740, HT33248, HT33250, HT33633); *Senecio pseudoarnica* Less. (HT31682, HT33303); *Solidago virgaurea* L. subsp. *leiocarpa* (Benth.) Hultén (HT31720, HT33284); *Sonchus asper* (L.) Hill. naturalized! (HT32948, HT33298); *Sonchus brachyotus* DC. (HT33295, HT33297); *Stenactis strigosus* (Muhl.) DC. naturalized! (HT31935, HT32992); *Taraxacum officinale* Weber-naturalized! (HT31700, HT31704, HT31917); *Taraxacum shikotanense* Kitam. (HT31928); *Taraxacum venustum* H. Koidz. (HT31750, SM1012)

**ZOSTERACEAE:** *Phyllospadix iwatensis* Makino (HT31693, HT31696)

**LILIACEAE:** *Convallaria keiskei* Miq. (HT31719, HT31951, HT33628); *Fritillaria camtschatcensis* (L.) Ker Gawl. (HT31746); *Gagea lutea* (L.) Ker Gawl. (HT31681); *Gagea vaginata* Pascher (HT31680, HT31715); *Hemerocallis dumortieri* Morren var. *esculenta* (Koidz.) Kitam. (SA665); *Lloydia triflora* (Ledeb.) Baker (SM1001, HT31729); *Maianthemum dilatatum* (Wood) A. Nelson et J.F. Macbr. (HT31726, HT33631); *Paris verticillata* M. Bieb. (HT31738); *Polygonatum odoratum* (Mill.) Druce var. *maximowiczii* (F. Schmidt) Koidz. (HT31735, HT33639); *Veratrum album* L. subsp. *oxysepalum* Hultén (HT31734, HT31963, HT33653)

**IRIDACEAE:** *Iris setosa* Pall. (HT31946)

**JUNCACEAE:** *Juncus tenuis* Willd. (HT31914, HT33290, HT33889); *Luzula capitata* (Miq.) Miq. (HT31919, HT31936)

**POACEAE:** *Agrostis clavata* Trin. (HT31939, HT31965); *Agrostis gigantea* Roth- naturalized! (HT33891); *Alopecurus aequalis* Sobol. (HT33679); *Brachypodium sylvaticum* (Huds.) P. Beauv. (HT31941, HT33909); *Calamagrostis hakonensis* Franch. et Sav. (HT33252, HT33274); *Calamagrostis langsdorffii* (Link) Trin. (HT31903, HT31942, HT32971, HT33005); *Elymus dahuricus* Turcz. ex Griseb. (HT32941, HT33251); *Festuca extremiorientalis* Ohwi (HT31943); *Fes-*

*tuca rubra* L. (HT31900, HT31907, HT33680, HT33681); *Hierochloa odorata* (L.) Beauv. var. *pubescens* Krylov (HT31709); *Leymus mollis* (Trin.) Pilger (HT31692); *Miscanthus sinensis* Andersson (HT33288, HT33897); *Phalaris arundinacea* L. (HT32982, HT33901); *Phleum pratense* L.- naturalized! (HT31901, HT32991, HT33276); *Phragmites australis* (Cav.) Trin. ex Steud. (HT33278, HT33902); *Poa annua* L. (HT33657, HT33906); *Poa macrocalyx* Trautv. et Mey. var. *tatewakiana* (Ohwi) Ohwi (HT31966); *Poa palustris* L. (HT31938, HT32947); *Poa pratensis* L.- naturalized! (HT31898, HT31906, HT31915, HT31923, HT31949); *Poa radula* Franch. et Sav. (HT31932, HT33622, HT33643, HT33658); *Poa trivialis* L.- naturalized! (SM779, SM783); *Sasa chartacea* (Makino) Makino (HT31945, HT33287, HT33892)

**ARACEAE:** *Arisaema serratum* (Thunb.) Schott (TI117)

**CYPERACEAE:** *Carex aphanolepis* Franch. et Sav. (KI1318); *Carex gmelinii* Hook. et Arn. (SM740, HT31916); *Carex lanceolata* Boott (SM781, HT31751); *Carex longerostrata* C. A. Mey. (SM1040); *Carex lyngbyei* Hornem. (SM750); *Carex microtricha* Franch. (SM1028, HT33636); *Carex onoei* Franch. et Sav. (SM734); *Carex sabynensis* Less. ex Kunth (SM733, HT33676); *Carex sordida* Van Heurck et Muell. Arg. (HT31921, HT33677)