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A description of the naturalised *Clusia rosea* Jacq. (Clusiaceae) populations in South Africa



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Scan this QR code with your smart phone or mobile device to read online. **Background:** *Clusia rosea* is an ornamental plant that has been cultivated in South Africa since the late 19th century. Ornamental plant species are known to be a source of invasive plants.

Objectives: To document the current distribution of *C. rosea* in South Africa and its naturalisation status.

Method: Reports of *C. rosea* were verified in the field and herbarium vouchers were collected. Coordinates were taken for each plant, their reproductive status was assessed and heights were measured. In addition, the Southern African Plant Invaders Atlas database and five herbaria were checked for records.

Results: A total of 284 plants were found outside of cultivation, mostly in the KwaZulu-Natal Coastal Belt Grassland. *Clusia rosea* appears to be reproducing through apomixis. No records of naturalisation could be found elsewhere in Africa.

Conclusion: It is recommended that *C. rosea* be added to the Species Under Surveillance – Possible Eradication or Containment Targets (SUSPECT) list to investigate whether it requires formal legal listing.

Introduction

Clusia rosea Jacq. is an evergreen shrub to large tree that is indigenous to the neotropics from the Yucatan province, Mexico, south of Colombia and the Guiana Shield (Berry et al. 2007; Maguire 1976). It is also indigenous to the Bahamas and Virgin Islands, the Greater Antilles, the Dominican Republic and the Florida Keys (Francis 1993; Little, Woodbury & Wadsworth 1974; Sugden 1982; Tolentino & Peña 1998; United States Department of Agriculture 2015). Commonly known as the pitch-apple, cupey or autograph tree [Florida Native Plant Society (FNPS) 2013], *C. rosea* often grows as an epiphytic strangler (Wright 1868). The yellow-white, resinous latex, which has been reported as poisonous (Gilman & Watson 1993), is used as pitch to decorate and caulk the seams of boats in the Caribbean (Saunders 1872; Starr, Starr & Loope 2003). It is widely cultivated as an ornamental plant in the tropics (Gargiullo, Magnuson & Kimball 2008) and the earliest record found for South Africa was a tree planted in the Durban Botanic Gardens (DBG) in 1894 (Wood 1897).

Clusia rosea is naturalised in the evergreen forests of Sri Lanka (Peabotuwange et al. 2012) and considered a weed in Brazil, India and South Africa (Randall 2017). The species is also considered invasive in the following Pacific islands: Hawai'i (Daehler & Baker 2006; Starr et al. 2003), Maui, Kaua'i, O'ahu (Maui Invasive Species Committee 2006) and New Caledonia (Randall 2017). Following a search through a number of botanical checklists, no records of naturalisation could be found elsewhere in Africa (Burrows & Willis 2005; Figueiredo & Smith 2008; Global Biodiversity Information Facility 2014; Klopper et al. 2006). Although *C. rosea* is known to be a weed in South Africa, this article provides a description of the naturalised populations and a basis for further assessment of this species to inform management decisions.

Research methods

The invasive nature of *C. rosea* was brought to our attention by a local conservation group in southern KwaZulu-Natal (KZN) in 2010 (D. Halle pers. comm., 26 February 2010). It was added to the Durban Early Detection and Rapid Response website (www.durbaninvasives.org.za) and featured in a Southern African Plant Invaders Atlas (SAPIA) newsletter (Henderson 2013) to create awareness about the species and encourage sighting reports.

The SAPIA database (SAPIA 2016) and five herbarium collections: South African Museum (SAM), Compton (NBG), KwaZulu-Natal (NH), Bews (NU) and the National Herbarium (PRE) were checked for records of *C. rosea*.

Populations outside of cultivation were detected through searches and reports from the public, particularly from the Durban Invasives website (www.durbaninvasives.org.za). GPS coordinates were collected for each plant, using a Garmin GPSMAP 64s, and a note was made of plant height and whether the plants were in flower or fruit. Herbarium vouchers were collected and submitted to the KZN Herbarium.

Ethical consideration

Material was gathered under permit OP 3929/2015 issued by Ezemvelo KwaZulu-Natal Wildlife.

Results

The KZN and the National Herbarium contained six cultivated specimens of *C. rosea*, which were collected in

South Africa, the oldest being from the Barberton Agricultural Research Station, Mpumalanga, in 1958 (*PRE 30524*). The remaining five specimens were collected from gardens in Durban, three of the five being from the Durban Botanic Gardens (*Poynton 17230 & 17244, PRE; Strey 5600, NH*). No specimens could be found in the other collections. There was one record from the SAPIA database prior to this study, from the Krantzkloof Nature Reserve in 2003.

A total of 284 plants were found outside of cultivation, across five different vegetation types, with the majority (n = 278) occurring near Port Edward in the KZN Coastal Belt Grassland, 57 metres above sea level (m.a.s.l.) (Table 1). This vegetation type has a conservation status of critically endangered (Scott-Shaw & Escott 2011). The remainder (n = 6) were found as solitary trees or in pairs, with a scattered

TABLE 1: Abundance, height and reproductive status of Clusia rosea plants at four different sites in KwaZulu-Natal.

Vegetation type	Conservation status	Total number of plants	Number of flowering plants	Number of fruit- bearing plants	Height of tallest plant (m)
Eastern scarp forests	Least threatened	3	1	2	3.0
KZN coastal forests	Critically endangered	1	1	1	10.0
Pondoland-Ugu sandstone coastal sourveld	Critically endangered	2	0	0	1.6
KZN coastal belt grassland	Critically endangered	278	5	9	12.2

Vegetation type and conservation status follows the classification of Scott-Shaw and Escott (2011).

KZN, KwaZulu-Natal; m, metres.



Source: Authors' own work

FIGURE 1: Known distribution of naturalised Clusia rosea in South Africa (•). Shaded areas indicate all critically endangered vegetation types in KwaZulu-Natal.

distribution in Kloof, Durban, and near Port Edward (Figure 1) underneath the canopies of indigenous vegetation. The three sightings on the Durban Invasives website were all of single trees within the eThekwini municipality. Two were verified by the first author, while the third, from New Germany nature reserve, could not be found.

Clusia rosea was seen to flower and produce fruit all year round but only pistillate flowers were observed. The smallest fruit-bearing plant had a stem thickness of 20 mm and was 2.2 m tall. The only herbivory noted on this species was from vervet monkeys (*Chlorocebus aethiops* L.) eating the fruit, with seeds sticking to their fur.

Discussion

An annotation on the oldest herbarium specimen collected in Durban (*Strey 5300, NH*) states 'used as a hedge plant in Kloof'. This is a suburb approximately 18 km inland from the DBG. It is noteworthy that the SAPIA record, which was submitted in 2003, was from this suburb and was verified with subsequent field work in 2016 (*Cheek 2434, NH*). The period of persistence and observed recruitment would suggest that it is more than a casual garden escape and that *C. rosea* can be considered naturalised, following the definition of Pyšek et al. (2004). The 278 plants in the KZN Coastal Belt Grassland are in two populations on vacant plots, roughly 800 m apart, in the coastal town of Southbroom, 17 km north of Port Edward. *Clusia rosea* is still in cultivation on some properties in Southbroom (A. Skelton pers. comm., 29 March 2017) and are the likely origin of those outside of cultivation. Following the framework of Blackburn et al. (2011), *C. rosea* can be classed at the C3 invasion stage in South Africa, with self-sustaining, reproducing populations relatively close to the points of introduction. In this framework, C3 is the final stage of naturalisation and establishment, but not yet being invasive, where reproducing populations are established significant distances (over 1 km) from where they were introduced.

Vervet monkeys eating the fruit may account for the scattered distribution of the six individuals under the canopy layer at Durban, Kloof and Port Edward. In its indigenous range, *C. rosea* is bird dispersed (Francis 1993) and this may also be a method of spread in South Africa.

Maguire (1976) concluded that *C. rosea* plants may be wholly apomictic in their indigenous range, because trees were producing fruit with viable seed, despite the presence of only pistillate flowers. Our observations concur with this finding as fruit were readily produced, even in isolated trees (Figure 2).



Source: Photos by R. Lalla

FIGURE 2: Semi-succulent opposite, obovate leaves (a); pistillate flower (b); capsule that has split open, showing sticky, orange flesh containing seeds (c); mature tree with prop roots (d); and aerial roots (e).

The original tree from the 1894 planting is still in existence at the DBG; however, the DBG management has not observed natural regeneration from this tree as yet (J. Gates pers. comm., 6 December 2016).

Clusia rosea is currently considered indigenous to the Florida Keys; however, there is some uncertainty as to whether the first specimens recorded in the 1840s were introduced from the Caribbean (Morton 1988). It is listed by the Florida Keys Invasive Exotics Task Force as a plant that is not a serious problem as yet, but one that should be monitored (Florida Keys Invasive Exotics Task Force 2005). Being bird dispersed it spreads readily into the Florida landscape (FNPS 2013; Gilman & Watson 1993; Morton 1988). We recommend that *C. rosea* be added to the Species Under Surveillance – Possible Eradication or Containment Targets (SUSPECT) list (Wilson et al. 2013) so that its invasive potential can be adequately assessed via a formal risk assessment.

Specimens examined

Clusia rosea

SOUTH AFRICA. Mpumalanga: Barberton Agricultural Research Station, 12 Mar. 1958, (PRE). KwaZulu-Natal: Durban, Botanic station gardens, Jun. 1964, *Strey 5300* (NH); Durban, 1 Feb. 1968, *Coleman 513* (PRE); Durban, 9 Jan. 1968, *Gardener s.n.* (PRE); Durban, Durban Botanic Gardens, 18 Mar. 1983, *Poynton 17230* (PRE); Durban Botanic Gardens, 18 Mar. 1983, *Poynton 17244* (PRE); Durban, Kloof, Glenholme nature reserve, 29.79781 °S 30.83222 °E, 502 m.a.s.l., 2 Feb. 2016, *Cheek M. 2434* (NH); Durban, Kloof, Krantz Kloof nature reserve, 2 Feb. 2016, *Cheek 2434* (NH); Port Shepstone, South Broom, 30.91147 °S 30.31843 °E, 57 m.a.s.l., 16 Mar. 2016, *Cheek M. 2540* (NH).

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Competing interests

The authors declare that they have no financial or personal relationships that may have influenced them in writing this article.

Authors' contributions

Both M.D.C. and R.L. were involved in fieldwork, subsequent research, data interpretation, mapping and manuscript drafting.

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