

# NOTES ON THE POTAMOGETONES OF THE ZUIDLAREN LAKE AND ITS ADJACENT WATERS

BY

E. W. CLASON (Groningen)

(Received June 30, 1952)

More than half a century ago VUYCK (1895, p. 630) urged the need of a renewed investigation of the occurrence and distribution of Potamogetones in the northern provinces of the Netherlands. Judging from the localities recorded by KLOOS (1936), it is obvious that this recommendation is still actual, especially so for the province of Groningen. Whilst Potamogetones occur there in almost every water, on the maps of KLOOS (l.c.) only a small number of squares is marked. Therefore I collected in the summer of 1950 the Potamogetones of the Zuidlaren Lake and some adjacent waters, situated about 10 km S of the city of Groningen. Potamogetones of this greatest oligohaline lake of the Netherlands were mentioned earlier by HAVINGA (1919, p. 14; this paper contains ample general information on the Lake) and by CLASON (1928, II, p. 42). However, some species found by HAVINGA I could not find again, also some species I found in 1928 were not collected in 1950 and with some other species happened just the reverse. KLOOS (l.c.) does not record any species from the Lake; however, on his maps the square comprising the lake-area is crossed for *P. natans* L., *P. lucens* L. and *P. oblongus* Viv. (= *P. polygonifolius* Pourr.). In the following notes I stick to the nomenclature and the descriptions of ASCHERSON and GRAEBNER (1913); numbers refer to table I.

## 1. *P. natans* L. var. *prolixus* Koch.

Easily recognizable, especially by 4—5 mm high fruits. The plants found in the Lake and its vicinity have very constantly the following features: ligules considerably shorter than the petioles; floating leaves small (30—40 mm wide and 40—70 mm long); petioles long, often twice and more the length of lamina, in fresh condition not furrowed on the upper-side; lamina passing decurrently into the petiole, the transition marked by two small puckers only.

By no means abundant in the Lake; only in sheltered corners and in pools of open water in the *Scirpeto-Phragmitetum*, where the bottom is muddy, it is regularly found. In adjacent canals and ditches this same variety is very abundant.

## 2. *P. polygonifolius* Pourr.

Fruits only 2 mm high. I could not find it in 1950. A herbarium-specimen which I collected in 1928 under that name, proved to belong to *P. natans* L. var. *prolixus* Koch. No other herbarium-material available; the occurrence of this species must be considered uncertain.

According to local Dutch floras, this species should be confined to oligotroph waters (e.g. HEIMANS c.s., 1950, p. 194, states: "in heath-pools"). On the map of KLOOS (l.c., p. 569) the majority of the habitats in the Netherlands is situated on higher grounds, indicating poor waters. However, round about the city of Groningen the map shows a coherent area, including the Lake-area, where nowadays oligotroph waters are very rare. As HAVINGA (l.c., p. 14) mentions the species from the Lake, it may have disappeared in recent times, because the water of the Lake became more eutroph in consequence of intensive manuring and progressing industrialisation of the hinterland.

TABLE I  
Western-european Potamogetones according to ASCHERSON & GRAEBNER and the available data about their occurrence in the Zuidlaren Lake and adjacent waters.

Sections and species	Havinga 1919	Clason 1928	Kloos 1936	Clason 1950
<b>I. HETEROPHYLLI</b>				
1. <i>natans</i> L. . . . .	x	x h	O	O x h
2. <i>polygonifolius</i> POURR. . . . .	x	x ?	O	
3. <i>fluitans</i> ROTH. . . . .				
4. <i>coloratus</i> VAHL . . . . .				
5. <i>alpinus</i> BALBIS . . . . .				
6. <i>perfoliatus</i> L. . . . .		x		O x h
7. <i>praelongus</i> WULFEN . . . . .		O h		
8. <i>lucens</i> L. . . . .		x	O	O x h
9. <i>zizii</i> MERTENS & KOCH . . . . .				x h
10. <i>gramineus</i> L. . . . .	x			
(11.) <i>nitens</i> WEBER . . . . .				
<b>II. BATRACHOSERIS</b>				
12. <i>crispus</i> L. . . . .		O		O h
<b>III. CHLOÉPHYLLI</b>				
13. <i>compressus</i> L. . . . .				O x h
14. <i>acutifolius</i> LINK. . . . .				O h
15. <i>obtusifolius</i> MERTENS & KOCH. . . . .				x h
16. <i>mucronatus</i> Schrad. . . . .		x ?		
17. <i>pusillus</i> L. . . . .				O x h
(18.) <i>rutilus</i> WOLFGANG . . . . .				
19. <i>trichoides</i> CHAMISSO & SCHL. . . . .				
<b>IV. COLEOPHYLLI (PECTINATI)</b>				
20. <i>pectinatus</i> L. . . . .	x	x		x h
(21.) <i>filiformis</i> PERS. . . . .				
<b>V. ENANTIOPHYLLI</b>				
22. <i>densus</i> L. . . . .	x			

x = in the Lake; O = in adjacent waters; h = in the Herbarium of the State University, Groningen; ( ) = not (yet) found in the Netherlands.

6. **P. perfoliatus** L.

In spring shoots show at the base internodes of 8 cm, blades oval to oblong, up to 7 cm long; farther above internodes shorter and blades smaller. Lateral shoots show very variable habits, obviously connected with the growing circumstances, viz. in periods of foulness of the water by water-bloom (abundant development of algae) and towards the end of growing-season they develop thin stems with small leaves. Margins of older blades not serrate, only very young not yet fully unfolded leaves have a somewhat rough margin. KLOOS (l.c., p. 527) has described the leaf-margin as finely-serrate, however, this does not hold good for the plants of the lake.

Most common species of the open water of the Lake, also the most striking species. In small to very big patches, mostly in shallow places with a sandy bottom, but also very common in deeper places (to about 1.75 m), sometimes with a peaty bottom.

7. **P. praelongus** Wulfen.

In 1923 growing in the peaty mill-canal, which discharges via the Noordlaren canal into the Lake. In 1950 I could find it no more. A herbarium-specimen has leaves 10—15 cm long and up till 2.5 cm wide.

8. **P. lucens** L.

Leaf-form distinctly connected with growing circumstances, cf. KLOOS, l.c., p. 537. In deep water, with rising water-level and with streaming water leaf long with long tapering point. In shallow, stagnant water with falling waterlevel leaf shorter with small point only. So the blades are oblong to lanceolate, cf. var. *vulgaris* Cham.; shoots with smaller, oval blades correspond more with var. *nitens* Cham. However I found these blades on shoots of the same plants, due to changing circumstances during the season.

In some places in fairly thin patches in the open water of the lake and also more regularly in sheltered corners and pools of the *Scirpeto-Phragmitetum*.

9. **P. zizii** Mertens et Koch (fig. 1, A 1—5).

According to KLOOS (l.c., p. 539) this species has not been found with certainty in the Netherlands up to now. An important charac-

Leaves numbered from apex of shoot	Lamina		Unlaminated petiole long mm
	long mm	wide mm	
1. first fully unfolded . . . . .	77	25	15
(1. idem <i>P. lucens</i> ) . . . . .	(90)	(24)	( 2)
2. . . . .	78	26	14
3. . . . .	78	24	9
4. . . . .	(damaged)		
5. . . . .	73	18	2
6. . . . .	73	16	2
(6. <i>P. lucens</i> ) . . . . .	(99)	(25)	( 2)

teristic is, that the uppermost leaves have longer petioles than the lower ones. I took the following measurements of leaves from a non flowering shoot; two measurements of corresponding leaves of a shoot of *P. lucens* L. (cf. var. *nitens* Chamisso) of the same locality have been inserted for sake of comparison.

All parts of *P. zizii* are less robust than the same parts of *P. lucens* growing next to it. Further features of *P. zizii* of the Zuidlaren Lake are the following. Lateral nerves unite with mid-nerve near base of blade, the outermost nerves last of all; alternately this union happens gradually resp. with a final curve to the mid-nerve. No well developed maze formed by very small nerves along the mid-nerve, only one such a small nerve on both sides along the mid-nerve. Peduncles are not thickened towards the top at flowering time, whereas this thickening happens to a considerable degree after the fruits have set. Well developed fruits to 3 mm high and almost as wide, distinctly flattened with a slightly convex to almost straight ventral suture and short apex. *P. lucens* of the same locality has 4—5 mm high fruits and these are more rotund, caused by a distinctly convex ventral suture. Ligule of *P. zizii* usually more pointed than that of *P. lucens*. I did not find floating leaves, otherwise the plants correspond to the variety *validus* Fieber.

In the S-E-edge of the Lake in sheltered corners with a sparse vegetation of emerging plants (*Scirpus lacustris* L., *Nymphaea alba* L. and *Nuphar luteum* Sm.).

#### 12. *P. crispus* L.

The absence of this species in the Lake-area is embarrassing, as in the adjacent waters it is found abundantly.

#### 13. *P. compressus* L.

Well developed leaves usually 3 mm wide; a mid-nerve and a parallel smaller nerve along both margins; between these 3 nerves a greater number of very fine nerves which unite near the apex with the mid-nerve. Apex narrows down fairly abruptly and ends in a small tapering point, fig. 1 B.

Very abundant in pools of open water with a muddy bottom amidst the *Scirpeto-Phragmitetum*; great patches of interwoven plants.

#### 14. *P. acutifolius* Link.

Plants differ from *P. compressus* by the following features:

- a. fully developed leaf usually not more than 2 mm wide, ending in a fine point, cf. var. *minor* Fieber. Venation same as that of *P. compressus*; however, the very fine nerves end in the parenchyma and do not unite with mid-nerve near the top, fig. 1 C.
- b. peduncles shorter and fruits more rotund, higher (to 3 mm, against 2 mm for *P. compressus*). On the ventral side the fruit has usually some small knobs.

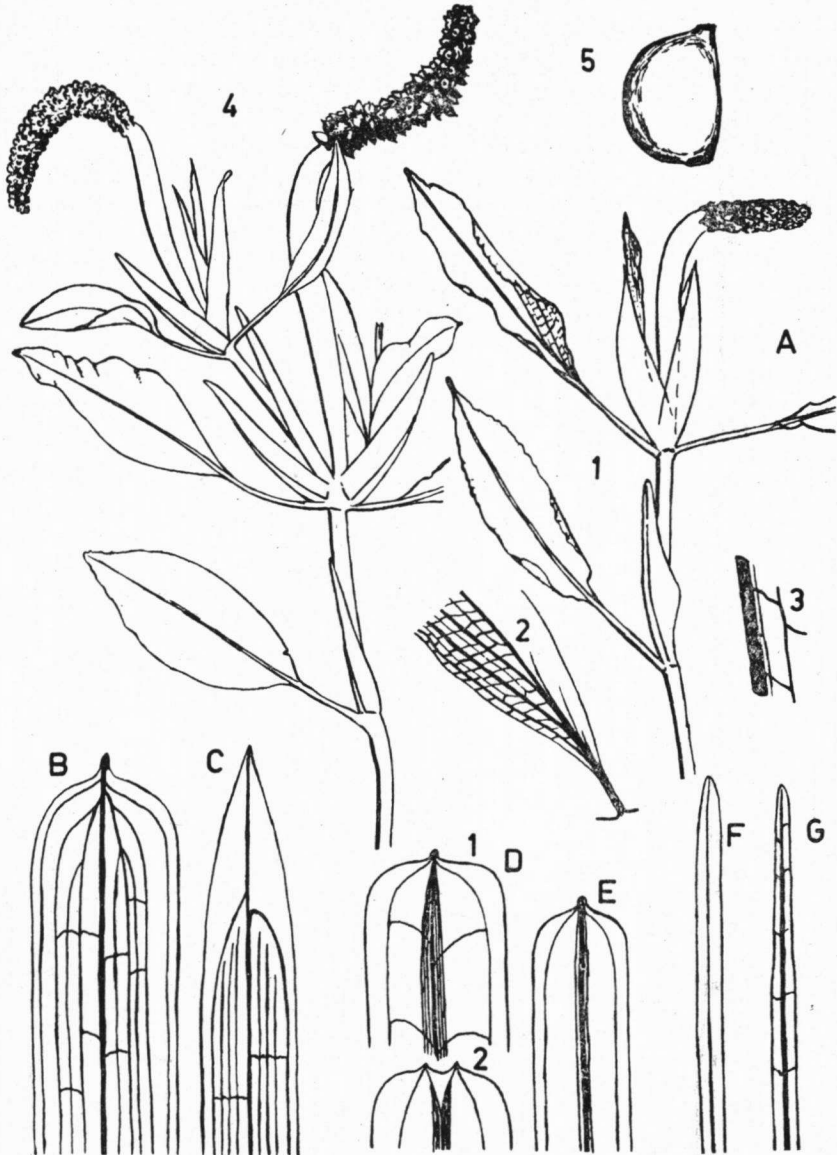


Figure 1. Potamogetones of the Zuidlaren Lake.

A = *P. zizii* M. et K. 1. shoot with a peduncle and ear (1-8-1950); 2. lateral nerves on base of blade; 3. fine nerve along the mid-nerve; 4. shoot with a fruiting ear and a newly formed flowering ear (11-8-1950); 5. a mature fruit in fresh condition (3 mm high). The shoots  $\frac{5}{8}$  of the full size.

Apices of blades from: B = *P. compressus* L. (wide 3 mm); C = *P. acutifolius* LINK (2 mm); D = *P. obtusifolius* M. et K. (2 mm), 1. normal and 2. twotopped; E = *P. pusillus* L. var. *berchtoldi* A. subvar. *mucronatus* A. et G. forma *typicus* F. (2 mm); F = *P. pusillus* L. var. *tenuissimus* M. et K. subvar. *angustifolius* F. (0.5 mm); G = *P. pectinatus* L. var. *scoparius* W. (0.5 mm).

However, the two dark knobs, which are said to occur usually at the bases of the leaves, are not present in my specimens.

I found this species only in a peat-ditch about 5 km S of the Lake.

15. ***P. obtusifolius*** Mertens & Koch.

Characterized by somewhat flattened stems and short peduncles. Leaves about 3 mm wide, very blunt tops, while end of mid-nerve protrudes as a very small point only, fig. 1 D 1; I found one leaf with a branched mid-nerve and consequently two small points, fig. 1 D 2.

The plants grow very profusely in pools of open water amidst the *Scirpato-Phragmitetum*. In some places they lie in very compact masses under water close on the mud. In other places they reach the surface and the uppermost leaves float on the surface. These floating leaves show a fatty lustre and after being dried a reddish colour.

16. ***P. mucronatus*** Schrad.

Formerly I have mentioned this species (GLASON, 1928, II, p. 44). As I visited in 1950 several times the same place where it should be abundant according to my notes of 1928, and could not find it again, I am compelled to consider the occurrence of this species as uncertain.

17. ***P. pusillus*** L.

The plants of this species, characterized by round stems and fairly long peduncles, belong to two forms, *viz.* a variety with flat leaves and a variety with fine threadlike leaves. They correspond satisfactorily with the descriptions of the following two varieties.

a. var. *berchtoldi* Ascherson subvar. *mucronatus* Ascherson & Graebner.

Width of leaves usually almost 2 mm. At some distance from the mid-nerve on both sides one parallel nerve in the parenchyma, in addition one nerve along each margin. Apex of leaf rounded with a small point, fig. 1 E. Peduncles about 25 mm long, that is often four times as long as the ear. Fruits about 1.5 mm high, often some knobs.

b. var. *tenuissimus* Mertens & Koch subvar. *angustifolius* Fischer. Habit

threadlike, with at first sight only small differences between stems and leaves. Usually the internodes about 30 mm long carry leaves about 20 mm long. Apex of leaf runs down over a length of some mm and ends fairly abruptly in a conical, blunt point, fig. 1 F. Transverse section of leaf almost circular (diam. about 0.5 mm) with a very fine furrow on the upper-side; section shows one nerve only.

Both varieties occur among *P. obtusifolius*, *P. compressus* and other demerse waterplants.

20. ***P. pectinatus*** L. var. *scoparius* Wallraven.

Fresh rhizomes only 3 mm thick, vertical shoots hardly 50 cm long and usually not reaching the water-surface. Stems thin, at the base internodes 3 cm, upwards gradually shorter with increasing ramifi-

caution. Leaves to 6 cm long with a tightly fitting, inconspicuous sheath around the stem. Apex ends fairly abruptly in a blunt point, fig. G. Transverse section of leaf shows a flat upper-side and a semi-circular under-side, with two air-canals separated by a vertical septum, containing the mid-nerve. No marginal nerves; some rows of somewhat longish cells in the margins cannot be considered as nerves in my opinion. Greatest diam. 0.5 mm. Long peduncles (to 8 cm). Ears with separated whirls of fruits; large fruit-ears look out of proportion with the thin plants.

Scattered on the shallow sandy bottom of the eastern side of the Lake. There also *Alisma gramineum* Gmel., *Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Ranunculus circinnatus* Sibth., *Elodea canadensis* Rich., *Chara* sp. and *Tolypella* sp.

I found repeatedly more robust forms of this species adrift in the Lake. As I could not find rooted plants, I am satisfied that these plants were carried there by the water of the Hunze, a canalized river which debouches into the Lake from the South.

## DISCUSSION

Of the 22 western-european species according to ASCHERSON and GRAEBNER (l.c.), 19 were found in the Netherlands (KLOOS, l.c.); recently *P. fluitans* was found by KERN and REICHEL, 1950, p. 250), only *P. nitens*, *P. rutilus* and *P. filiformis* are not yet on record (table I). Of the Zuidlaren Lake and adjacent waters 14 species have been mentioned, however, only from 10 species herbarium-specimens are available.

*P. perfoliatus* and *P. lucens* show gradual variation of habit and especially of leaf-form, which is correlated obviously with the external circumstances. *P. pectinatus* also shows some variation, but the plants of the other species are strikingly alike and accord clearly to only one of the many forms described by ASCHERSON and GRAEBNER (l.c.). Only *P. pusillus* shows two forms, but the plants of each form are also strikingly alike.

KLOOS (l.c., p. 556) encountered among extensive herbarium-material from the Netherlands only two specimens, which he suspected to be hybrids of two species. I did my utmost to find hybrids, but I did not succeed. As in several habitats of the Lake-area plants of different species grow interwoven, one should expect hybridisation as there were many hybrids mentioned in literature.

## REFERENCES

- ASCHERSON, P. and P. GRAEBNER, Synopsis der Mitteleuropäischen Flora. — Leipzig, 1913, Bnd I, p. 455—548.  
CLASON, E. W., De plantengroei van het Zuidlaarder Meer en omgeving. — De Levende Natuur, 1928, II, p. 40—45.  
HAVINGA, B., Studiën over flora en fauna van het Zuidlaarder Meer. — Diss. Groningen, 1919.

- HEIMANS, E., H. W. HEINSIUS and JAC. P. THYSSE, Geïllustreerde Flora van Nederland, 17th ed. by J. HEIMANS, A. W. KLOOS and G. KRUSEMAN. — Amsterdam, 1950.
- KERN, J. and TH. REICHGELT, Over enige critische planten van onze flora. — Ned. Kruidk. Arch., 1950, dl. 57, p. 244—261.
- KLOOS, A. W., Het geslacht Potamogeton L. in Nederland. — Ned. Kruidk. Arch., 1936, dl. 46, p. 525—576.
- VUYCK, L., Revisie van het geslacht Potamogeton. — Ned. Kruidk. Arch., 1895, 2de serie, dl. 6, p. 629—698.