

First record of the invasive *Tradescantia fluminensis* Vell. (*Commelinaceae*) in three rivers in Cyprus

Daniel Spitale & Athina Papatheodoulou

Abstract. – *Tradescantia fluminensis* is an invasive weed that has been recorded for the first time in Cyprus. The species occurs in river banks, mainly under shady conditions. It has been recorded in three sites, always at low density: Marathasa river (Lefkosia district), Kargotis river (Lefkosia district), Kryos river (Lemesos district).

Addresses. – Daniel Spitale, BioMonitoring Team, via Stenico 2, I-38095 Tre Ville, Italy; spitale@biomonitoraggi.it. – Athina Papatheodoulou, I.A.CO Environmental & Water Consultants Ltd, 3 Stavrou Av. Office 202, CY-2035 Strovolos, Cyprus; athinap@iaco.com.cy

Introduction

Tradescantia L. is one of 41 genera in the *Commelinaceae* R. Br. (Faden 1988), a family of monocotyledonous herbs that are largely tropical and subtropical. The genus consists of about 70 species of erect or trailing habit, many of which are cultivated for ornamental purposes (Mabberley 1997). The genus name derives from John Tradescant (1608–1662), gardener of King Charles I of England whereas the species name 'fluminensis' is a Latin translation of 'from Rio de Janeiro'.

Species description

Perennial plant. **Stems** trailing or creeping, somewhat fleshy, **branched**, producing adventitious roots at the nodes. **Leaves** alternately arranged, somewhat fleshy, broadly lanceolate, ovate, or oblong, 3.0–6.5 × 1–3 cm, dark green above, often slightly purplish underneath, sheathing at the base; sheaths 5–10 mm long, pubescent or glabrous; blades hairless or occasionally with some cilia along the margins; margins entire, apex acute. **Inflorescences** terminal, with two small leafy bracts at the base; flowers **stalked**, stalks 1.0–1.5 cm long; **corolla** white, about 2 cm across; **sepals** three, 6–8 mm long, greenish; petals 3, each 7–10 mm long, acute; stamens six, small, yellow. **Fruit** a small capsule, with three chambers.

Viable seeds have not been seen and it is not known if the plant produces such seeds in Cyprus. However, it is reproduced with stem fragments which are easily detached and dispersed by the water or other vectors.

Flowering occurs mainly during spring and summer (Fig. 1).



Fig. 1: *Tradescantia fluminensis*, flower (above), upper leaves and flower buds (middle) and stems (below), at station r3-2-1-85 (see text), 19.6.2018. – Daniel Spitale.

Distribution

Even though *T. fluminensis* is native to the tropical rainforests of south-east Brazil (Barreto 1997) and neighbouring areas, it has been reported from United States, South Africa, Kenya, New Zealand, Australia, Japan and many other countries (Global Invasive Species Database 2018). Among the Mediterranean countries, it is present in Portugal (Aguiar & al. 2001), Spain (Gassó & al. 2012), Italy (Celesti-Grappo & al. 2010), France (France GT IBMA 2016), Greece (Dimopoulos & al. 2013) and Turkey (Uludağ & al. 2017). It is however, very likely to be present in many, if not most, countries of the world as an ornamental pot plant (not recorded).

Habitat

In its native range, *T. fluminensis* occurs in rainforest and other damp, humid and shaded places (Barreto 1997). Damp fertile soils support high density of plants whereas growth is scanty on more rocky substrates. The species is tolerant to water-logging and shading (Barreto 1997). An important limiting factor to the distribution is its intolerance of frost (Bannister 1986).

Outside its native range, *T. fluminensis* also occurs in damp, humid and shaded places such as gardens, stream-sides and forest. Its distribution is however limited by the dependence on stream current, people or animals for dispersal. *T. fluminensis* invades the edges of forest or canopy gaps where light levels promote its biomass accumulation (Standish & al. 2004). High biomass mats appear to remain indefinitely in canopy gaps and at forest edges. It has been reported invading lowland podocarp-broadleaf forest in New Zealand (Standish & al. 2004), lowland temperate rainforest in Australia and mesic mixed hardwood forests in Florida, USA (Global Invasive Species Database 2018).



Fig. 2: *Tradescantia fluminensis*, habitat at station r9-6-1-87 (see text), 14.6.2018. – Athina Papatheodoulou.

First records in Cyprus

T. fluminensis was recorded in three perennial river stretches along Marathasa, Kargotis and Kouris catchments in Cyprus (Tab. 1, Fig. 3). It was found in shady, wet river banks, of mid-altitudes, always at low density. All three records took place in periods at which the species was in flower. The identification was conducted both macroscopically and under the dissecting microscope for confirmation.

Station r3-2-1-85, falls within the Marathasa river (Marathasa catchment), Lefkosia district. It feeds Kalopanagiotis reservoir and is downstream of the homonymous community. Within the channel there is an old Venetian bridge. The canopy of the riparian vegetation is characterised by *Platanus orientalis* and *Alnus orientalis*, whereas *Rubus sanctus* and *Arundo donax* dominate in the understorey. The station exhibits signs of degradation both of the channel and the river banks. The main land-use directly neighbouring the river, is agricultural, with fruit orchards reaching the channel. There are concrete embankments and channelisation of the river, while parts of the river bed has been covered with concrete. The substrate is stable, consisting of boulders and pebbles, and the water velocity is fast. Population size was small when found and consisted of several individuals in a single patch. Specimens collected from station r3-2-1-85 have been deposited at the Department of Forest Herbarium (CYP number pending).

Station r3-3-3-15, is located within the Kargotis river (Kargotis catchment), Lefkosia district, at Galata village. The dominant woody vegetation is *Alnus orientalis* riparian forest, however the presence of the naturalised invasive species *Ailanthus altissima* is also apparent at the station. The substrate is firm, characterised by the presence of boulders and pebbles. Due to its proximity to the community, the station was subjected to embankment, deflector and expansion of cultivations very close to the riverbed. The station is close to agricultural and built-up areas and lies within the Natura 2000 Special Area of Conservation "Koilada Kargoti – CY2000012". Only few individuals were present along the surveyed river area stretching to 100 m.

Station r9-6-1-87 is at Kryos river (Kouris catchment), near Koilani village, Lemesos district. There is a Venetian bridge downstream of the station. The main woody vegetation is *Alnus orientalis* riparian forest. The substrate is characterised by the presence of boulders, fast, clear waters with rapids, riffles and steps. In close proximity to the river there are orchards, with scattered agricultural premises. The riverbanks have been highly altered with concrete deflectors (as a flood protection aid) of about 100 m in either river side. The species was found at the bottom of the deflectors, where many individuals were recorded. Here was the biggest population density of *T. fluminensis* recorded among the three stations.

Even though *T. fluminensis* is not included in the list of invasive alien species of European Union concern, as drawn up by the EU Regulation 1143/2014, its invasiveness has been apparent in countries like Australia, Bermuda, New Zealand, Portugal, Swaziland and the USA (Global Invasive Species Database 2018). Aguiar & al. (2001) have shown that human-disturbed fluvial ecosystems are particularly vulnerable to exotic plant establishment. In Portugal, the presence of *T. fluminensis* was related to channelised river segments. All three stations where the species was recorded in Cyprus,

are subjected to channelisation works, but were also quite close to inhabited areas. However, further study is required to assess the current distribution of this species in the island as well as pathways of unintentional introduction, and to assess the risk the species exerts to local biota. Based on the current available data, *T. fluminensis* could be classified as established but not invasive.

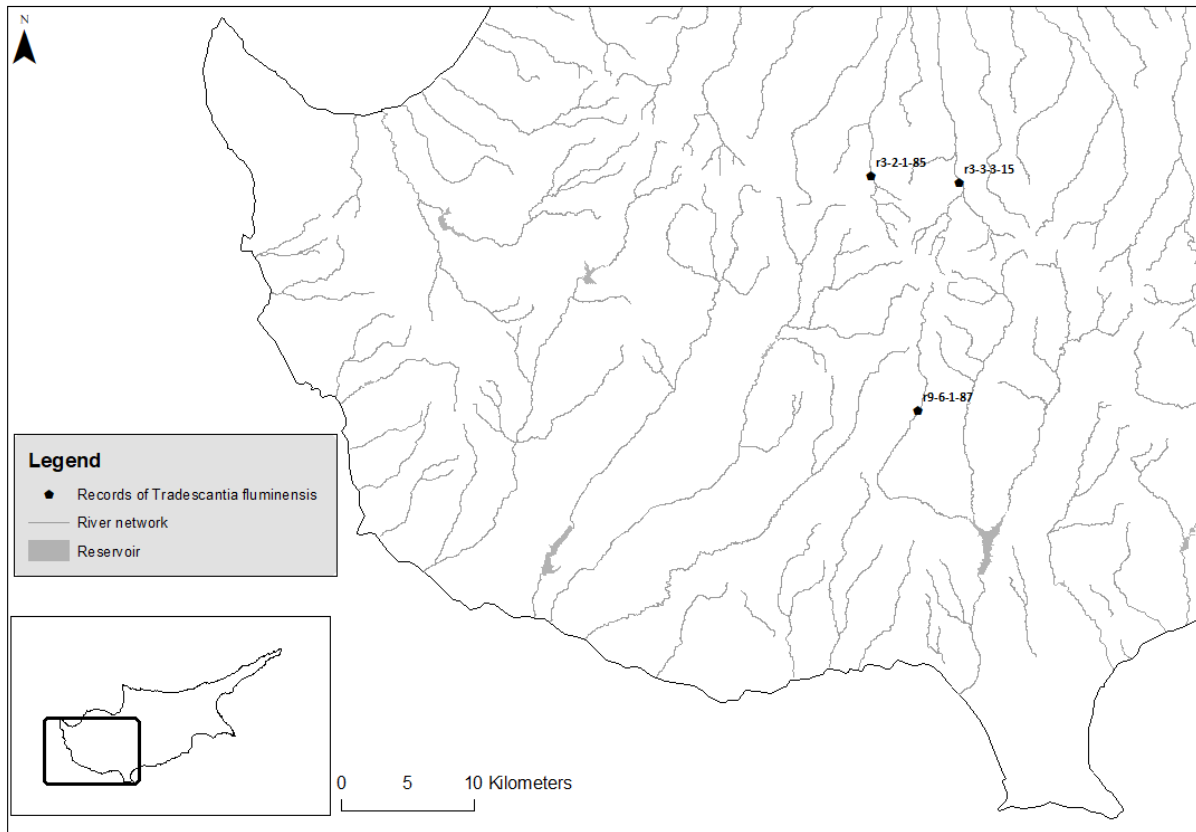


Fig. 3: Map of stations at which *Tradescantia fluminensis* has been recorded in Cyprus.

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Tab. 1: Basic descriptors for the sites at which *Tradescantia fluminensis* has been recorded.

	Record 1	Record 2	Record 3
Site code	r3-2-1-85	r3-3-3-15	r9-6-1-87
Date of collection	2018-06-19	2018-06-19	2018-04-15
Station name	Marathasa U/S Kalopanagiotis Dam	Kargotis at Galata (Hydrom. St.)	Kryos at Koilani
River	Marathasa	Kargotis	Kryos
Catchment	Marathasa	Kargotis	Kouris
River type (regime at station)	Perennial	Perennial	Perennial
Coordinates (UTM 36N WGS84)	484170/3873120	490875/3872625	487769/3855333
Altitude (m)	599	598	675
Channel shading	Medium	Medium-dark	Dense (5 % or less direct sunlight)
Environment	<i>Platanus orientalis</i> and <i>Alnus orientalis</i> riparian forest (Habitat type: 92C0)	<i>Alnus orientalis</i> riparian forest (Habitat type: 92C0)	<i>Alnus orientalis</i> riparian forest (Habitat type: 92C0)
Companion species	<i>Adiantum capillus-ve- neris</i> , <i>Apium graveo- lens</i> , <i>Arundo donax</i> , <i>Ballota nigra</i> , <i>Brachy- podium sylvaticum</i> , <i>Helosciadium nodiflo- rum</i> , <i>Melissa officinalis</i> , <i>Mentha spicata</i> , <i>Parie- taria judaica</i> , <i>Rubus sanctus</i> , <i>Rumex conglo- meratus</i> , <i>Samolus vale- randi</i>	<i>Anagallis arvensis</i> , <i>Arundo donax</i> , <i>Carduus argentatus</i> , <i>Crepis as- pera</i> , <i>Mentha spicata</i> , <i>Nasturtium officinale</i> <i>Parietaria judaica</i> , <i>Pip- tatherum miliaceum</i> , <i>Polypogon viridis</i> , <i>Ru- mex conglomeratus</i> , <i>Samolus valerandi</i> , <i>So- lanum nigrum</i>	<i>Brachypodium sylvati- cum</i> , <i>Campanula pere- grina</i> , <i>Carex cyprica</i> , <i>Epilobium hirsutum</i> , <i>Equisetum ramosissi- mum</i> , <i>Helosciadium nodiflorum</i> , <i>Melissa officinalis</i> , <i>Mentha spi- cata</i> , <i>Nasturtium offi- cinale</i> , <i>Parietaria judaica</i> , <i>Piptatherum miliaceum</i> , <i>Plantago major</i> , <i>Poly- pogon viridis</i> , <i>Pulicaria dysenterica</i> , <i>Rumex conglomeratus</i> , <i>Smyr- nium olusatrum</i>
Population Density	3–10 individuals in a single patch	3–10 individuals in a single patch	10–20 individuals along 2 m at the bottom of a deflector