

## FIRST OCCURENCES OF *LEMNA MINUTA* KUNTH (FAM. LEMNACEAE) IN THE MALTESE ISLANDS

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### ABSTRACT

The occurrence of *Lemna minuta* Kunth in the Maltese Islands is reported for the first time, from two sites in Malta and one site in Gozo. Notes on its historical and current distribution in Europe, its invasive properties and its habitat preferences in Malta are given. Also included are the distinguishing morphological features from the closely related *Lemna minor* L., another frequent alien species of ponds and valleys in the Maltese islands.

Keywords: *Lemna minuta*, valleys, watercourses, alien species, invasive species, flora of Malta

### INTRODUCTION

*Lemna minuta* Kunth (synonyms: *L. minuscula* Heter ; *L. minima* Phil ex Hegelm) commonly known as Least Duckweed, is native to the eastern area of North America, western coasts of Mexico and stretches in temperate zones in Central and South America (Mesterházy et al., 2007). It was introduced into Europe in the last third of the 20<sup>th</sup> Century where, soon after, it had become naturalised in several European countries. It was first recorded in Europe erroneously as *L. valdiviana* from Biarritz, South West of France in 1965 and then as *L. minuscula* from Cambridge, UK in 1977 (Landolt, 1979 cited in Lacey, 2003).

Today, 45 years after its first published occurrence, *L. minuta* is widespread throughout Europe and it is recorded from France, England, Belgium, Germany, (GRIN; GBIF), Switzerland, Ukraine (GRIN), Netherlands, Portugal, Spain, Sweden (GBIF), Ireland (Lacey, 2003), Hungary (Mesterházy et al., 2007), Slovakia (Feráková & Onderfíková, 1998), Romania (Ciocârlan, 2000), Greece (Landolt, 1986), Austria (Fischer et al., 2005) and Italy (Desfayes, 1993 cited in Iamonico et al., 2010 ; Conti et al., 2005). As of 2005, the Italian records were all based in the Northern regions of Lombardy, Tyrol (Trentino-Alto Adige), Veneto, Friuli-Venezia Giulia and Emilia-Romagna (Conti et al., 2005) but recently, *L. minuta* was reported also in southern parts of Italy namely the regions of Apulia, Latium, Abruzzi and Sardinia according to Iamonico et al. (2010). No published record from Sicily has traced by the author at the time of writing.

*L. minuta* was found by the author in two stations, one in Malta and one in Gozo. It was found at Wied tal-Hzejjen valley system, limits of Mgarr and Mosta, MALTA (11-Mar-2009) and Wied ta' Zejta, Victoria GOZO (9-Jun-2010). The first record might however be that of Edwin Lanfranco from Wied tal-Qlejgha in the 1990s, but the determination remained doubtful and the material collected deteriorated with time. (pers. com.: Edwin Lanfranco, May 2010). However, *L. minuta* from Wied tal-Qlejgha, limits of Rabat, Malta, was found in April 2010 by Attila Mesterházy. (pers. com.: Attila Mesterházy, May 2010)

The three valleys mentioned above have the following physical characteristics in common:

- 1) Pass through agricultural areas and are assumed to be enriched by nutrient-rich leachate.
- 2) Retain water through a series of dams forming a lentic water body that grades into a stagnant condition
- 3) Hold water that persists up to May and early June.

The above factors coincide with the known ecological preferences of the species which, according to Mesterházy et al. (2007), prefers a high Nitrogen and Phosphorus-containing water and a balanced climate where the winter temperature does not fall below -1°C and a Summer temperature between 16-26°C. The observed eutrophication in the valleys where *L. minuta* was present is a direct sign of water with high level of nutrients (MP). The stated temperature conditions also matches with the mean temperatures in Malta where the low average temperature during the coldest months are 12.4 °C (December), 11.5 °C (January) and 10.8 °C (February), while the high average

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temperatures in May and June are 21.6 °C and 26.5 °C respectively (mean average temperature during these months is 20.4 °C – 24.4 °C) (MW). Since these valleys are intermittent streams that dry out completely during the beginning of summer, populations of *Lemna* spp. die after end of June.

The populations of *L. minuta* in Wied tal-Hzejjen and Wied ta' Zejta were observed to be monospecific, and no other Lemnaceae or obligate floating hydrophytes were present.

*L. minuta* has, over the course of a wet season, been observed to establish a contiguous layer of fronds on the surface of water bodies and eventually colonise them, especially when these are slow-flowing or stagnant. These surface mats impose a negative effect upon the biodiversity of freshwater organisms by reducing light penetration and gas exchange, and hence, reducing levels of dissolved oxygen in water. Trials in UK have shown that *Lemna minuta* inhibited growth of *Potamogeton crispus* L. due to light deprivation. (Janes et al., 1996 cited in Mesterházy et al., 2007). *L. minuta* does not prefer fast flowing water courses, because the free-floating fronds get washed away (Lacey, 2003). In Maltese valleys, such flow diminishes during the drier months of mid/late Spring and consequently this is the peak period for population growth. It was also observed that *Arundo donax* L. (the Giant Reed) helps in the population growth of *Lemna* species even during earlier months. Debris of reeds floating firmly upon the water (especially at the sides of valleys) traps fronds afloat and acts as reservoirs of the species. The sides of dams are also a sink for trapped fronds, because water usually overflows from the central part of the dam. Similarly, patches of filamentous algae can trap *Lemna* spp in streams with flowing water. The trapped fronds will regenerate into a mat-forming populations when, sooner or later, the water becomes less dynamic.

*L. minuta* has been reported to be invasive in several countries including Italy (Iamonico et al., 2010), United Kingdom (Lacey, 2003), Belgium (ISB) and Hungary (Mesterházy et al., 2007). Its invasiveness can be exemplified in UK. After the publication of its first record in 1977, the records of 10-km squares for *L. minuta* counted as 17 in 1981 and had risen to 89 sites in 1993. The total number of 10-km square occurrences in the period between 1987-1999 for *L. minuta* in Britain summed up to 538 (Lacey, 2003 citing Preston et al., 2002). This may also be the case in Maltese wetlands; although no quantitative indications that support this were available at the time of writing, extensive mats of fronds of *L. minuta* packed close to each other were observed in the 2 stations found by the author.

The mode of introduction and dispersal of *L. minuta* in Malta is a matter for speculation, although accidental introduction by human agency is the most likely source while it has been suggested that migratory birds also play role in dispersal of *Lemna* spp (Mesterházy et al., 2007).

Fronds of *L. minuta* in Malta measured an average of 1.5-2.5mm. Although *L. minuta* is generally smaller than *L. minor*, there is overlap in size and this may introduce confusion in the determination of the species. For this reason, *L. minuta* have perhaps escaped the attention of previous naturalists and botanists and was misidentified as *L. minor*. It is likely to be found in other valleys with similar physical characteristics mentioned above. Table 1 gives the most important morphological differences between the two taxa, of which, the frond's venation is the most reliable diagnostic character in the field.

Apart *Lemna minuta*, four other species of the Lemnaceae (treated as members of Araceae by some authors) are reported from Malta. These are *L. minor* L., *Spirodela oligorrhiza* (Kurz) Hegelm, *S. polyrhiza* (L.) Schleid and *Wolffia arrhiza* (L.) Hork. Ex Wimmer. (Mifsud, 2008).

**Table 1:** Distinguishing features between *L. minuta* and *L. minor* – adapted from Lacey (2003) and Mesterházy et al., (2007).

Morphological feature	<i>Lemna minuta</i> Kunth	<i>Lemna minor</i> L.
Frond veins	1	3-5
Frond size	1-3 mm	(2-)3-5 mm
Frond thickness	0.1-0.25(0.35) mm	(0,2-)0,3-0,7(-0,9)mm
Frond colour	Pale green, dull	Dark green, shining
Frond shape	Usually elliptic, symmetrical	Usually obovate, asymmetrical
Frond apex	Obtuse, usually with slight point	Rounded, usually without a point
Adaxial surface of frond	Very shallowly ridged, visible to the naked eye or a hand lens	Flat or smoothly rounded, never ridged.
Airspaces on the adaxial surface	Missing at the margins.	Present on the whole surface



**Figure 1:** *Lemna minuta* Kunth from Wied tal-Hzejjen (photographed 4th April 2009). In this photo, the single central vein is clearly visible in several fronds. Filamentous algae and debris of *Arundo donax* L. (Giant Reed) are also shown in this photo.

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