

Pittosporum undulatum Vent. is an invasive tree on Robinson Crusoe Island (Juan Fernández Archipelago), Chile

Pittosporum undulatum Vent. es un árbol invasor en la Isla Robinson Crusoe (Archipiélago de Juan Fernández), Chile

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RESUMEN

Se documenta la infestación del árbol invasor *Pittosporum undulatum* en la Isla Robinson Crusoe (Más a Tierra). Se proporciona una comparación morfológica con otras especies de *Pittosporum* reportadas de la isla. Debido a que *P. undulatum* se conoce como una especie de gran influencia negativa en muchas otras islas, se recomienda su erradicación.

As on many other oceanic islands, large numbers of non-native plant species have been introduced to Robinson Crusoe Island (Archipelago Juan Fernández, southeast Pacific Ocean). Many of them are now naturalized (established) and some are spreading –they are invasive *sensu* Richardson *et al.* (2000). There are approximately 200 naturalized vascular plant species on Robinson Crusoe Island (Stuessy *et al.* 2018: Table 5.2) and about 25 of them are assumed to cause “significant alteration of the habitats” (Greimler *et al.* 2018: Table 8.3). About half of these are woody species (shrubs or trees).

Over the last 15 years, four shrub/tree species of *Pittosporum* have been reported from the island (Danton *et al.* 2006, Carvallo & Castro 2017, Danton & Perrier 2017, Greimler *et al.* 2018, Stuessy *et al.* 2018, Stuessy 2020). Three of them have been labeled as “cultivated”, “in gardens”, or “within the village” (*P. crassifolium*, *P. tenuifolium*, *P. tobira*). Only *P. eugenioides* has been classified as naturalized/invasive (Danton 2006, Greimler *et al.* 2018, Stuessy 2020). However, only *P. crassifolium* is listed from the Juan Fernández Archipelago in the “Catálogo de las plantas vasculares de Chile” by Rodríguez *et al.* (2018). No *Pittosporum* species was reported from the island by Skottsberg (1922), Matthei *et al.* (1993), Swenson *et al.* (1997), Cuevas *et al.* (2004), and Smith-Ramírez *et al.* (2017). Interestingly, however, already in 1893, *Pittosporum undulatum* Vent. had been mentioned together

with *Pinus pinaster*, *Acacia lophantha*, *Spartium junceum* and *Deutzia scabra* as cultivated in the settlement on the island: “De estas cinco especies se cultivan unos que otros ejemplares en las cercanías de las chozas de los colonos.” (Johow 1893, p. 969).

During my visit in February 2020, I noticed *Pittosporum undulatum* (Victorian box), not only frequently cultivated in San Juan Bautista, but also spontaneously spreading in the area of Aguas Buenas, around a ruined gunpowder magazine and the supposed campsite of Alexander Selkirk (“Robinson Crusoe”) who stayed on the island from 1704 to 1709. This place is located about 2/3 of the way from San Juan Bautista to Mirador de Selkirk (Figs. 2 to 4 in Takahashi *et al.* 2007). The center of the infested area is approximately 33°38'12.00”S and 78°50'47.83”W, 278 m a.s.l. The area is about 2 ha large and includes well over 50 trees, 2-4 m tall, and many saplings (Fig. 1). Some trees may be over 20 years old. Native vegetation is dominated by *Nothomyrcia* (*Myrceugenia fernandeziana*) and *Pernettya rigida* (*Gaultheria racemulosa*). Trees of *Drimys confertifolia* are also present. Introduced *Ugni molinae*, *Aristotelia chilensis* and *Rubus ulmifolius* proliferate among the native vegetation.

I am certain that this is the current expansion of the *Pittosporum* population that Danton *et al.* (2006, p. 494) reported from this location (besides the village of San Juan Bautista) in 2001 and identified as *P. eugenioides* A. Cunn.

This is what they wrote about this infestation (emphasis added): “Observé depuis 2001: originaire de Nouvelle-Zélande, cet arbre est présent dans le village de San Juan Bautista sur RC (au pied de los Patriotas par exemple) et s’est naturalisé jusque dans le territoire du Parc national (secteur El Guidal sur le camino Mirador de Selkirk, etc.) où il est en extension. Il s’agit d’une espèce très envahissante qui, comme le maqui [*Aristotelia chilensis*], remplace peu à peu les arbres indigènes et élimine la myrtisylve fernandézienne. Bien que déjà fortement implanté, il serait important d’éliminer cette espèce qui menace l’île.” The cited paper was apparently the source of information that was later used by Carvallo & Castro (2017), Greimler *et al.* (2018), Stuessy *et al.* (2018) and Stuessy (2020). In a vegetative stage, *P. eugenioides* and *P. undulatum* are somewhat similar (both with often undulate leaves), but otherwise the two species are very different. Table 1 summarizes major morphological attributes of all five species mentioned in this communication.

To my knowledge, *P. eugenioides* has never been found as clearly invasive (Rejmánek & Richardson 2013). It is occasionally naturalized in Tasmania and continental Australia

(Baker 2011, Hosking *et al.* 2007). However, *Pittosporum undulatum* is a very difficult invader on many islands and even in parts of Australia where it is not native (Bellingham *et al.* 2018, Gleadow 1982, Lourenço *et al.* 2011, Silva *et al.* 2017, Smith-Ramírez *et al.* 2017). A decline in the species richness and cover of native herbaceous plants and shrubs was documented from communities invaded by *P. undulatum* in Australia. At an invaded dry sclerophyll forest remnant on the Mornington Peninsula, Victoria, vascular plant species richness declined from an average 15 species per 9 m² in plots where *P. undulatum* cover was less than 20% to just five species where its cover was more than 80% (Mullett 2001). Significant negative impact of increasing *P. undulatum* basal area on the growth and diversity of native plant species was reported from Jamaica (Bellingham *et al.* 2005, 2018). The best representation of what an unchecked invasion of *P. undulatum* might lead to, in climatically similar islands, can be observed on the Azores Archipelago where about 30% of the total forest cover is currently occupied by this species (Lourenço *et al.* 2011, Silva *et al.* 2017).

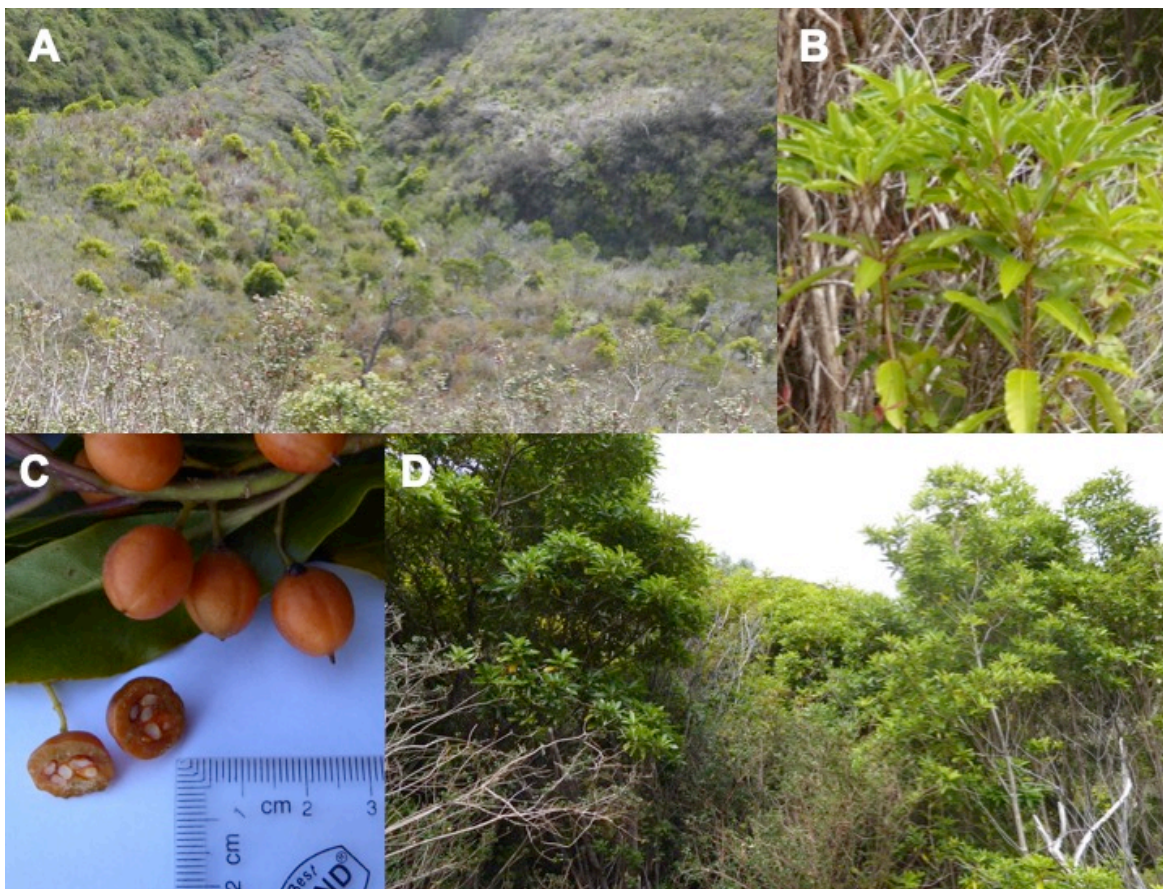


FIGURE 1. *Pittosporum undulatum*. A: Infestation in the area of Aguas Buenas (light green crowns of trees). B: Seedlings. C: Fruits. D: Dense stand. / *Pittosporum undulatum*. A: Infestación en la zona de Aguas Buenas (copas de árboles verde claro). B: Plántulas. C: Frutas. D: Soporte denso.

TABLE 1. Attributes of *Pittosporum crassifolium*, *P. tenuifolium*, *P. eugenioides*, *P. undulatum*, and *P. tobira* / Atributos de *Pittosporum crassifolium*, *P. tenuifolium*, *P. eugenioides*, *P. undulatum* y *P. tobira*.

	LEAVES	FLOWERS	PETALS	CAPSULES
<i>P. crassifolium</i> Banks & Soland. ex A. Cunn.	3 - 10 x 1 - 3 cm, obovate to oblanceolate, margins strongly revolute, lateral veins about 5/side	2 - 10, fascicled	dark red to purple, 10 - 16 x 3 - 5 mm	trigonus, 3-valved, 10 - 30 mm, white- to brown-tomentose
<i>P. tenuifolium</i> Banks & Soland. ex Gaertn.	1.5 - 12 x 1.2 - 4.7 cm, obovate to elliptical, margins flat, lateral veins 6 - 12/side	1 - 3, solitary or fascicled	dark purple, rarely pink to white, 8 - 16 x 2 - 5 mm	subglobose, 3-valved, 9 - 14 mm, dark gray, almost black, tomentose
<i>P. eugenioides</i> A. Cunn.	5 - 15 x 2 - 4 cm, oblong-elliptic to elliptic*, margins often undulate, lateral veins 20 - 30/side	30 - 70 , umbeliform cymes	green-yellow , 5 - 7 x 1.5 - 2 mm	ellipsoid, 2-valved, 9 - 10 mm long, green to black , glabrous
<i>P. undulatum</i> Vent.	6 - 16 x 1.5 - 5 cm, elliptic-oblong to oblanceolate, margins undulate or flat, lateral veins about 12/side	4 - 15 , subumbelliform	creamy white , 11 - 17 x 3 - 4 mm	subglobose, 2-valved, 9 - 14 mm, orange- yellow to brown , glabrous
<i>P. tobira</i> (Thunberg) W. T. Aiton	4 - 10 x 2 - 4 cm, obovate, leathery, dark green shining above, margins turned under, veins not readily apparent	8 - 40, umbel-like cluster	cream-white/yellow, 9 - 12 x 2.5 - 5 mm	ovoid, 2- and 3-valved, 10 - 16 mm, yellow- green, tomentose

*Leaves lemon-scented when crushed.

Based on Cooper (1956), Cayzer et al. (2000), Nelson (2011), Zhang and Turland (2003), and herbarium specimens. The attributes that are different between *P. eugenioides* and *P. undulatum* are printed in bold. A voucher specimen of *P. undulatum* from the investigated area is deposited in the herbarium of the University of California - Davis (DAV).

Control programs for *P. undulatum* most often utilize the cut and paint method whereby individual trees are cut and stumps are immediately treated with herbicides. This method provides very encouraging results initially, but the associated increase of light and soil disturbance may promote establishment of new seedlings, particularly in the absence of follow-up and control. Bark stripping is effective in preventing sprouts, but only if all bark, from 30 cm down to soil level, is removed. A more efficient control method for this species is the drill and fill technique whereby herbicides are injected into the trunk and the canopy contracts over time (Mullett 2002).

P. undulatum eradication on Robinson Crusoe island is probably still possible, but it would require a substantial effort - at least 400 man-hours (Rejmánek & Pitcairn 2002). Like the two most important woody invaders on Robinson Crusoe Island (*Aristotelia chilensis* and *Rubus ulmifolius*), *P. undulatum* is apparently dispersed primarily by a (semi)native bird, the Austral thrush - *Turdus falcklandii* (Smith-Ramírez et al. 2013).

Any potentially successful eradication project would have to be spatially and temporarily very rigorous and persistent.

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