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Flora and Vegetation of Ukijima Mire

Conservational Flora of Hokkaido 2

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Abstract

In the present paper, the authors listed (1) Lichens, Musci, Pteridophyta and Spermatophyta collected, and (2) plant communities registered in Ukijima Mire centered at 43°56 NL and 142°58 EL, approximately 870 m in alt., C. Hokkaido.

Furthermore the authors discussed on the standards of conservation values of species protected for nature conservation. Using the simplest standard for this, the following items were considered to be "Important species": **A.** *Noticeable species* in Taxonomy and Phytogeography, *Cornus suecica* Linn., *Lycopodium inundatum* Linn., *Vaccinium microcarpum* Linn., *Eriocaulon sachalinense* Miyabe et Nakai; **B.** *Valuable species* for conservation, *Sphagnum* species; and **C.** *Endangered* or *threatened species*, *Sphagnum* species and Bonsai forms of *Picea glehnii*.
Aside from the standards mentioned above, the authors designed "Degree of muddiness" or "Nukarumi-Do" in Japanese to estimate tolerance of plants to treading. From the results, the authors considered that it is imperative to protect the Caricetum limosae, the Scheuchzerio-Rhynchosporetum albae boreale and the Sphagnetea from the treading.

Key Words: Conservational flora, Degree of muddiness, Endangered species, Noticeable species in Taxonomy and Phytogeography, Standards of conservational value of species, Threatened species, Ukijima mire, Valuable species for conservation.

1. Introduction

Ukijima mire is a part of the Takinoue Plateau situated 7 km of the southwest of Mt. Teshio (1,557.6 m in alt.), and 4.5 km of the northnorthwest of Kamikoshi National Railway Station, centered at 43°56 NL and 142°58 EL (Figure 1). The mire has developed on a gently sloping volvanic terrace from 865.5 m to 870 m in alt. The physiognomy of the mire is characterized by 70 deep or shallow pools or ponds, some of which have "Ukijima" or "floating islets". This mire area was designated as a landscape preservation and protection forest by Kamikawa Forestry Office in 1960. Since then, visitors are increasing year by year, and the tourism is affecting the original vegetation which is sensitive to man's impacts, and is leading to the deterioration. From the point of view of nature conservation as well as of phytosociological interest, we conducted our scientific works in 1967 and 1968 (Ito

and Umezawa 1970), and in 1985. As a result, we have concluded that this mire is one of the invaluable mires in Japan, which must be protected from unreasonable man's activities, and managed wisely for the long-term maintenance and preservation because both flora and vegetation are of considerable interest and noticeable as an excellent example of tephra-oligotrophic mire of Japan (*cf.* Wolejko and Ito 1986).

2. Enumeration of plants collected in Ukijima mire

LICHENS

Ascolichens (Ascomycetes)

Cladoniaceae

Cladonia rangifera (L.) Web.	Hanagoke

MUSCI

Sphagnidae cf. Suzuki, H. (1972)

Sphagnaceae

Sphagnum flexuosa Dozy et Molk (=*Sph. amblyphyllum* (Russ.) Zickendr.	Aomorimizugoke
Sph. apiculatum Lindb.	Sankakumizugoke
Sph. dusenii Warnst.	Futoharimizugoke
Sph. fuscum (Schimp.) Klinggr.	Chamizugoke
Sph. magellanicum Brid.	Murasakimizugoke
Sph. papillosum Lindb.	Ibomizugoke
Sph. pulchrum (Braithw.) Warnst.	Utsukushimizugoke
Sph. rubellum Wils.	Akamizugoke
Sph. tenellum Hoffm.	Watamizugoke

Bryidae

Polytrichaceae

Polytrichum spp.	Sugigoke

Grimmiaceae

Rhachomitrium lanuginosum (Hedw.) Brid.	Shimofurigoke

Aulacomniaceae

Aulacomnium palustre (Hedw.) Schwaeger.	Ôimogoke

Amblystegiaceae

Calliergon stramineum (Brid.) Lindb.	Itosasabagoke
Pleurozium schreberi (Brid.) Mitt.	Tachihaigoke

Hepaticae

Lochoziaceae

Gymnocolea inflata (Huds.) Dum.	Heritoriurokogoke

Cephaloziaceae

Cephalozia otaruensis Steph.	Otaruyabanegoke

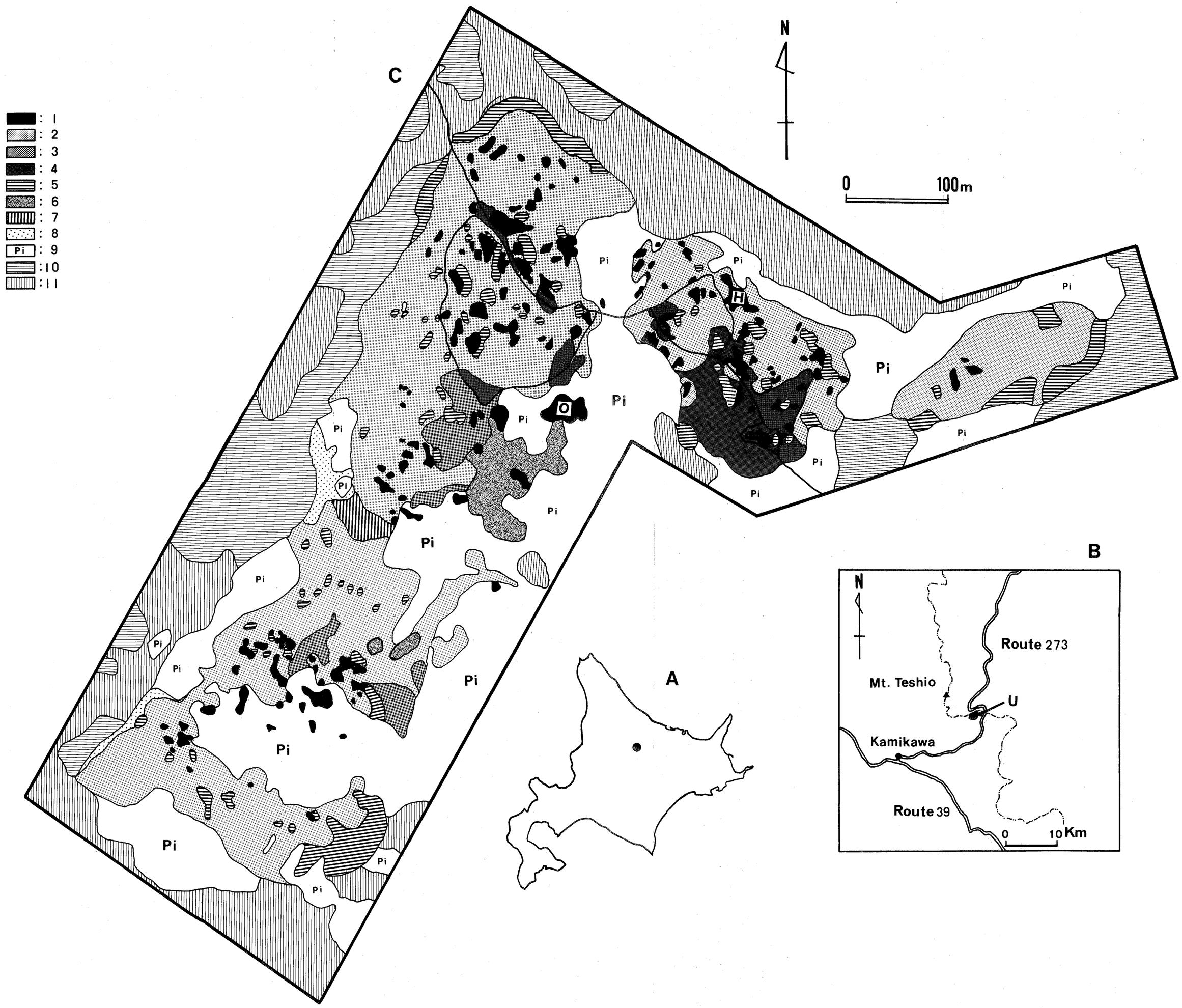

Figure 1. Geological location of Ukijima mire (A & B), and a map of community complexes (C).

Cladopediella fluitans (Nees) Buch	Ukiyabanegoke

PTERIDOPHYTA

Lycopodiaceae	
Lycopodium clavatum Linn. var. *nipponicum* Nakai	Hikagenokazura
L. complanatum Linn.	Asuhikazura
L. inundatum Linn.	Yachisugiran
L. obscrum Linn.	Mannensugi
Osmundaceae	
Osmunda asiatica (Fernald) Ohwi	Yamadorizenmai
Aspidiaceae	
Lastrea phegopteris (Linn.) Bory	Miyamawarabi
L. quelpaertensis (H. Chr.) Copel.	Ôbashorima

SPERMATOPHYTA

GYMNOSPERMAE

Pinaceae	
Abies sachalinensis (Fr. Schm.) Masters	Todomatsu
Picea glehnii (Fr. Schm.) Masters	Akaezomatsu
Pinus pumila (Pallas) Regel	Haimatsu

ANGIOSPERMAE

Dicotyledoneae

Choripetalae

Myricaceae	
Myrica gale Linn. var. *tomentosa* C. DC.	Yachiyanagi
Betulaceae	
Alnus hirsuta Turcz.	Keyamahannoki
Betula ermanii Cham.	Dakekanba
Nymphaeaceae	
Nymphaea tetragona Georgi var. *erythrostigmatica* Ko. Ito	Ezobenihitsujigusa
N. tetragona Georgi var. *tetragona*	Ezohitsujigusa
Ranunculaceae	
Anemone yezoensis (Miyabe) Koidz.	Ezoichige
Caltha palustris Linn. var. *barthei* Hance	Ezonoryûkinka
Coptis trifolia (Linn.) Salisb.	Mitsubaôren
Droseraceae	
Drosera rotundifolia Linn.	Môsengoke
Saxifragaceae	
Parnassia palustris Linn.	Umebachisô
Rosaceae	
Geum pentapetalum (Linn.) Makino	Chinguruma

Prunus maximowiczii Rupr.	Miyamazakura
Rubus chamaemorus Linn.	Horomuiichigo
R. pseudo-japonicus Koidz.	Himegoyôichigo
Sorbus commixta Hedl.	Nanakamado
Rutaceae	
Skimia japonica Thunb. var. *intermedia* Komatsu form. *repens* (Nakai) Owhi	Haishikimi
Aquifoliaceae	
Ilex crenata Thunb. var. *paludosa* (Nakai) Hara	Haiinutsuge
I. sugerokii Maxim. var. *brevipedunculata* (Maxim.) S. Y. Hu	Akaminoinutsuge
Celastraceae	
Euonymus macropterus Rupr.	Hirohatsuribana
Aceraceae	
Acer tschonoskii Maxim.	Minekaede
A. ukurunduense Trautv. et Mey.	Ogarabana
Umbelliferae	
Angelica genuflexa Nutt.	Ôbasenkyû
Cornaceae	
Cornus canadenasis Linn.	Gozentachibana
C. suecica Linn.	Ezogozentachibana

Gamopetalae

Ericaceae	
Andromeda polifolia Linn.	Himeshakunage
Chamaedaphne calyculata Moench.	Horomuitsutsuji
Ledum palustre Linn. var. *diversipilosum* Makai	Ezoisotsutsuji
Leucothoe grayana Maxim. var. *oblongifolia* (Miq.) Ohwi	Hanahirinoki
Menziesia pentandra Maxim.	Koyôrakutsutsuji
Rhododendron albrechtii Maxim.	Murasakiyashio
R. brachycarpum D. Don	Ezoshakunage
Vaccinium hirtum Thunb.	Usunoki
V. microcarpum Linn.	Himetsurukokemomo
V. ovalifolium J. E. Smith var. *coriaceum* H. Boiss.	Ezokurousugo
V. oxycoccus Linn.	Turukokemomo
V. praestans Lamb.	Iwatsutsuji
V. smallii A. Gray	Ôbasunoki
V. uliginosum Linn.	Kuromamenoki
Primulaceae	
Trientalis europaea Linn. var. *arctica* (Fisch.) Ledeb.	Kotusmatorisô
Gentianaceae	
Gentiana triflora Pall. var. *horomuiensis* (Kudo) Hara	Horomuirindô
Tripterospermum japonicum (Sieb. et Zucc.) Maxim.	Tsururindô

Labiatae	
Clinopodium gracile (Benth.) O. Kunze var. *sachalinense* (Fr. Schm.) Ohwi	Miyamatôbana
Lycopus uniflorus Michx.	Ezoshirone
Caprifoliaceae	
Viburnum furcatum Blume	Ôkamenoki
Compositae	
Aster glehnii Fr. Schm.	Ezogomana
Ixeris dentata (Thunb.) Nakai	Nigana
Senecio cannabifolius Less.	Hangonsô

Monocotyledoneae

Potamogetonaceae	
Potamogeton fryeri A. Benn.	Futohirumushiro
Scheuchzeriaceae	
Scheuchzeria palustris Linn.	Horomuisô
Gramineae	
Agrostis scabra Willd.	Ezonukabo
Calamagrostis langsdorffii (Link) Trin.	Iwanogariyasu
Moliniopsis japonica (Hack.) Hayata	Numagaya
Phragmites australis W. Clayton	Yoshi
Sasa kurilensis (Rupr.) Makino et Shibata	Chishimazasa
Cyperaceae	
Carex limosa Linn.	Yachisuge
C. middendorffii Fr. Schm.	Horomuisuge
C. omiana Franch. et Savat.	Yachikawazusuge
C. pauciflora Lightf.	Migaerisuge
C. rhynchophysa C. A. Mey.	Ôkasasuge
C. sachalinensis Fr. Schm.	Gongensuge
C. stipata Muhlenb.	Ôkawazusuge
C. tenuiflora Wahlenb.	Ipponsuge
C. traiziscana Fr. Schm.	Hirohaozenumasuge
Eriophorum vaginatum Linn.	Watasuge
Rhynchospora alba (Linn.) Vahl	Mikazukigusa
Eriocaulaceae	
Eriocaulon sachalinense Miyabe et Nakai	Krafutohoshikusa
Juncaceae	
Juncus effusus Linn. var. *decipiens* Buchen.	Igusa
Liliaceae	
Heloniopsis orientalis (Thunb.) C. Tanaka	Shôjyôbakama
Hemerocallis middendorffii Trautv. et Mey.	Ezozenteika
Hosta rectifolia Nakai	Tachigiboushi

H. rectifolia Nakai var. *atropurpurea* (Nakai) Tatewaki et Kawano	Kurobanatachigiboushi
Maianthemum dilatatum (Wood) Nels. et Macbr.	Maizurusô
Trillium kamtschaticum Pall.	Ôbananoenreisô
Veratrum grandiflorum (Maxim.) Loes. fil.	Baikeisô
Araceae	
Lysichiton camtschatcense (Linn.) Schott	Mizubashô
Orchidaceae	
Listera nipponica Makino	Miyamafutabaran
Platanthera mandrinorum Reichb. fil. var. *brachycentron* (Franch. et Sav.) Koidz.	Yamasagisô
P. tipuloides Lindl. var. *nipponica* (Makino) Ohwi	Kobanotonbosô
P. tipuloides Lindl. var. *tipuloides*	Hosobanokisochidori
Pogonia japoncia Reichb. fil.	Tokisô
Pog. japonica Reichb. fil form. *pallescens* Tatewaki	Shirobanatokisô
Tultis ussuriensis (Regel) Hara	Tonbosô

3. Enumeration of plant communities

HYDROPHYTE COMMUNITIES

Submerged plant communities

1. *Batrachospermum vagi* Ito & Umezawa 1970, nom. prov.
   a. Batrachospermum vagum soc. Ito & Umezawa 1970

Floating-leaf communities

2. *Nymphaeetum tetragonae* auctt.: Ito & Umezawa 1970; Ito & Tachibana 1985
   b. Nymphaea tetragona soc. Ito & Umezawa 1969; Ito & Tachibana 1985
3. *Potamogeteum fryeri* Ito & Umezawa 1970
   c. Potamogeton fryeri soc. Ito & Umezawa 1970

MOSS VEGETATION

Hollow plant communities

4. *Caricetum limosae* Miyawaki *et al.* 1967: Ito & Umezawa 1970
   d. Carex limosa soc. Ito & Umezawa 1970
   e. C. limosa-Eriocaulon sachalinense soc. Ito & Umezawa 1970
5. *Scheuchzerio-Rhynchosporetum albae boreale* Ito & Umezawa 1970
   f. C. limosa-R. alba-Sphagnum apiculatum soc. Ito & Umezawa 1970
   g. C. limosa-R. alba-Sphag. pulchrum soc. Ito & Tachibana 1985
   h. Scheuchzeria palustris-R. alba soc. Ito & Umezawa 1970, Ito & Tachibana 1985
6. *Moliniopsido japonicae-Rhynchosporetum albae* Ko. Ito, assoc. nov., sed nom. prov.

i. Moliniopsis japonica-R. alba soc. Ito & Umezawa 1970

7. *Geo-Rhynchosporetum albae* Ko. Ito, assoc. nov., sed nom. prov.

j. Geum pentapetalum-R. alba soc. Ito & Umezawa 1970

Hummock plant communities

8. *Sphagnetum papillosi* Miyawaki *et al.* 1967: Ito & Umezawa 1970. = *Rubo chamaemori-Sphagnetum papillosi* Miyawaki & Ohba 1970: Ito & Tachibana 1985.

k. Sphagnum magellanicum soc. Ito & Tachibana 1985

l. Sph. papillosum soc. Ito & Umezawa 1970: Ito & Tachibana 1985

m. R. alba-Sph. papillosum soc. Ito & Umezawa 1970: Ito & Tachibana 1985

9. *Ledo-Sphagnetum fusci* Miyawaki & Ohba 1970: Ito & Tachibana 1985. = *Sphagnetum fusci* acutt.: *Vaccinio-Caricetum middendorflii sensu* Ito & Umezawa 1970, non. Suz.-Tok. p. p. minor.

n. Sph. fuscum soc. Ito & Tachibana 1985

10. *Vaccino-Caricetum middendorffii* (Suz.-Tok.) Ito & Umezawa 1970. = *Oxycocco-Caricetum middendorffii* Suz.-Tok. 1964.

o. Carex middendorffii-Sph. rubellum soc. Ito & Tachibana 1985 (Vaccinium oxycoccus-C. middendorffii soc. Ito & Umezawa 1970, p. p. minor.)

p. C. middendorffii-R. alba-Sph. tenellum soc. Ito & Tachibana 1985 (Vac. oxycoccus-C. middendorffii soc. Ito & Umezawa 1970, p. p. minor.)

q. V. oxycoccus-C. middendorffii soc. Ito & Umezawa 1970.

11. *Carici-Moliniopsidetum japonicae* Miyawaki, Itow & Okuda 1967

r. Myrica gale var. tomentosa-Geum pentapetalum-C. middendorffii soc. Ito & Umezawa 1970: Ito & Tachibana 1985

s. Ledum palustre var. diversipilosum-C. middendorffii soc. Ito & Umezawa 1970: Ito & Tachibana 1985

t. G. pentapetalum-C. middendorffii soc. Ito & Umezawa 1970

u. Osmundastrum cinnamomeum var. fokiense-C. middendorffii soc. Ito & Umezawa 1970: Ito & Tachibana 1985

v. Hosta rectifolia var. atropurpurea-C. middendorffii soc. Ito & Tachibaba 1985

12. *Geo-Cladonietum* Ko. Ito, assoc. nov. 1970

w. G. pentapetalum-Cladonia spp. soc. Ito & Umezawa 1970: Ito & Tachibana 1985

FEN VEGETATION

Macroherbaceous communities

13. *Phragmitetum australis* auctt. = *Phragmitetum communis* auctt. = *Phragmitetum oseaum* Suz.-Tok. 1954

x. Phragmites australis soc.: Ito & Tachibana 1985

y. Calamagrostis langsdorffii soc. Ito & Umezawa 1970

z. Hemerocalis middendorffii-Phragmites australis soc. Ito & Umezawa 1970

FOREST VEGETATION

14. *Ledo-Piceetum glehnii* Ito & Umezawa 1970, nom. prov. sine diagn. sp.: Ito & Tachibana 1985
   aa. Picea glehnii-Ilex sugerokii var. brevipedunculata-C. middendorffii soc. Ito & Umezawa 1970: Ito & Tachibana 1985
   ab. P. glehnii-L. palustre var. diversipilosum-C. middendorffii soc. Ito & Umezawa 1970

4. Discussion and Conclusion

In a previous work (Ito and Umezawa 1970), Ito calculated a similarity coefficient (Czekanowski 1913, accord. to Greig-Smith 1964). The results were shown in the species combination with high coefficients such as *Carex limosa-Rhynchospora alba, R. alba-Drosera rotundifolia-Vaccinium oxycoccus* (incl. *V. microcarpum*), *Carex middendorffii-V. oxycoccus, C. middendorffii-Hosta rectifolia* var. *atropurpurea*. Here, *C. limosa* and *R. alba* form a *C. limosa-R. alba* soc. in hollow parts, and the former is a major species in the Caricetum limosae, and the latter is one in the Scheuchzerio-Rhynchosporetum albae boreale. *Carex middendorffii, V. oxycoccus*, and *H. rectifolia* var. *atropurpurea* are species commonly found in hummock parts, and the former two species are the character species of the Vaccinio-Caricetum middendorffii, and the rest is one of the physiognomically important species of that association. Close combination of those species indicates the skeleton of spontaneous vegetation in Ukijima mire.

The Caricetum limosae and the Scheuchzerio-Rhynchosporetum are conservationally important communities, because they are the representatives of mire vagetation developed under extremely wet conditions; they are communities which have been maintained in a dynamic balance between water circulation and peat accumulation (development); and they are less resistant to the treading or the trampling. In fact, frequent treadings have led to the destruction and deterioration of some communities of this mire including those associations and the Sphagnetea. When man encroaches the edge of ponds and walks through the carpet of Sphagna without caution, floating islets covered with the Saphgnetea and those associations easily disappear. Areas and communities which are affected by this kind of impact are gradually increasing and have metamorphosed from natural vegetation to a plantless peat mass in landscape as seen in Figures 2 to 5.

In 1985, we designed a scale of how to evaluate the damage caused by the treading. Ito called it "degree of muddiness" or "Nukarumi-Do", and defined 5 grades of the degree, which can be evaluated by perception of muddy conditions, when man walks through a community cover.

A principle of the degree of muddiness is based on the fact that the surface of wetlands is usually wet but organized by accumulated peat layers so that it is easily modified into disorganized and muddy conditions by the disturbance of man's impacts such as the treading resulting from mechanical pressures of pressing, twisting, sliding, digging of the surface layer of wetlands. Muddiness of the surface

of wetlands is thought to be an expression of man's impacts caused by walking or treading in comparison to normal, undisturbed condition of the surface layer.

According to the degree of muddiness as shown in Table 1, evaluation of the damage was measured along a trail, which leads from the southern entrance of the mire, usually called "Nakakoshi Entrance", to the center of the mire as shown in Figure 1. The total length of trail was 438.3 m, and the result is shown in Table 2.

Table 1. Five grades of the degree of muddiness

Grades	Contents
1	The earth surface is normal or nearly normal, hard or soft; the damage of vegetation is very low and the stripping of surface layer by man's impacts are limited or none.
2	The surface is nearly normal, hard or soft; the stripping of surface layer is recognizable, but the vegetation is mostly sound.
3	The surface is becoming soft; the stripping of surface layer is conspicuous, and the vegetation is damaged.
4	The surface is quagmire; the vegetation is vanishing.
5	The surface is completely muddy, and walking is impossible; the vegetation is disintegrated with or without fragmentations of the components.

Table 2. Frequencies of Degree of muddiness along a trail from the southern entrance to the center of mire

Grades of degree of muddiness	No. of samples*	Length (m)	Percentages (%)**
1	13	29.7	6.8
2	29	137.8	31.4
3	24	76.5	17.5
4	25	114.7	26.2
5	5	79.6	18.2

* sample area: $1 \times 1\ m^2$

** Length occupied by a given degree of muddiness/Total length (438.3 m)×100(%)

Furthermore, Table 3 shows that the relations of the degree of muddiness to plants.

Table 2 shows that percentages of the degree of muddiness from 4 to 5 are 44% of the total length of trail; the so-called fragile vegetation has been considerably destroyed and the habitat is too muddy to walk through the mire on foot. It means that half of the trail was across a fragile vegetation which is mostly composed of the hummock-hollow system, when the Forestry Office designated this mire as a recreation forest. As a result of repeated treading of the designated course of the trail by visitors who view and enjoy the mire landscape, the course was stripped of its surface layer and become barren with mud (Figure 2). In

Table 3. Frequencies of main plants in each degree of muddiness

Degree of muddiness	Weak ←				→ Strong	Frequencies of all samples (96)
	1	2	3	4	5	
No. of samples	13	29	24	25	5	
No. of species	21	25	14	14	7	
Species						
Hosta rectifolia var. *atropurpurea*	53.8%	37.9%	16.7%	12.0%	40.0%	29.2%
Gentianaf triflora form. *horomuiensis*	23.1	20.7	8.3	0	20.0	12.5
Carex middendorffii	100.0	55.2	41.7	28.0	0	20.0
Rhynchospora alba	46.2	48.3	54.2	68.0	60.0	56.3
Scheuchzeria palustris	15.4	6.9	16.7	36.0	6.0	20.8
Sphagnum papillosum	53.8	10.3	20.8	20.0	0	20.8
Geum pentapetalum	100.0	48.3	33.3	0	0	37.5
Vaccinium oxycoccus	23.1	13.8	0	8.0	0	9.4
Coptis trifolia	7.7	17.2	4.2	0	0	7.3
Eriophorum vaginatum	15.4	0	4.2	4.0	0	4.2
Moliniopsis japonica	7.0	10.3	0	4.0	0	5.2
Carex omiana	0	13.8	4.2	20.0	0	10.4
Solidago virga-aurea var. *leiocarpa*	7.7	3.4	0	0	0	2.1
Andromeda polifolia	30.8	3.4	0	0	0	5.2
Ledum palustre var. *diversipilosum*	15.4	10.3	0	0	0	5.2
Carex limosa	0	0	8.3	20.0	40.0	9.4
Eriocaulon sachalinense	0	0	0	4.0	20.0	2.1
Lysichiton camtschatcense	0	0	0	4.0	20.0	2.1

spring when melting water floods the mire, or after showers, this course becomes a water course, and the vegetation and the surface layer was eroded to lead to a complete disappearance of the vegetation and to a modification of topography (Figure 3).

Table 3 shows that different plants react to impacts by man in different manners. Most plants, however, decrease their survival percentages from weak impacts to strong impacts as seen in such plants as *Carex middendroffii, Geum pentapetalum* (although this plant is not a mire plant), *Sphagnum papillosum*, but some have survived strong impacts as seen in *Carex limosa* and *Rhynchospora alba*, which are plants with lower vitality.

Through the field observation and examination of the Tables communities which are most susceptible to the treading are the Caricetum limosae, and the Scheuchzerio-Rhynchosporetum albae boreale (Figures 4 and 5). The typical association of ponds, the Nyphaeetum tetragonae, is affected by erosion of boggy surface: lower transparency resulted from the suspension of minute particles. The Sphagnetea are considerably damaged by the treading: barren moss carpet, and invasion of extra-Sphagnetea plants from outside of the association.

At the present time, those associations are the most notable communities from the point of view of nature conservation. It, however, is fortunate that the damage is not so serious, and the vegetation may survive for a while. A suitable treatment

carried out in the Ozegahara mire by Tachibana *et al.* (Tachibana 1976) will be a great help to repair the affected areas or parts of the vegetation.

There are several ways to evaluate the importance of species from a conservational point of view. In 1978, Shimizu *et al.* attemped to set forth an objective standard of important species in a conservational sense. In this attempt it was stressed that the standard should be based on the score method, in which several items were selected as follows: (1) number of individuals, (2) attribution to any vegetation type, (3) dimensions or areas of the vegetation type attributed, (4) propagation capacity, (5) life-form, (6) geographical range, (7) importance of the taxonomical group including a given species, (8) fluctuation of number of individuals during the latest several years, (9) possible danger of allowing a species to be extinguished from the original habitat, and (10) significance of a given species for rare animals co-existed. In every case, 5 classes are defined, ranging from 1 to 5. Although Ito took part in this plan, he was hardly agreeable to this method, because items to be selected will increase indefinitly according to our evolving knowledge of plants, and because the whole is not the sum of parts as the ecological principle states. We think that the total evaluation of a species is essential in this case, and that simple is best.

In *Nature Conservation Review* edited by Ratcliffe (1977), reviewers showed that the grading of sites resulted from the comparison of site qualities among similar types of sites. Items cited are (1) size or extent, (2) diversity, (3) naturalness, (4) rarity, (5) fragility, (6) typicalness, (7) recorded history, (8) position in an ecological/geographical unit, (9) potential value, and (10) intrinsic appeal. Despite numerous items, complexity was avoided by giving a clear description of each category. They calculated variety of sites according to 4 degrees of grade, from grade 1 to 4.

In particular, we think that the following are in agreement with our opinion: the present view is an attempt to prescribe the contemporaneous requirement for conservation of special sites according to current values, views, information and constraints. However, elaborate the rationalisations which might be made to justify the way it has been done, it would be wrong to disclaim the element of intutition involved, though one hopes that this is built on awareness and experience. The method of evaluation and site election used in the *Review* are therefore provisional and pragmatic, and dictated especially by incompleteness of survey information and the need to produce a working report within a reasonable time. Urgency and realism rather than theory and idealism have been the keynote of the operation. (p. 14).

In 1981, Russian botanists, S. S. Xarievich and N. N. Kachura proposed six standards for selection of species to protect for nature conservation as follows:

0: *near extinct*; species which gradually decrease in the nature or grow in a specific inaccessible habitat or have been maintained themselves in cultivation.

1: *endangered*; species which are facing extinction, and which could not survive if special care is not provided.

2: rare; species which are quantitatively decreasing and are narrowing the

habitat range. If care is not given, they will disappear in a short time.

3 : *decreasing* ; species which are decreasing in quantity and in habitat ranges year by year owing to anthropogenic or spontaneous causes.

4 : *unstable* ; species where there is a possibility or extinction, but there is no accurate information of the exact status of species at the present time.

5 : *stable* ; species which are not threatened or may not decrease for a while.

The standards are built up by a simple princeple. And they require more precise field works for the purpose of this kind of effort for the selection of important species for nature conservation in their book.

Rapoport, et al. (1986) mathematically designed a conservational value of species (Vs) as follows :

$$Vs = Va \times Vc \times Vf$$

Where Va is the degree of occupation of each species in the grid set up on a given nature reserve ; Vc is the continental value, a measure of the geographic range of species ; Vf is frequency or abundancy value in this conservational values. The main constraint is the geographic range of species and the density of each species, which is substitutionable with qualitative indices, when there is no numerical data.

This is a very simple and effective method to assess an important species in the plan of nature reservation in a definite area.

In Flora of Shiraishi City (1983), we can find the simplest standard for selecting important species. Although this standard is limited to a local flora, the simplicity is best in the overviewing of the conservational status of a species. It is characteristic of a non-hierarchial standards, which are distinguished by 8 categories from A to G. Important species are judged by a single category such as A, or F, or G, in one case but are designated by a combination of several categories such as (A, B and E), (A, B, E, F and G) in the other case. Those standards are rather excellent in practice than complex standards in concept.

In Ukijima mire, man's impacts on the vegetation are low at present. However, several species are suffering from unreasonable and unpleasant activities of man such as a forced walk through the Sphagnetea as a result of issuing passes to the visitors by the Forestry Office without any consideration of the nature of wetlands and outright theft of dwarf-formed plants of *Picea glehnii* for the *Bonsai* by Bonsai lovers. Therefore, first, our attention should be centered on protection of plants from damage of the treading and outright theft of plants including the *Bonsai* plant. We are attempting to design a repair plan of deteriorated areas of the mire according to Tachibana's work in Ozegahara mire (1976), that is, a kind of experiment on ecosystem, or ecotechnological experiment prepared by Ito. Secondarily, we set the following categories for the conservation of the mire species in this area in a form of very easily understandable simple expression based on the principle that all species on the earth are endangered today.

A. *Noticeable species in taxonomy and phytogeography*. *Cornus suecica* Linn. (limited distribution in Hokkaido), *Vaccinium microcarpum* Linn. (limited

distribution in Hokkaido), *Lycopodium inundatum* Linn. (limited distribution in Hokkaido), *Eriocaulon sachalinense* Miyabe et Nakai (limited distribution in Hokkaido and rare species in Japan; this species has been reported on this site in Hokkaido, but its taxonomical position is not clear, because a Russian author considers it to be identical with *Eriocaulon atrum* Nakai [Woroschilov 1966 and 1982]).

B. *Valuable species for conservation*: *Sphagnum* species, which are low resistant to man's impacts, and which are intolerant to eutrophication of mires.

C. *Endangered* or *threatened species*: No species are included in this category at present, but *Sphagnum* species and *Bonsai* form of *Picea glehnii* are most likely to be endangered in the near future as far as man's impacts increase.

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Photo 2. A bird's-eye view of Higashi-Ohnuma pond area of Ukijima mire from a research ballon at a height of ca. 300 m. Bare walk surrounds the regeneration complex composed of the Scheuchzerio-Rhynchosporetum albae boreale, the Sphagnetum papillosi, and the Sphagnetum fusci. (by courtesy of the PASCO, 3 Aug. 1985).

Photo 3. A muddy path becomes the water course after a shower. (photo by Ito, 11 Sept. 1985).

Photo 4. Barren vegetation on the shore of Ohnuma pond. (photo by Ito, 11 Sept. 1985).

Photo 5. Floating islets on Ohnuma pond, of which vegetation has been completely damaged by the treading. (photo by Ito, 11 Sept. 1985).