

**Fossil Pollen Grains of the Genus *Nuphar* Found in the
Late Holocene Deposits from the Komatsubara Moor
in Mt. Naeba, Niigata Prefecture**

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新潟県苗場山小松原湿原の完新世後期の
堆積物中に見出されたコウホネ属の花粉

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Fossil pollen grains of the genus *Nuphar* type were found in the late Holocene deposits from the Komatsubara moor in Mt. Naeba, Niigata Prefecture. The morphological features of the long spines of the fossil pollen bear some resemblance to those of *Nuphar pumilum*. Thus, we assumed that *Nuphar pumilum* was probably distributed as a glacial relict until the late Holocene in the ponds of the Komatsubara moor, although it is not found there at present.

The Komatsubara moor is situated on the northern part of Mt. Naeba (2145.3m above sea level) lying on the boundary between Niigata and Nagano Prefectures. It is located between 36°53' and 36°54' N and 138°40' and 138°42' E and at altitudes of 1350m–1550m. The forest vegetation around the moor is the upper part of cool temperate deciduous forest consisting chiefly of *Fagus crenata*, *Betula ermanii*, *Viburnum furcatum*, *Acer tschonoskii*, *A. japonicum*, *Fraxinus lanuginosa* and *Sasa paniculata*. The *Abies mariesii* forest with the undergrowth of *Sasa kurilensis* is also found at the margin of the moor. This moor is divided by altitudes into three sections; upper, middle and lower sections, and

they are called Kamiyashiki (1550m), Nakayashiki (1500m) and Shimoyashiki (1350m), respectively. Some small ponds are found in the Kamiyashiki and Nakayashiki. The physiognomic features of the Kamiyashiki and Nakayashiki are typical high moor, and actual moor vegetation is composed mainly of *Moliniopsis-Sphagnetum papilloso* and/or *Rhynchosporo yasudanae-Sphagnetum tenelli* (Aizawa 1983).

In October, 1990, while carrying out a pollen analytical study of the peat deposits from the Kamiyashiki, we found three fossilized pollen grains of *Nuphar* type with abundant pollen of *Betula*, *Fagus*, *Abies*, *Quercus* and fern spores at a depth of 85cm. The absolute age of this horizon

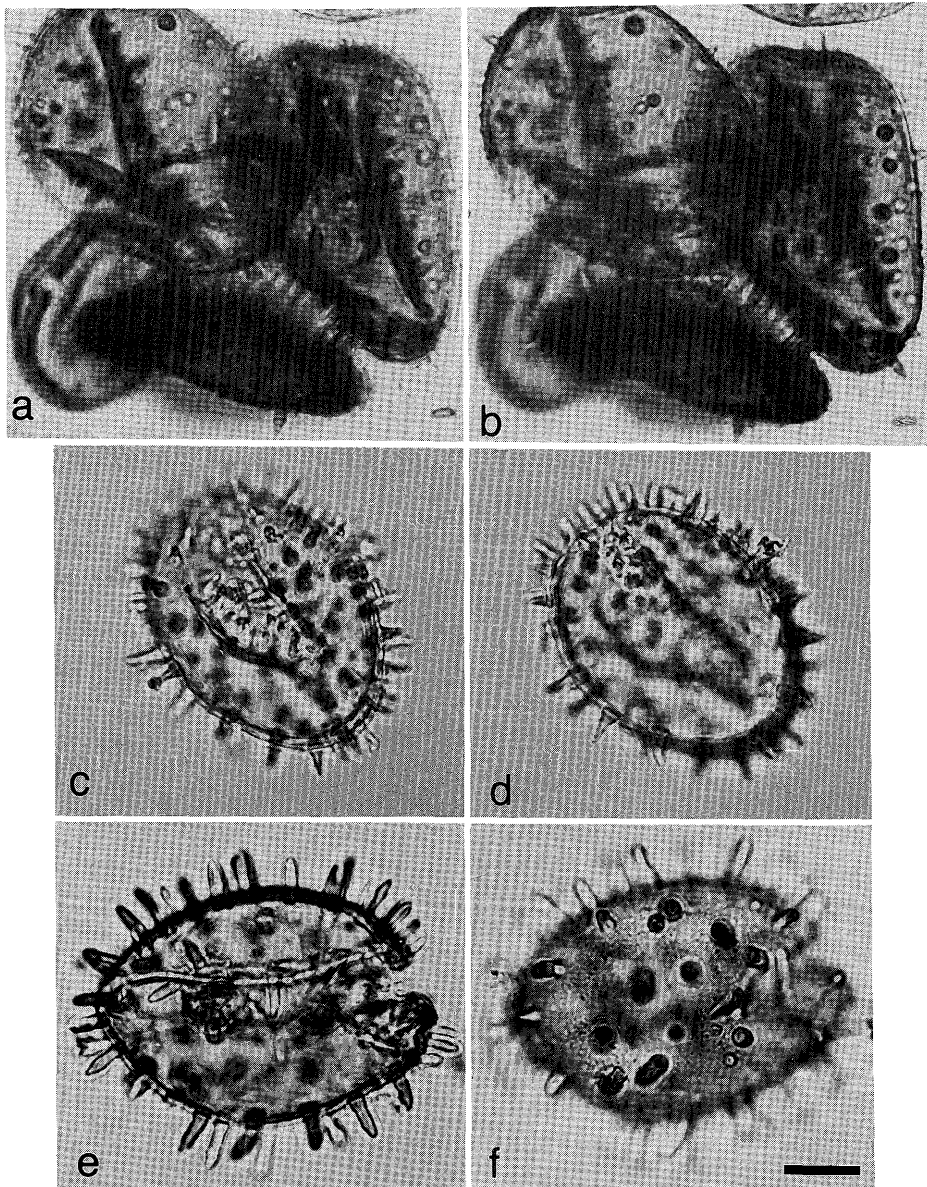


Fig. 1. Photomicrographs of *Nuphar* pollen. Bar indicates $10\ \mu\text{m}$. (a) fossil pollen of *Nuphar* type; (b) same as (a) at slightly lower focus; (c) modern pollen of *N. pumilum*, proximal part; (d) same as (c) (optical section); (e) modern pollen of *N. pumilum* var. *ozeense*, proximal part; (f) same as (e) (optical section).

determined by ^{14}C -dating is 2940 ± 80 y.B.P. (N-5782).

The fossil pollen grains of *Nuphar* type (Fig. 1-a, b) are monocolpate, $40\text{--}45\ \mu\text{m}$ long. The surface of exine is scabrate with sharp pointed

spines which are $3\text{--}6\ \mu\text{m}$ long.

Four species and two varieties belonging to genus *Nuphar* are distributed in Japan (Ohwi and Kitagawa 1983). Among them, *N. japonicum*, *N. japonicum* var. *rubrotinctum*, *N. oguraense* and *N.*

subintegerrinum are found in the lowlands in Japanese Islands. *Nuphar pumilum* is a boreal-subarctic species distributed mainly in northern Europe, Siberia and Kamchatka. In Japan, this species occurs in the lowlands in Hokkaido and in the montane ponds such as Ohse-yachi (Hakkoda Mountains), Naga-numa (Hachimantai Mountains) and Tashiro-numa (Mt. Kurikoma) in the northeastern part of Honshu. A variety, *N. pumilum* var. *ozeense* is also today known to grow in the ponds of Ozegahara moor (type locality) and Midagahara moor in Mt. Gassan, and in the northern part of Hokkaido as shown in Fig. 2 (Ito 1967, Iwate shokubutsu no kai 1970. The Compilation Committee of Flora of Fukushima Prefecture 1987, Yuhki 1972), the scattered occurrences of *N. pumilum* and *N. pumilum* var. *ozeense* have been regarded as glacial relics, and they are thought to have been spread widely in Japan at least during the last glacial times (Hara 1951, Hara and Mizushima 1954).

Within our knowledge, the natural growth of *Nuphar* has not yet been reported from the moors situated in Mt. Naeba.

Judging from the present distribution of *Nuphar*, however, fossil *Nuphar* pollen detected from the Komatsubara moor are probably derived from either *N. pumilum* or *N. pumilum* var. *ozeense* which survived until the late Holocene in the Komatsubara moor.

Therefore we examined whether or not the morphological features of modern pollen permit the specific identification within *N. pumilum* and *N. pumilum* var. *ozeense*.

Nuphar pumilum (Fig. 1-c, d)

Specimen examined: Nemuro, Hokkaido, Coll. J. Nakamura, July 1960.

Pollen grains are elliptical, monocolpate, furrows are long strip, $(37.5 \times 50.0) \times (27.0 \times 36.0) \mu\text{m}$. The surface of exine is scabrate with

long, sharp pointed spines, 3.0–6.0 μm long.

Nuphar pumilum var. *ozeense* (Fig. 1-e, f)

Specimen examined: Ozegahara moor, Gumma Prefecture, Coll. J. Nakamura, Aug. 1939.

Pollen grains are elliptical, monocolpate, furrows are long stripe, $(40.0 \times 47.5) \times (28.5 \times 36.0) \mu\text{m}$. The surface of exine is scabrate or granulate with long obtusely pointed spines, 4.0–8.0 μm long.

It is impossible to separate *N. pumilum* var. *ozeense* from *N. pumilum* by means of pollen size and micro sculpture of exine examined by the light microscope. The spines of *N. pumilum* pollen, however, are shorter, more sharp pointed and somewhat less numerous than those of *N. pumilum* var. *ozeense*.

The characters of the spines of fossil *Nuphar* pollen from the Komatsubara moor are rather similar to those of *N. pumilum*, mentioned above.

We assumed that, therefore, *N. pumilum* was distributed more widely in northeastern part of Japan in the last glacial age as described by Hara (1951) and Hara and Mizushima (1954). It also grown as a glacial relics in the ponds of the Komatsubara moor in Mt. Naeba until the late Holocene, and then it disappeared from the areas during the past 3,000 years. The reasons why it disappeared from the Komatsubara moor are obscure.

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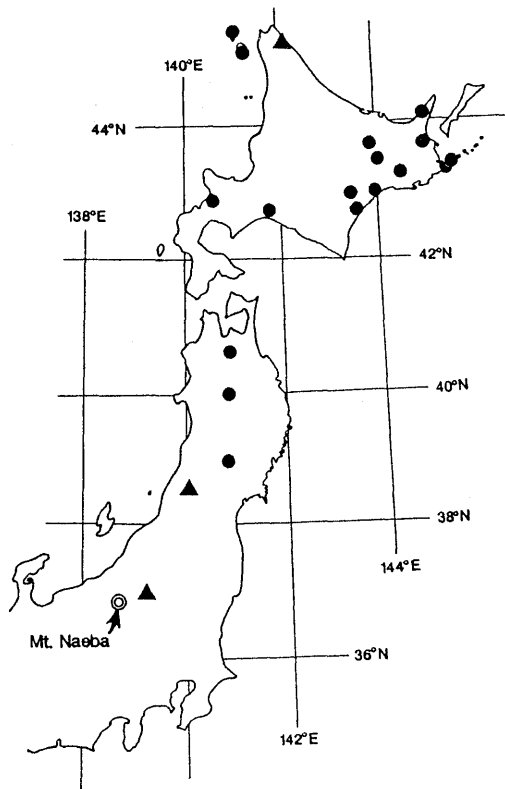


Fig. 2. Present distribution of *Nuphar pumilum* and *Nuphar pumilum* var. *ozeense* in Honshu and Hokkaido. Solid circles, *N. pumilum*; solid triangles, *N. pumilum* var. *ozeense*.

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要 旨

新潟県苗場山の北部にある、小松原湿原の上屋敷(海拔1550m)から採取した完新世後期の堆積物の花粉分析を行った。その際深さ85cmの層準(2,940±80y. B. P.)から、やや変形しているが、明かにコウホネ属のものと判定できる化石花粉を見出した。現在のコウホネ属植物の分布と小松原湿原の地理的位置からみて、この花粉はネムロコウホネかオゼコウホネに由来するものと考え、両者の花粉と化石花粉との比較を試みた。その結果、長刺状突起の形状と数に関して、化石花粉とネムロコウホネとの間に類似性が認められた。現在苗場山系の湿原・池沼にコウホネ属植物は生育していないが、少なくとも約3,000年前まではネムロコウホネが氷期の遺存種として分布していた可能性がある。