

Key Words: Evaluate, Naturalized, Ornamental Palm, Armed Petiole, Bird-dispersed

Family: *Areaceae*

Taxon: *Licuala grandis*

Synonym: *Pritchardia grandis hort. ex W. Bull (basiony)* **Common Name:** ruffled fan palm
 Vanuatu fan palm
 Palas palm

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation:	EVALUATE
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score	6
101	Is the species highly domesticated?		y=-3, n=0		n
102	Has the species become naturalized where grown?		y=1, n=-1		
103	Does the species have weedy races?		y=1, n=-1		
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		y
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)		
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		y=1, n=0		
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		
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		y=1, n=0		y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		y=1, n=0		y

411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	
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	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	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	
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	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: EVALUATE

WRA Score **6**

Supporting Data:

101	1960. McCurrach, J.C.. Palms of the world. Harper, New York	[Is the species highly domesticated?? No evidence]
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Species suited to tropical or subtropical climate(s) 2-High] "Native: PACIFIC Southwestern Pacific: Vanuatu"
202	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Quality of climate match data 2-High]
203	2012. Tropilab Inc.. Licuala grandis - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropilab.com/licuala-gran.html	[Broad climate suitability (environmental versatility)? No] "USDA zone 9 - 11"
204	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Introduced to Tahiti in 1930, it was cultivated since 1936 in the JBHS, where it is currently locally naturalized."
204	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Native: PACIFIC Southwestern Pacific: Vanuatu"
205	1990. Keng, H.. The Concise Flora of Singapore: Gymnosperms and dicotyledons. Singapore University Press, Singapore	[Does the species have a history of repeated introductions outside its natural range? Singapore] "Native of New Hebrides and New Britain; often cultivated."
205	1992. DeFilippis, R.A.. Ornamental Garden Plants of the Guianas. Department of Botany, Smithsonian Institution, Washington, D.C.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Range: New Hebrides (Espiritu Santo 1., Malekula 1.) in the Southwest Pacific Ocean. Cultivated at the Promenade Gardens and Botanic Gardens in Georgetown, Guyana; and in Surinam (Ostendorf, 1962)."
205	2003. Vander Velde, N.. The Vascular Plants of Majuro Atoll, Republic of the Marshall Islands. Atoll Research Bulletin. 503: 1-141.	[Does the species have a history of repeated introductions outside its natural range? Majuro Atoll] "Recent introduction. New Britain and Vanuatu. Rare. Ornamental potted plant found in Rita and in Arnata Kabua's garden. Grows well even under other trees and is showing invasive properties in some parts of Polynesia (NVV 2000; RRT 2000AB, 2001) (DPMJ0043, DPMJ0642). * **"
205	2004. Dransfield, J./Barfod, A. S./Pongsattayapipat, R.. A preliminary checklist to Thai Palms. Thai Forest Bulletin (Botany). 32: 32-72.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Exotic Palms Commonly Cultivated in Thailand" [Includes Licuala grandis]
205	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Hawaiian Islands]
205	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Does the species have a history of repeated introductions outside its natural range? French Polynesia] "Introduced to Tahiti in 1930, it was cultivated since 1936 in the JBHS, where it is currently locally naturalized."
301	2007. McCormack, G.. Cook Islands Biodiversity Database, Version 2007.2.. Cook Islands Natural Heritage Trust, Rarotonga http://cookislands.bishopmuseum.org	[Naturalized beyond native range? No evidence from Cook Islands] "COOK ISLANDS STATUS: Introduced - Recent, Not naturalised; Land, lowlands, gardens"
301	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Naturalized beyond native range? Yes] "Twelve species of palms are sparingly or widely naturalized in French Polynesia (Table 2). Meyer (1998) reported that the ruffled fan palm or Vanuatu fan palm (Licuala grandis, locally called "palmier-cuillère" in Tahiti, which means "spoon palm" because of its large leaves), was established in wet, low-elevation secondary forest in a valley on the island of Tahaa (Society Islands) (Fig. 2)." ... "Introduced to Tahiti in 1930, it was cultivated since 1936 in the JBHS, where it is currently locally naturalized." ... "Locally naturalized (Tahiti, FP), widely naturalized (Tahaa, FP)"

301	2012. Wagner, W.L./Herbst, D.R./Khan, N./Flynn, T.. Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai'i & Hawai'i's Ferns & Fern Allies. http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/supplement.htm	[Naturalized beyond native range? No evidence from Hawaiian Islands]
302	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). <i>Palms</i> . 52: 71-83.	[Garden/amenity/disturbance weed? Naturalized] Potential Environmental Weed
303	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). <i>Palms</i> . 52: 71-83.	[Agricultural/forestry/horticultural weed? Naturalized] Potential Environmental Weed
304	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). <i>Palms</i> . 52: 71-83.	[Environmental weed? Potentially Yes] "In 1999, Meyer officially advised the Department of the Environment of French Polynesia to ban introduction of <i>Licuala grandis</i> , <i>Washingtonia</i> spp. and <i>Elaeis guineensis</i> ." [Recommended ban due to potential negative ecological impacts]
305	2008. Dawson, W./Mdolwa, A.S./Burslem, D.F.R.P./Hulme, P.E.. Assessing the risks of plant invasions arising from collections in tropical botanical gardens. <i>Biodiversity and Conservation</i> . 17: 1979–1995.	[Congeneric weed? No evidence] "Table 3 Regenerating species with known planting history in ABG" [<i>Licuala peltata</i> Roxb. ex Buch.-Ham. - Location found is indicated—P = found in plantation compartments originally planted only]
305	2012. Lau, A./Frohlich, D.. New plant records from O'ahu for 2009. <i>Bishop Museum Occasional Papers</i> . 113: 7-26.	[Congeneric weed? <i>L. spinosa</i> naturalized] " <i>Licuala spinosa</i> Wurbm New naturalized record This species, native to indonesia, is a clump forming fan palm to 10 feet tall with fronds more or less circular in outline. It looks similar to the more common <i>Licuala grandis</i> but differs in having its fronds divided nearly to the base. This species was first collected in Hawai'i from Foster Botanical Garden in 1949. it was noted here very sparingly naturalized sprouting from a hedged row of adventive and naturalized <i>Tabebuia heterophylla</i> saplings, as well as other naturalized species and garden escapes near Foster Botanical Garden (Henderson 2009; Hodel 2009)."
305	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Congeneric weed? No evidence]
401	2012. Tropilab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropilab.com/licuala-gran.html	[Produces spines, thorns or burrs? Yes] "The petiole has a prominent hastula and is armed toward the base with small, curved teeth along the fibrous margins."
402	2012. WRA Specialist. Personal Communication.	[Allelopathic? Unknown]
403	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Parasitic? No] Arecaceae
404	2012. WRA Specialist. Personal Communication.	[Unpalatable to grazing animals? Unknown] Fruit eaten by birds, but palatability of foliage unknown
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No evidence]
406	2012. thegardengeeks. <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://thegardengeeks.com/home/	[Host for recognized pests and pathogens] "Pests and Diseases: Ruffled Fan Palm (<i>Licuala grandis</i>) is susceptible to fungal leaf spots and spider mites, scale insect, and mealybugs when grown indoors."
407	2000. Lewis, C.E./Zona, S.. A survey of cyanogenesis in palms (Arecaceae). <i>Biochemical Systematics and Ecology</i> . 28: 219-228.	[Causes allergies or is otherwise toxic to humans? No evidence of cyanogenesis] "We surveyed leaf material of 545 individual palms representing 108 genera and 155 species for cyanogenesis using the Feigl-Anger test. We detected HCN production in only two species of one genus, <i>Drymophloeus</i> . Additional smaller surveys of shoot meristems and roots revealed cyanogenesis only in the shoot meristem of one species of <i>Dypsis</i> . Our results indicate that cyanogenesis is rather rare in the family."
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans? No evidence]

408	2012. PACSOA. Palms: <i>Licuala grandis</i> [Accessed 24 Aug 2012]. PACSOA (Palm and Cycad Society of Australia), http://www.pacsoa.org.au/palms/Licuala/grandis.html	[Creates a fire hazard in natural ecosystems? No evidence] "Lowland rainforest of the Solomon Islands, and Vanuatu" ... " Likes moist soil, and can stand full sun in the tropics (high humidity), though requires shade in the sub-tropics." [Unlikely given humid, rainforest habitat]
409	2012. Dave's Gardern. PlantFiles: Ruffled Fan Palm, Vanuatu Fan Palm, Palas Palm - <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://davesgarden.com/guides/pf/go/59235/	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Sun Exposure: Light Shade Partial to Full Shade"
409	2012. Tropilab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropilab.com/licuala-gran.html	[Is a shade tolerant plant at some stage of its life cycle? Presumably Yes. Understory palm] "Needs lots of water; high humidity, light shade." ... "However, grow in a protected area. Do not expose to heavy winds since it is a understory rainforest palm"
410	2012. Dave's Gardern. PlantFiles: Ruffled Fan Palm, Vanuatu Fan Palm, Palas Palm - <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://davesgarden.com/guides/pf/go/59235/	[Tolerates a wide range of soil conditions? Possibly Yes] "Soil pH requirements: 6.6 to 7.5 (neutral)"
410	2012. Learn 2 Grow. <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://www.learn2grow.com/plants/licuala-grandis/	[Tolerates a wide range of soil conditions? Yes] "Soil pH - Acidic, Neutral; Soil Drainage - Well Drained; Soil type - Loam, Sand"
410	2012. PACSOA. Palms: <i>Licuala grandis</i> [Accessed 24 Aug 2012]. PACSOA (Palm and Cycad Society of Australia), http://www.pacsoa.org.au/palms/Licuala/grandis.html	[Tolerates a wide range of soil conditions] "A very popular plant among palm collectors. Likes moist soil, and can stand full sun in the tropics (high humidity), though requires shade in the sub-tropics."
411	1960. McCurrach, J.C.. Palms of the world. Harper, New York	[Climbing or smothering growth habit? No] "Trunk: To 6 ft. in height, 3 in. diameter or less. Petiole: 3 ft. long, slender, spines near base and halfway to leaf. Leaf: Palmate; 3 by 2 ft.; circular appearance but really more wide than long; not divided, unless split by wind, but notched at tips. M. and R. Foster, in their book, Brazil, speak of the leaves as resembling knife-pleated skirts or corrugated roofs. Segments: Bright, dark, glossy green; split at ends; very pleated. Flowerstalk: Among leaves, same length as leaves."
412	2008. Meyer, J-Y./Laverigne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Forms dense thickets? Potentially Yes] "In its native range of Vanuatu (San Cristobal and Santa Cruz), <i>L. grandis</i> is known to be gregarious in shaded understory of rain forest and forms extensive colonies (Jones 1995, Whitmore 1975)."
501	1960. McCurrach, J.C.. Palms of the world. Harper, New York	[Aquatic? No] Terrestrial palm
502	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Grass? No] Arecaceae
503	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Nitrogen fixing woody plant? No] Arecaceae
504	1965. Neal, M.C. In Gardens of Hawaii. Bishop Museum Press, Honolulu, HI	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "A slender palm...about 6 feet tall bears handsome, dark green, round, fine-pleated leaves, which are entire except for inch-long bifid lobes around the edge; the leaves measure about 3 feet across and have slender stems 3 feet long, spine-edged in the lower half"
601	2012. PACSOA. Palms: <i>Licuala grandis</i> [Accessed 24 Aug 2012]. PACSOA (Palm and Cycad Society of Australia), http://www.pacsoa.org.au/palms/Licuala/grandis.html	[Evidence of substantial reproductive failure in native habitat? No evidence]

602	1999. Siregar, H.M./Utami, N.W.. Seeds germinability of palem kol (<i>Licuala grandis</i> H.A. Wendl.) at several stages of fruit maturity. Bulletin Kebun Raya Indonesia. 9(1): 26-34.	[Produces viable seed? Yes] "Experiment I. The aim of this study was to investigate the germination of seeds at different stages of fruit maturity (green, ripe, over-ripe) with or without pericarp removal. Seeds with a particular stage of maturity were either: directly planted as control, soaked in water for 24 hrs, soaked in water for 2x24 hrs, soaked in GA3 solution (100 mg/l) for 24 hrs, or soaked in GA3 solution (100 mg/l) for 2x24 hrs. The result indicated that seed maturity affected percentage of final germination in which over-ripe seeds had the highest level of seed germination. The over-ripe seed with pericarp removal soaked in water for 24 hrs gave the highest final seed germination (70.67 percent) and germination value (0.075) and germination began at 82 days after planting. Experiment II. Over-ripe seeds with or without pericarp removal were soaked in a range of concentrations of GA3 solution (750; 1000; 1250 mg/l). The result indicated that seed with pericarp removal soaked in GA3 750 mg/l gave the highest final seed germination (64.00 percent) and germination value (0.072), and germination began at 86 days after planting"
602	2012. Tropiclab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropiclab.com/licuala-gran.html	[Produces viable seed? Yes] "Propagation - Seeds"
603	2001. Ellison, D./Ellison, A.. Cultivated palms of the world. UNSW Press, Sydney.	[Hybridizes naturally? Unknown] No hybrids reported in genus
604	1990. Silberbauer-Gottsberger, U.. Pollination and Evolution in Palms. Phytoneuron. 30(2): 213-233.	[Self-compatible or apomictic? Unknown] "Self-compatibility seems to be the prevailing breeding system in palms, and different mechanisms to promote outcrossing are developed."
604	2003. Barfod, A.S./Burholt, T./Borchsenius, F.. Contrasting pollination modes in three species of <i>Licuala</i> (Arecaceae: Coryphoideae). Telopea. 10(1): 207-223.	[Self-compatible or apomictic? Unknown. Related species potentially self-compatible] "Rachillae bagged with nets impenetrable to insects (6 rachillae with a total of 187 flowers) showed a fruiting success of 3.4%, comparable with that of unbagged inflorescences from adjacent palms growing in shady conditions (5.5%; 2 rachillae with a total of 145 flowers). <i>Licuala spinosa</i> is thus potentially self-compatible."
605	2003. Barfod, A.S./Burholt, T./Borchsenius, F.. Contrasting pollination modes in three species of <i>Licuala</i> (Arecaceae: Coryphoideae). Telopea. 10(1): 207-223.	[Requires specialist pollinators? No] "The most common pollen dispersing agents are beetles followed by bees and flies. Except for Knuth (1904) who reported abundant nectar production in the flowers of <i>Licuala grandis</i> H. Wendl., and listed some insects as likely pollinators, nothing has been published about pollination within this large genus."
605	2007. Junker, R./Chung, A.Y.C./Bluthgen, N.. Interaction between flowers, ants and pollinators: additional evidence for floral repellence against ants. Ecological Research. 22: 665-670.	[Requires specialist pollinators? No. Pollinated by stingless bees] "Although <i>A. gracilipes</i> displayed aggressive behaviour against stingless bees at <i>L. grandis</i> , we could not find a reduction in visitation rate, perhaps because inflorescences are very large and may provide sufficient space for both ants and pollinators. Bees spend similar time spans on or near inflorescences with and without ants, and even remained for the same time at each flower once they found a flower unoccupied by ants. However, each visit to an inflorescence on which ants were active, involved increased movement and searching across flowers and, thus, a smaller proportion of actual flower contact."
606	2011. Anderson, P.J.. Identifying Commonly Cultivated Palms. In A Resource for Pests & Diseases of Cultivated Palms. Florida Dept. of Ag. & Consumer Service, Div. of Plant Industry & Identification Tech. Program, CPHST, PPQ, APHIS, USDA, Fort Collins, CO	[Reproduction by vegetative fragmentation? No evidence] "Stems: Solitary, upright stems to 3 m tall and 5-8 cm in diameter, ridged with leaf scars and some remnant fibers from leaf sheaths. "
606	2012. Tropiclab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropiclab.com/licuala-gran.html	[Reproduction by vegetative fragmentation? No evidence] "Propagation - Seeds"
607	2001. Zona, S./Maidman, K.. Growth Rates of Palms in Fairchild Tropical Garden. Palms. 45(3): 151-154.	[Minimum generative time (years)? Unknown] "Table 1. Average growth rates of palms growing in Fairchild Tropical Garden. The growth rate can be converted into inches per year by dividing the figure by 2.54." [Licuala grandis = 5 cm/yr]
607	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Minimum generative time (years)? Unknown] "Seeds are slow to germinate (three to six months or more), and seedlings grow slowly."
607	2012. Florida Palm Trees. Ruffled Fan Palm Tree - <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://www.florida-palm-trees.com/ruffled-fan-palm-tree/	[Minimum generative time (years)? Unknown] "Growth Rate: Slow. <i>Licuala grandis</i> is a very attractive, slow growing palm that can get up to 5-10ft tall, but usually doesn't get higher than 6ft with a spread of 5-10ft wide."

701	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No evidence] "The small fleshy fruits (ca. 1 cm in diameter) of <i>Dypsis madagascariensis</i> and <i>Licuala grandis</i> might be dispersed over long distances by frugivorous birds," [Small fruits & seeds could potentially be dispersed accidentally, but lack means of external attachment]
702	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules dispersed intentionally by people? Yes] Cultivated as an ornamental
703	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Propagules likely to disperse as a produce contaminant? No evidence] "The small fleshy fruits (ca. 1 cm in diameter) of <i>Dypsis madagascariensis</i> and <i>Licuala grandis</i> might be dispersed over long distances by frugivorous birds," [Small fruits & seeds could potentially be dispersed accidentally, but lack means of external attachment]
704	1992. DeFilipps, R.A.. Ornamental Garden Plants of the Guianas. Department of Botany, Smithsonian Institution, Washington, D.C.	[Propagules adapted to wind dispersal? No] "Fruit red or orange, c.1.3 cm wide."
704	2012. Tropilab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropilab.com/licuala-gran.html	[Propagules adapted to wind dispersal? No] "Fruit: bright red when ripe; like a marble. Seeds: small and round"
705	1992. DeFilipps, R.A.. Ornamental Garden Plants of the Guianas. Department of Botany, Smithsonian Institution, Washington, D.C.	[Propagules water dispersed? No evidence] "Fruit red or orange, c.1.3 cm wide." [Although fruits may potentially float, adaptation is for vertebrate (i.e. bird & bat) dispersal]
706	1981. Snow, D.W.. Tropical Frugivorous Birds and Their Food Plants: A World Survey. Biotropica. 13(1): 1-14.	[Propagules bird dispersed? Yes] "Table 1. Plant genera recorded in the diets of frugivorous birds in the tropics (including subtropical South Africa and Australasia, and excluding oceanic islands and Madagascar)." [Includes <i>Licuala</i>]
706	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Propagules bird dispersed? Yes] "Moreover, several palm species with small fruits (<i>Ptychosperma macarthurii</i> in Fiji [Watling 2005], <i>Licuala grandis</i> and <i>Dypsis madagascariensis</i> in Tahiti, <i>Washingtonia robusta</i> in La Réunion) are actively dispersed by alien frugivorous birds, especially mynas (<i>Acridotheres tristis</i> in many tropical islands, and <i>A. fuscus</i> in Fiji) the bulbuls (<i>Pycnonotus cafer</i> and <i>P. jocosus</i>), over long distances."
706	2012. Tropilab Inc.. <i>Licuala grandis</i> - Ruffled Fan Palm. [Accessed 24 Aug 2012]. http://www.tropilab.com/licuala-gran.html	[Propagules bird dispersed? Presumably Yes] "Fruit: bright red when ripe; like a marble. Seeds: small and round"
707	1998. Tan, K.H./Zubaid, A./Kunz, T.H.. Food habits of <i>Cynopterus brachyotis</i> (Muller) (Chiroptera: Pteropodidae) in Peninsular Malaysia. Journal of Tropical Ecology. 14: 299-307.	[Propagules dispersed by other animals (externally)? Potentially Yes] "Table 1. Fruit remnants collected beneath feeding and day-time roosts of <i>Cynopterus brachyotis</i> ." [Bat-dispersed. May be carried and pulp consumed, rather than internally dispersed]
708	2008. Meyer, J-Y./Lavergne, C./Hodel, D. R.. Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms. 52: 71-83.	[Propagules survive passage through the gut? Presumably Yes] "The small fleshy fruits (ca. 1 cm in diameter) of <i>Dypsis madagascariensis</i> and <i>Licuala grandis</i> might be dispersed over long distances by frugivorous birds, such as the common myna (<i>Acridotheres tristis</i>), introduced in the early 1900s in Tahiti and found at lower elevations, and the red-vented bulbul (<i>Pycnonotus cafer</i>), introduced in the 1970s and found at higher elevation (up to 2000 m), but also by the endemic fruit dove <i>Ptilinopus purpuratus</i> , which is a generalist frugivorous wild pigeon found in mid-elevation rain forests in the Society Islands. Meyer observed red-vented bulbuls feeding on mature fruits of <i>L. grandis</i> in the main town of Papeete."
801	2012. PACSOA. Palms: <i>Licuala grandis</i> [Accessed 24 Aug 2012]. PACSOA (Palm and Cycad Society of Australia), http://www.pacsoa.org.au/palms/Licuala/grandis.html	[Prolific seed production (>1000/m ²)? Unknown] Unlikely, but photos of prolific fruit production on infructescences suggest that multiple palms growing together may create high seed densities
802	2012. Florida Palm Trees. Ruffled Fan Palm Tree - <i>Licuala grandis</i> [Accessed 24 Aug 2012]. http://www.florida-palm-trees.com/ruffled-fan-palm-tree/	[Evidence that a persistent propagule bank is formed (>1 yr)? Potentially] "Propagation: Propagated by seed. It might take as long as 12 months for seeds to sprout."
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] No information on herbicide efficacy or chemical control of this species
804	2012. WRA Specialist. Personal Communication.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Unknown]
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Naturalized in French Polynesia
- Thrives in tropical climates
- Armed toward the base with small, curved teeth
- Shade tolerant
- Fleshy-fruited with bird-dispersed seeds

Low Risk / Desirable Traits

- Non-toxic
- Requires shade, moisture, and high humidity (will not thrive in all habitat types)
- Landscaping and ornamental value
- Slow-growing & small-statured