

Pistia stratiotes L. & *Eichornia crassipes* (Mart.) Solms – tropical invaders in aquatic ecosystems of Eastern Europe (Ukraine)

Mariana Prokopuk¹



maryanaprokopuk406@gmail.com

Yulia Bereznichenko¹



yu_bereza@yahoo.com

1. Institute for Evolutionary Ecology of the National Academy of Sciences of Ukraine, Kyiv, Ukraine

Introduction

Pistia stratiotes and *Eichornia crassipes* are free-floating aquatic plants with a tropical, a subtropical origin. They were brought to Europe as ornamental plants, became popular, and at the end of the last century spread to the natural environment. Pathways of introduction into secondary areas are two: ESCAPE FROM CONFINEMENT (the species is popular in the aquarium culture, grown in garden pools and other ornamental ponds), and RELEASE IN NATURE (deliberate introduction by amateurs). Invasions of *Pistia stratiotes* were noted in the Netherlands, Denmark, Germany, Slovenia (numerous finds); in France, Spain, Italy – known one-time finds. *Eichornia crassipes* has spread through the river basins of France, Italy, Portugal and Spain. The species has been recorded as random in several European countries with a moderate climates – Belgium, Germany, Netherlands, Great Britain and Czech Republic.

Both plants grow very quickly and form dense floating mats that can capture entire ponds. They are responding positively to the gradual rise in average annual water temperatures in Europe today due to global climate change. These properties make them potentially dangerous alien species. *Pistia stratiotes* has been in the EPPO list of invasive plants since 2012, *Eichornia crassipes* in 2008.

Results

The first large-scale invasions of *Pistia stratiotes*, which covered the natural habitats of Ukraine and caused serious environmental damage, took place in 2013, in the basin of the Siverskyi Donets River (Kharkiv region). Mass development of the plant caused a change in the trophic status of water bodies. Since 2016, reports of *Pistia stratiotes* invasion in the middle reaches of the Dnipro River, the lower reaches of the river and some park urban reservoirs (Kyiv, Odesa) have become more frequent. In 2020, the most massive outbreaks of *Pistia stratiotes* were observed in the Dnipro River and its floodplain reservoirs near Kyiv (Fig. 2). The plant successfully winters and reproduces, mainly vegetatively. The species blooms in Ukraine. Forms phytomass up to 6.16 kg/m² (raw mass).

The first single finds of *Eichornia crassipes* were recorded in 2020 in one of the park ponds in Kyiv. The plant has not reached the stage of flowering and did not overwinter. In 2021 there is a mass outbreak of *Eichornia crassipes* in the drainage canals and straits of the Dnipro River near Kyiv (Fig. 3). The plants bloom and form phytomass reserves of 2.67–13.11 kg/m². Such massive development of tropical weeds makes further observations relevant.

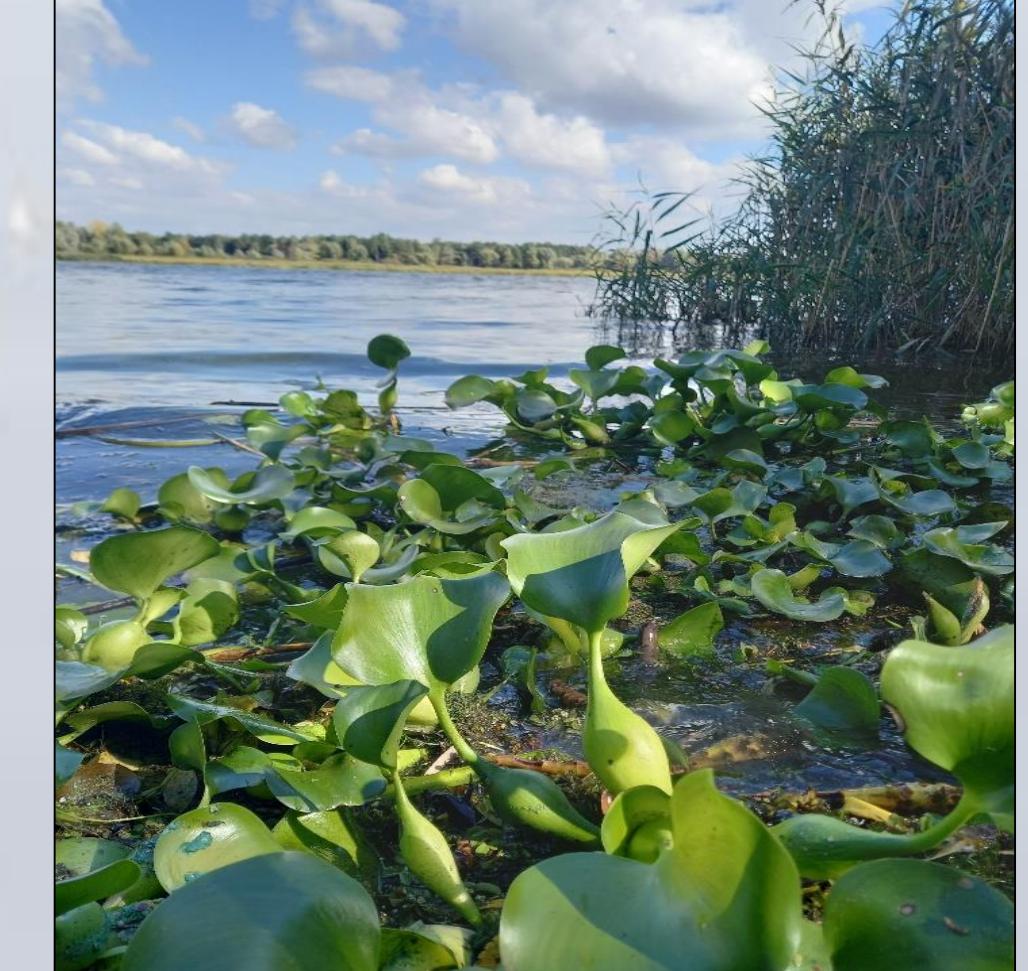
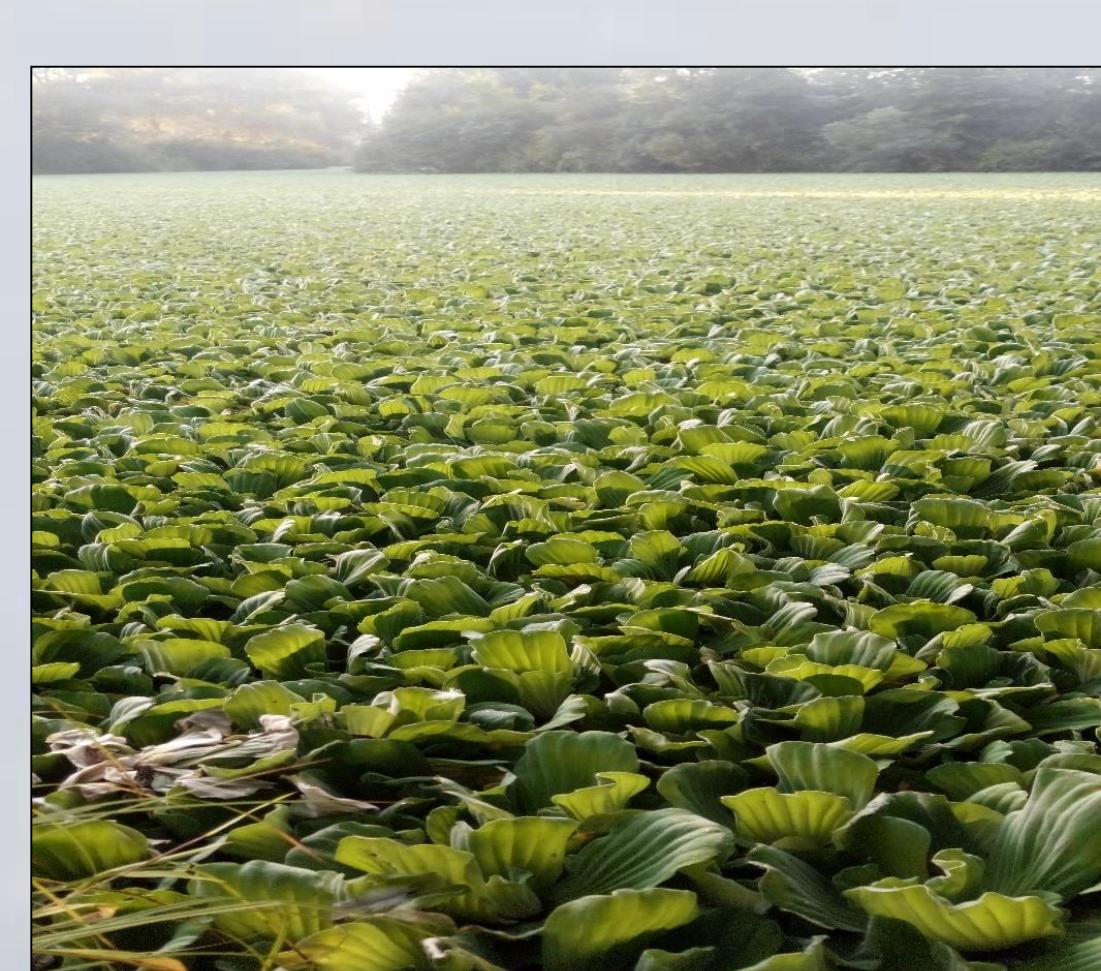


Fig. 2. General view of the surface of the water objects with thickets of *Pistia stratiotes*

Fig.3. *Eichornia crassipes* in the Dnipro River (Kyiv region)

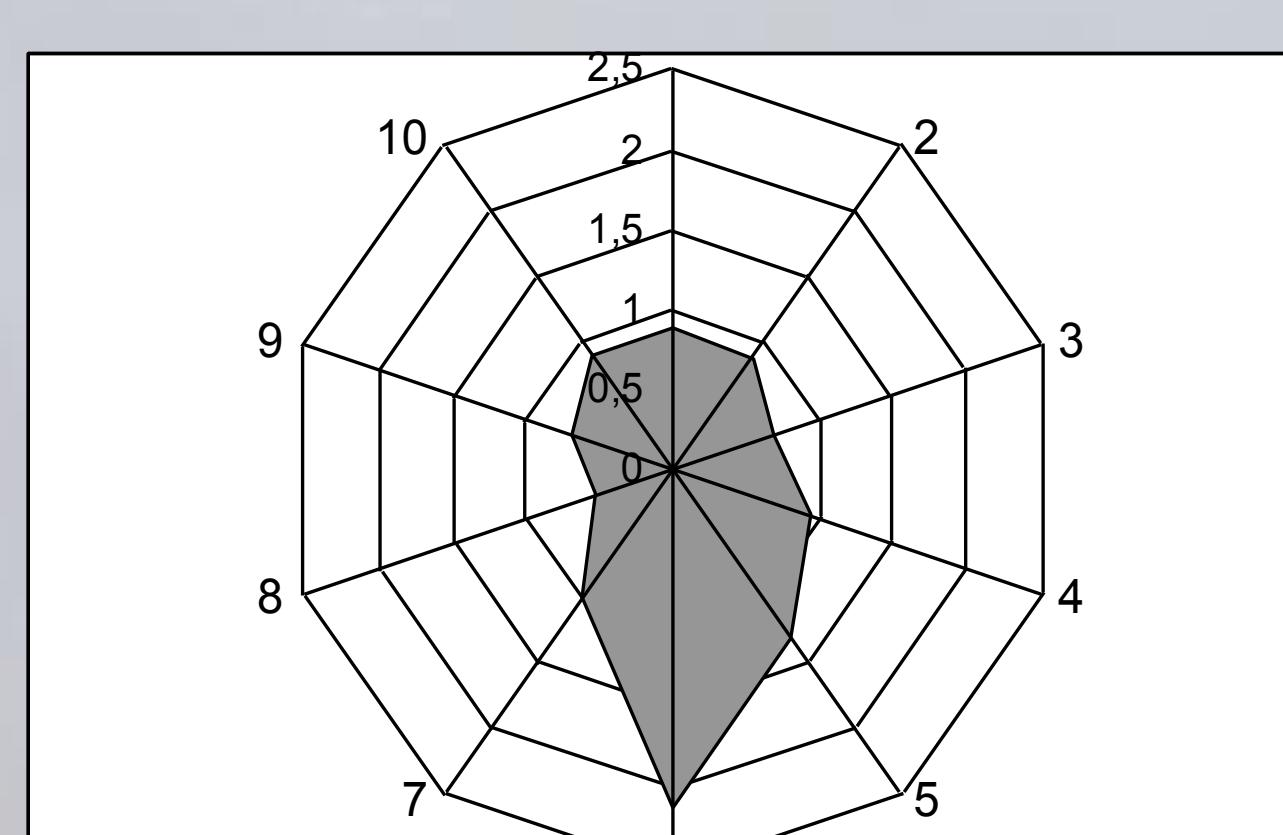


Fig.4. Variation of the *Pistia stratiotes* (1) *Eichornia crassipes* (2) phytomass value (raw phytomass, kg/m²) in the local population. A scale of values is plotted on the radius, and the ordinal number of samples is plotted around a circle.

Literature cited

- Kazarinova G.O. (2014) Syngenetic changes of the higher aquatic vegetation of the Siverskyi Donets river valley. Ukr. Bot. J. 71(4):435–441.
Prokopuk M S, Zub L M (2020) Urban ecosystems as locations of distribution of alien aquatic plants. Folia Oecologica 47(2):158–166

Materials and methods

The objects of research were local populations of *Pistia stratiotes*, *Eichornia crassipes* common in Kyiv and its suburbs. Kyiv is located in the midstream of the Dnipro, which flows through Ukraine from north to south for 1,100 km and is part of the Central European invasion corridor. The Kyiv area has a well-developed floodplain hydraulic network which transformed significantly with the development of the city. 6 expansion locations – *Pistia stratiotes*, 3 – *Eichornia crassipes* – were examined thoroughly (Fig. 1). The study was conducted during the growing seasons May – October 2013 – 2021 using general hydrobotanical methods.

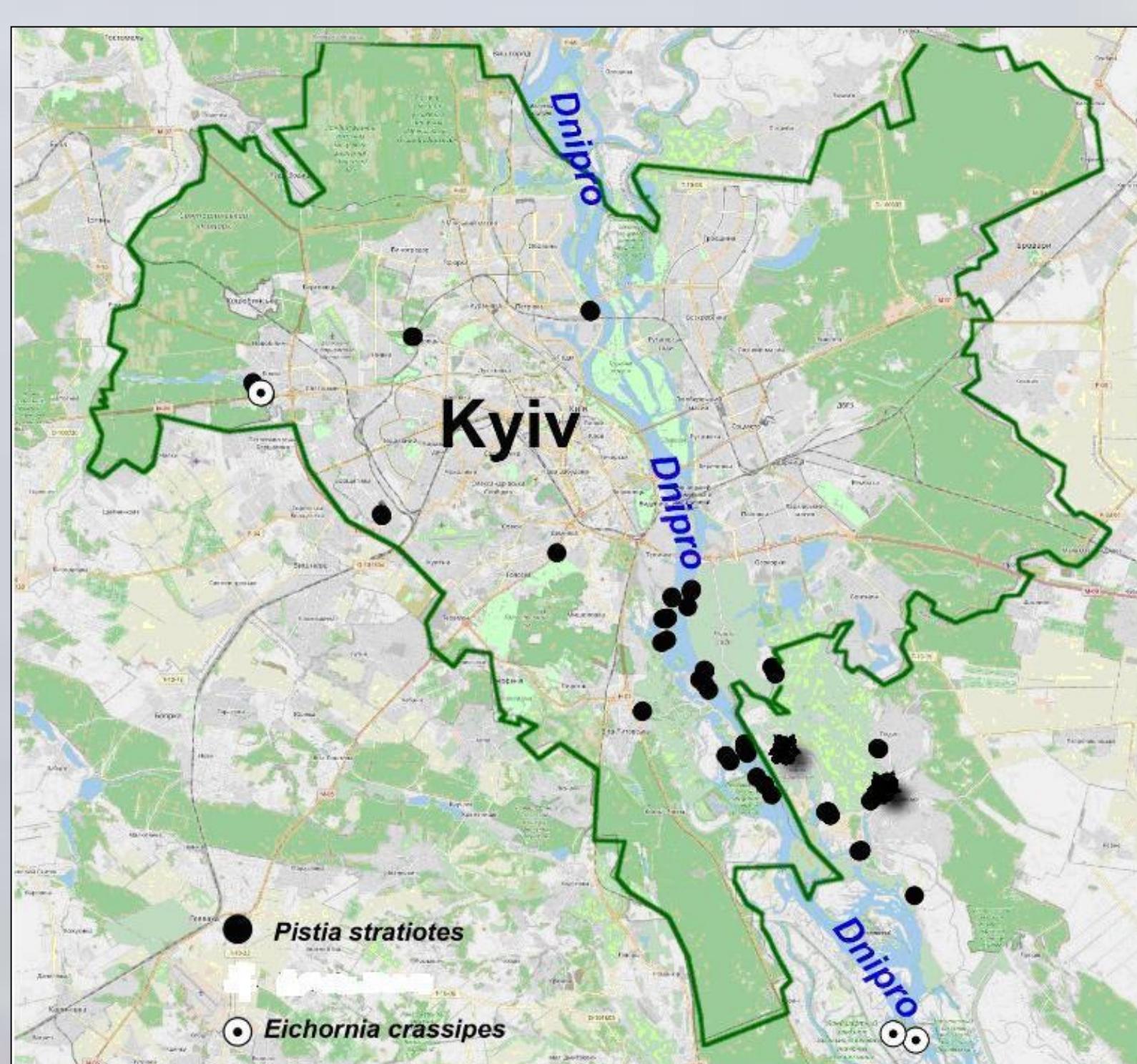


Fig. 1. Distribution map of tropical invasive species in the water bodies of Kyiv and its suburbs (2013–2021)

Conclusions

High competitiveness and eurythopcity of popular species in urban aquaculture – *Pistia stratiotes*, *Eichornia crassipes* – gives grounds for us to consider them as types of violet ecological and phytocoenotic strategy, capable of further invasive distribution by the drainage system of Ukraine. The formation of stable local populations in the conditions of natural watercourses and floodplain bodies of water may be expected. The severity of variations in production parameters in the middle of local populations of these species indicates their plasticity in the conditions of the research region and the first stages of their invasion.