

AN OVERVIEW OF SOME *POTAMOGETON* SPECIES FROM THE ROMANIAN BANAT

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Abstract. The genus *Potamogeton* L. includes submerged or floating perennial hydrophytes. Globally, botanists discuss up to 120 species. In the Romanian Flora, volume XI (eds. SĂVULESCU & NYÁRÁDY, 1966) there are described 15 species. CIOCĂRLAN (2009) and SĂRBU et al. (2013) present 15 confirmed species and 2 unconfirmed for Romania. Over time, in Banat (with reference especially from Timiș and Caraș-Severin counties), we found reports about several species of *Potamogeton*. The studies belong mainly to (TÖKES, 1905), SORAN (1954, 1956), BOȘCAIU (1966), GRIGORE (1971), COSTE (1974), VICOL (1974), OPREA et al. (1974), ARVAT (1977), ARSENE et al. (in STĂNESCU, 2005), MATAČĂ (2005), NEACȘU (2008). Some of these species, as *Potamogeton compressus* and *Potamogeton obtusifolius* are no longer reconfirmed in the field, due to the reduction or disappearance of some wet zones. The weight of the common species of *Potamogeton* (like *Potamogeton crispus* and *Potamogeton natans*) in the structure of the aquatic vegetation is significant and it indicates, from an ecological point of view, the eutrophication, an obvious phenomenon in the Lake Sânandrei (Timiș county), which we studied (NEACȘU, 2008). SÎRBU & OPREA (2011) do not mention any species of *Potamogeton* as invasive for our country. On the other hand, CIOCĂRLAN (2009) and SĂRBU et al. (2013) maintain in their list a rare species, *Potamogeton coloratus* (cited from Mehedinți county). The distribution of this species was considered uncertain in the old flora of our country (1952-1976).

Keywords: *Potamogeton*, wet zones, Romanian Banat

INTRODUCTION

For the aquatic environment, the *Potamogeton* genus is one of the most important, because its species are habitats and food for aquatic fauna. This genus is well represented, botanists discussing over 100 species spread across the globe. The taxonomy of the genus is still debated, but the molecular analysis is helping to clarify some aspects.

The first publication of *Potamogeton* was made by CAROLUS LINNAEUS (CARL VON LINNÉ) in 1753, in his famous work, *Species Plantarum* (International Plant Names Index <https://www.ipni.org/n/30005042-2>). According to Plants of the World Online (POWO), there are 90 accepted species (<https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30005042-2>). In some references, it is discussed even 120 species, but WIEGLEB & KAPLAN (1998) consider that it is unjustified to consider a larger number of species or, that if such a thing is accepted, then these assessments are based on a narrower concept than of the species. For this reason, they take into account and describe only 69 species.

The most frequently used characters to distinguish *Potamogeton* species are leaves and seeds morphology. ANTONESCU (1951) divides the genus into 5 groups, depending on the successive development of the leaves (heteroblastic / homoblastic plants) and the environment in which they develop (submerged / emerged). Altogether there are 16 species, 7 of which are considered common: *P. pusillus*, *P. pectinatus*, *P. crispus*, *P. perfoliatus*, *P. lucens*, *P. natans* and *P. fluitans*. The 16 species considered by ANTONESCU are: *Potamogeton compressus*, *P. crispus*, *P. fluitans*, *P. lucens*, *P. natans*, *P. obtusifolius*, *P. pectinatus*, *P. perfoliatus*, *P. berchtoldii*, *P. trichoides*, *P. gramineus*, *P. coloratus*, *P. acutifolius*, *P. rutilus*, *P. densus* (today

synonymous for *Groenlandia densa*), *P. mucronatus* (synonymous for *P. friesii*). He does not mention *P. nodosus* and *P. alpinus* (considered by CIOCÂRLAN, 2009 and SÂRBU *et al.*, 2013).

MATERIAL AND METHODS

This study is based on our own data, collected from 2005 until now and from botanical literature: R.P.R. / R.S.R. flora (the old flora), other recent Romanian national floras, scientific articles, PhD thesis, biodiversity databases etc. We followed the *Potamogeton* species from the Romania's flora and we discussed those reported in Banat areas. For these we specified their status, the habitats (according to CIOCÂRLAN, 2009), the location indications and we added observations from the field.

RESULTS AND DISCUSSION

In the Romania's flora, are described and confirmed 15 species of *Potamogeton* and also are mentioned other 2 species with uncertain presence (unconfirmed). The 15 species of *Potamogeton* confirmed in our flora are: *Potamogeton compressus*, *P. crispus*, *P. pusillus*, *P. lucens*, *P. natans*, *P. obtusifolius*, *P. pectinatus*, *P. perfoliatus*, *P. berchtoldii*, *P. trichoides*, *P. nodosus*, *P. gramineus*, *P. coloratus*, *P. alpinus*, *P. acutifolius*. The species *P. friesii* (*P. mucronatus*) and *P. rutilus* are not confirmed, but some authors still keep them in their lists. From Banat, are reported 12 species (table 1). Among them are 3 rare species: *P. compressus*, found by BOȘCAIU (1966) surroundings of the city of Lugoj, Timiș county (although CIOCÂRLAN, 2009 only names Mureș and Tulcea counties), *P. trichoides*, cited by VICOL (1974) at Lugoj and MATAČĂ (2005) from Iron Gates Natural Park and *P. acutifolius*, found by GRIGORE (1971) at Timișoara, VICOL (1974) at Lugoj and ARVAT (1977) at Jebel. The other *Potamogeton* species are mainly sporadic.

Table 1.

Potamogeton species from Banat wet zones

	Species name	Geoelement	Status	Habitats	Reports from Banat
1.	<i>P. acutifolius</i> Link	Eurasian	rare	the steppe zone, the silvosteppe, the layer of the oak tree	Timișoara (Romanian Flora XI, 1966), near Timișoara (GRIGORE, 1971), Lugoj (VICOL, 1974), Jebel (ARVAT, 1977)
2.	<i>Potamogeton compressus</i> L.	Circumpolar	rare, Mureș and Tulcea counties	the steppe zone - the gorun layer, stagnant or smoothly flowing waters	Lugoj (BOȘCAIU, 1966). In 1974, VICOL did not find this species.
3.	<i>Potamogeton crispus</i> L.	Cosmopolitan	very frequent	the steppe zone - the layer of the beech tree, stagnant and smoothly flowing waters	Timișoara (TÖKES, 1905), Liebling and surroundings (SORAN, 1954), Banat (Romanian Flora XI, 1966), Lugoj (BOȘCAIU, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Lescovița, Socol-Locvei Mountains (COSTE, 1974), Satchinez (OPREA <i>et al.</i> 1974), Iron Gates Natural

					Park (MATACĂ, 2005), Surduc, Pișchia, Liebling lakes (NEACȘU, 2008)
4.	<i>P. gramineus</i> L.	Circumpolar	sporadic	the steppe zone - beech layer, stagnant water	Timișoara (TÖKES, 1905), Timiș-Bega Interfluve (GRIGORE, 1971), Iron Gates Natural Park (MATACĂ, 2005)
5.	<i>Potamogeton lucens</i> L.	Eurasian	sporadic	the steppe zone-beech layer, stagnant waters, lakes	Timișoara (TÖKES, 1905, Romanian Flora XI, 1966), Lugoj (BOȘCAIU, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Pojejena-Locvei Mountains (COSTE, 1974), Iron Gates Natural Park (MATACĂ, 2005)
6.	<i>Potamogeton natans</i> L.	Circumpolar	sporadic	the steppe zone-fir layer, stagnant water	Timișoara (TÖKES, 1905), Liebling and surroundings (SORAN, 1954), Timișoara, Deta, Lugoj (Romanian Flora XI, 1966), Lugoj (BOȘCAIU, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Iron Gates Natural Park (MATACĂ 2005), Satchinez Swamps (ARSENE <i>et al.</i> in STĂNESCU, 2005), Surduc, Liebling, Sânanndrei lakes (NEACȘU, 2008)
7.	<i>P. nodosus</i> Poiret (cited as <i>Potamogeton fluitans</i> Roth.)	Circumpolar	sporadic	the steppe zone - the area of oak forests, smooth flowing waters, rarely stagnant	Deta, Ghiroda, Satchinez (Romanian Flora XI, 1966), Lugoj (BOȘCAIU, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Iron Gates Natural Park (MATACĂ, 2005)
8.	<i>Potamogeton obtusifolius</i> Mert. et Koch	Circumpolar	sporadic	the steppe zone - the layer of the beech tree, stagnant and smoothly flowing waters	Caransebeș (Romanian Flora XI, 1966), Lugoj (BOȘCAIU, 1966)
9.	<i>Potamogeton pectinatus</i> L.	Cosmopolitan	sporadic	the steppe zone-beech layer, stagnant water	Liebling and surroundings (SORAN, 1954), Timiș-Bega Interfluve (GRIGORE, 1971), Pojejena-

					Locvei Mountains (COSTE, 1974), Satchinez (OPREA et al. 1974), Pișchia, Sânanđrei lakes (NEACȘU, 2008)
10.	<i>Potamogeton perfoliatus</i> L.	Cosmopolitan	sporadic	the steppe zone - the layer of the beech tree, stagnant and smoothly flowing waters	Lugoĵ (BOȘCAIU, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Iron Gates Natural Park (MATACĂ, 2005)
11.	<i>Potamogeton pusillus</i> L.	Circumpolar	sporadic	the steppe zone - the layer of the holm, weakly saline stagnant waters	Timișoara (TÖKES, 1905), Liebling and surroundings (SORAN, 1954), Timișoara, Liebling, Lugoĵ, Românești (Romanian Flora XI, 1966), Timiș-Bega Interfluve (GRIGORE, 1971), Lugoĵ (VICOL, 1974)
12.	<i>Potamogeton trichoides</i> Cham. et Schlecht.	Eurasian (sub-Mediterranean)	rare	the area of the oak forests - the layer of the fir tree, stagnant and smoothly flowing waters	Lugoĵ (VICOL, 1974), Iron Gates Natural Park (MATACĂ, 2005)

There is the possibility that the species *Potamogeton berchtoldii* was present here in the past or was cited under the name *Potamogeton pusillus*, as a misapplied name (auct. non - auctorum non), because CIOCĂRLAN (2009) maintains it in (Crișana, Transylvania) Banat. Looking for the dichotomous key, however, at *P. pusillus* the lateral veins of the leaves are not obvious, while at *P. berchtoldii* they are obvious. CIOCĂRLAN, 2009 and SĂRBU *et al.*, 2013 consider *Potamogeton pusillus* L. = *P. panormitanus* Biv. and *Potamogeton berchtoldii* Fieber = *P. pusillus* auct. non-L. Even DRĂGULESCU (2013) maintains *Potamogeton berchtoldii* in the flora of the Timiș Basin (keeping a citation at Caransebeș, from FRE, 1946). Also, *P. nodosus* was mentioned as *Potamogeton fluitans*, but this last is not considered today (CIOCĂRLAN, 2009, SĂRBU *et al.* (2013).

In this area, we did not find any mentions on *P. alpinus* (very rare, in Harghita and Suceava counties, according to CIOCĂRLAN, 2009). CIOCĂRLAN (2009) also indicate in Mehedinți county (Eșelnița) a rare species, *P. coloratus*.

We found some *Potamogeton* species in the Surduc, Pișchia, Liebling, Sânanđrei lakes and Satchinez Swamps. The most frequent are *P. crispus*, *P. natans* and *P. pectinatus* and the areas occupied by them are sometimes appreciable. Along the canals from Satchinez and at the border between the water and the marshy land, at Sânanđrei (where large amounts of nutrients are collected), the populations of three *Potamogeton* species develop best and their presence indicates water eutrophication.

Table 2.

The distinctive characters of the main species of *Potamogeton*

Species	type of leaves	leaf description
<i>Potamogeton crispus</i> L.	all the leaves are submerged	with wavy-wrinkled edges
<i>Potamogeton natans</i> L.	emergent/floating and submerged leaves	floating leaves, ovate-elliptic, opaque, with a subcordate base and with 2 obvious folds; submerged leaves reduced to phyllodes
<i>Potamogeton pectinatus</i> L.	all the leaves are submerged	narrowly linear, the blade starts from the extremity of a long sheath that tightly surrounds the stem



Figure 1. *Potamogeton crispus*, *P. pectinatus* and *P. natans* at Liebling, Pișchia, Sânnandrei and Satchinez - details and general view (original foto)

In table 2 are presented the distinctive characters of the leaves and in figure 1, there are a few photos of these species. We also mention that at Satchinez, the species *P. gramineus*

and *P. pusillus* are probable, while *P. lucens*, reported by TÖKES (1905), is now absent (ARSENE *et al.*, in STĂNESCU, 2005).

The *Potamogeton* species are submerged or floating plants so depend on water level and are related to the restriction of the surfaces over time. They can form characteristic plant associations (*Potamogetonnetum lucentis*, *Potamogetonnetum perfoliati*, *Potamogetonnetum graminei*, *Potamogetonnetum trichoidis*, *Potamo-Ceratophylletum submersi*, *Potametum natantis* etc.) and appear in the vegetation of *Lemnetea*, *Charetea fragilis*, *Zosteretea marinae*, *Ruppiaetea maritima*, *Potamogetonetea pectinati*, *Phragmitetea* (COLDEA, 1997).

Talking about some neighboring countries, in the flora of Serbia are listed 13 species of *Potamogeton*, VUKOV *et al.* (2004) found 6 of which in the Danube River, in the main channel. They noticed that *P. lucens* and *P. pectinatus* are abundant and *P. crispus* is rarely encountered. On the other hand, LUKÁCS *et al.* (2020) analyzed the disappearance and reappearance of *P. coloratus* in Hungary, one of the endangered species due to habitat loss and population decline and found that they were strongly influenced by fluctuations in water levels and temperature. They also highlight the importance of the dispersal ability by means of endozoochory. This species is also rare in our flora. The Bulgarian Flora Online mentions that 16 species of *Potamogeton* are found in Bulgaria. ASSYOV & PETROVA (2006), in the flora of Bulgaria, present chorological maps for *P. acutifolius*, *P. alpinus*, *P. crispus*, *P. friesii*, *P. gramineus*, *P. lucens*, *P. natans*, *P. nodosus*, *P. pectinatus*, *P. perfoliatus*, *P. polygonifolius*, *P. praelongus*, *P. pusillus*, *P. trichoides*, to which it is added *Groenlandia densa*. ARDELEAN (2006) includes in the flora of Arad County (located in the immediate northern vicinity of the Romanian Banat) 5 species of *Potamogeton* (*P. crispus*, *P. gramineus*, *P. lucens*, *P. natans* and *P. nodosus* Poiret (*P. fluitans* Roth pro parte).

CONCLUSIONS

In the Romania's flora, 15 species of *Potamogeton* are confirmed and in Banat we found 12 of them. The most frequently encountered by us are *Potamogeton crispus*, with wide spread in Romania as well, *Potamogeton natans* and *Potamogeton pectinatus*, both with sporadic spread nationally. *Potamogeton alpinus* is not found here. The references are not very accurate for *Potamogeton berchtoldii* and *P. coloratus*. The regression of some species (*P. compressus*, *P. obtusifolius*) is closely related to the reduction of wet habitats in Banat.

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