

## Luronium – 2024



### 2.1. Latinsk navn (Latin name)

*Luronium natans* (L.) Rafin.

### 2.2 Røddlistestatus (redlist status)

Sterkt truet - Endangered (EN)

### 2.3 Utbredelse (spreading/place)

*Luronium natans* is an European endemic. It occurs in Western and Central Europe, southern part of Scandinavia, in the range of the Atlantic and Subatlantic climate. The Oslo populations seems to be the northernmost in the whole range (and the only natural sites in Norway). The main range of distribution of this plant is Western and Central Europe, including Poland.

### 2.4 Lokalteter i Norge (locations in Norway)

In Norway *Luronium natans* is known from 5 lakes in Oslo municipality where their occurrence were noticed during last 100 years. Information about *Luronium* in “Kinnhalvøya i Brunlanes, Larvik i Vestfold” was based on the false identification of the species. The location of Opegård given in 1999 is not confirmed and “Roppestaddammen” from Fredrikstad was implanted.

#### 2.4.1. Lokalteter i Oslo (locations in Oslo)

##### 5 known locations:

- Alunsøen, Breisjøen, Dausjøen, Maridalsvannet, Svartkulp.

#### 2.4.2. Location in Fredrikstad – Roppestaddammen. –not investigated in 2024.

## Introduction.

After the reconstruction of the Breisjøen dam, when the water level was reduced by 6.5 m from mid-April to the end of October 2020, in the year 2021, precise boat and diving observations were made on Breisjøen and Alunsjøen. The work was carried out with the same method as in the 2018 mapping process and resulted in two maps of the current distribution of the *Luronium* population in these lakes. The comparison of maps from 2018 and 2021 allows the assessment of the effectiveness of the conservation activities carried out in 2019 and 2020 in Breisjøen and Alunsjøen (described in the 2021 report).

Accurate observation and mapping of the distribution of the entire population of *Luronium* in the lake is only possible by diving. In 2022 and 2023, it was not possible to obtain funding for this research.

In 2024, it was possible to obtain funds to carry out research on only 3 lakes - Alunsjøen, Breisjøen and Dausjøen. On Maridalsvannet and Svartkulp, only observations from the shore were carried out.

## *Luronium natans* growth forms and research methods.

According to the English botanical literature, *Luronium natans* has two distinct forms: *submersum* - with submerged linear-lanceolate leaves, which are flat and only grow in water, and *repens* - with “expanded” leaves. Expanded leaves have petioles and blades, and may float or be submerged (WILLBY & EATON 1993, LANSDOWN & WADE 2003). Thus, the division line is between forms having only submerged leaves and forms having both submerged and expanded floating leaves. Forms growing on the not flooded, exposed substrate, are not described in details.

In turn, in Polish botanical literature (f.e. SZMEJA 2001) there are described two forms either. The division line is between submerged plants (even they have expanded floating leaves) and terrestrial forms. The latter grow on the exposed substrate, not in the water, and they have aerial ovate leaves, sometimes with remnants of a rosette of submerged leaves. However, the causes of variation in growth form are apparently environmental rather than genetic, and these forms are not consistent.

So, we distinguish three forms for the purposes of this study - it makes it easier to inventory *Luronium* in the field and better shows the diversity of the population of this plant in the area of research although these forms are often a continuum in space or in time:

(i) **Submerge vegetative form** - completely submerged form with rosettes of linear-lanceolate leaves connected with white or green stolons but without “expanded” floating leaves. It occurs in deeper water – one to several meters.

(ii) **Form with floating leaves\*** - form with submerged leaves rosettes, stolons and with “expanded” floating leaves (elliptical to ovate, on long petioles which grow out of underwater leaves rosette); white flowers (~1 cm of diameter) occur on the water surface (on long pedunculates); forms grow in not very deep water, usually up to 1 m depth.

\*I decided to shorten the name of the "**Submerge form with floating leaves**" category by removing the term "**submerge**". It is more correct in the light of the hydrobotany definition. A plant with some organs on the surface of the water is no longer strictly "submerge".

(iii) **Terrestrial form** - with “expanded” aerial leaves, elliptical to ovate shape, on short petioles, sometimes with white flowers; they occur on exposed muddy bottom or in not very deep water (up to several centimeters).

## Location: 1. DAUSJØEN

**Individuals:** The number of individuals is estimated at about **500,000**, which is less than in 2018. This estimate is due to a slight decrease in the total area and the disappearance of large areas with a dense occurrence of *Luronium* and their replacement with patches with a scattered occurrence.

**Area:** Sum = **18268 m<sup>2</sup>** (20223 m<sup>2</sup> in 2018). (see Table 1 and map 1. 2.)

Description for tables and maps.

A: form with floating leaves and flowers. Usually growing to a depth of 0 - 1.5m

B: submerged vegetative form. Usually growing to a depth of 1.5 – 4m.

C: plants from seeds germinated in the summer of 2020 in a moist mud at a bottom depth of 4 - 6m, below the depth at which *Luronium natans* grew under normal conditions.

Table 1.

	2024		2018
	m2	% wartości 2018	m2
A dense	0,94392	0,178156266	529,827
A scattered	0	0	2108,165
B dense	5003,652282	41,33343699	12105,58
B scattered	13263,06711	242,0460739	5479,563
Razem	18267,66331	90,33052151	20223,135

**Environment (habitat):** Lake with stable (not regulated by dam) water level. Plants which are growing on the depths between 10 -100 cm could be visible from ashore if they produce floating leaves and flowers. **Submerge vegetative form of *Luronium* is practically inaccessible for observation from the shore and the only way to determine the area occupied by this form is by diving.** *Luronium* grows preferably on empty sandy and clayey (mineral) bottom with a thin layer of organic sediment, but also together with: *Lobelia dortmanna*, *Juncus bulbosus*, *Equisetum fluviatile*, *Carex vesicaria*, *Lysimachia thyrsiflora*, *Alisma plantago-aquatica* (rarely), *Nuphar luteum* and in deeper parts with *Isoëtes lacustris*, *I. echinospora*. Maximum depth where *Luronium* is growing in Dausjøen – 2,2 m.

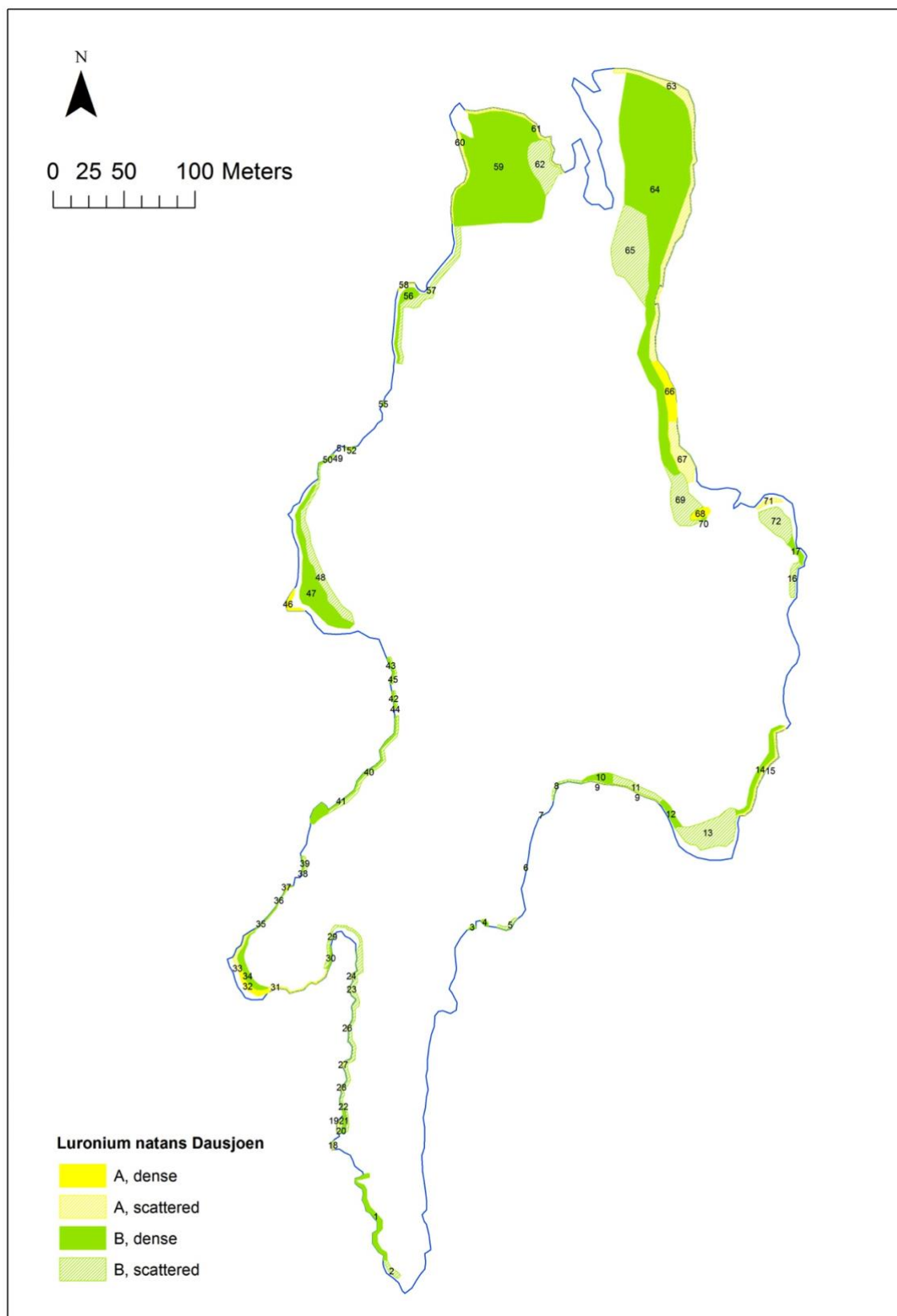
**Condition:** In the summer 2024 the observation was carried out by diving method. Due to the relatively cool summer, *Luronium* produced almost no floating leaves and flowers. Only one small cluster with floating leaves was found at the steep western bank. It is possible that the ducks' feeding also contributed to this. Hence, even in very shallow water we observed only vegetative rosettes - therefore, these surfaces were classified as form "B". In comparison with 2018, a considerable sparseness of plants was observed on large surfaces in the northern bays of the lake, but on other surfaces, on the eastern shores, *Luronium* grew more densely.

**GPS-coordinates:** 60° 0'31.70"N 10°47'23.08"E

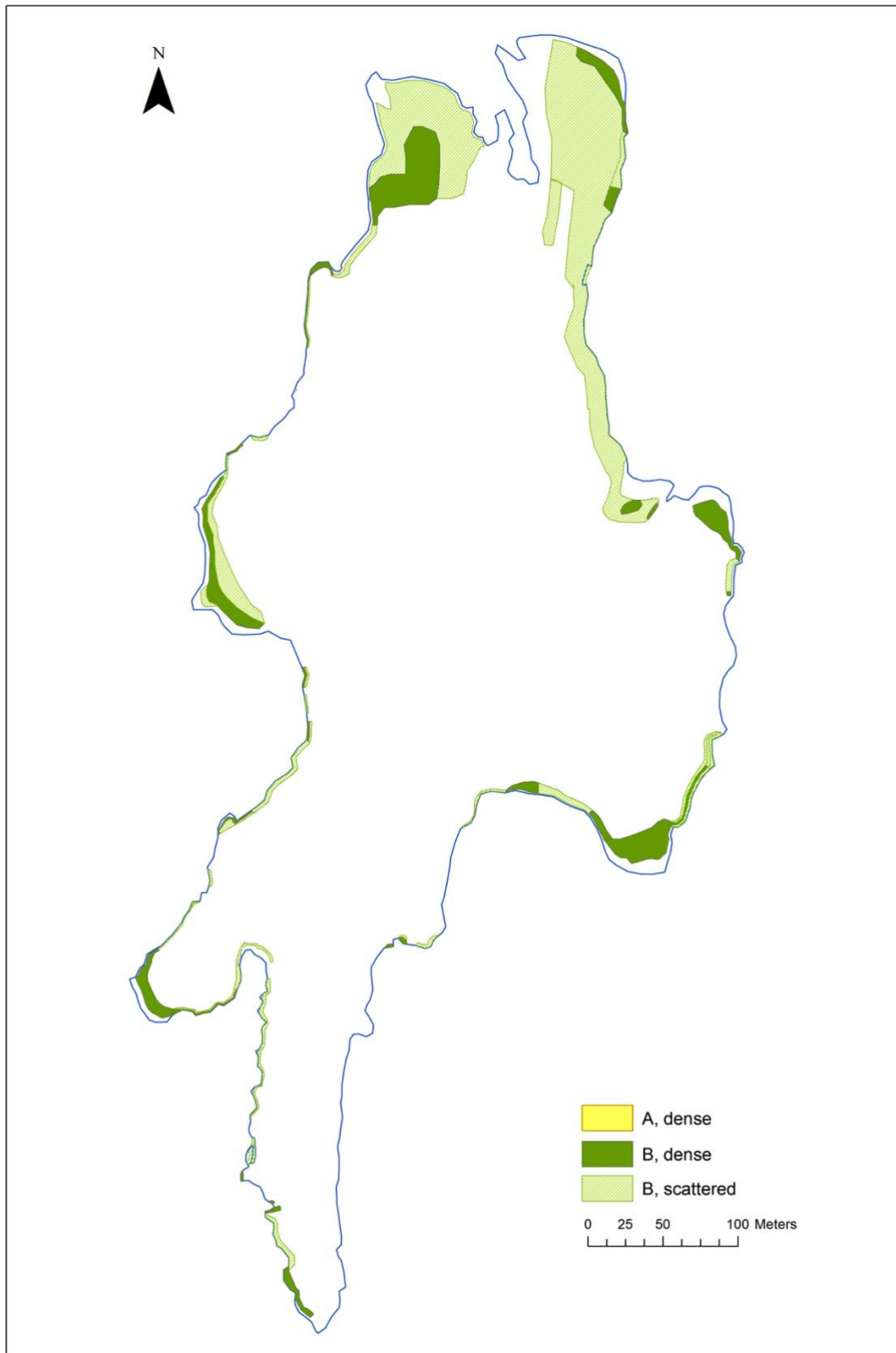
**Date of watch:** 8.08.2024.

**Photos:** R. Gramsz

**Observer:** R. Gramsz and Katarzyna Bociąg.



Map 1. Dausjøen. Distribution of the *Luronium natans* population in **2018**. Authors: Katarzyna Bociąg & Roman Gramsz.



Map 2. Dausjøen. Distribution of the *Luronum natans* population in **2024**. Authors: Katarzyna Bociąg & Roman Gramsz.

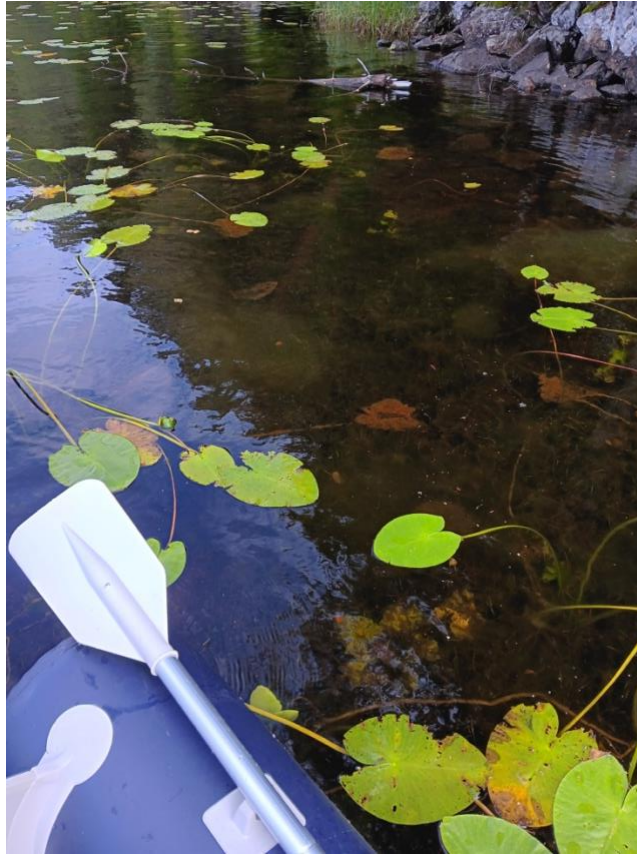


Photo 1. Even on very shallow surfaces *Luronium* grows as a vegetative form. 8.08.2024.



Photo 2. In the bay at the mouth of the Movassbekken, *Luronium* grows more densely than in 2018. 8.08.2024.

## Location: 2. BREISJØEN

*Luronium natans* monitoring was carried out this year using a boat and a diving method. Field research and cartographic works were carried out using the same method as in 2018 and 2021. Thus, the comparison of maps made in 2018 and in 2021 gives the opportunity to assess the effects of draining the lake during the reconstruction of the dam on the range of the *Luronium* population and the effectiveness of the protective measures taken at that time. And the map from this year (4 years after the reconstruction of the dam) shows how *Luronium* is coping in the changed environment after the reconstruction of the dam.

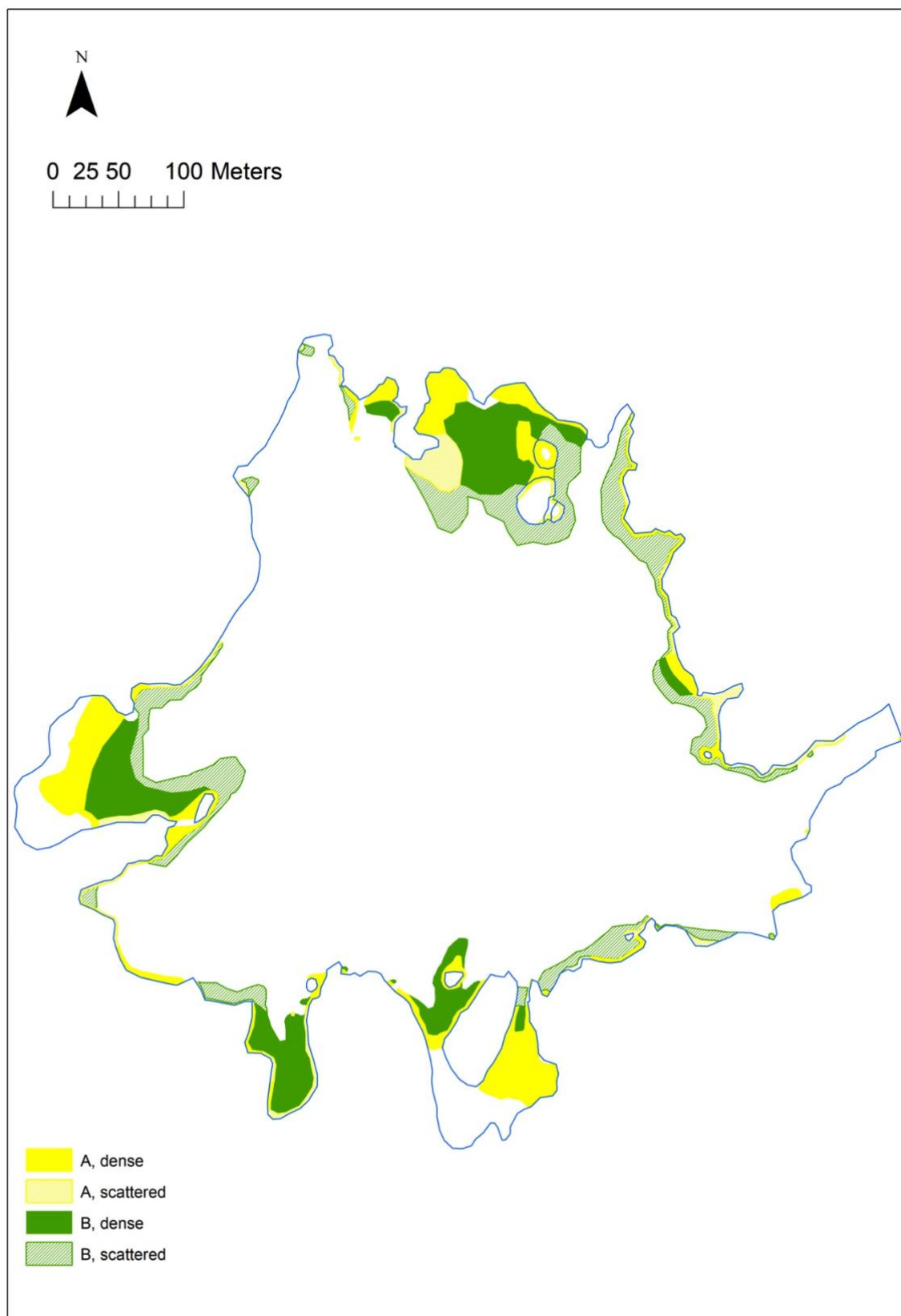
**Individuals:** The number of individuals in the lake can only be estimated. After research in 2018, 2021 and 2024, we estimate that the number of *Luronium* individuals has recovered after being depleted during the reconstruction of the dam in 2020 to the state from 2018. - which means **about 1,200,000 - 1,500,000 individuals**

**Area:** The area occupied by the *Luronium* population in 2024 is **41 162m<sup>2</sup>** which is 109% of the area occupied in 2018 and 148% of the area occupied in 2021.

The exact data are presented in Table 1 and Maps 1, 2 and 3

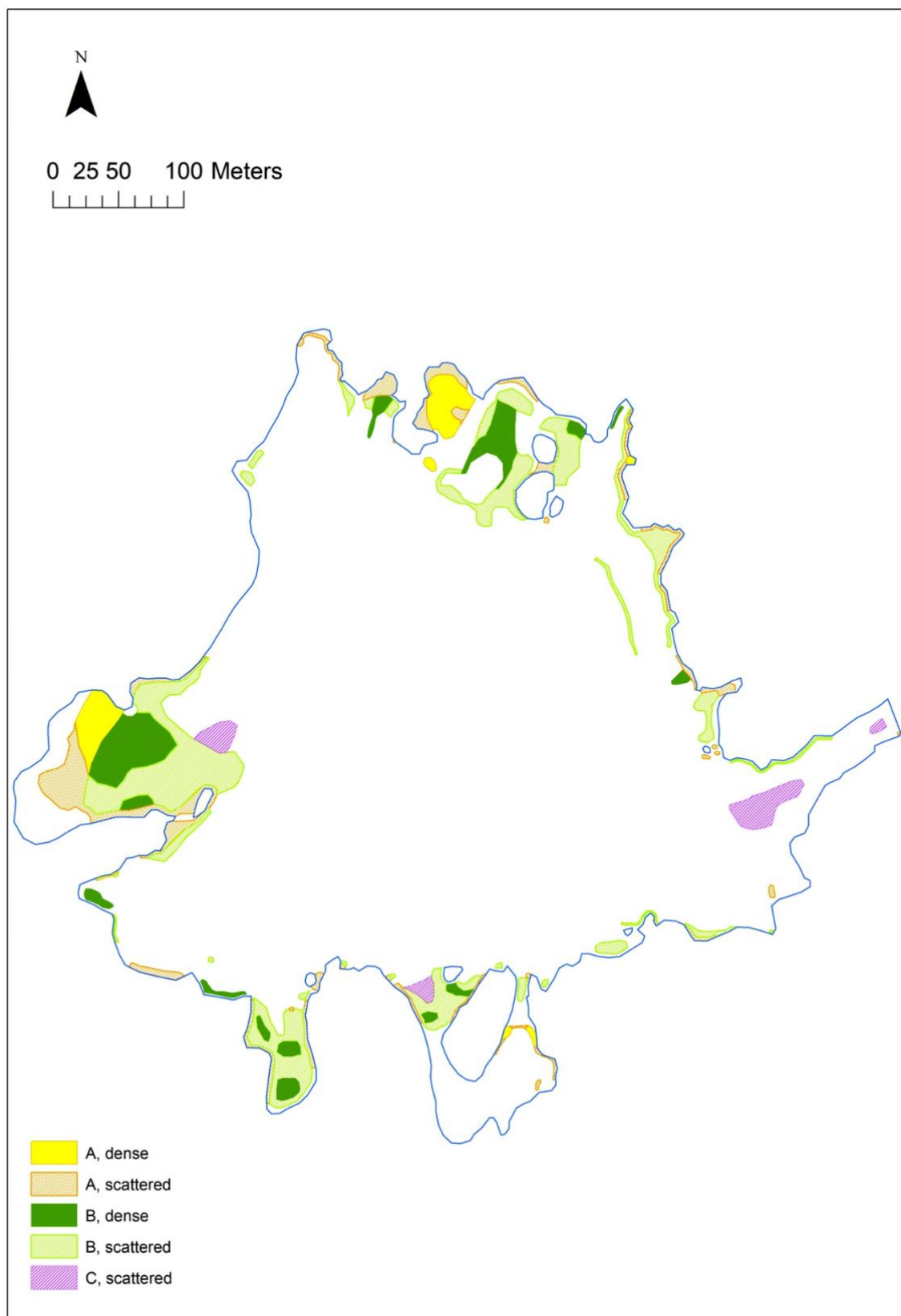
Table 1.

Forms	/ Year	2024			2021		2018
		m2	% of 2021	% of 2018	m2	% of 2018	m2
A	dense	1193	46	11	2588	22,91	11296
A	scattered	7133	131	194	5448	147,93	3683
B	dense	6913	132	63	5225	47,51	10999
B	scattered	24757	196	211	12635	107,63	11739
C	scattered	1165	63		1850		
<b>Sum</b>		<b>41162</b>	<b>148</b>	<b>109</b>	<b>27747</b>	<b>73,57</b>	<b>37717</b>

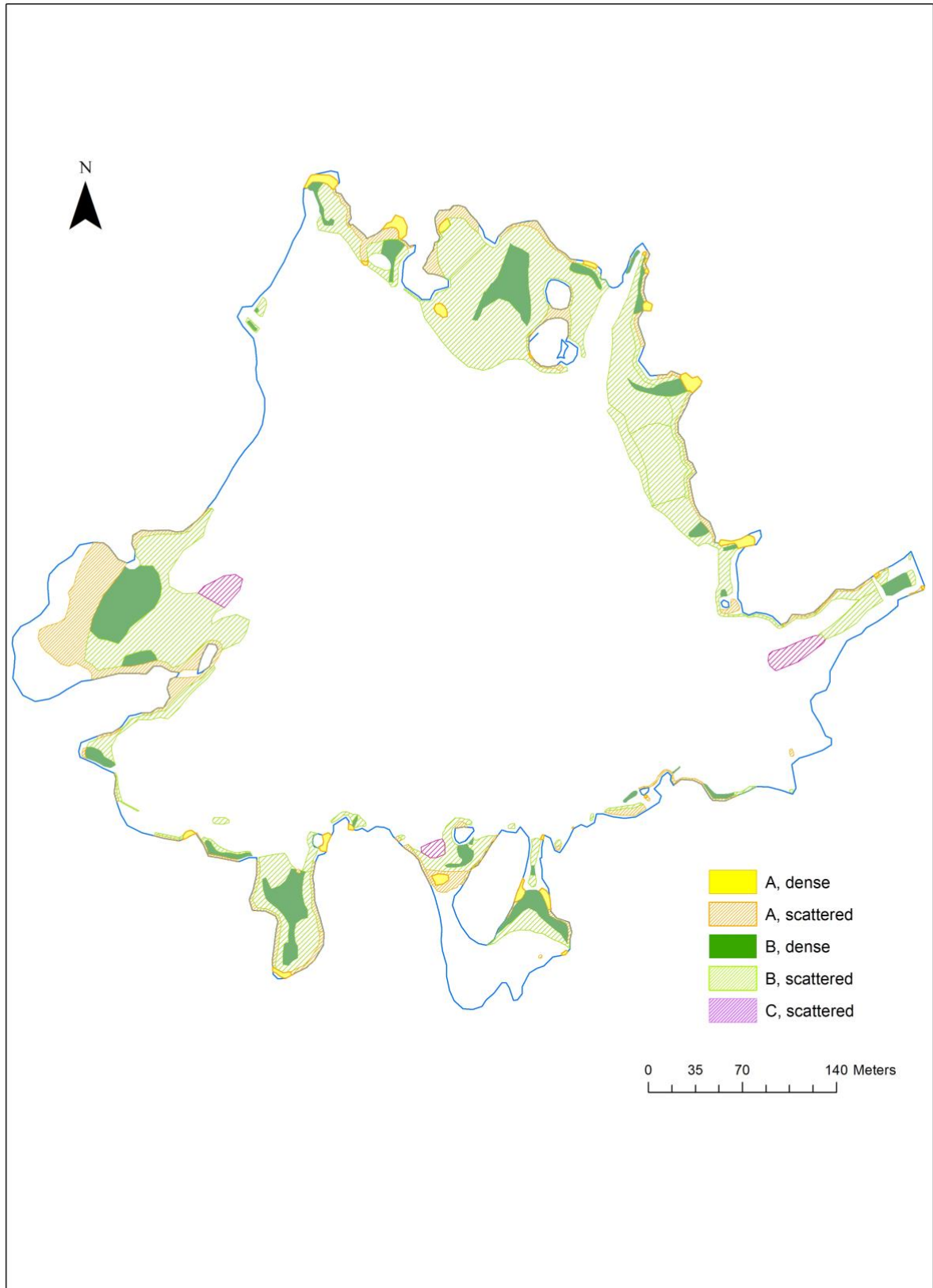


Map 1. Breisjøen. Distribution of the *Luronum natans* population in **2018**.  
Authors: Katarzyna Bociąg & Roman Gramsz.





Map 2. Breisjøen. Distribution of the *Luronum natans* population in 2021.  
Authors: Katarzyna Bociąg & Roman Gramsz



Map 3. Breisjøen. Distribution of the *Luronum natans* population in **2024**.  
Authors: Katarzyna Bociąg & Roman Gramsz.

**Environment (habitat):** This lake has variable water level. Plants can grow both on the exposed shore and submerge in water. *Luronium* grows preferably on empty sandy and clayey (mineral or mix mineral-organic) bottom. Observations from 2020 confirmed that the most favorable substrate for *Luronium* is possibly a thick organic-clay layer covered with a thin, liquid organic layer. Such conditions occur on the flat fragments of the bottom. *Luronium* can also grow on underwater rocky shelves and on not very steep slopes if it is covered with a layer of silt. On the depth of water to about 1m *Luronium* grows together with: *Lobelia dortmanna*, *Juncus bulbosus*, *Ranunculus reptans*, *Isoëtes echinospora* (?), *Equisetum fluviatile*, *Carex vesicaria*, *Lysimachia thyrsoiflora*. Vegetation at a places deeper than 1.5m is very pure so, it is less competition for *Luronium*. The water in the lake is very transparent which allows the plant to grow to a depth of 4 m.

The drainage of the lake in 2020 resulted in major changes to the habitat occupied by *Luronium*. These are:

- erosion, washing out of clay-organic sediments, especially from steep parts of the bottom near the shores which resulted in the disappearance or significant thinning of the plants in this zone
- change of sediment properties where they have not been rinsed (flat parts of the bottom in lake bays) - overdrying and oxygen access
- changed species composition of plants on some surfaces. Some of these changes may be long lasting and these species compete with *Luronium*, e.g.: *Juncus bulbosus*, *Potamogeton alpinus*, *Glyceria* sp.
- appearance of plants that germinated from seeds during the summer of 2020 on the then exposed bottom with moist silt at a depth of 4 - 6m. This is a depth that the *Luronium* in Breisjøen did not grow at. These plants survived until 2021 in the form of small vegetative rosettes. On map 2 marked in pink as form "C".

**Condition: The population of *Luronium* in Breisjøen is doing well after 4 years from the reconstruction of the dam.**

During reconstruction of the dam in 2020, the entire area where *Luronium* occurs was drained. The water level of the lake was lowered by 6.5 m between April and October. *Luronium* suffered the greatest losses in shallow places, on the bottom slopes, especially where no protective measures, like irrigation were taken.

By 2024, *Luronium* had returned to almost all of these sites, although it still occurs there in scattered places. *Luronium* also appeared on a large flat area of the bottom, at a depth of about 3 m on the eastern side of the lake. In 2018, there was a dense "meadow" of *Isoëtes echinospora* - which mostly died out in 2020. This is a significant, large additional area now covered by *Luronium*, together with a small number of regenerating *Isoëtes*. This is one of the reasons why *Luronium* occupies 3500 m<sup>2</sup> more area in 2024 than during the period of population stability in 2018.

As was to be expected, *Luronium* is dying out in the deepest places (4-6m) that it inhabited in the summer of 2020 - although there are still some of these plants (form "C") at a depth of 4-5m noticed in 2024.

It may be wondered that in comparison to 2018, in 2024 "submerge vegetative form" - B occupies a much larger surface than "form with floating leaves" - A. One of the explanations is that the plants survived better in deeper positions, but also the very definition of "form with floating leaves". Mainly depending on the water temperature in a given year, a different part of the *Luronium* population produces floating leaves and flowers on the water surface. In cold years, floating leaves and flowers are produced only by the most shallowly growing plants, so the remaining part of the plants without floating leaves are classified as submerged vegetative form. The summer of 2024 was much cooler compared to the extremely hot summer of 2018.

During the studies in 2018, the average surface water temperature in Breisjøen was around 25 degrees, and in 2024 it did not exceed 20 degrees.

Also intriguing is the small share of dense patches of plants with floating leaves - here, in addition to the water temperature, a large influence may be the feeding of mallard ducks *Anas platyrhynchos*. In addition to eye observations of such feeding, large amounts of torn *Luronium* shoots can be seen floating on the surface everywhere in the shallow bays of the lake.

**GPS-Coordinates:** 59°58'47.17"N 10°51'38.11"E

**Date of watch:** 12.06, 16.07, 5 – 7.08, 24.09.2024.

**Photos:** R. Gramsz

**Observer:** R. Gramsz and Katarzyna Bociąg



Photo 1. Small eastern bay - A place where *Luronium* has regenerated very well. It grows densely here at a depth of 20 - 80 cm as a form with floating leaves and flowers. This year relatively few leaves and flowers have reached the water surface. 16.07.2024.



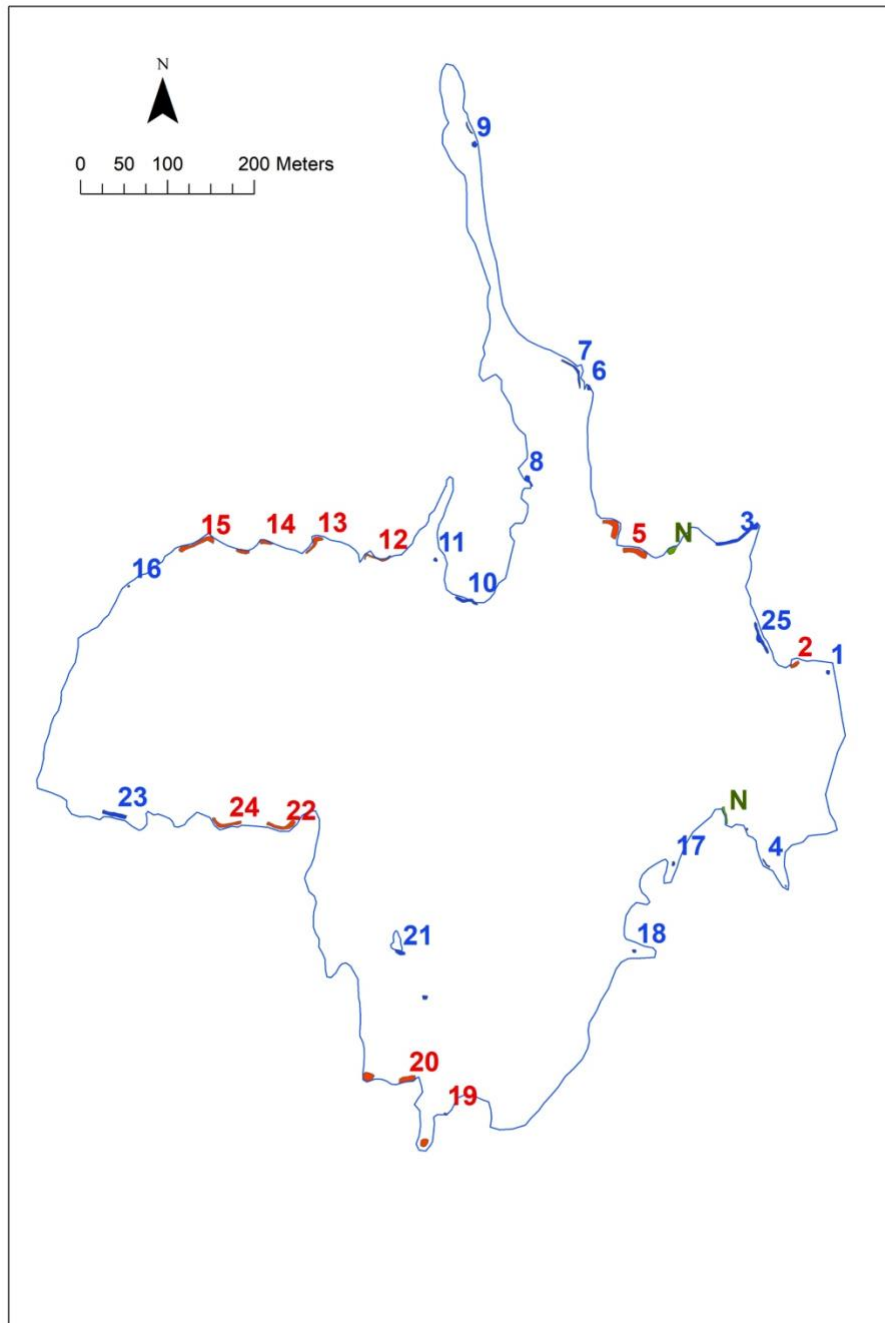
Photo 2. In the southern bay *Luronium* also regenerates well, but is eaten by ducks (*Anas platyrhynchos*). The torn shoots of *Luronium* float on the surface of the bay. 5.08.2024.



Photo 3. Diver, Katarzyna Bociag prepared for deep diving to find *Luronium* remains at a depth of 4-6 m (Form "C"). 6.08.2024.

### Location: 3. ALUNSJØEN.

*Luronium natans* monitoring was carried out this year using a boat and a diving method. The main goal of this research was to make a map of the *Luronium natans* population distribution, 5 years after transplanting a large number of plants to 25 locations along the banks of Alunsjøen.



Map.1. On the map - Alunsjøen, locations of *Luronium natans* in 2024.

- green areas with "N" - existing natural sites
- blue areas and numbers – extinct planted sites
- red areas and numbers – existing planted sites

**Individuals:** ca. 600

The presence of plants on 2 natural locations was confirmed during observations in 2024. Plants are spread in locations creating one bigger and a dozen or so small concentrations (clusters) with a 100 – 200 as a sum of individuals.

Of the 25 sites where *Luronium* was planted, 10 of them were confirmed that plants have survived Map 1. However, only single plants grew on most of these sites. Only at site no. 15 *Luronium* seems to be developing well. There are two concentrations of flowering and vegetative plants, numbering several hundred individuals, and a dozen more plants scattered nearby. Only 3 more sites (19, 20 and 24) have more than 20 plants scattered throughout the site. Therefore, mainly due to the development of *Luronium* at site no. 15, we estimate the number of plants - descendants of plants planted in 2019 at 400 - 500 individuals

**Area:** Sum = ca. 600m<sup>2</sup>.

**Environment (habitat):** The littoral belt of Alunnsjøen is still very pure with vegetation after dam rebuilding in 2007 -2008. However, from 2020, a massive development of *Characeae* algae - *Chara virgata* has been notice. This overgrowing started from Mjøservika where until last year (2023) the entire bottom of the bay was covered with a compact 50 cm thick layer of *Chara virgata*. In recent years *Chara* has been gradually overgrowing, mainly the N and E shores of the lake, probably contributing to the disappearance of *Luronium* planted at sites 1 - 11.) In 2024 *Chara virgata* died in Mjøservika Bay (a thick layer of this plant disappeared, leaving an empty bottom), but it is spreading further, mainly in the NE part of the lake. In Mjøservika Bay, *Nuphar luteum* and *Potamogeton natans* have survived and are in good condition. But these species are practically absent in other parts of the lake. But a greater share of *Potamogeton alpinus* and *Juncus bulbosus* is observed in the littoral zone.

On 3.08.2024 the surface water temperature in Alunnsjøen was 19 degrees and pH 7.0. The water flowing out of the tunnel from Breisjøen has a pH of 7.5.

**Condition:** Plants were hard to see, they produced few floating leaves and flowers. That is why they are difficult to see on the water surface and the small vegetative rosettes growing on the bottom are often masked by *Chara virgata*, *Juncus bulbosus*, *Lobelia Dortmana* and *Potamogeton alpinus*. Only at natural locations and location no 15 plants were better visible. *Luronium* has not been observed below a depth of 1.2 m.

**Care:** Field research was conducted using the diving method in the period 3-5.08.2024. Based on these studies, a map of the distribution of *Luronium natans* sites in Alunnsjøen was created.

**GPS-coordinates:** 59°57'57.94"N 10°51'4.54"E

**Date of watch:** 16.07; 3 - 5.08; 24.09.2024

**Photos:** R. Gramsz

**Observer:** R. Gramsz and Katarzyna Bociąg.



Photo 1. *Chara vigata* and *Lobelia Dortmana* increasingly compete with *Luronium natans* in the old, natural site. 3.08.2024.



Photo 2. Small concentration of *Luronium*, together with *Juncus* in a site no 15. 3.08.2024.





Photo 3. Alunnsjøen. Searching for *Luronium* by diving. Even in shallow places a diver can see more precisely what is growing there. 3.08.2024.

## **Location: 4. SVARTKULP**

In 2024, only observations from the shore were conducted. Due to the low transparency of the water, even observations using a pontoon and water binoculars do not give much. It is necessary to repeat the research using the diving method.

**Individuals:** *Luronium* is not growing so abundant in Svartkulp as in Breisjøen and Dausjøen but after our underwater observation (2016) we estimate that it is growing on area of about 1600 m<sup>2</sup>. That means (if we use 10 individuals/1 m<sup>2</sup>) = **16000** individuals. - estimated after research in 2016

**Area:** Ca. **1600 m<sup>2</sup>** – as found out by diving in year 2016. (with submerge vegetative form)

**Environment (habitat):** This lake has rather stabile water level. Is relatively small and surrounded by forest and high, steep rocks on Eastern side. Western and North - Western shallow shore is overgrown by mire vegetation. *Luronium* plants are growing preferably on empty mix mineral/organic) bottom, but also together with: *Nuphar luteum*, *Potamogeton natans*, *Juncus bulbosus*, *Equisetum fluviatile*, *Carex vesicaria*, *Lysimachia thyrsiflora*. *Sparganium sp.* At the day of observation 16.07.2024 it was very high water level, water was brown and little transparent.

**Condition:** No floating leaves or flowers were observed, only a few fragments of plants torn from the bottom...

**Care:**

**GPS-Coordinates:** 59°58'30.95"N 10°50'51.30"E

[Luronium-Svartkulp4](#)

**Date of watch:** 16.07.2024.

**Photos:** no photos

**Observer:** R. Gramsz

## **Location: 5. MARIDALSVANNET**

In 2024, only observations from the shore were conducted.

**In order to update the data on *Luronium* in this lake, it is necessary to repeat the research by diving.**

**Individuals:** *Luronium* in most places is growing spread, not as dense as it can grow in Breisjøen and Dausjøen. So, if we estimate 20 individuals/m<sup>2</sup> x 29650m<sup>2</sup> = **593 000** individuals. Maximum depth – 2m. - estimated after research in 2018

**Area:** Sum = **29650m<sup>2</sup>**. (The size of set surfaces after data from year 2018 report.)

**Environment (habitat):** Big lake with variable water level. The spots with *Luronium* at Maridalsvannet are less abundant than in Dausjøen or Breisjøen. Surface of water in the lake can strongly wave because of its size. *Luronium* avoids exposure to waves and it is possible to find it only in sheltered bays, behind rocky spurs or protected against waving by other plants and in places located deeper than 30 cm. Transparency of water is smaller than in Breisjøen and Alunsjøen. Typically, *Luronium* were found at a depth of 30 to 150 cm (max. 2m) from maximum water level. In a slow flowing estuary part of Dausjøelva (during researches in 2018) we have found a few small locations of *Luronium* and some interesting plants like: *Limosella aquatica*; *Subularia aquatica* and other most common plants in Maridalsvannet: *Alisma plantago aquatica*, *Lobelia dortmanna*, *Litorella uniflora*, *Juncus bulbosus*, *Heleocharis acicularis*, *Ranunculus reptans*, *Isoëtes lacustris*, *Equisetum fluviatile*, *Carex vesicaria*, *Lysimachia thyrsoiflora*, *Nuphar luteum*, *Myriophyllum alterniflorum*, *Potamogeton natans*, *Sagittaria sagitifolia*, *Sparganium sp div.*

**Condition:** In the bay, near the water gauge, two small patches with floating leaves and flowers were visible. Due to the high water level at the mouth of Dausjøelva, *Luronium* was not observed.

**Care:**

**Date of watch:** 16.07.2024.

**Photos:** no photos

**Observer:** R. Gramsz