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A new species of *Zannichellia* L. (Zannichelliaceae) from Malta

Abstract

Brullo S., Giusso del Galdo G. & Lanfranco E.: A new species of *Zannichellia* L. (Zannichelliaceae) from Malta.

Zannichellia melitensis a new species from the Maltese Archipelago is described and illustrated. It occurs in the small pools of the calcareous plateaux, where it grows together with other hydrophytes.
Its relationships with the other known species of the genus *Zannichellia* are also examined.

Introduction

Zannichellia L. is a widely distributed genus centred in the Northern Hemisphere with the highest concentration of species in the Mediterranean basin. On the basis of morphological features, regarding the habit, stamens, stigmas and achenes, several species were previously described within this genus (Desfontaines 1798, Willdenow 1805, Reichenbach 1830, Wallmann 1840, Reuter 1854, Clavaud 1888, etc.). On the contrary, other authors regard that many of the described taxa have to be referred to a single variable species (see Dandy 1980). More recently, Talavera & al. (1986), in their revision of the genus *Zannichellia*, recognise six species, well differentiated from the morphological, caryological and anatomical point of view; they are *Z. obtusifolia* Talavera, Garcia Murillo & Smit, *Z. palustris* L., *Z. pedunculata* Reichenb., *Z. contorta* (Desf.) Chamisso & Schlech., *Z. peltata* Bertol. and *Z. major* Boenn. ex Reichenb.

During field work connected with the Maltese flora, a peculiar *Zannichellia*, occurring frequently in small pools on the calcareous plateaux of the islands of this archipelago, was found. Previously, Sommier & Caruana Gatto (1915), Borg (1927) and Haslam & al. (1977) referred these populations to *Z. palustris* and/or *Z. pedunculata* (as "*Z. palustris* var. *pedicellata* Fries"); but morphological and anatomical surveys have allowed to highlight that these populations are well differentiated from the other known species of the genus *Zannichellia*. Therefore, they are treated as a species new to science.

Zannichellia melitensis Brullo, Giusso & Lanfranco **sp. nova** (Fig.1)

Typus: Malta, Ghallis, 28.02.1999, Bartolo, Brullo, Lanfranco & Stevens (holotype CAT)

Herba aquatica, annua, internodiis usque ad 2 mm longis, 7-8 aeriphorus canalibus in cortice, foliis 1.5-5 cm longis, 0.25-0.3 cm latis, obtusiusculis, 2 aeriphorus canalibus in mesophyllo, flores masculini et feminei in eodem nodo, filamento staminali 5-10 mm longo, anthera tetraloculari, 1.3-1.4 mm longa, flore femineo, 3-4 carpellato, stigmate linguiformi, lanceolato, superficie alveolata, achenio sessili vel subsessili, corpore 3-3.2 mm longo, plicato in margine convexo, rostro 1.2-1.5 mm longo.

Hydrophyte submerged, annual, monoecious, rhizomatous. Stem elongated, slender, 6-15 cm high. Internodes up to 2 cm long, with 7-8 aeriferous canals in the cortex. Leaves linear, flat, 1.5-5 cm long, 0.25-0.3 mm wide, somewhat obtusely at apex, with 2 aeriferous canals in the mesophyll. Female and male flowers inserted in the same node. Stamen filament 5-10 mm long, and anther 4-locular, 1.3-1.4 mm long. Female flower shortly pedicelled, with membranous perianth, provided with 3-4 (5) free carpels. Stigma linguiform, lanceolate, entire at margin, with alveolate surface. Achenes sessile or subsessile, with corpus 3-3.2 mm long, laterally compressed, plicate at the convex margin, beak 1.2-1.5 mm long.

Specimina visa. – Malta, in inundatis Wied S. Julian, 10.03.1874, Duthie (FI); ibid., secus diam a Notabile (Rabat) ad Imtahleb ducentim in rivo, 06.05.1907, Sommier (FI); ibid., inter Birchircara et S. Paulo a mare in rivo ad viam, 03.05.1907, Sommier (FI); ibid., in inundatis Wied at Zasel, 16.03.1874, Duthie (FI); ibid., 27.03.1967, Wied il-Ghasel, Lanfranco (L); ibid., 26.10.1969, Ta' Zuta, in a rock pool, Lanfranco (L); ibid., Wied Harq Hamiem, 25.10.1970, Lanfranco (L); ibid., 10.02.1972, Verdala, Lanfranco (L); ibid., Wied il-Ghasel, 01.02.1978, Lanfranco (L); ibid., 04.03.1979, Wied Babu, specimen with galls, Lanfranco (L); ibid., Dingli, 27.02.1999, Bartolo, Brullo, Lanfranco & Stevens (CAT); ibid., Ras il Bajjada, 27.02.1999, Bartolo, Brullo, Lanfranco & Stevens (CAT); ibid., Fiddien near Rabat, 16.04.1987, Brullo, Pavone (CAT); ibid., Tal-Blata, 09.04.1984, Brullo, Pavone (CAT); Gozo, Cala Dueira, in una pozzanghera laghetto, 17.04.1906, Sommier (FI); ibid., in una pozzanghera, 17.04.1907, Sommier (FI); ibid., Cala Dweira, 13.04.1987, Brullo, Pavone (CAT); ibid., Xlendi Valley, 13.04.1987, Brullo, Pavone (CAT); ibid., Wied il Mielah, 13.04.1987, Brullo, Pavone (CAT); Comino, 07.05.1907, Sommier (FI); ibid., pozzanghera, 07.05.1907, Sommier (FI).

Ecology and distribution. – *Zannicchellia melitensis* is linked to the small deep pools, temporary swamped by rainwater, which are quite frequent on the calcareous plateaux of the Archipelago Maltese islands. In particular it grows in the islands of Malta, Gozo and Comino, where is possible to see it from December to April.
In these damp habitats, *Z. melitensis* is associated with other submerged hydrophytes, such as *Damasonium bourgaei* Cosson, *Callitriche truncatula* Guss., *Elatine gussonei* (Sommier) Brullo & al., *Chara vulgaris* L., *Ranunculus saniculifolius* Viv., etc. From the phytosociological point of view, this community can be assigned to the *Callitricho-Batrachion,* alliance of the *Potametea* class.

Taxonomic relationships. – According to Talavera & al. (1986), within the genus *Zannichellia* L. two sections can be recognized: sect. *Zannichellia* and sect. *Monopus* Graebner. The first one is morphologically characterized by male and female flowers borne by the same node, stamen filament 0.7-10 mm long, and anthers generally 2-locular (rr. 3- 4-locular); while the second one is differentiated by male and female flowers borne by different nodes, stamen filament 9-60 mm long, and anthers 4-locular. Due to the monoecious nodes and short stamen filaments, *Z. melitensis* belongs clearly to sect. *Zannichellia*; however, because of the constant occurrence of 4-locular anthers, it must be referred to the sect. *Monopus.* Therefore, it is possible to assert that the number of the anther loculi is not a good diacritic character to differentiate the sections, since *Z. palustris,* which is the species type of the sect. *Zannichellia,* shows anthers with 2-4 loculi.

In its obtuse leaves, aeriferous canals in the cortex and 4-locular anthers, *Z. melitensis* would seem related to *Z. obtusifolia*, but they differ in many morphological characters. In particular, *Z. obtusifolia* shows leaves 1.5 mm wide, without aeriferous canals, stamen filament 12-60 mm long, anther 1.7-2.5 mm long, dioecious nodes, stigma infundibular, ovate, achene corpus 1.7-2.5 mm long, dentate at margin. Basing on the occurrence of aeriferous canals in the cortex, stamen filament up to 10 mm long, monoecious nodes, female flower with 3-5 carpels, stigma linguiform and lanceolate, *Z. melitensis* seems to be related to *Z. major* as well. However, the latter differs distinctly from *Z. melitensis* in having a more robust habit, leaves acute, up to 2 mm wide, achene corpus 3.2-4.5 mm long, dentate at margin.

Moreover, *Z. melitensis* differs from all the other known species, apart from the many morphological features, also in its ecological requirements. In fact, this species occurs exclusively in the small deep pools hollowed out in the calcareous rock, while all the others, according to Van Vierssen (1982) and Talavera & al. (1986), grow on the muddy bottom of rivers, streams, lagoons, ponds, marshes with stagnant or slow moving waters (fresh or brackish).

On the whole, *Z. melitensis* can be considered a species taxonomically quite differentiated, having an anient origin in consequence of its geographic isolation and ecological specialisation. Therefore, as with many other palaeo-endemisms occurring in the Maltese Archipelago (see Brullo & Pavone 1987, 1988; Lanfranco 1989, 1995), *Z. melitensis* is an ancestral species, with a remarkable phytogeographical significance.

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Table 1 Differential morphological characters of the species of *Zannichellia*

Character	***obtusifolia***	***contorta***	***peltata***	***palustris***	***major***	***pedunculata***	***melitensis***
life form	annual	perennial	annual	annual	perennial	annual	annual
internodes [perhaps it is better to state "<x" or ">x" rather than long/short]	long	short	long	long	long	long	long
no. aeriferous canals in the cortex	9-11	0	0	0	several	0	7-8
leaf width (mm)	1,5	0.7	0.5	1	2	0.8	0.25-0.3
leaf apex	obtuse	acute	acute	acute	acute	acute	obtuse
no. aeriferous canals in the leaf	0	2	2	2	2	2	2
length of stamen filament (mm)	12-33(60)	9-42	10-30	0.7-10	2-10	1.5-4 (7)	5-10
anther length (mm)	1,7-2,5	1-1.5	1.2-1.8	0.3-1.7	1.2-1.8	0.3-0.8	1.3-1.4
no. loculi of the anther	4	4	4	2-3-4	2	2	4
flower sexuality in the nodes	dioecious	dioecious	dioecious	monoecious	monoecious	monoecious	monoecious
no. carpels of female flower	2 (3-5)	4 (7)	2 (3-5)	(2) 4 (8)	(2) 3-5	2-4 (6)	3-4 (5)
stigma shape	infundibular, ovate	discoid, rounded	infundibular, rounded	infundibular, lanceolate	linguiform, lanceolate	linguiform, lanceolate	linguiform, lanceolate
stigma surface	alveolate	crested	alveolate	alveolate	alveolate	alveolate	alveolate
stigma margin	entire or slightly dentate	irregular	irregularly dentate	irregularly dentate	entire	entire	entire
achene podocarp (mm)	0,6-1,5	0.3-0.7	0.2-0.5	0.2-0.9	- absent or unknown?	0.8-2	0-0.2
achene corpus (mm)	1,7-2,2 (2,5)	2.2-2.3	2.5-3	1.6-2.8	3.2-4.5	1.8-2.7	3-3.2
achene beak (mm)	1-1,5	0.5-1	0.9-2	0.1-1.4	1.5-1.7	1.3-2	1.2-1.5
ecology	temporary lagoons with fresh waters	brooks and streams of calcareous mountains with fresh and oxygenated waters	lagoons with slow moving waters (fresh or brackish)	lakes or streams with fresh or brackish waters	salt-marshes with sandy soils	lakes or streams with fresh or brackish waters	temporary small pools on calcareous rocks with fresh waters