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SHORT COMMUNICATION

Specificity of *Lepidelphax pistiae* (Hemiptera: Delphacidae) to *Pistia stratiotes* (Araceae)

Guillermo Cabrera Walsh[a]*, Mariano Maestro[a], Alejandro Sosa[a] and Philip W. Tipping[b]

[a]*Fundación para el Estudio de Especies Invasivas (FUEDEI), Hurlingham, Buenos Aires, Argentina;* [b]*USDA-ARS Invasive Plant Research Laboratory, Fort Lauderdale, FL, USA*

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The delphacid *Lepidelphax pistiae* was found on water lettuce in Argentina. Nymphs and adults did not survive past seven days on 29 species of test plants, and no progeny were produced. In contrast, survival and reproduction were high on water lettuce. Results suggest that *L. pistiae* is monospecific to water lettuce.

Keywords: water lettuce; no-choice tests; aquatic weeds

The floating macrophyte water lettuce, *Pistia stratiotes* L. (Araceae), is invasive in most tropical and subtropical regions of the world. It has been a target of biocontrol and management research for three decades (Cordo, DeLoach, Runnacles, & Ferrer, 1978; DeLoach, DeLoach, & Cordo, 1976; Gillett, Dunlop, & Miller, 1988; Neuenschwander, Julien, Center, & Hill, 2009). The planthopper *Lepidelphax pistiae* Remes Lenicov (Hemiptera: Delphacidae) was discovered on *P. stratiotes* in central and northern Argentina in 2009. It is currently the only species in this new genus. This delphacid has five nymphal instars: instars I and II live amidst the leaf trichomes feeding on the leaf surface. Instars III to adults live on the trichome layer, and use their unusually long rostrum to reach the leaf surface (Remes Lenicov & Cabrera Walsh, 2013). Feeding damage was observed in the laboratory in the form of plant stunting and chlorosis (Remes Lenicov & Cabrera Walsh, 2013).

A series of no-choice specificity tests were performed on 25 species of Araceae and four other wetland species commonly found in habitats that are invaded by *P. stratiotes* in Florida (Table 1). Testing was conducted at the Fundación para el Estudio de Especies Invasivas (FUEDEI) in Hurlingham, Buenos Aires, Argentina and at the USDA-ARS Invasive Plant Research Laboratory (IPRL) in Fort Lauderdale, FL, USA. Specificity trials at FUEDEI consisted of no-choice tests in which five individuals were released on test plants kept in a greenhouse. A number of living planthoppers as well as their position in the experimental arenas were recorded every day. As brachypterous adults and fifth instars are about the same size and difficult to tell apart without much manipulation, we released an undefined mix of both. There were eight repetitions per plant species. The aquatic test plants (Table 1)

*Corresponding author. Email: gcabrera@fuedei.org
Current address: Mariano Maestro, Instituto Nacional de Tecnología Agropecuaria, Instituto de Microbiología y Zoología Agrícola, Aristizabal s/n, Castelar, Buenos Aires, Argentina.

Table 1. List of test plants used in Argentina (FuEDEI) and Florida (IPRL) for specificity studies with *L. pistiae*.

Plant species	FuEDEI	IPRL
Aquatic Araceae		
Pistia stratiotes L.	x	x
Landoltia punctata (Mey.) Les & Crawford	x	–
Lemna disperma Hegelm.	x	–
Lemna gibba L.	x	–
Lemna valdiviana Phil.	x	–
Spirodela polyrrhiza (L.) Schleid.	–	x
Spirodela intermedia Koch	x	–
Wolffia brasiliensis Wedd.	x	–
Wolffia columbiana Karst.	x	–
Wolffiella oblonga (Phil.) Hegelm.	x	–
Aquatics, other families		
Azolla caroliniana Willd.	–	x
Limnobium spongia (Bosc) Rich. ex Steud.	–	x
Pontederia cordata L.	–	x
Sagittaria latifolia Willd.	–	x
Terrestrial Araceae		
Agloanema commutatum Schott	x	x
Anthurium sp.	x	–
Arum italicum Miller	x	–
Colocasia esculenta (L.) Schott	x	–
Dieffenbachia bownannii Carriere	x	x
Dieffenbachia maculata Sweet	x	x
Philodendron hastatum Koch & Sello	x	–
Philodendron bipinnatifidum Schott ex. Endl	x	–
Philodendron scandens Koch & Sello	x	–
Philodendron undulatum Engl.	x	–
Scindapsus aureus Engl.	x	–
Spathiphyllum cv. 'sensation'	x	–
Spathiphyllum wallisii Hort.	x	x
Syngonium podophyllum Schott.	x	–
Xanthosoma sagittifolium (L.) Schott	x	–
Zantedeschia aethiopica (L.) Spreng.	x	–

were tested in 9-L tubs with 5 L of water fertilised with one-fourth strength Sato and Kondo solution (1981), and the terrestrial species were tested by enclosing the insects in 50 × 20 cm gauze sleeves tied around the foliage of potted plants. Available greenhouse space at FuEDEI was not enough to accommodate enough arenas, so four control *L. pistiae* cultures were kept on *P. stratiotes* in 9-L polycarbonate tubs alongside the experimental plants. The tubs were conditioned as described above, and contained three large *P. stratiotes* plants. Ten *L. pistiae* were released per control tub, in order to test the same final number of insects.

A second series of no-choice survival and development tests were conducted in a climate-controlled greenhouse at IPRL using an experimental design that was a randomised complete block with five replications (blocks). Each block containing

P. stratiotes and nine other test plants ($n = 10$; Table 1). Four of the test plant species were also tested at FUEDEI plus species that are commonly found in the same wetland habitats in Florida as *P. stratiotes*. Three macropterous females and two males that were one to two weeks of age were released on test plants to feed and oviposit. Living and dead insects were identified and removed after seven days. A variety of arenas were used as described above including sleeve cages that held a single leaf or branch, aquaria (40 L), or clear plastic jars (5 L) with screened lids. The plants were monitored and emergence recorded until emergence of F_1 adults was completed from *P. stratiotes*.

In the Argentina trials, *L. pistiae* were invariably observed sitting on the *P. stratiotes* plants, and high survival and reproduction were verified. The initial 40 test individuals increased to about 750 within four weeks, but the actual reproductive rate could not be recorded. Also, no dead planthoppers were found, although some mortality may have been overlooked due to the high reproductive rate of the insect, and the plant density within the arena. In contrast, the planthoppers were rarely seen on the other test plants, spending most of their time on the walls of the containers. Although all stages of *L. pistiae* are too small to verify feeding without disturbing them, all the insects died in less than five days on every test plant other than the natural host. In the Florida trials, the mean mortality on *P. stratiotes* over the course of a week was $22.0 \pm 6.4\%$, while the mean number of F_1 adult progeny per female per day was 4.7 ± 0.6. On the other test plant species, all the adults died within one week and no progeny were produced. The results on test plants tested in both locations were identical with respect to survival after five to seven days of exposure.

This delphacid has so far proven to be specific to *P. stratiotes*. This is probably not surprising, since the genus *Pistia* is a highly specialised and isolated taxon within the Araceae, of which *P. stratiotes* is the sole extant species. Chloroplast and mitochondrial DNA sequences indicate that the closest taxon is the also monospecific *Protarum sechellarum* Engl., a terrestrial species endemic to the Seychelles (Renner & Zhang, 2004). In addition, *P. stratiotes* is the only species in the family with a dense layer of hairs covering the leaves. The combination of the test results, taxonomic isolation and morphological adaptations of *L. pistiae* to the tomentose leaves, point to a highly specialised herbivore that should be further considered as a biocontrol candidate for *P. stratiotes*.

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