Asystasia gangetica subsp. *micrantha*, a new record of an exotic plant in the Northern Territory

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Abstract

An herbaceous weed of the acanthus family, *Asystasia gangetica* subspecies *micrantha*, sometimes known as Chinese Violet, was found naturalised in Darwin in April 2015 and was immediately eradicated. Although cultivated as an ornamental, this plant is regarded as an invasive weed in eastern Australia where it has been established for 15 years, and is a recognised problem weed in neighbouring tropical countries. Identification and taxonomic aspects of this species are briefly discussed, as is its distribution in Australia and overseas, and its possible means of arrival in Darwin.

Introduction

Asystasia gangetica subspecies *micrantha* (Nees) Ensermu is a target weed species of the Northern Australia Quarantine Strategy which means that it has been identified as a plant that, if introduced, is likely to have substantial detrimental impacts on agricultural production and the environment. *Asystasia gangetica* subsp. *micrantha* is also on the Alert List for Environmental Weeds (Australian Government Department of Environment 2000), a list of non-native plants that threaten biodiversity and cause other environmental damage.

Asystasia gangetica subsp. *micrantha* is a form of Chinese Violet and belongs to the large, predominantly tropical plant family Acanthaceae. It is a perennial herb that can grow in a mat-forming habit and smother more desirable ground plants, thus potentially affecting agriculture or reducing biodiversity.

It is a major weed overseas, particularly in Malaysia, Indonesia and the Pacific Islands (Kiew & Vollesen 1997; Anonymous 2003; Hsu *et al.* 2005). In these places it infests plantations and competes effectively for soil nutrients, especially nitrogen and phosphorous (Barnes & Chan 1990: 148), reducing productivity and increasing crop management costs. It could also become an agricultural weed in Australia.

The taxonomy of *Asystasia* requires worldwide revision and *A. gangetica* is a variable species with two subspecies recognised, *viz.* subsp. *gangetica* and subsp. *micrantha*.

Fig. 1. Habit of *Asystasia gangetica* subsp. *micrantha* at Rapid Creek, JOW 4806. (John Westaway)

Fig. 2. Flowers of *Asystasia gangetica* subsp. *micrantha* illustrating the distinctive purple markings on the lower corolla lobe. (John Westaway)

Detailed botanical descriptions of *A. gangetica* subsp. *micrantha* are available in Ensermu (1994) and Kiew & Vollesen (1997), but in summary this plant is a sprawling perennial herb that grows rapidly to 0.5 m tall (higher on supporting vegetation) and can form mats due to its propensity to take root at stem nodes (Fig. 1). Leaves are oval shaped (to approx. 15 x 5 cm), opposite, and paler on the lower surface. The bell-shaped flowers (usually 15–25 mm long) are white with distinctive purple blotches in two parallel lines (Fig. 2). Club-shaped seed capsules (approx. 30 mm long) have four flattened seeds attached by hooks.

The two subspecies are closely related but differ in floral morphology with the typical subspecies having larger flowers (greater than 30 mm long) that may be blue, mauve, white or sometimes yellow but lack the purple blotches on the lower corolla lobe.

Asystasia gangetica subsp. *gangetica* is sometimes cultivated in tropical gardens for its large showy flowers and has also become naturalised in the Northern Territory and Queensland. The two subspecies also differ in their ecology with subsp. *gangetica* typically found as a relatively benign 'garden escapee' which does not seem as successful or aggressive as subsp. *micrantha* at invading bushland.

Distribution

Asystasia gangetica subsp. *gangetica* occurs from India to SE Asia but is cultivated more widely in tropical zones. This typical subspecies sometimes forms naturalised populations beyond gardens and has been recorded in settlements across the Northern Territory from Darwin to Croker Island, Maningrida, Numbulwar and Dhalinybuy in eastern Arnhem Land.

Fig. 3. Distribution of exotic occurrences of *Asystasia gangetica* subsp. *micrantha* in Australasia as indicated by herbarium records stored in the Australian Virtual Herbarium. New Northern Territory record in green.

Asystasia gangetica subsp. *micrantha* is native only on the African continent, but is also cultivated and is now widely naturalised in Asia, the Pacific and central and southern America (for example, see Kiew & Vollesen 1997; Gorham & Hosking 2003; PIER 2006; Daniel & Figueiredo 2009; Luján *et al.* 2012). It can be found as naturalised populations in neighbouring countries of biosecurity interest to Australia such as Indonesia, Timor-Leste, Papua New Guinea and the Solomon Islands.

There are three main areas of establishment of *A. gangetica* subsp. *micrantha* in Australia (Fig. 3). It was first encountered in Australia in the Port Stephens area in 1999 (on the New South Wales mid-north coast) where it is established at a number of locations in and near Anna Bay and Boat Harbour (Anonymous 2003, Skinner 2015).

The species was later found at Shoal Water Bay Training area, north of Rockhampton in Queensland in 2011 where there are at least two naturalised populations established on this military land (HERBRECS). It is also established on the Gold Coast in south east Queensland by 2013 where it has ingressed into native vegetation in Currumbin Conservation Park (HERBRECS; Anonymous 2014).

Asystasia gangetica subsp. *micrantha* was found naturalised near the Darwin airport in April 2015 by Michael Schmid and Lesley Alford of Veg North whilst they were conducting weed management work in Darwin International Airport's Rapid Creek Reserve (Fig. 4). This represents the first confirmed naturalised population of this taxon in the Northern Territory. It was present on Darwin International Airport land adjacent to the drain

Fig. 4. The habit of *Asystasia gangetica* subsp. *micrantha* at Rapid Creek (left), and following weed treatment (right). (Lesley Alford, John Westaway)

running north to Rapid Creek from behind the Rydges Darwin Airport Resort barbecue area (12.4041°S, 130°.8807'E).

Identification was confirmed by JW and a specimen has been lodged at the NT Herbarium (JOW 4806). At this site many sprawling plants together occupied approx 5–10% ground cover (Fig. 4) over an area of about 60 m^2 in mulched brown clay loam at the edge of a minor drainage channel (Fig. 4). The vegetation there consisted of *Acacia auriculiformis* and *Corymbia bella* – dominated remnant grassy woodland with *Pandanus spiralis* common in the understory.

Fig. 5. *A. gangetica* subsp. *micrantha* completely dominating the field layer in a teak forest in western Java. (John Westaway)

Asystasia gangetica subsp. *micrantha* had apparently been cultivated in the George Brown Darwin Botanic Gardens and subsequently eradicated (Anonymous 2003). There is an horticultural record of *Asystasia gangetica* from 1994 at these Gardens but the subspecies is not specified (Ben Wirf pers. comm.).

Should *A. gangetica* subsp. *micrantha* became more widely established in Australia, it could potentially impact commercial agricultural crops such as vegetables, legumes, cut flowers and horticultural and forestry (e.g. Fig. 5) enterprises (Anonymous 2003; Skinner 2015). Skinner (2015) provides a summary of this species impact and its management in Australia and internationally. Its competitive success over a wide geographical range is attributable to its fast establishment, stoloniferous growth form capable of rooting at stem nodes, rapid growth rate, early flowering and high seed production (Anonymous 2003). As an environmental weed, it is likely to have similarly detrimental effects, smothering native

flora and degrading wildlife habitat, particularly in already modified environments. The species' ability to readily invade undisturbed native vegetation is unclear.

Asystasia plants at Rapid Creek were treated with the herbicide 2,4-D as part of proactive weed work being undertaken by Darwin International Airport who have a process in place for management of the environment of their leased lands.

Taxonomy

In a paper on morphological variation within *Asystasia gangetica*, Ensermu (1994) recognised two subspecies; one the large-flowered type of the species from India, throughout Asia to Indonesia and Pacific Islands, and the other a smaller-flowered African taxon, subsp. *micrantha*. Kiew & Vollesen (1997) tabulated morphological differences between the two subspecies. However the NSW Herbarium (PlantNet) and the Australian Plant Census (APC), an authoritative conspectus of Australian plant taxonomy, have recently relegated the two subspecies to synonymy under *A. gangetica*.

The Northern Australia Quarantine Strategy (NAQS) has observed and collected both subspecies in several locations in northern Australia and neighbouring countries during the course of plant health surveys and is of the view that the two subspecies are distinct on the basis of differing floral morphology and different invasion behaviour. NAQS has been conducting a molecular study to investigate genetic variation between the two subspecies (and closely related congeners) across the geographic range of *A. gangetica* subsp. *micrantha*. Preliminary results from this analysis, which will be published in the near future, strongly support the contention that *A. gangetica* subsp. *micrantha* is distinct from the typical subspecies. This is further supported by the existence of a difference in the number of chromosomes in the two taxa, with subsp. *gangetica* being tetraploid (four sets of chromosomes) and subsp. *micrantha* diploid (two sets of chromosomes). This creates reproductive isolation between the two taxa, with any hybridisation resulting in the production of sterile triploid plants (three sets of chromosomes).

Introduction to Australia

Asystasia gangetica (especially subsp. *gangetica*) is cultivated in tropical climates as an ornamental garden plant. It spreads by seeds released explosively from drying capsules, as well as by stems which are capable of taking root when in contact with moist soil. Dispersal over long distances is by human agency through accidental transportation of plant material in gardening, landscaping, roadworks, mining and defence activities.

The original incursion of *A. gangetica* subsp. *micrantha* in the Port Stephens area is thought to be derived from an horticultural introduction with subsequent populations having also spread from garden plantings or resulting from the dumping of garden waste. Care is required to ensure correct disposal of plant material as much of its spread has been attributed to poor disposal of plant parts which can contain seeds and broken stems that can readily establish and form new plants, causing the infestation to spread.

The means of introduction of the recent Darwin incursion at the airport may be via seed inadvertently transported by people or machinery from eastern Australia or overseas. A plausible scenario could entail a visitor from overseas staying at the cottages along the back of the resort and accidently depositing seed from his/her footwear or clothing that had travelled with them. The infestation occurred in a drain that runs off the airport so it is possible that plant material could have arrived on an aircraft, or machinery transported by air.

It is perhaps no coincidence that the Darwin incursion is near Defence land as is the Shoalwater Bay site in central Queensland, suggesting that transport via military hardware may have been implicated.

The Darwin population at Rapid Creek has been treated with herbicide and any regeneration will be monitored and treated as necessary. Soil removed from the site during drain maintenance is disposed of appropriately to ensure seed and plant material is not spread. Whether propagules were transported beyond the site prior to treatment (e.g. downstream in the Rapid Creek catchment) remains to be seen next wet season.

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