

Taxon: Alluaudia procera (Drake) Drake

Family: Didiereaceae

Common Name(s): Arbre Pieuvre
Madagascar ocotillo

Synonym(s): Didierea procera Drake

Assessor: No Assessor

Status: Assessor Approved

End Date: 2 May 2018

WRA Score: -6.0

Designation: L

Rating: Low Risk

Keywords: Spiny Tree, Arid Climate, Ornamental, Dioecious, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	n
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence of domestication] "The bole is often sawn in rough planks to be used in local house construction. The wood, known as 'fantsilotra', is also commonly used for boxes and crates. It has been used for containers for tobacco and vanilla because it is odourless. It is suitable for interior trim, furniture, laths for tile roofs, supporting framework, veneer for inner layers of plywood, and particle board. It is used as firewood and for charcoal production. <i>Alluaudia procera</i> is in great demand as an ornamental and is the most common member of Didiereaceae in succulent collections."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 2 May 2018]	"Native Africa WESTERN INDIAN OCEAN: Madagascar"
	World Conservation Monitoring Centre. 1998. <i>Alluaudia procera</i> . The IUCN Red List of Threatened Species 1998: e.T30436A9550092. http://www.iucnredlist.org . [Accessed 2 May 2018]	"Range Description: Extreme south of Madagascar, beyond the Tropic of Capricorn"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 2 May 2018]	

203	Broad climate suitability (environmental versatility)	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	" <i>Alluaudia procera</i> occurs in dry forest and thickets, at 100–450(–800) m altitude, often together with xerophytic <i>Euphorbia</i> spp."
	Dave's Garden. 2018. Madagascar Ocotillo, Madagascan Ocotillo, African Ocotillo - <i>Alluaudia procera</i> . https://davesgarden.com/guides/pf/go/53187/ . [Accessed 2 May 2018]	"Hardiness: USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	" <i>Alluaudia procera</i> is endemic to south-western and southern Madagascar, north to the Mangoky river."
	World Conservation Monitoring Centre. 1998. <i>Alluaudia procera</i> . The IUCN Red List of Threatened Species 1998: e.T30436A9550092. http://www.iucnredlist.org . [Accessed 2 May 2018]	"Range Description: Extreme south of Madagascar, beyond the Tropic of Capricorn"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/ . [Accessed 2 May 2018]	" <i>Alluaudia procera</i> (Drake) Drake (Confirmed) Synonyms: Syn. <i>Didierea procera</i> Drake First Collected: 1992 Locations: Koko Crater Botanical Garden (Confirmed) Waimea Arboretum & Botanical Garden"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Collectors of succulents are likely to have almost any of the 11 species in cultivation, but the only one at all likely to be grown by an average home gardener in Hawai'i is <i>Alluaudia procera</i> "
	Dave's Garden. 2018. Madagascar Ocotillo, Madagascan Ocotillo, African Ocotillo - <i>Alluaudia procera</i> . https://davesgarden.com/guides/pf/go/53187/ . [Accessed 2 May 2018]	"Regional - This plant has been said to grow in the following regions: Peoria, Arizona Phoenix, Arizona Scottsdale, Arizona Surprise, Arizona Bostonia, California Carlsbad, California Clayton, California Hayward, California Lake Elsinore, California Mountain View Acres, California Oak View, California Oakland, California Pittsburg, California Reseda, California Roseville, California San Diego, California (3 reports) Spring Valley, California Thousand Oaks, California Miami, Florida Wailuku, Hawaii Orange, Texas Port Isabel, Texas Portland, Texas"

Qsn #	Question	Answer
301	Naturalized beyond native range	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	Wagner, W.L., Herbst, D.R. & Lorence, D.H. 2018. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/ . [Accessed 2 May 2018]	No evidence to date
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
305	Congeneric weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
401	Produces spines, thorns or burrs	y
	Source(s)	Notes
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Deciduous, dioecious small tree up to 15 m tall; bole branchless for up to 6(-10) m, cylindrical, up to 40(-55) cm in diameter; bark thick, surface whitish to grey, inner bark reddish; branches upright, with many, stout, 1-2 cm long, solitary spines. Leaves in pairs below each spine, simple and entire, thick and fleshy, with vertical blades, nearly sessile, caducous; stipules absent; blade elliptical to oblong or obovate, 7-25 mm x -12 mm, glabrous."

Qsn #	Question	Answer
402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Deciduous, dioecious small tree up to 15 m tall" [Didiereaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Simmen, B. et al. (2006). Plant species fed on by Lemur catta in gallery forests of the southern domain of Madagascar. Pp. 55-68 In Ringtailed lemur biology. Springer US	"TABLE 5.1. List of plant species and items consumed by ringtailed lemurs in Berenty, Antserananomby, and Beza-Mahafaly" [<i>Alluaudia procera</i> - Food items = yl, ml, fl ... young leaf and leaf bud (yl), mature leaf (ml), flower (fl)]
	Dave's Garden. 2018. Madagascar Ocotillo, Madagascan Ocotillo, African Ocotillo - <i>Alluaudia procera</i> . https://davesgarden.com/guides/pf/go/53187/ . [Accessed 2 May 2018]	"This plant is resistant to deer"
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[Seedlings palatable] "In plantations seedlings should be protected against browsing by cattle."

405	Toxic to animals	n
	Source(s)	Notes
	Simmen, B. et al. (2006). Plant species fed on by Lemur catta in gallery forests of the southern domain of Madagascar. Pp. 55-68 In Ringtailed lemur biology. Springer US	[No evidence] "TABLE 5.1. List of plant species and items consumed by ringtailed lemurs in Berenty, Antserananomby, and Beza-Mahafaly" [<i>Alluaudia procera</i> - Food items = yl, ml, fl ... young leaf and leaf bud (yl), mature leaf (ml), flower (fl)]
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Unknown] " <i>Alluaudia procera</i> " ... "Didiereas thrive outdoors without special attention in our climate, and they would do well in dry, leeward Hawaiian settings."

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Useful Tropical Plants Database. 2018. <i>Alluaudia procera</i> . http://tropical.theferns.info/viewtropical.php?id=Alluaudia+procera . [Accessed 2 May 2018]	"Known Hazards - None known"
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Dave's Garden. 2018. Madagascar Ocotillo, Madagascan Ocotillo, African Ocotillo - <i>Alluaudia procera</i> . https://davesgarden.com/guides/pf/go/53187/ . [Accessed 2 May 2018]	"This plant is fire-retardant"
	Grubb, P. J. (2003). Interpreting some outstanding features of the flora and vegetation of Madagascar. <i>Perspectives in Plant Ecology, Evolution and Systematics</i> , 6(1-2), 125-146	"Within the dry evergreen forest region where rainfall is moderate (900–1600 mm yr ⁻¹) a sub-set of trees with fire-resistant bark seems to have evolved at sites prone to frequent ground fires"

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Extremely well drained, porous soil is essential; full sun to high, broken shade is ideal"
	Useful Tropical Plants Database. 2018. <i>Alluaudia procera</i> . http://tropical.theferns.info/viewtropical.php?id=Alluaudia+procera . [Accessed 2 May 2018]	"Requires a sunny position[200]. Prefers a position in light shade [423]."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). <i>PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale)</i> , Wageningen, Netherlands	" <i>Alluaudia procera</i> is most commonly found on well-drained calcareous or alluvial soils, but also on gneissic, sandy and sandstone soils. "
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Extremely well drained, porous soil is essential"

411	Climbing or smothering growth habit	n
	Source(s)	Notes

Qsn #	Question	Answer
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Deciduous, dioecious small tree up to 15 m tall; bole branchless for up to 6(-10) m, cylindrical, up to 40(-55) cm in diameter; bark thick, surface whitish to grey, inner bark reddish; branches upright, with many, stout, 1-2 cm long, solitary spines."

412	Forms dense thickets	
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[A dominant component of thicket vegetation] " <i>Alluaudia procera</i> occurs in dry forest and thickets, at 100-450(-800) m altitude" ... "n the early 1970s it has been estimated that the area of distribution of <i>Alluaudia procera</i> comprises about 200,000 ha. Locally, <i>Alluaudia procera</i> is dominant, and although the bole diameters are moderate, the total bole volume per ha can be quite high, sometimes more than 300 m ³ with 2000 boles of over 8 cm diameter. However, the bark is thick and represents 32-55% of the bole volume. On favourable sites on red sands, the net wood volume is up to 80 m ³ /ha. The thinning of natural stands promotes diameter growth. It is recommended to process the wood as soon as possible after felling to avoid attacks by fungi and insects, or to treat it immediately with preservatives."
	Sussman, R. W., Green, G. M., Porton, I., Andrianasolondraibe, O. L., & Ratsirarson, J. (2003). A survey of the habitat of <i>Lemur catta</i> in southwestern and southern Madagascar. <i>Primate Conservation</i> , 19: 32-57	[Forms stands. Does not appear to exclude other vegetation] "Figure 1b. Stand of <i>Alluaudia procera</i> trees of the endemic plant family Didiereaceae, on the road between Betioky and the Beza-Mahafaly Special Reserve."

501	Aquatic	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[Terrestrial] "Deciduous, dioecious small tree up to 15 m tall ... <i>Alluaudia procera</i> occurs in dry forest and thickets, at 100-450(-800) m altitude, often together with xerophytic <i>Euphorbia</i> spp."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 2 May 2018]	Family: Didiereaceae Subfamily: Didiereoideae

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 2 May 2018]	Family: Didiereaceae Subfamily: Didiereoideae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Deciduous, dioecious small tree up to 15 m tall"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Although <i>Alluaudia procera</i> and some other <i>Alluaudia</i> spp. are locally common or even dominant, some concern is needed about the decline of populations. <i>Alluaudia procera</i> has been included in the IUCN Red List, although it still is considered to be at lower risk but near threatened. Much of the dry forest in southern Madagascar has been replaced by grassland, whereas the exploitation of <i>Alluaudia procera</i> for its timber is another serious threat. All species of Didiereaceae, including <i>Alluaudia procera</i> , have been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This has been done to monitor the international trade in especially live plants for succulent lovers."
	World Conservation Monitoring Centre. 1998. <i>Alluaudia procera</i> . The IUCN Red List of Threatened Species 1998: e.T30436A9550092. http://www.iucnredlist.org . [Accessed 2 May 2018]	"Red List Category & Criteria: Lower Risk/near threatened ver 2.3"

Qsn #	Question	Answer
602	Produces viable seed	y
	Source(s)	Notes
	Useful Tropical Plants Database. 2018. <i>Alluaudia procera</i> . http://tropical.theferns.info/viewtropical.php?id=Alluaudia+procera . [Accessed 2 May 2018]	"Propagation Seed - surface sow in a seed tray in a lightly shaded position and place the tray in a plastic bag until the first signs of germination are seen. The seed germinates best at a temperature of 22 - 25 c[200]."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"The weight of 1000 seeds is about 1.5 g. The best period for sowing is December. The germination rate is low; some tests showed a germination rate of only 0.1%. Some seeds germinate already -9 days after sowing, but germination may take up to 4 months."

603	Hybridizes naturally	
	Source(s)	Notes
	Eggl, U. 2002. Illustrated handbook of succulent plants: Dicotyledons. Springer-Verlag, Berlin - Heidelberg - New York	[Possibly] " <i>A. montagnacii</i> ... This is the most local and rarest of all Didiereaceae, and possibly the natural hybrid <i>A. ascendens</i> x <i>A. procera</i> ."

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Deciduous, dioecious small tree up to 15 m tall"

605	Requires specialist pollinators	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Flowers unisexual, small, greenish yellow to whitish, sweet-smelling, with short pedicel, each flower subtended by 2 cap-shaped, slightly unequal, c. 2 mm long bracts; tepals 4, broadly ovate, c. 2 mm long, outer 2 slightly larger than inner 2; stamens 8, fused at base, 4 longer and 4 shorter, hairy at base of filaments; ovary superior, ovoid to slightly 3-angular, 1-celled, style very short, stigma with 3 large, irregularly incised lobes; male flowers with rudimentary ovary, female flowers with rudimentary stamens." ... "The flowers are probably pollinated by bees. They open in the late morning and wilt already in the afternoon of the same day."
	Useful Tropical Plants Database. 2018. <i>Alluaudia procera</i> . http://tropical.theferns.info/viewtropical.php?id=Alluaudia+procera . [Accessed 2 May 2018]	"Pollinators - Bees"
	Kubitzki, K., Rohwer, J.G. & Bittrich, V. (eds.). 1993. The Families and genera of vascular plants. Volume II. Springer-Verlag, Berlin, Heidelberg, New York	[Family description] "POLLINATION. Most flowers are white or cream and have a scent of honey, which points to melittophily. Indeed bees as pollinators have been observed by Rauh (1961). The flowers open only at sunshine in late morning and wilt in the afternoon of the same day (Rauh, pers. commun.)."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Propagation by cuttings is easy, and plants can also be successfully propagated by layering and root suckers."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Baldwin, D. L. 2013. <i>Succulents Simplified: Growing, Designing, and Crafting with 100 Easy-Care Varieties</i> . Timber Press, Portland, OR	"As the common name implies, <i>Alluaudia procera</i> is from Madagascar." ... "It takes years for <i>alluaudia</i> to bloom, and when it does, sprays of dainty flowers give the plant airy top-knots."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"The growth of seedlings is slow; seedlings are on average only 2 cm tall after 6 months, although some may reach 25 cm tall after 14 months. Taking into consideration the climate and the dry, sandy soils in the area of distribution, established <i>Alluaudia procera</i> trees grow quite rapidly. Annual growth rates of 100–175 cm in height but only 2–3(–6) mm in bole diameter have been recorded, whereas annual wood volume increments in natural stands are 0.6–5.0 m ³ /ha. In plantations of 11 years old raised from cuttings, the largest trees were 8 m tall and 1–20 cm in diameter, but most of them had a bad bole shape."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Kubitzki, K., Rohwer, J.G. & Bittrich, V. (eds.). 1993. <i>The Families and genera of vascular plants. Volume II</i> . Springer-Verlag, Berlin, Heidelberg, New York	"DISPERSAL. The fruits are disseminated by wind."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence. No means of external attachment] "Fruit a top-shaped nut 2–3 mm long, enclosed by the persistent bracts and tepals, indehiscent, 1-seeded. Seed with thin seed coat and whitish caruncle."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Baldwin, D. L. 2013. <i>Succulents Simplified: Growing, Designing, and Crafting with 100 Easy-Care Varieties</i> . Timber Press, Portland, OR	"As the common name implies, <i>Alluaudia procera</i> is from Madagascar. Its thorny gray trunks are lined with oval, bright green leaves that it may lose in winter, making it look prickly and bleached. It takes years for <i>alluaudia</i> to bloom, and when it does, sprays of dainty flowers give the plant airy top-knots. Designers love its verticality."
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Collectors of succulents are likely to have almost any of the 11 species in cultivation, but the only one at all likely to be grown by an average home gardener in Hawai'i is <i>Alluaudia procera</i> "

Qsn #	Question	Answer
	Dave's Garden. 2018. Madagascar Ocotillo, Madagascan Ocotillo, African Ocotillo - <i>Alluaudia procera</i> . https://davesgarden.com/guides/pf/go/53187/ . [Accessed 2 May 2018]	Cultivated as an ornamental

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Baldwin, D. L. 2013. <i>Succulents Simplified: Growing, Designing, and Crafting with 100 Easy-Care Varieties</i> . Timber Press, Portland, OR	[No evidence. Unlikely. A slow-growing, dioecious tree of xeriscapes. Not grown with produce] "It takes years for alluaudia to bloom, and when it does, sprays of dainty flowers give the plant airy top-knots."

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). <i>PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale)</i> , Wageningen, Netherlands	"The flowers are probably pollinated by bees. They open in the late morning and wilt already in the afternoon of the same day. The fruits are dispersed by wind."

705	Propagules water dispersed	n
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Didiereas thrive outdoors without special attention in our climate, and they would do well in dry, leeward Hawaiian settings."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). <i>PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale)</i> , Wageningen, Netherlands	[Unlikely. Wind-dispersed seeds may be buoyant, but plant occurs in dry habitats] "The flowers are probably pollinated by bees. They open in the late morning and wilt already in the afternoon of the same day. The fruits are dispersed by wind." ... " <i>Alluaudia procera</i> occurs in dry forest and thickets"

706	Propagules bird dispersed	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). <i>PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale)</i> , Wageningen, Netherlands	[No evidence] "Fruit a top-shaped nut 2–3 mm long, enclosed by the persistent bracts and tepals, indehiscent, 1-seeded. Seed with thin seed coat and whitish caruncle." ... "The fruits are dispersed by wind."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence] "Fruit a top-shaped nut 2–3 mm long, enclosed by the persistent bracts and tepals, indehiscent, 1-seeded. Seed with thin seed coat and whitish caruncle." ... "The fruits are dispersed by wind."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"Answer 'no' where the taxon is unlikely to be eaten by animals or if seeds are not viable following passage through the gut."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence of consumption or internal dispersal] "Fruit a top-shaped nut 2–3 mm long, enclosed by the persistent bracts and tepals, indehiscent, 1-seeded. Seed with thin seed coat and whitish caruncle." ... "The fruits are dispersed by wind."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[Unlikely. 1-seeded fruit with low germination percentage] "Fruit a top-shaped nut 2–3 mm long, enclosed by the persistent bracts and tepals, indehiscent, 1-seeded." ... "The germination rate is low; some tests showed a germination rate of only 0.1%."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2018) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 2 May 2018]	"Storage Behaviour: Orthodox p. Storage Conditions: 53 % viability following drying to mc's in equilibrium with 15 % RH and freezing for 3 months at -20°C at RBG Kew, WP."
	Louppe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Louppe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"The germination rate is low; some tests showed a germination rate of only 0.1%. Some seeds germinate already 6–9 days after sowing, but germination may take up to 4 months. Seedlings are susceptible to damping off and watering should be done carefully. Seeds can be stored up to 6 months."

Qsn #	Question	Answer
803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Loupe, D. & Lemmens, R.H.M.J., 2010. <i>Alluaudia procera</i> (Drake) Drake. In: Lemmens, R.H.M.J., Loupe, D. & Oteng-Amoako, A.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[Ability to sucker suggests plants may be able to resprout after cutting] "Propagation by cuttings is easy, and plants can also be successfully propagated by layering and root suckers."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Unknown] "Collectors of succulents are likely to have almost any of the 11 species in cultivation, but the only one at all likely to be grown by an average home gardener in Hawai'i is <i>Alluaudia procera</i> "

Summary of Risk Traits:

High Risk / Undesirable Traits

- Grows in tropical climates
- Spiny
- Reproduces by seeds & suckers
- Seeds dispersed by wind & intentionally by people

Low Risk Traits

- No reports of invasiveness or naturalization
- Commonly cultivated & values as an ornamental
- Seedlings palatable to cattle
- Requires well-drained soils
- Dioecious
- Relatively slow-growing & long time to maturity
- Seeds may not persist after 1 year