

# Moor Vegetation in Japan with Special Emphasis on *Eriocaulo-Rhynchosporion fujiianae*

by

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In relation to the distribution of the moor vegetation in Japan, there are various communities of high moor (*Sphagnum* bog), mixed *Sphagnum* bog, and low moor (hygrophorbium) from Hokkaido down to Yakushima in Kagoshima Prefecture. In Okinawa Prefecture in the southern part of the country reports were made on low moor hygrophorbium which is represented by *Phragmitietea* (by Suzuki, K. in 1979 and others). But there has been no report on high moor *Sphagnum* bog and mixed *Sphagnum* bog.

Reports have been made on high moor *Sphagnum* bog, by R. Tüxen, other northern European and North American Authors in many parts of the northern hemisphere. In recent years the comparative study has been made of *Oxycocco-Sphagneteta* and *Scheuchzerietea* of high moor *Sphagnum* bog. High moor *Sphagnum* bog in the whole northern hemisphere has been re-examined, and communities have been classified by R. Tüxen and others.

The author has been making a comparative study of taxa-combination of high moor *Sphagnum* bog and mixed *Sphagnum* bog in many parts of Japan since 1966 on the basis of a phytosociological study of the moor in Ozegahara. In the celebration of Prof. Dr. Drs. h. c. R. Tüxen's 80th birthday the present writer would like to make a report of the arrangement and phytosociological system and propose newly-systematized *Eriocaulo-Rhynchosporion fujiianae*. Together with the celebration, I am very grateful to Prof. Dr. R. Tüxen for his many instructions on *Eriocaulo-Rhynchosporion fujiianae*.

## 1. *Oxycocco-Sphagneteta* Br.-Bl. et Tx. 1943

*Oxycocco-Sphagneteta* Br.-Bl. et Tx. 1943 are large group of plant communities which grow in a convex landform generally called "Bulten". It is characterized by *Oxycoccus quadripetalus*, *Andromeda polifolia*, *Eriophorum vaginatum* which are based on *Sphagnum fuscum*, *Sph. magellanicum*, *Sph. rubellum* and *Sph. papillosum* in the northern hemisphere. Three orders have been recognized according to the difference of taxa-combination (by Tüxen, R., A. Miyawaki and K. Fujiwara 1972). The vegetation mainly in Japan are as follows:

1) *Sphagnetalia fusci* (Tx. 1955) em Tx. 1970

The character taxa of the orders are *Sphagnum fuscum*, *Rubus chamaemorus*,

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*Chamaedaphne calyculata* and *Oxycoccus microcarpus*. The differential taxa are *Empetrum nigrum*, *Ledum palustre*, *Cladonia rangiferina*, and *Cladonia sylvatica* etc. in taxa-combination of alpine desert and solfatara formation.

Four alliances have been recognized till now in the northern hemisphere:

- a. Myricoto tomentosae-Sphagnion fusci (Japan)
- b. Ledo decumbentis-Sphagnion fusci (North America)
- c. Kalmio-Sphagnion fusci (North America)
- d. Calluno-Sphagnion fusci (Europe)

In the district of the littoral climate or in the moor of little snowfall in winter, the vegetation grow where the base has a small water-holding capacity.

In Japan two communities of *Rubus chamaemorus*-*Sphagnum papillosum*-Ass. Miyawaki et Ohba 1970 and *Ledo diversipilosi*-*Sphagnetum fusci* Miyawaki et Ohba 1970 have been recognized (by Miyawaki, A. and K. Fujiwara 1970; Miyawaki, A., S. Okuda, K. Fujiwara and K. Inoue 1977). The main distribution areas are Sarobetsu-gehya and Konsen-gehya in North and East-Hokkaido.

## 2) *Eriophoro vaginati*-*Sphagnetalia papillosum* Tx. 1970

The character taxa are *Eriophorum vaginatum*, *Sphagnum papillosum*, and *Odontoschisma sphagni*. The moor was originally a marsh or a basin with the maximum water content and the peat is as thick as 5 to 6 meters. Two alliances have been recognized in Japan and Europe, but it is a large question whether they can be grouped into the same order.

- a. *Moliniopsis*-*Sphagnion papillosum* (Japan)
- b. *Calluno*-*Sphagnion papillosum* (Europe)

In Japan Ozegahara, Kirigamine, and Kokenuma (in Akita Prefecture) are the main districts. They are often called "yurugitashiro" (removed peat moor), and the upper-growing of *Sph. papillosum* is remarkable and is apt to form the "yachimanako" (The eye of peat moor). They are made up of the character taxa of the class. *Moliniopsis japonica* and *Carex middendorffii* are the only ones that differ from those of foreign countries. In Japan they have developed in the *Fagetea crenatae* region. Tough *Sph. papillosum* forms a community around the pool ("kolke") in the *Sphagnetalia compacti* district in the following item. This type is treated as a community belonging to *Sphagnetalia compacti*.

## 3) *Sphagnetalia compacti* Tx., Miyawaki et Kazue Fujiwara 1970

The character taxon is *Sph. compactum*. It exists in what is called high moor like snow patch. In Japan they grow in the slope of a lava mountains and near the top of high mountains. A sedge peat and grasses peat from the main bases. *Sph. compactum* and *Sph. tenellum* are considered the taxa of composition.

In Japan *Geetea pentapetalae* species, such as *Fauria crista-galli*, *Geum pentapetalum* and *Tilingia ajanensis*, are regarded as the differential species (Miyawaki et al., 1968). They have developed in the *Vaccinio-Piceetea* region. The layer of the peat is as thin as several tens of centimeters, and is considered as a type of Anmoor. These three orders can be considered as belonging to the class *Oxycocco-Sphagnetea* Br.-Bl. et Tx. 1943. But the taxa-combination of "*Scheuchzerieta palustris*" in the hollows (Schlenken),

which corresponds to Oxycocco-Sphagnetea on the hummocks (bulten) of high moor, has raised a problem.

The development of Schlenke is not necessarily sufficient in the districts of Sphagnetalia fusci and Sphagnetalia compacti. When it is not developed into Kolke, they are apt to continue. In the latter, it is partly because the pile of peat is thin. In the former, the drying time of summer and the small amount of rain through the year are the factors which prevent Schlenke from being developed. Sphagnetalia fusci is Sphagnum high moor in the latter stage of formation and forms a lens-like moor after the development of a rhythm series on account of the continuity of "Schlenke" and "Bult", and this phenomenon seems to be that it prevents Schlenke from being developed. *Rhynchospora alba*, *Scheuchzeria palustris* and *Drosera anglica*, which are the taxa of combination of Scheuchzerieta palustris, may grow if the place is a little concave and supplied with water, and they may grow together with *Sph. papillosum*, *Sph. compactum* and *Sph. tenellum*.

## 2. Scheuchzerieta palustris Den Held, Barkman et Westhoff 1969. em Tx., H. Suzuki et Kazue Fujiwara 1970

Tüxen, R. (in 1980) established newly Sphagnetalia cuspidati and Drosero-Rhynchosporieta albae with comparative study of Sphagnum bog vegetation in the north hemisphere.

Then he is treated as orders belonging to Oxycocco-Sphagnetea. Moliniopsio-Rhynchosporion albae Miyawaki et Kazue Fujiwara 1970 in Japan is treated as a suballiance belonging to Drosero-Rhynchosporion as Rhynchosporion albae (Tüxen 1980). Then it is put in order Drosero-Rhynchosporieta albae.

In this report they are conformed to the system by A. Miyawaki and Kazue Fujiwara in 1970.

Moliniopsio-Rhynchosporion albae Tx., H. Suzuki et Kazue Fujiwara 1970

- 1) Moliniopsio-Sphagnetum pulchri
- 2) Eriocaulum dimorphoelytri
- 3) Rhynchosporo fauriei-Caricetum limosae
- 4) Rhynchosporieta albo-yasudanae
- 5) Eriocaulum kusiroensis
- 6) Eriocaulum monococci-Sphagnetum dusenii

These communities and newly-collected data have been put in order into a synoptic syntaxon table (Tab. 1)

New association

- 1) Sphagnetum triseripori ass. nov.

The character taxon: *Sphagnum guwassaense* subsp. *triseriporum*

Its Taxa combination is limited as it grows under water. The middle species number are between 3 and 5 species: *Carex middendorffii*, *Moliniopsis japonica*, *Drosera rotundifolia*.

They are communities replaced by *Sphagnum cuspidatum* in the Sphagnetalia

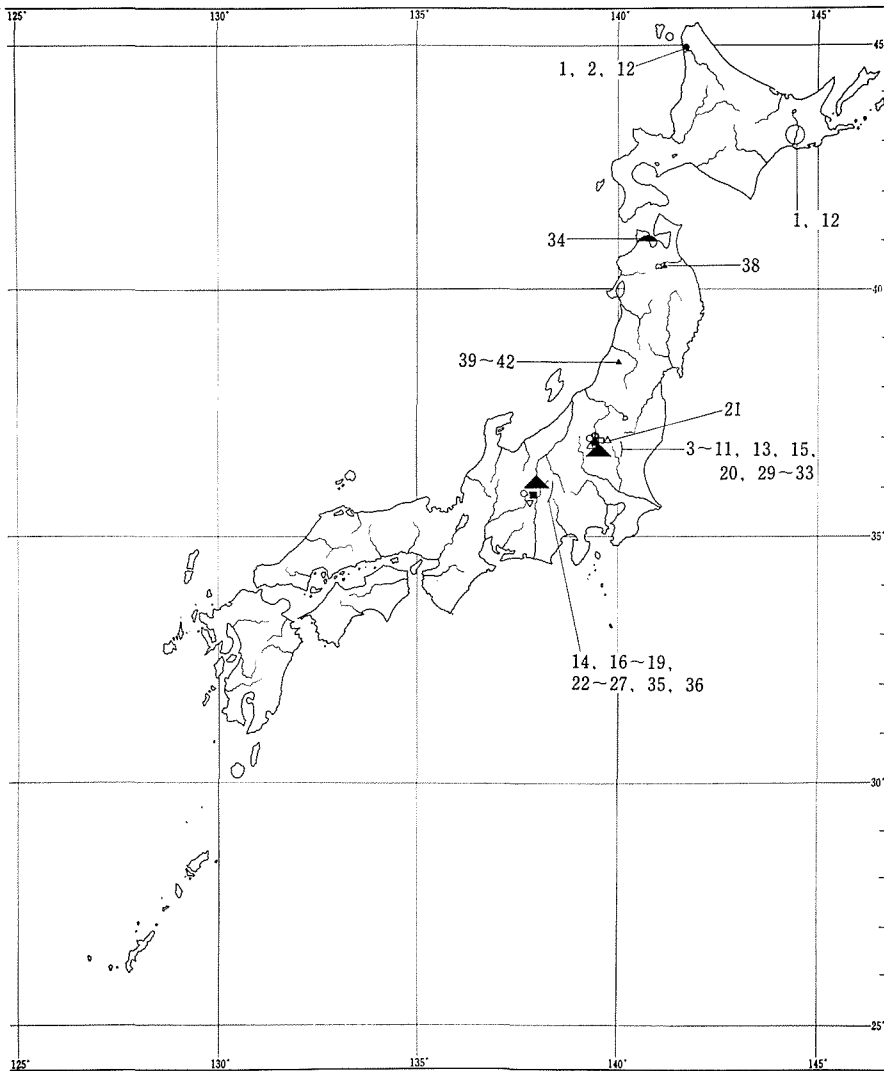


Fig. 1 Distribution of the each association of Moliniopsio-Rhynchosporion albae in Japan. No. 1~42: Number of record (Tab. 1)

- Moliniopsio-Sphagnetum pulchri,
- ⊕ Eriocaulum dimorphoelytri,
- Rhynchosporo fauriei-Caricetum limosae
- ▲ Eriophoro gracilis-Caricetum limosae
- ▲ Rhynchosporium albo-yasudanae,
- Eriocaulum monococci,    ■ Sphagnetum takedai
- ▽ Eriocaulum atroidis,    ▲ Sphagnetum triseripoli

compacti district of the subalpine zone.

2) Eriocaulum monococci ass. nov.

The character taxon: *Eriocaulon monococcon*

The differential taxon: *Carex lasiocarpa* var. *occultans*

The relevé has been made in the Tsugaru-hanto (peninsula). It seems that it is found in Hokkaido, too. It grows in peat without *Sphagnum*. It was recognized

in the moor of the hind of the sea coast in the Tsugaru-peninsula. The main community-making species in Schlenke of Japan are *Scheuchzeria palustris*, *Rhynchospora alba*, *Sphagnum cuspidatum*, and *Sphagnum pulchrum*. (The only reports have been made on the communities in Ozegahara and Kirigamine.) *Drosera rotundifolia* grows both in "Bult" and in "Schlenke," and is widely found in the mixed *Sphagnum* bog in wet meadow. So it can't be considered the character taxon of the class. In Japan there are comparatively few moors with *Sphagnum cuspidatum*. It certainly is a singular species which represent hollows, but then, the location of *Carex limosa* and *Rhynchospora alba* comes into question if it is to be considered *Sphagnetea cuspidati*. In the next monograph a comparative study shall be made with reference to the data from Europe and the United States.

### 3. Eriocaulo-Rhynchosporion fujii all. nov.

Reports have been made on their local growth in *Eriocaulon*, *Rhynchospora*, *Dimeria ornithopoda* var. *tenera*, and *Habenaria radiata*, and in mud and on the community including *Utricularia* which has the ground leaves in linear or spatulate (it is found in North America and should be compared with *Lecticula* or *Stomoisia*) (Kurauchi 1977, Senuma 1977, Ohga 1965, Hada 1975-77).

As a result of comparison of these relevés with newly-collected data, the following community units have been put in order.

1) *Juncus wallichianum*-*Rhynchospora fauriei* ass. nov. (prov.)

The character taxon: *Rhynchospora fauriei*

The differential taxa: *Parnassia Palustris*, *Inula ciliaris*, *Sanguisorba tenuifolia* var. *alba*, *Juncus yokoscensis*, *Ischaemum antheophoroides*, *Juncus wallichianus*, *Lycopus maackianus*

Found in the hind of the coastal of the Shimokita-peninsula.

2) *Eriocaulum nudicuspis* Kurauchi 1978

The character taxon: *Eriocaulum nudicuspe*

It is distributed in the Nohbi plain and its vicinity. *Eriocaulum nudicuspe* with its big white spike forms a unique view.

3) *Rhynchosporium faberi* ass. nov.

The character taxa: *Rhynchospora faberi*, *Utricularia racemosa*

4) *Rhynchosporium chinensis* ass. nov.

The character taxon: *Rhynchospora chinensis*

5) *Utricularia yakusimensis*-*Eriocaulum sikokiani* ass. nov.

The character taxon: *Utricularia yakushimensis*

6) *Rhynchospora fauriei*-*Sphagnetum palustris* ass. nov.

The differential taxon: *Sphagnum palustris*

Those mentioned in 3) to 6) are distributed in Okayama and Hiroshima prefectures in the Chugoku District (SW-Honshu).

7) *Eriocaulum echinulati* ass. nov. (Tab. 4)

The character taxa: *Eriocaulum echinulatum*, *Drosera indica*, *Rhynchospora rubra*

The differential taxon: *Machaerina nipponensis*

Miyazaki Prefecture in the Kyushu has the only place with this community. This

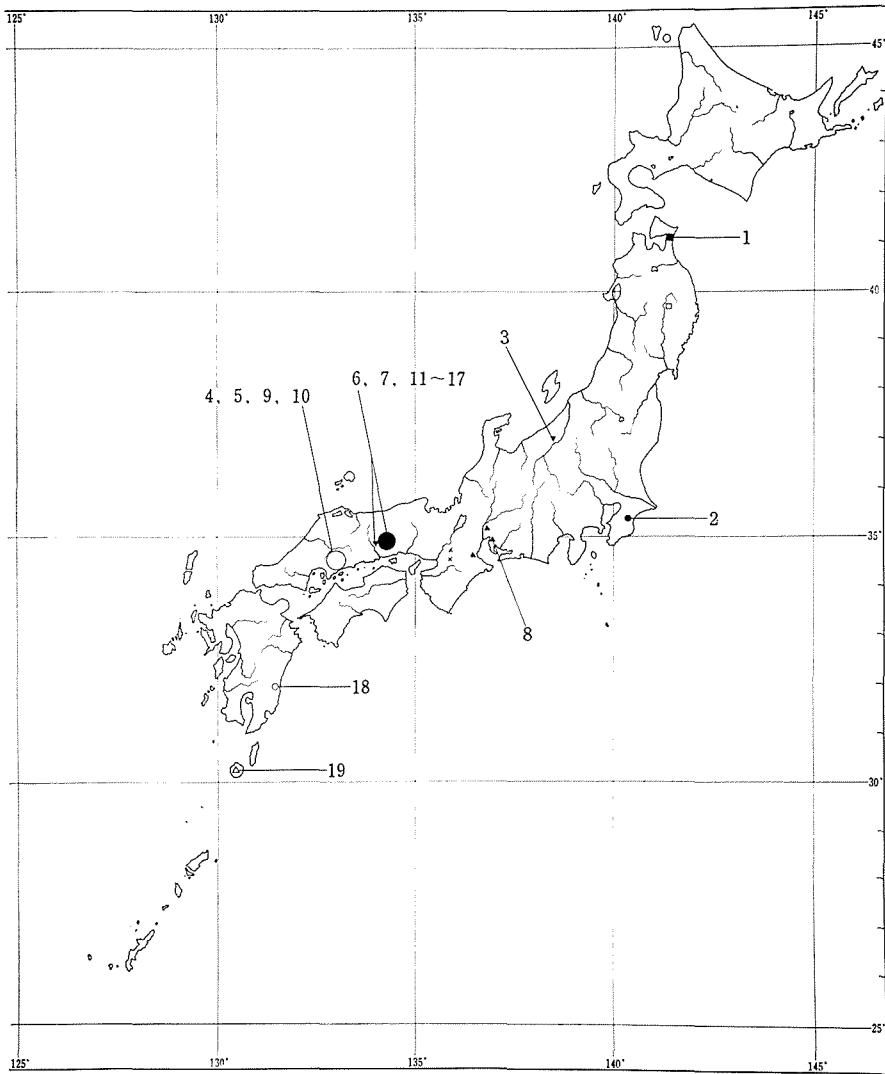


Fig. 2 Distribution of the each association of *Eriocaulo-Rhynchosporion fujii* in Japan. No. 1~19: Number of record (Tab. 2)

- *Juncus wallichianus*-*Rhynchospora fauriei*-Ass.
- *Schoenus apogon*-*Eriocaulon hondoensis*-community
- ▼ *Rhynchosporium faberi*
- , ○ *Rhynchosporium chinensis*, *Utriculario yakusimensis*-*Eriocaulum sikokiani*, *Rhynchospora fauriei*-*Sphagnetum pulchri*, *Rhynchospora frownii*-Gesellschaft
- *Eriocaulum echinulati*
- △ *Eriocaulum hananoegoensis*
- , × unsolved communities

is a singular area with *Alnus travenculosa* growing adjacent to it.  
 8) *Eriocaulum hananoegoensis* ass. nov. (Tab. 5)

The character taxa: *Eriocaulon hananoegoense*, *Eleocharis congesta* var. *thermaris*. It is distributed at Hananoego in Yakushima-isle. It is considered as a surviving community from the glacial period. Next to them are found *Carex omiana* var. *yakushimana*-*Sphagnum papillosum*-community.

### Conclusion

In addition to these, similar communities are recognized in many parts of the country, such as Haruko-yachi in Iwate Prefecture (N-Honshu); Nara, Fukui (Middle-Honshu), Kochi (Shikoku), and Oita (Kyushu) Prefectures. On these communities the relevés have not been collected to the regret of the present writer. Concerning the Harukoyachi moor in Iwate Prefecture, the relevé was obtained in 1975, but *Eriocaulon* seems to be a new species and difficult to classify. So its classification shall be treated in his later monographs. Both published and unpublished communities were categorized into 8 communities. And Eriocaulo-Rhynchosporion fujiianae was prescribed with *Dimeria ornithopoda* var. *tenera*, *Sphagnum microporum*, *Habenaria radiata*, *Utricularia bifida*, *Eriocaulon sikokianum*, *Eriocaulon miquelianum*, *Rhynchospora fujiiana*, and *Cirsium sieboldii* as the character taxa and *Isachne globosa* and *Scirpus hotarui* as the differential taxa.

Eriocaulo-Rhynchosporion fujiianae is invaded more and moor by *Phragmites australis* (syn: *communis*) in the southern part of Japan. The number of the low moor-making species increased due to the inflow of the waste water, fire, mowing and other artificial impacts. Standort is based on the peat of *Cyperaceae* and *Gramineae*.

### Afterword

For Scheuchzerieta palustris and Eriocaulo-Rhynchosporion fujiianae, the present writer would like to collect more data and make a comparative study in the future. This report is restricted to advocating Eriocaulo-Rhynchosporion fujiianae based upon the present stage of study. It is likely that, with additional data from South-eastern Asia and the United States, the comparative study of the moors with *Rhynchospora*, *Eriocaulon*, *Scheuchzeria* and *Sphagnum cuspidatum* will become possible. Their community system and location shall also be made clear.

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