

# AQUATIC AND MARSHY MACROPHYTES IN THE ECOSYSTEM OF LAKE CHIRIȚA (IAȘI)

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## Introduction

Lately there has been noticed a wide growth of the population of aquatic macrophytes (pond weed, bill-hook, water milfoil, horned pondweed, duckweed), growth that affects in a negative way the good management of the lake, because of their wide spreading, thus reducing the possibilities of exploiting the water that supplies the Iasi town.

The hydrophytes are plants that adapted to the aquatic life (in fresh or salted water), with a small root and their leaves close to the water surface. Hydrophytes depend almost entirely on the force of water, lacking the strengthening element of terrestrial plants (the lignin). At the same time, they do not possess the protection mechanisms against negative phenomena, like drought, cold or excessive sunlight. The intensity of light depends on the water's turbidity and depth. The aquatic plants have a very thin tissue of lignin and also a very delicate layer of epidermis, no cuticle and this allows the absorption of water with nutrients through the whole surface of the plant, compensating the lack of a root, and also makes them very flexible, being able to swing with the currents. Their flexibility is enhanced also by the fact that the conductive tissue of aquatic plants is structured in a central core, as opposed to the terrestrial plants, where the conductive tissue is like a bundle around the stem. The large spaces, filled with air, named aerenchyma, allows them to float (it can be observed at *Lemna gibba* L. on the back of the frond like a small bag) and provides a stock of oxygen that is easily accessible and distributed throughout the whole plant.

There are five families of plants in the ecosystem of Chirița Lake: Ceratophyllaceae, Haloragaceae, Potamogetonaceae, Zanicelliaceae and Lemnaceae. The Ceratophyllaceae and Haloragaceae families belong to the Magnoliatae (Dicotyledonatae) class and the Potamogetonaceae, Zanicelliaceae and Lemnaceae families to the Liliatae (Monocotyledonatae) class.

In the last few years there has been noticed a wide growth of macrophytes population (reed, bulrush, sedge) growth that affects in a negative way the good management of the lake, because of their wide spreading, thus reducing the possibilities of exploiting the water surface.

As a result, some measures are necessary for reestablishing the normal features of the lake, so it can be managed in optimal conditions and in a long term plan. Such a program must target the reducing of the number and surface of these species but with taking in account the fact that the purpose of the lake is supplying with drinkable water.

Marshes are situated at the borderline between terrestrial and aquatic ecosystems. As on land, the chemical reactions with the atmosphere take place very quickly, but the flora and fauna are specific. The marshes are land with excessive humidity, affected by temporary quantities of still water at the surface, and invaded by marshy vegetation.

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Marshes are the result of poor draining or insufficient clogging (filling with deposits of mud brought by running waters, lacustrine areas, artificial lakes, ponds, puddles, everglades or the river bed) of an excavation.

The hydro-bio-ecological character of the marsh is well established. In some cases it represents the intermediary element between dry land and the aquatic units. The lakes and puddles often have a marshy area at the border, where the dominant vegetation is represented by the marshy macrophytes (towards the border) and the aquatic ones (toward the water) .

### Results and discussions

The Ceratophyllaceae family – is represented by submerged species of plants, perennial, rootless, a thin stem, branched, with whorled leaves, dichotomically divided in segments resembling rigid threads. The flowers are very small, monosexual, greenish, placed at the back of the leaves; the masculine ones have 10 to 16 stamina. The floral cover is a perigon made of 9 to 12 segments grown at the base. The pollination takes place through water.

The *Ceratophyllum* L. genus has two species: *Ceratophyllum demersum* L. (bill-hook, whorl-leaf water milfoil, with a long and thin stem, branched, and rather fragile and *Ceratophyllum submersum* L. – bill-hook, whorl-leaf. It has whorled leaves dichotomically divided three or four times in four to 13 very thin spears, mildly or not serrated, relatively soft at touch. At the base of the branches they have 1 – 3 whorls with 6 – 8 leaves, undivided or divided only in 2 - 4 spears. The fruits are sparse, oval, with a small thorn on top, much shorter than the fruit. This species can cover relatively wide areas at the bottom of the lakes where they prosper. Because they break very easily, their branches, leaves and stems gather along the border of pools, puddles, covering them with a thick layer. The dense bushes of whorl-leaf draw in fish that find here many Chironomide that build pipes among the leaves of the plant.



Fig. 1 – *Ceratophyllum submersum*



Fig. 2 – *Ceratophyllum demersum*

The Haloragaceae family – is represented by species of submersed perennial, plants with a branched, thin stem, with a large number of soft leaves, pectinate – pennate, arranged from 3 to 6 in whorls (C. Antonescu, 1951). The flowers are small, with 4 sepals, 4 petals, 8 stamina.

The *Myriophyllum* L. genus-whorl-leaf, water milfoil – has two species: *Myriophyllum spicatum* L. is a perennial species, almost 3 meters long, with deeply divided leaves arranged 4 in whorls (seldom in 3 or 5), a long leaf of about 15 – 30 mm., it has 13- 38 filiform segments on each side of the fin. Before maturity the leaves have microscopically glands that discharge a substance named myriophyllum. The top of the stem rises above the water surface and has white flowers arranged in whorls of 4; the whorls are arranged in straight, long, broken ears. The bracts are shorter or in the most cases as long as the flowers, the superior ones being whole and the inferior ones serrated. It is a common species in still

and slow moving waters. *Myriophyllum verticillatum* L. – has its leaves arranged 5 – 6 in whorls. The leaf is 4 – 4.5 cm long, with 24 – 35 smooth linear segments on each side. Before maturity they have small elongated glands that produce myriophyllum. The top of the stem rises above the water surface and has white flowers arranged in 10 – 25 whorls that form a final condensed ear 10 – 25 cm long. All bracts are equal or longer than the flowers. Fecundation and hibernation take place through turions (winter buds) 6 – 50 mm long.

The water bed covered with whorl leaf offers shelter and food to fish. Both species take part in the biogenic decalcification of water, taking away its carbon dioxide, while the calcium carbonate (limestone) precipitates on their leaves, which are often course because of that.



Fig. 3 – *Myriophyllum spicatum*



Fig. 4 – *Myriophyllum verticillatum*

The Potamogetonaceae family – are aquatic fresh water (in our case) or salted water plants with whole leaves, submersed or floating, at the base with alary stipels, or with a sheath and ligulae. The main axis is a long crawling rhizome. The flowers are hermaphrodite, arranged in thin ears; the floral cover is green or brown; the ovary is superior. The family is represented by the species of its only genus: – *Potamogeton* L. – the pond weed. The species are: *Potamogeton crispus* L., *Potamogeton gramineus* L., *Potamogeton lucens* L., *Potamogeton pectinatus* L.. Some species of *Potamogeton* produce successively during their development two types of leaves that cannot usually be seen at the same time on the same stem. These types of plants are called heteroblastic. In this case, the leaves that grow first are called primary leaves and those that grow later are secondary leaves. As opposed to these there are the homoblastic plants which have only one type of leaves. There are many heteroblastic water plants, some strongly heteroblastic and some mildly heteroblastic, (E. Țopa, 1959).



Fig. 5 – *Potamogeton crispus* L.



Fig. 6 – *Potamogeton pectinatus* L.





Fig.7 – *Potamogeton pusillus* L.



Fig. 8 – *ZanicHELLia palustris*

The Zanicelliaceae family – they are perennial hydrophytes species with adventives roots and linear, liguled leaves. The flowers are unisexual, isolated or in groups, the masculine ones with 3 – 1 stamina and the female 1 – 9 free carpels. The fruit is drupaceous. The family is represented by one genus with one species and one subspecies – *ZanicHELLia palustris* L. ssp. *palustris* (the typical species) and ssp. *pedicellata* Arcangeli – the horned pondweed. It has a long thin, crawling stem, very branched and it has adventives or floating roots. The brightly green leaves are up to 10 cm long and very narrow (2 mm at the most). The flowers are very small, single or in pairs of two at the alar part of the leaf. The fruits are sessile, and long shaped. They grow in still or slow moving waters, developing submersed meadows.

The Lemnaceae family – are perennial herbaceous aquatic plants, submersed or floating, very small (the smallest are from the Magnoliophyta phylum); their stem is reduced to a floating disc like a small leaf (a frond) of about 1 cm, growing from one another through budding, grouped or single, with no leaves and with thin roots, (that lack at the *Wolffia arrhiza* Horkel), ended with a calyptras. The flowers are nude, unisexual, the masculine ones have 1 – 2 stamina, and the female ones are have a monocarpellary gynaecium, and protected by a membrane; they are arranged by 2 or 3 (usually 1 – 2 male and one female) in a marginal excavation of the frond. The *Lemna* L. genus – the duckweed – is represented in Chirița Lake by the species *Lemna gibba* L. (in reduced quantities) and *Lemna minor* L. (dominating).



Fig. 9 – *Lemna gibba* L.



Fig. 10 – *Lemna minor* L.

As it can be seen in the above image, the most part of the marshy macrophytes are represented by the *Phragmites* Adanson and *Typha* L genera that grow like a large rim on the right border of the lake and advancing in the lake.

The largest surface is covered with *Phragmites australis* Steudel – reed that creates

dense Microsystems along with other specific plants that form the well noun association – *Phragmitetum vulgaris* Soó 1927 - the thicket.

The *Phragmites australis* species Steudel have wide lanceolate leaves, coarse towards the edges, but very elastic, a thick root, up to 12 m long. The ears are 1 cm long with 3 – 8 reddish and yellow flowers grouped in a big panicle. The reed spreads through stolons that start at the knots of the rhizome which is embedded in mud. They crawl in the mud at first, and then they start to bend upwards. From these soon grows the thicket that invades the lake. Another way of spreading is through twigs that grow at the surface of the water then sink at the bottom giving out roots and buds from every knot. The reed forms, together with the bulrush and the scouring rush, a true belt of thicket, but the reed are most encountered association.

Having roots well stuck in the ground, these plants take their nutrients from the soil. Their vegetative parts are well above water, so the oxygen that is produced does not stay in the aquatic medium.

Less widespread in the marshy area of Lake Chirița is the *Typha* L. genus – the bulrush, with its two well known species, *Typha latifolia* L. and *Typha angustifolia* L.

These are perennial plants, with a crawling rhizome, long, linear leaves, and flowers arranged in cylindrical, brownish ears. The masculine ear is placed at the top of the inflorescence and the female one under it. The flowers are unisexual, very stuffed, the perigon has 3 stamina, a superior ovary and the fruits are very small. At maturity, the inflorescence opens in wooly wisps, and the seeds are scattered by the wind.

*Typha angustifolia* L. has its flowery stem 80-210 cm high, linear, narrow, at least 10 cm wide and arched on the inferior side. The masculine ear is away from the female one. It grows in still and slow moving waters. More spread is the *Typha latifolia* L. species. The flowery stem is up to 250 cm high, the leaves are 15-25 mm wide, the male and female ear has the same length and they touch each other. It also grows in still and slow moving waters.

*Typha latifolia* L. is the most widespread species and though accompanied by *Typha angustifolia* L., it defines the association *Typhetum latifoliae* Lang 1973 – the bulrush.

When it is not very crowded, the bulrush lets the sunlight reach the bottom of the lake, and amongst it we usually find the big fish. When it is too dense, the bulrush is harmful, because it blocks the sunlight and the heat, depraving the fish from their food and the soil from its valuable nutrients. That is why in natural ecosystems the bulrush is a hard plant to fight with and people use it in different ways, but it has no place in well taken care of ponds .

Along with these prevalent species, there are many accompanying species in lake Chirița, such as *Alisma plantago-aquatica* L., *Butomus umbellatus* L., *Calystegia sepium* R. Br., *Carex riparia* Curtis, *Catabrosa aquatica* Beauv., *Epilobium hirsutum* L., *Galium palustre* L., *Glyceria maxima* Holmberg, *Lycopus europaeus* L., *Lysimachia vulgaris* L., *Lythrum salicaria* L., *Mentha aquatica* L., *Myosotis scorpioides* L., *Rorippa amphibia* Besser, *Sparganium erectum* L. ssp. *neglectum* K. Richter, *Stachys palustris* L., *Veronica beccabunga* L. etc.



Fig. 11 – *Typha latifolia*



Fig. 12 – *Glyceria maxima*





Fig. 13 – *Phragmites australis*



Fig. 14 – *Typha angustifolia*

### Conclusions

The representatives genus of aquatic macrophytes in Chirița Lake are: *Ceratophyllum* L. with two species: *Ceratophyllum demersum* L. and *Ceratophyllum submersum* L.; *Myriophyllum* L. – whorl-leaf, water milfoil – has two species: *Myriophyllum spicatum* L. and *Myriophyllum verticillatum* L.; *Potamogeton* L. – the pond weed with: *Potamogeton crispus* L., *Potamogeton gramineus* L., *Potamogeton lucens* L. and *Potamogeton pectinatus* L.. The Zanichelliaceae family is represented by one genus with one species and one subspecies – *Zanichellia palustris* L. ssp. *palustris* (the typical species) and ssp. *pedicellata* Arcangeli – the horned pondweed.

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