Taxon: Pachypodium eburneum Lavranos & Rapan. **Family:** Apocynaceae

Common Name(s): Madagascar palm **Synonym(s):** P. rosulatum Baker var. eburneum

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 23 Jan 2017

WRA Score: -1.0 **Designation:** L **Rating:** Low Risk

Keywords: Tuberous, Shrub, Spiny, Endangered, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
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
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
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
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
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	?
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	?
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
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
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
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n

Qsn #	Question	Answer Option	Answer
304	Environmental 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
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
402	Allelopathic		
403	Parasitic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	y
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems	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	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	n
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
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
412	Forms dense thickets		
501	Aquatic	y=5, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	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

Qsn #	Question	Answer Option	Answer
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	y
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	y
602	Produces viable seed	y=1, n=-1	y
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
603	Hybridizes naturally		
604	Self-compatible or apomictic		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	y
605	Requires specialist pollinators	y=-1, n=0	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
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
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
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
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
801	Prolific seed production (>1000/m2)		

Qsn #	Question	Answer Option	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	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		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		
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**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	[No evidence of domestication] "There are two known subpopulations of this species. One subpopulation was recorded in the Betafo area of Andranomangatsiaka where the total population probably numbers less than 100 individuals. The subpopulation at Ibity massif was visited in August 2005 but was not found (Rapanarivo pers. comm. 2015). Moreover, the staff member of the Missouri Botanical Garden who manages the site within the newly protected area has not found any individuals of this species. Therefore, the Ibity massif subpopulation is assumed to be extirpated."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2017. 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. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Jan 2017]	"Native: Africa Western Indian Ocean: Madagascar"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Jan 2017]	

203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**
	LLIFLE - Encyclopedia of living forms. 2017. Pachypodium eburneum. http://www.llifle.com/. [Accessed 23 Jan 2017]	"Altitude range: 1,500 to 1,999 metres above sea level."

Qsn #	Question	Answer
	Grow Plants. 2017. Pachypodium eburneum. http://www.growplants.org/growing/pachypodium-eburneum. [Accessed 23 Jan 2017]	"Pachypodium eburneum growing succulent shrub of the genus Pachypodium also known as Madagascar Palm, Pachypodium eburneum perennial deciduous plant used as fragrant ornamental drought tolerant plant can grow in subtropical, mediterranean or desert climate"
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"This species is endemic to Madagascar, where it grows in the province of Antananarivo at elevations of 1,500 to 1,999 m asl."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"This species is endemic to Madagascar, where it grows in the province of Antananarivo at elevations of 1,500 to 1,999 m asl. Subpopulations have only been found in Ibity and Andranomangatsiaka."

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	**Notes**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"Use and Trade: This plant is collected for the horticultural trade."

301	Naturalized beyond native range	n
	Source(s)	**Notes**
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2017. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 23 Jan 2017]	No evidence to date

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

303	Agricultural/forestry/horticultural weed	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	n
	Source(s)	**Notes**
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"Succulent shrub 20-40 cm high, base subglobose, up to 20 cm in diameter; bark greygreen, smooth; branches thick, erect or spreading, up to 18 cm long, 5-8 cm in diameter and tapering to 3 cm, often unarmed and with leaf scars in their lower part and in the apical part spiny; branchlets short, 0.5-3 cm long, 1.6-3 cm in diameter, covered with paired straight spines, 5-16 mm long, 2-4 mm in diameter at the base, basal part conical 0.4-0.5 of the spine length and upper part needle-like, pubescent when young."

402	Allelopathic	
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	[Unknown. Grows with other vegetation] "ECOLOGY. On quartz rocks in sandy humus. Alt. c. 1600 m, in full sun. Accompanied by Pachypodium densiflorum, P. brevicaule, Aloe laeta and Aloe trachyticola."

403	Parasitic	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"Succulent shrub 20-40 cm high," [Apocynaceae. No evidence]

Qsn #	Question	Answer
404	**Unpalatable to grazing animals**	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	Unknown, but spines, and potential toxicity, might deter browsing

405	**Toxic to animals**	**y**
	Source(s)	**Notes**
	Bester, S. P. 2007. Pachypodium Lindl. PlantZAfrica. SANBI. https://www.plantzafrica.com/plantnop/pachypodium.htm. [Accessed 23 Jan 2017]	"Pachypodium falls in a group of the Apocynaceae notorious for poisonous properties and for yielding potent poisons that have been used most effectively in arrow poison since ancient times. The active principles in these poisons are usually glucosides with a digitalis-like action that stimulates the heart, and their effect is well known to hunters who often control and administer them with great skill. "
	Stein, G. 2012. Pachypodiums- The caudiciform collectors plant- Introduction to the species and cultivational suggestions. http://davesgarden.com/guides/articles/view/539. [Accessed 23 Jan 2017]	"Pachypodiums are members of the family Apocynaceae which also includes Adeniums, Oleanders, Plumeria and Periwinkles. Pachypodium means thick foot', referring to the large, swollen caudiciform stems all members of this genus have. They not only have succulent stems but most are heavily armed with thick, stiff spines on the caudex and branches. They are also protected by their toxic sap (true of all Apocynaceaes, though Pachypodiums have clear sap, not the white latex seen running from Plumeria injuries)."

406	**Host for recognized pests and pathogens**	
	Source(s)	**Notes**
	Grow Plants. 2017. Pachypodium eburneum. http://www.growplants.org/growing/pachypodium-eburneum. [Accessed 23 Jan 2017]	"Pests and diseases in Pachypodium eburneum: ?"

407	**Causes allergies or is otherwise toxic to humans**	**y**
	Source(s)	**Notes**
	Bester, S. P. 2007. Pachypodium Lindl. PlantZAfrica. SANBI. https://www.plantzafrica.com/plantnop/pachypodium.htm. [Accessed 23 Jan 2017]	"Pachypodium falls in a group of the Apocynaceae notorious for poisonous properties and for yielding potent poisons that have been used most effectively in arrow poison since ancient times. The active principles in these poisons are usually glucosides with a digitalis-like action that stimulates the heart, and their effect is well known to hunters who often control and administer them with great skill. "
	Stein, G. 2012. Pachypodiums- The caudiciform collectors plant- Introduction to the species and cultivational suggestions. http://davesgarden.com/guides/articles/view/539. [Accessed 23 Jan 2017]	"Pachypodiums are members of the family Apocynaceae which also includes Adeniums, Oleanders, Plumeria and Periwinkles. Pachypodium means thick foot', referring to the large, swollen caudiciform stems all members of this genus have. They not only have succulent stems but most are heavily armed with thick, stiff spines on the caudex and branches. They are also protected by their toxic sap (true of all Apocynaceaes, though Pachypodiums have clear sap, not the white latex seen running from Plumeria injuries)."

408	**Creates a fire hazard in natural ecosystems**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"ECOLOGY. On quartz rocks in sandy humus. Alt. c. 1600 m, in full sun. Accompanied by Pachypodium densiflorum, P. brevicaule, Aloe laeta and Aloe trachyticola." [No evidence. Unlikely given succulent habit & habitat]
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"This species is threatened by illegal collection for the horticultural trade and habitat loss caused by annual wildfire." [Damaged by fire]

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"ECOLOGY. On quartz rocks in sandy humus. Alt. c. 1600 m, in full sun."
	LLIFLE - Encyclopedia of living forms. 2017. Pachypodium eburneum. http://www.llifle.com/. [Accessed 23 Jan 2017]	"It like full sun."
	Grow Plants. 2017. Pachypodium eburneum. http://www.growplants.org/growing/pachypodium-eburneum. [Accessed 23 Jan 2017]	"Light conditions in optimal condition for growing Pachypodium eburneum: Full Sun / Half shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"P. eburneum grows in fissures on outcrops of quartzite. It is adaptec to acid soils with pH 4.5." ... "ECOLOGY. On quartz rocks in sandy humus." ... "Substrate loose peat with quartz sand, pH 3.5."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"HABIT. Tuberous plant with thick branches and few ramifications, up to 40 cm high."

Qsn #	Question	Answer
412	**Forms dense thickets**	
	Source(s)	**Notes**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"t has an area of occupancy (AOO) of 9 km2 and it has one location. The total number of individuals in probably under 100 but the number of mature individuals has not been quantified."
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	[No evidence] "ECOLOGY. On quartz rocks in sandy humus. Alt. c. 1600 m, in full sun. Accompanied by Pachypodium densiflorum, P. brevicaule, Aloe laeta and Aloe trachyticola."

501	**Aquatic**	**n**
	Source(s)	**Notes**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"Habitat and Ecology: This shrub or stem succulent grows in subhumid woodlands and on inselbergs or rock faces on quartzitic rocks (Rapanarivo 1999). This species can be found with these associated species: Pachypodim brevicaule, Pachypodium densiflorum, Uapaca bojeri, Aloe capitata and Sarcolaena oblongifolia. Systems: Terrestrial"

502	**Grass**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Jan 2017]	Family: Apocynaceae Subfamily: Apocynoideae Tribe: Malouetieae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Jan 2017]	Family: Apocynaceae Subfamily: Apocynoideae Tribe: Malouetieae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"Succulent shrub 20-40 cm high, base subglobose, up to 20 cm in diameter; bark grey-green, smooth; branches thick, erect or spreading, up to 18 cm long, 5-8 cm in diameter and tapering to 3 cm, often unarmed and with leaf scars in their lower part and in the apical part spiny;"

Qsn #	Question	Answer
601	**Evidence of substantial reproductive failure in native habitat**	**y**
	Source(s)	**Notes**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"One of these has been extirpated and the remaining subpopulation is not located within a protected area. It has an area of occupancy (AOO) of 9 km2 and it has one location. The total number of individuals in probably under 100 but the number of mature individuals has not been quantified. In addition, the species experiences continuing decline due to illegal collection for the horticultural trade and loss of habitat caused by annual wildfire. It is therefore assessed as Critically Endangered."
602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"REPRODUCTION. By seeds."
603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Eggli, U. 2002. Illustrated handbook of succulent plants: Dicotyledons. Springer-Verlag, Berlin - Heidelberg - New York	[Unknown] "Occasional wild hybrids have been reported, and garden hybrids have been created, but none so fare between Madagascan and African species."
604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Lipow, S. R., & Wyatt, R. (1999). Floral morphology and late-acting self-incompatibility in Apocynum cannabinum (Apocynaceae). Plant Systematics and Evolution, 219(1-2): 99-109	[Unknown for P. eburneum] "... five species of Pachypodium (Anderson 1983) are self compatible."
605	**Requires specialist pollinators**	**y**
	Source(s)	**Notes**
	Botanic Wonders. 2017. Growing Pachypodiums. http://www.botanicwonders.com/Growing-Pachypodiums.html. [Accessed 23 Jan 2017]	"Most indigenous pollinators don't know how to pollinate their flowers. Fortunately they are not that difficult to pollinate by hand. With a little research and practice you can produce your own seeds. Seeds germinate easily, and grow relatively quickly."
	Eggli, U. 2002. Illustrated handbook of succulent plants: Dicotyledons. Springer-Verlag, Berlin - Heidelberg - New York	"Pollination is as for Adenium..." "... Adenium .. Pollination requires a long, slender proboscis to enter the lower chamber between one of the five slits in the androecial cone. Incoming pollen lands on the stigmatic area; as the proboscis is withdrawn it is gummed by contact with the knob of the style and picks up fresh pollen from the anthers above. In cultivation a cat's whisker or horse's tail hair can be used to cross-pollinate two plants."

Qsn #	Question	Answer
606	**Reproduction by vegetative fragmentation**	**n**
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"REPRODUCTION. By seeds." [No evidence]

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	LLIFLE - Encyclopedia of living forms. 2017. Pachypodium eburneum. http://www.llifle.com/. [Accessed 23 Jan 2017]	"Flowers: Large, showy, ivory colored with a yellow tint in the center throat on long peduncles. Each peduncle bears about 6 (or more) flowers. Flowers will set in the second year in good conditions."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant." [No evidence]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Rau, E. 2016. President, Sustainable Bioresources, LLC. Personal Communication. 29 December	"P. eburneum (seedlings in propagation)"
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"Use and Trade: This plant is collected for the horticultural trade."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant." [Unlikely. No evidence]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	[Yes, but may be ineffective over long distances] "The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant."

705	Propagules water dispersed	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	[Unlikely. Tufted seeds may by buoyant, but occurs in dry habitat] "ECOLOGY. On quartz rocks in sandy humus. Alt. c. 1600 m, in full sun." ... "The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant. In addition, it is possible that insects,birds and also small rodents may disperse the seeds."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant. In addition, it is possible that insects, birds and also small rodents may disperse the seeds." [Possibly No. Primarily adapted for wind dispersal]

707	Propagules dispersed by other animals (externally)	
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant. In addition, it is possible that insects, birds and also small rodents may disperse the seeds." [Possibly. Hairs may adhere to fur or feathers, or rodents may cache and disperse seeds]

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. Plant Protection Quarterly, 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."

Qsn #	Question	Answer
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"The seeds of Pachypodium spp. are provided with awns suggesting that dispersal is by wind. However, according to Keraudren (1963) wind dispersal may not be very effective because the awns of the seeds separate easily or even as soon as the fruit follicles open, and the seeds will fall on the ground near the mother plant. In addition, it is possible that insects, birds and also small rodents may disperse the seeds." [Probably No. Seed dispersal, if any, by animals likely to occur externally]

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Rapanarivo, S.H.J.V. (1999). Pachypodium (Apocynaceae): Taxonomy, Ecology & Cultivation. CRC Press, Boca Raton, FL	"REPRODUCTION. By seeds." [Unknown, but probably no. No description of prolific seeding]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	Bester, S. P. 2007. Pachypodium Lindl. PlantZAfrica. SANBI. https://www.plantzafrica.com/plantnop/pachypodium.htm. [Accessed 23 Jan 2017]	[Generic description] "Seeds soon lose their viability. Harvest fresh seed from the taped up pods and sow in a ± 5 mm deep, sterile, sandy medium (4 parts fine and 4 parts coarse river sand; 1 part sieved, well-rotten compost; 1 part perlite; 1 part vermiculite) in summer. Keep moist and at a temperature of 27-35°C to ensure rapic germination. All seed not germinated after 6 weeks can be regarded as nonviable."

803	Well controlled by herbicides	
	Source(s)	**Notes**
	WRA Specialist. 2017. 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**
	Members of the IUCN SSC Madagascar Plant Specialist Group. 2015. Pachypodium eburneum. The IUCN Red List of Threatened Species 2015: e.T68501373A68709739. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T68501373A68709739.en. [Accessed 23 Jan 2017]	"This species is threatened by illegal collection for the horticultural trade and habitat loss caused by annual wildfire." [Presumably killed by fires]
	WRA Specialist. 2017. Personal Communication	Unknown. Other species described as having regenerative properties.

Qsn #	Question	Answer
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Grows in tropical climates
• Spiny
• Genus reportedly toxic
• Reproduces by seeds
• Reaches maturity in 2 years
• Seeds likely dispersed by wind and people

Low Risk Traits
• No reports of invasiveness or naturalization, but limited evidence of widespread introduction outside native range
• Landscaping and ornamental value
• Specialized pollinator requirements (likely limits seed set outside native range)
• Not reported to spread vegetatively