Phytogeographic Notes on Some Aquatic Plants in Yakutia, Eastern Siberia

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Abstract. In 1992–1993, botanical surveys of Yakutia in eastern Siberia were carried out. Aquatic plants were collected and new phytogeographic information was added. Utricularia macrorhiza Le Conte was collected from four sites in Yakutia, suggesting that this species is more widely distributed in northeastern Asia. Sparganium natans L. was recorded from eastern Siberia. This evidence fills up the gap in its circumpolar distribution. The present collection of Spirodela polyrhiza (L.) Schleid. is the second formal record from Yakutia, probably the northern limit of this species in Asia.

Key words: aquatic plants, Lemnaceae, phytogeography, Siberia, Sparganium, Utricularia, Yakutia.

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Specimens of aquatic plants have been scarcely recorded from Siberia, and therefore their taxonomy, ecology and phytogeography are still insufficiently known. Our botanical field surveys were carried out in Yakutia, which is located in eastern Siberia, including the taiga to tundra regions in 1992 and 1993.

Here we note the phytogeography of representatives of the Yakutian aquatic plants; Utricularia, Sparganium, and Lemnaceae.

Materials and Methods

Yakutia is situated in eastern Siberia (Fig. 1) and has a severe continental climate and low diversity of vascular plants (Takahashi, 1994). In Yakutia the six main rivers from west to east are the Anabar, Olenek, Lena, Yana, Indigirka and Kolyma, all of which flow northwards into the Arctic Ocean.

Our collection sites in 1992–1993 botanical surveys were the following five regions along the Lena and Yana river systems; from south to north Olekminsk, Yakutsk, Zhigansk, Verkhoyansk and Tiks (Fig. 1). The position of the main city or town in each region is as follows: Olekminsk, 120°30' E, 60°30' N; Yakutsk, 129°45'E, 62°05'N; Zhigansk, 123°E, 66°N;
FIG. 1. Map showing research sites in Yakutia.

Verkhoyansk, 133°23'E, 67°33'N; Tiksi, 128°52'E, 71°38'N. We collected aquatic plants from various water habitats, and detailed locality and other data relevant to each collection are given below for the specimens examined. Brief water condition at every site was indicated by the electric conductivity (EC; TOA CM-11P EC meter). EC values at 25°C were noted in each habitat when measured. All specimens are deposited in the Herbarium, Faculty of Agriculture, Hokkaido University (SAPT), and duplicates of some specimens are in SASY, TUS and H.

Results and Discussion

Utricularia

All plants of Yakutian Utricularia collected in our surveys belong to U. vulgaris L. or U. macrorhiza Le Conte. Taylor (1989) recognized U. macrorhiza as a definite species distinguished from U. vulgaris in having markedly upwards curved distal part of spur of corolla with acute apex and internal glands on both dorsal and ventral surfaces. Based on these features all Yakutian specimens (Fig. 2) should be attributable to U. macrorhiza.

Although Hultén (1968) regarded U. macrorhiza as a subspecies of U. vulgaris, he treated U. macrorhiza as a North American taxon and U. vulgaris as a Eurasian taxon. Later Hultén and Fries (1986) demonstrated that
`American' *U. macrorhiza* occurs also in Kamchatka and the Amur region in eastern Asia. In addition to these localities, Taylor (1989) noted its occurrence in Sakhalin, the Ussuri region and westwards to the Altai in the USSR. But, until now specimens identified as *U. macrorhiza* have not been recorded from eastern Siberia.

In our expeditions, *U. macrorhiza* was collected from the Olekminsk and Yakutsk regions along the Lena River and the Verkhoyansk region along the Yana River. This means that *U. macrorhiza* occurs more widely in eastern Siberia than expected.

**Utricularia macrorhiza** Le Conte


Specimens examined. OLEKMINSK: Neryuktyai village, Biryuk settlement, a somewhat eutrophic, long and narrow pond (695–842 μS cm⁻¹, more than 40 cm in depth) by the settlement, July 2, 1993, fl., H. Takahashi et al. 15662 (SAPT, TUS). YAKUTSK: Yakutsk city, eutrophic pools (2420–3310 μS cm⁻¹) with a bad smell on marshlike banks of the Lena River, July 18, 1993, fl., H. Takahashi et al. 16081 (SAPT); About 30 km NW of Yakutsk city, a pond (198–229 μS cm⁻¹) at the Spaskayapad Forest Station of Yakutsk Institute of Biology, July 8, 1993, fl., H. Takahashi et al. 15787 (SAPT). VERKHOYANSK: Verkhoyansk town, Appyt settlement, an oxbow lake (154–162 μS cm⁻¹) of the Yana River by the pasture, July 12, 1993, fl., H. Takahashi et al. 15938 (SAPT, TUS).
Sparganium

*Sparganium emersum* is the most common in Yakutia. It was found in somewhat disturbed or unstable places in more or less eutrophic standing water habitats. All specimens collected were erect and emergent, and some could tolerate periods of drought in summer. Cook and Nicholls (1986) reported that there is a clinal variation of stigma length and anther length for *S. emersum* from east to west in Eurasia. But plants of *S. emersum* even from eastern Siberia show variation in those characters. Specimens from the Yakutsk region (Fig. 3a) possess relatively small anthers (0.8–1.1 mm long) and stigmas (1.0–1.6 mm long) in comparison with the value by Cook and Nicholls (1986), and those from the Zhigansk region (Fig. 3b) possess larger anthers (1.1–1.3 mm long) and stigmas (1.5–2.0 mm long). Thus more specimens of *S. emersum* should be examined for ascertaining the geographical cline in Eurasia.

*Sparganium natans* was first formally confirmed from eastern Siberia in this study. Plants which produced aerial leaves and grew in clear waters of an oligotrophic lake in northern taiga (Fig. 4) from the Zhigansk region, are determined as *S. natans* by the following features—all female heads are axillary, the male head is solitary and remote from the uppermost female head with 15–25 mm long internodes, and the lowest bract is scarcely longer than the inflorescence (Fig. 5). The occurrence of *S. natans* from eastern Siberia fills the gap in its circumpolar distribution. Although Tolmachev (1974) noted *S. natans* (as *S. minimum*) in his Yakutian manual, Hultén and Fries (1986) wrote a question mark on eastern Siberia in the distribution map of this species and Cook and Nicholls (1986) did not...
record it from this region.

Typical North American plants of *S. natans* has the lowermost female heads which are usually sessile or have less than 10 mm long peduncles (Harms, 1973). Yakutian plants of *S. natans* sometimes show up to 20 mm long peduncles in the lowermost female heads. This trait of a tendency to longer peduncles in the lowermost female heads is also found in Alaskan and northwestern Canadian populations (Harms, 1973).

**Sparganium emersum** Rehm.


Specimens examined. YAKUTSK: Pokrovsk — Lena Pillars, on a big island in the Lena River, a somewhat eutrophic, shallow pond (up to 40 cm in depth) by the pasture, August 12, 1992, fr., H. Takahashi et al. 13701 (SAPT); About 40 km E of Yakutsk city, a lake at the Alas Station of Yakutsk Institute of Biology, July 23, 1992, flr., H. Takahashi et al. 12967 (SAPT, SASY). ZHIGANSK: About 50 km S of Zhigansk town, the confluence of the Undyulyung River and the Lena River, a dried up pond, August 5, 1992, flr., H. Takahashi et al. 13438 (SAPT, SASY, TUS, H), fr., H. Takahashi et al. 13441 (SAPT, SASY).

**Sparganium natans** L.


Specimens examined. ZHIGANSK: About 50 km S of Zhigansk town, the confluence of the Undyulyung River and the Lena River, a clear oligotrophic pond, August 5, 1992, emergent, flr., H. Takahashi et al. 13409 (SAPT, SASY, TUS, H).
FIG. 5. A dried specimen of Yakutian Sparganium natans from the Zhigansk region, 13409. F, female heads; M, male heads.

Lemnaceae

Tolmachev (1974) reported three species of Lemnaceae from Yakutia; Spirodela polyrhiza (L.) Schleid., Lemna trisulca L. and L. minor L. Landolt (1986) regarded all the northern Asian ‘L. minor’ as L. turionifera Landolt, but it is difficult to distinguish the two using dried specimens. In the present study, we use L. minor following the conservative treatment. In any case, we confirmed all the three species from Yakutia.

Collection records of these species are quite rare from Yakutia (Landolt, 1986), and those of Spirodela are especially rare. Only one collection of Spirodela was observed for Yakutia in the distribution map of Hultén and Fries (1986). The present collection of Spirodela is the second formal record from Yakutia and is near the northern limit of it in Asia (Hultén and Fries, 1986; Landolt, 1986). Similarly, the Lemna minor population of Verkhoyansk may be near the northern limit of this species in Asia.

Lemna minor L.


Specimens examined. YAKUTSK: Yakutsk city, eutrophic pools (2420–3310 μS cm⁻¹) with a bad smell on marshlike banks of the Lena River, July 18, 1993, st., H. Takahashi et al. 16090 (SAPT); About 30 km NW of Yakutsk city, a pond (198–229 μS cm⁻¹) at the Spaskayapad Forest Station of Yakutsk Institute of Biology, July 21, 1992, st., H. Takahashi et al. 12793B (SAPT), July 8, 1993, st., H. Takahashi 15789 (SAPT).

VERKHOYANSK: Verkhoyansk town, a somewhat eutrophic, long and
narrow oxbow pond within the town, July 10, 1993, st., H. Takahashi et al. 15829 (SAPT).

Lemma trisulca L.
Specimens examined. OLEKMINSK: Neryuktyai village, Biryuk settlement, a somewhat eutrophic, long and narrow pond (695–842 $\mu$S cm$^{-1}$, more than 40 cm in depth) by the settlement, July 2, 1993, st., H. Takahashi et al. 15663 (SAPT, TUS). YAKUTSK: Yakutsk city, eutrophic pools (2420–3310 $\mu$S cm$^{-1}$) with a bad smell on marshlike banks of the Lena River, July 18, 1993, st., H. Takahashi et al. 16082 (SAPT); About 30 km NW of Yakutsk city, a pond (198–229 $\mu$S cm$^{-1}$) at the Spaskayapad Forest Station of Yakutsk Institute of Biology, July 21, 1992, st., H. Takahashi et al. 12792 (SAPT), July 8, 1993, st., H. Takahashi et al. 15788 (SAPT, TUS); About 40 km NE of Yakutsk city, a pond at Ogrodtakh, July 27, 1992, st., H. Takahashi et al. 13113 (SAPT).

Spirodela polyrhiza (L.) Schleid.
Specimens examined. YAKUTSK: About 30 km NW of Yakutsk city, a pond (198–229 $\mu$S cm$^{-1}$) at the Spaskayapad Forest Station of Yakutsk Institute of Biology, July 21, 1992, st., H. Takahashi et al. 12791 (SAPT).

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References


高橋英樹1・佐藤利幸2・N.G. Solomonov3・B.I. Ivanov3: 東シベリア，ヤクーチア産水生植物の植物地理

東シベリアヤクーチアの植物調査（1992−1993）で採集した水生植物のうち，植物地理学的に興味のある種について報告した。Utricularia macrorhiza をヤクーチアの4地点から採集した。いずれも人家に近い富栄養化した池沼であった。本種は Hultén(1968) により，タヌキモ U. vulgaris の北アメリカ産亜種ともみられていたが，その後カムチャッカ，アムール地方などでも見つかっていた。今回の調査により，U. macrorhiza は，これまで考えられていたよりもさらに広く，北東アジアに分布している事が明らかとなった。Sparganium natans をジガンスカ付近の貧栄養の自然湖沼から採集した。これにより，東シベリアで欠落していた周北極分布がつながった。ウキクサ Spirodela polyrhiza をヤクーツクの人家近くのやや富栄養化した湖沼から採集した。アジアにおける北限に近い集団である。

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