Russian State Hydrometeorological University Department of Applied Ecology

The role of macrophytes in Ladoga Lake ecosystems

Dr. Nadezhda Zuyeva

Valaam

2010

One of the most important components of the water ecosystem are macrophytes.

Aquatic macrophytes are *vacular plants*, *large alga* and *mosses* developing in water or in conditions of surplus humidity.







The role of macrophytes in the freshwater ecosystem

- Forming microclimate in the coastal part of the water,
- Reducing the currents and wave activity,
- Intensive photosynthesis in thickets can change the oxygen and carbon dioxide regime and pH.



Macrophytes makes the habitat for different organisms.

Abundance and biomass of benthos are very big.

Phytoplankton is influenced by macrophytes especially in the small lakes. Water plants regulate an abundance of alga (especially cyanobacterium).

Macrophytes are the substrate of the complexes periphytons and habitatspecific phytophilous fauna.



The community of aquatic plants play a great role in a fish life, being a spawning, a graziery and a shelter.

For many birds and mammals it is a habitat and feeding grounds at the same time.



Life forms of macrophytes

1. Water is much denser than air, and it supports it's inhabit plants. This leads to underdevelopment or disappearance of their support (mechanical) tissue, so the stems and **leaves of many aquatic plants, soft, flexible and easy to move over**.





2. The water contains less oxygen than air, and water plants have many adaptations which protect it against "oxygen starvation". Thus, in contact with water bodies of aquatic plants can absorb water with dissolved oxygen throughout its surface. This is achieved thanks to the special structure of cell membranes covering tissues. For improving gas exchange there are strongly dissected submerged leaves, which increase their surface for the contact with water.

Life forms of macrophytes

3. Because of ability to absorb water with dissolved substances throughout the surface of some inhabitants of water bodies is poorly developed root system.





4. Penetration of solar energy into water is increased by the depth. This is the reason that submerged plants can capture weak light. Its morphology is obvious feature of adaptation to living conditions at the deficit of PhAR (photosynthetically active radiation).

Real aquatic plants	Type 1 - Hydrophytes, or real aquatic plants	 Macroalgae and aquatic mosses. Hydrophytes, freely floating in the water column; Immersed rooting hydrophytes Rooting hydrophytes with floating leaves; Hydrophytes, freely floating on the water surface.
Coastal aquatic plants	Type 2 - Helophyte, or air-aquatic plants	- Low-grass Helophyte; - High-grass Helophyte.
	Type 3 - Gigrohelophytes.	
The setting in the coastal water	Type 4 - Gigrophytes	
(wetland) plants	Type 5 - Gigromezo- and mezophytes.	0 , ∞
		According to materials Dr. V.G.Papchenkov

Factors forming the vegetation of the water

• Morphological characteristics of the water body (the depth, the steepness of bottom slope, irregularity of the coastline);

- Optical properties of water (the transparency and color);
- Dynamic factors (mobility of water masses and wind effects);

• Chemical factors (the composition of dissolved salts and organic matter, pH, gas regime, the dynamics of dissolved oxygen and carbon dioxide);

- Mechanical and chemical properties of soil;
- Temperature regime;
- Forest cover (shading) in coast.

Zones of macrophytes



Vertical zoning of macrophytes

- 1 Overwater level (high, mid and low grass);
- 2 Floating (floating plants and plants with floating leaves);
- 3 Underwater (high, mid, bottom grass).

Macrophytes of Lake Ladoga (based on materials of Dr. Igor Raspopov)

108 species of macrophytes

81 associations

(37 species flowering plants and 1 higher spore plant)

Phragmites australis (reed)

Potamogeton perfoliatus

Carex sp. (sedges)

Phragmites australis (reed)

Potamogeton sp.

Zone of fjords

- Water transparency, limiting the spread of plants to the depth;
- Properties of sediments;
- Mobility of the water mass.

Classical profile overgrown muddy littoral zone

8-12	12	10	8-15	5	15		3-5	m
Carex & Phalaroides		Phragmites		<i>Nuphar</i> with aqati plants	с	Potan	noge	əton
	<i>Phragmites</i> with aqatic		Potamogeton with aqatic		Ceratophyllu with aqatic	ım		
	plants		plants		plants			
							A REAL PROPERTY AND A REAL	

Geobotanical zone of open coast

West Coast poorer than East Coast: on the first there are 6 macrophyte associations, on the second - 17.

Zone of southern bays

24 associations of macrophytes

A characteristic feature not observed in other areas - the massive development of *Sciprus lacustris*.

Classical profile overgrowing at the littoral of small sands

Classical overgrowing of muddy littoral zone

Phragmites australis (reed)

Polygonum amphibium

Sagittaria sagittifolia

The total area occupied by macrophytes is less than 0,5% of the lake area Annually macrophytes produce about 3 g of air-dry matter to 1m²

81 association of macrophytes in Lake Ladoga

only 5 are common to all three geo-botanical regions

Phragmites

Phragmites with aqatic plants

Scolochloa with aqatic plants

Potamogeton perfoliatus

Polygonum amphibium with aqatic plants

