

Taxon: <i>Lodoicea maldivica</i>	Family: Arecaceae
Common Name(s): coco de mer double coconut sea coconut	Synonym(s): Borassus sonneratii Giseke Cocos maldivica J. F. Gmel. Lodoicea callypige Comm. ex J. St.- Lodoicea sechellarum Labill. Lodoicea sonneratii (Giseke) Baill.

Assessor: No Assessor	Status: Assessor Approved	End Date: 5 Aug 2014
WRA Score: -7.0	Designation: L	Rating: Low Risk

Keywords: Dioecious Palm, Unarmed, Slow-Growing, Large Seeds, Dispersal Limited

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	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
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	n
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

Qsn #	Question	Answer Option	Answer
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	y
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	n
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	n
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	n
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)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
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
	Rist, L., Kaiser-Bunbury, C. N., Fleischer-Dogley, F., Edwards, P., Bunbury, N., & Ghazoul, J. 2010. Sustainable harvesting of coco de mer, <i>Lodoicea maldivica</i> , in the Vallée de Mai, Seychelles. <i>Forest Ecology and Management</i> , 260(12): 2224-2231	[No evidence. Recently discovered and exploited] " <i>L. maldivica</i> previously occurred at relatively high densities across Praslin and Curieuse, but has been exploited intensively since its discovery by the French in 1768, mainly for timber, but also for palm hearts, leaves and nuts (Fischer and Fleischer-Dogley, 2008)."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2014. 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
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The double coconut, <i>Lodoicea maldivica</i> , is an endemic palm which occurs naturally on two small islands in the Seychelles group, i.e. Praslin (37 km ²) and Curieuse (3.6 km ²); fossil remains have also been found on a few neighbouring islets."

202	Quality of climate match data	High
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Riffle, R.L. & Craft, P. 2003. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	"The species does not tolerate frost and is adaptable only to zones 10b and 11,"
	Squire, D. 2007. Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	"USA Zones 10b and 11"
	Fleischer-Dogley, F., Kettle, C. J., Edwards, P. J., Ghazoul, J., Määtänen, K., & Kaiser-Bunbury, C. N. 2011. Morphological and genetic differentiation in populations of the dispersal-limited coco de mer (<i>Lodoicea maldivica</i>): implications for management and conservation. Diversity and Distributions, 17(2): 235-243	[Occurred in a broad range of habitats] "Prior to human colonization in the 18th century, <i>Lodoicea</i> was the dominant tree on two neighbouring islands in the Seychelles group, Praslin and Curieuse, occurring across a broad range of habitats from the coast to the uplands (Malavois 1787 quoted in Fauvel, 1909; Que'au de Quincy 1801 quoted in Fauvel, 1915; Bailey, 1942)."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). Nordic Journal of Botany, 22(2): 227-238	"Amongst the most spectacular of giant forms which occur on islands is the famous double coconut (<i>Lodoicea maldivica</i> (Gmel.) Pers.), which is native on two small islands in the Seychelles group..."

205	Does the species have a history of repeated introductions outside its natural range?	n
	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 5 Aug 2014]	"Locations: Foster Botanical Garden Harold L. Lyon Arboretum Ho'omaluhia Botanical Garden Pacific Tropical Botanical Garden (now National Tropical Botanical Garden)"
	Squire, D. 2007. Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	"Probably because of its very slow growth and the size of the very large mature seeds, which weight up to 20 kg, it is not common in cultivation."

301	Naturalized beyond native range	n
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica</i> . The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org	"This species is endemic to the Seychelles. It occurs naturally only on the two islands of Praslin (Fond Ferdinand, Vallée de Mai, Anse Marie-Louise) and Curieuse (Dogley and Matatiken 2006). These two islands have a total area of 41 km ² (National Statistics Bureau 2005). Historically, the species was also known from Round, St. Pierre and Chauve-Souris (Dogley and Matatiken 2006). It is planted on several other granitic islands, but these stands cannot be counted as naturalized. It occurs at less than six locations and the EOO is estimated to be less than 100 km ² (maybe even less than 50 km ²)."

Qsn #	Question	Answer
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. 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(2): 71-83	No evidence
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. 2012. <i>A Global Compendium of Weeds</i> . 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. 2012. <i>A Global Compendium of Weeds</i> . 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
304	Environmental weed	n
	Source(s)	Notes
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. 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(2): 71-83	No evidence
	Randall, R.P. 2012. <i>A Global Compendium of Weeds</i> . 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
305	Congeneric weed	n
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The monotypic genus <i>Lodoicea</i> is one of four palm genera in the subtribe <i>Lataniinae</i> of the tribe <i>Borasseae</i> ."
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. <i>Fibres. Plant Resources of Tropical Africa. Volume 16</i> . PROTA, Wageningen, Netherlands	"Dioecious palm up to 30 m tall, unarmed"
402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Fleischer-Dogley, F., Kettle, C. J., Edwards, P. J., Ghazoul, J., Määttänen, K., & Kaiser-Bunbury, C. N. 2011. Morphological and genetic differentiation in populations of the dispersal-limited coco de mer (<i>Lodoicea maldivica</i>): implications for management and conservation. <i>Diversity and Distributions</i> , 17(2): 235-243	[Unknown, but occurs with a number of other species in its native habitat] "The largest populations occur on Praslin, where males can grow as tall as 30 m and form a high, closed forest, together with four endemic palms (<i>Deckenia nobilis</i> , <i>Phoenixophorium borsigianum</i> , <i>Nephrosperma vanhoutteanum</i> and <i>Verschaffeltia splendida</i>) and endemic dicotyledonous trees such as <i>Paragenipa wrightii</i> , <i>Canthium bibracteatum</i> , <i>Syzygium wrightii</i> and <i>Erythroxylum sechellarum</i> (Fleischer-Dogley, 2006)."

403	Parasitic	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. <i>Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands</i>	"Dioecious palm up to 30 m tall, unarmed" [Arecaceae]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica. The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org</i>	[Palatability to grazing animals unknown] "The main threats to this species are harvesting and poaching, fires (human induced and wildfires), infrastructure development and introduced taxa (such as pathogens and parasites). Its restricted range, slow growth rate, limited dispersal ability and poor recruitment are other threats to this species."

405	Toxic to animals	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. <i>Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands</i>	No evidence
	Wagstaff, D.J. 2008. <i>International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL</i>	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica. The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org</i>	"Furthermore, a future continuing decline in the population by more than 30% can be suspected within a maximum of 100 years if the actual level of exploitation is continued and invasive pathogens are introduced. "

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes

Qsn #	Question	Answer
	Lucas, G. & Synge, H.(eds.). 1978. The IUCN Plant Red Data Book. IUCN, Gland, Switzerland	[No evidence] "As with most palms, the trees have many local uses. The 'cabbage' of young developing leaves was used in the past as a vegetable. The old leaves used for rooting, etc., the trunks for building materials and the young nuts for their edible, fleshy, white endosperm. The immature leaves (before they unfold) were used for making hats, vessels, baskets, brooms and even for filling pillows (3)."
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica</i> . The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org	[No evidence] "Previously used as a medicinal plant. The leaves have also been used locally as thatch and plaiting. The empty shells have been used as vessels and the down from young leaves has been used for stuffing pillows. The seeds are used and traded as souvenirs/decorations. Approximately 80% of the global population is used."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	[No evidence. At risk from fires] "Fire is another major threat which has repeatedly impacted on one small Praslin Island population, at Fond Ferdinand. These threats are compounded by the highly restricted distribution of the species, ..."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	[Seedlings & saplings are shade tolerant] "We suggest that <i>Lodoicea</i> evolved from a more typical borassoid palm (perhaps a plant like <i>Borassus aethiopicum</i> which is widespread in the savannas of Africa) and propose two hypotheses to explain why this occurred. According to the 'shade hypothesis', increasingly humid conditions on the Seychelles led to strong selection for plants with the tallest seedlings, since these would be the most likely to establish successfully under the low light conditions prevailing on the forest floor of closed forest."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica</i> . The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org	"This palm can be found on almost all soil types though it is confined to hill slopes and valleys. "

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands	"Dioecious palm up to 30 m tall, unarmed"

412	Forms dense thickets	y
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica</i> . The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org	"It grows best in forests on deep valley soils with good drainage. In such locations it forms the canopy species in almost pure stands of forest or mixed stands with other palms, e.g. <i>Deckenia nobilis</i> and screw pines <i>Pandanus hornei</i> ."
	Rist, L., Kaiser-Bunbury, C. N., Fleischer-Dogley, F., Edwards, P., Bunbury, N., & Ghazoul, J. 2010. Sustainable harvesting of coco de mer, <i>Lodoicea maldivica</i> , in the Vallée de Mai, Seychelles. <i>Forest Ecology and Management</i> , 260(12): 2224-2231	[Currently forms dense forest with other species] "The Vallée de Mai (19.5 ha; Fig. 1) is one of two remaining sites where <i>L. maldivica</i> palms create a dense low- to intermediate altitude palm forest together with four other endemic palms (<i>Phoenicophorium borsigianum</i> (K.Koch) Stuntz, <i>Neprosperma vanhoutteana</i> (Wendl. ex van-Houtt.) Balf., <i>Deckenia nobilis</i> Wendl., <i>Verschaffeltia splendida</i> (Wendl.) and the endemic screw palms <i>Martellidendron hornei</i> (Balf.) and <i>Pandanus sechellarum</i> (Balf.)."
	Lucas, G. & Synge, H.(eds.). 1978. The IUCN Plant Red Data Book. IUCN, Gland, Switzerland	[Formed pure stands in the past] "Hill slopes and valleys from near sea-level to c. 300 m, presumably forming pure stands in the past."

501	Aquatic	n
	Source(s)	Notes
	Fleischer-Dogley, F., Huber, M.J. & Ismail, S. 2011. <i>Lodoicea maldivica</i> . The IUCN Red List of Threatened Species. Version 2014.2. www.iucnredlist.org	[Terrestrial] "This palm can be found on almost all soil types though it is confined to hill slopes and valleys. "

502	Grass	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands	"Dioecious palm up to 30 m tall, unarmed" [Arecaceae]

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands	"Dioecious palm up to 30 m tall, unarmed" [Arecaceae]

Qsn #	Question	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Brink, M. & Achigan-Dako, E.G. 2012. Fibres. Plant Resources of Tropical Africa. Volume 16. PROTA, Wageningen, Netherlands	"Dioecious palm up to 30 m tall, unarmed" [Arecaceae]

Qsn #	Question	Answer
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Fleischer-Dogley, F., Kettle, C. J., Edwards, P. J., Ghazoul, J., Määtänen, K., & Kaiser-Bunbury, C. N. 2011. Morphological and genetic differentiation in populations of the dispersal-limited coco de mer (<i>Lodoicea maldivica</i>): implications for management and conservation. Diversity and Distributions, 17(2): 235-243	[Vulnerable, but not experiencing substantial reproductive failure] "Our study reveals that there are still large populations of <i>Lodoicea</i> on the two islands where the species is native and that the species is not under immediate threat, although the effective population sizes are certainly much smaller than the census population size. This conclusion is consistent with IUCN's designation of the species as 'Vulnerable'."

Qsn #	Question	Answer
602	Produces viable seed	y
	Source(s)	Notes
	Rist, L., Kaiser-Bunbury, C. N., Fleischer-Dogley, F., Edwards, P., Bunbury, N., & Ghazoul, J. 2010. Sustainable harvesting of coco de mer, <i>Lodoicea maldivica</i> , in the Vallée de Mai, Seychelles. Forest Ecology and Management, 260(12): 2224-2231	"Following germination, <i>L. maldivica</i> (Arecaceae: Coryphoideae) has a trunkless phase that lasts for at least 20 years, during which it produces leaves that can reach over 10m in length (Wise, 1998)."
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). Nordic Journal of Botany, 22(2): 227-238	"In the case of <i>Lodoicea</i> , there is good reason to suppose that equal numbers of male and female seedlings are produced, and that the biased sex ratio is the result of higher mortality amongst females."

Qsn #	Question	Answer
603	Hybridizes naturally	n
	Source(s)	Notes
	Fleischer-Dogley, F., Kettle, C. J., Edwards, P. J., Ghazoul, J., Määtänen, K., & Kaiser-Bunbury, C. N. 2011. Morphological and genetic differentiation in populations of the dispersal-limited coco de mer (<i>Lodoicea maldivica</i>): implications for management and conservation. Diversity and Distributions, 17(2): 235-243	[No evidence of intergeneric hybridization] " <i>Lodoicea maldivica</i> (Arecaceae) belongs to a monotypic genus within the tribe Borasseae (Uhl & Dransfield, 1987)."

Qsn #	Question	Answer
604	Self-compatible or apomictic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	[Dioecious] "In their native habitat, <i>Lodoicea</i> trees begin to produce flowers when the trunk is about 4 m high, and before then it is not possible to determine the sex of plants. Several studies indicate that populations of <i>Lodoicea</i> tend to have male biased sex ratios. In the sample studied by Savage & Ashton (1983) in the Vallee de Mai only 36% of mature trees were female (i.e. a male: female ratio of 1.78:1). A complete survey of all <i>Lodoicea</i> trees in the Vallee de Mai in 2001 (carried out by the Forestry Division of the Seychelles Ministry of the Environment, unpubl. data), found 818 males and 623 females (and 5624 immature plants whose sex could not be determined). This corresponds to a male: female ratio of 1.31: 1."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	"In situ observations suggest a number of potential biotic and abiotic pollination mechanisms including bees, flies, slugs, and geckos; trigonid bees are identified as the most likely potential natural pollinator."
	Gerlach, J. 2003. Pollination in the coco-de-mer, <i>Lodoicea maldivica</i> . <i>Palms</i> 47(3): 135-138	"The male inflorescence of <i>Lodoicea maldivica</i> produces copious nectar and a strong scent, characteristics that would attract animal pollinators but would not assist wind pollination." ... "The strong musty scent of the male flowers is characteristic of fly pollinated species, although distinct from the rotten meat or fermenting odors that attract large calyprate flies to terrestrial flowers, and in the field this scent is observed to be attractive to bees as well as flies." ... "The female flowers would appear to be structurally unsuited to wind pollination with an enclosed target area of no more than 4 mm ² ; the stigmas may also be receptive for a short period of time. Although the scent of these flowers is relatively weak to human senses, it does serve to attract dolichopodid flies. These flies are highly active and readily move between trees, unlike the other animals occasionally seen on female flowers (geckos and slugs). The scarcity of wind-dispersed <i>L. maldivica</i> pollen suggests that wind-pollination is not significant. Pollen is carried from the male flowers by all the animal groups observed on the flowers, most significantly by the bees and flies (possibly also the geckos although this could not be quantified), with only the latter moving between male and female flowers. Observations suggest that flies (and the dolichopodid <i>Ethiosciapus</i> cf. <i>bilobatus</i> in particular, but possibly including other families) are the main pollinators. The presence of <i>L. maldivica</i> pollen on <i>E. bilobatus</i> collected on the female flowers demonstrates that this species is capable of transferring pollen. There may also be a pollination role for some species of moths but this could not be confirmed during the limited duration night-time surveys."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Lucas, G. & Synge, H.(eds.). 1978. The IUCN Plant Red Data Book. IUCN, Gland, Switzerland	[No evidence] "It is said to be easy to grow from seed, but germination has proved difficult in some cases."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	[20+ years] "Like many palms <i>Lodoicea</i> has a trunkless juvenile phase during which there is considerable development belowground of the stem-base, which forms a massive saucer-shaped structure up to 100 cm across, and of the associated root system (Bailey 1942). The length of the juvenile phase varies according to light conditions but probably lasts at least 20 years, during which over 20 leaves are produced from the buried stem apex in the form of a huge basal rosette."
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	[25 years] "The trees, which may live for up to 350 years [2], are estimated to take a century to reach full size and 25 years to reach reproductive age [7, 17],..."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The massive fruit of <i>Lodoicea</i> is reported to take 6-7 years to develop (Corner 1966, Beaver & Chong Seng 1992). At maturity it weighs about 20 kg. It appears to have no mechanism for dispersal, and the flattened shape means that most fruits land close to the parent tree, though a few may travel downhill (Corner 1966)."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Wong, M. 2006. Palms for Hawaii Landscapes. Landscape L-19. College of Tropical Agriculture and Human Resources, Honolulu, HI	"The following palm species can be used to portray a strong "tropical" theme:" [Includes <i>Lodoicea maldivica</i> (coco de mer)]
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	"The species has been protected and the nut trade legally controlled since 1995, but poaching continues to represent a severe constraint upon regeneration in the wild [20, 23]."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes

Qsn #	Question	Answer
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The massive fruit of <i>Lodoicea</i> is reported to take 6-7 years to develop (Corner 1966, Beaver & Chong Seng 1992). At maturity it weighs about 20 kg. It appears to have no mechanism for dispersal, and the flattened shape means that most fruits land close to the parent tree, though a few may travel downhill (Corner 1966)."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Johnson, D.V. 1998. <i>Non-Wood Forest Products 10: Tropical Palms</i> . FAO, Rome	"An individual seed of the popular ornamental parlor palm (<i>Chamaedorea elegans</i>) weighs only 0.23 g, as compared to the massive seed of the double coconut (<i>Lodoicea maldivica</i>) which weighs as much as 20 kg. The double coconut has the distinction of bearing the largest seed in the plant kingdom."

705	Propagules water dispersed	n
	Source(s)	Notes
	Riffle, R.L. & Craft, P. 2003. <i>An Encyclopedia of Cultivated Palms</i> . Timber Press, Portland, OR.	"Since only nonviable fruits float, the palm has never grown anywhere but the Seychelles."
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	[Sinks in water] "These threats are compounded by the highly restricted distribution of the species, due largely to the fact that the nuts are too heavy to roll uphill, and also that they sink in water, rendering successful dispersal limited [4, 6]."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The massive fruit of <i>Lodoicea</i> is reported to take 6-7 years to develop (Corner 1966, Beaver & Chong Seng 1992). At maturity it weighs about 20 kg. It appears to have no mechanism for dispersal, and the flattened shape means that most fruits land close to the parent tree, though a few may travel downhill (Corner 1966)."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The massive fruit of <i>Lodoicea</i> is reported to take 6-7 years to develop (Corner 1966, Beaver & Chong Seng 1992). At maturity it weighs about 20 kg. It appears to have no mechanism for dispersal, and the flattened shape means that most fruits land close to the parent tree, though a few may travel downhill (Corner 1966)."

708	Propagules survive passage through the gut	n
	Source(s)	Notes

Qsn #	Question	Answer
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"The massive fruit of <i>Lodoicea</i> is reported to take 6-7 years to develop (Corner 1966, Beaver & Chong Seng 1992). At maturity it weighs about 20 kg. It appears to have no mechanism for dispersal, and the flattened shape means that most fruits land close to the parent tree, though a few may travel downhill (Corner 1966)."

801	Prolific seed production (>1000/m ²)	n
	Source(s)	Notes
	Edwards, P. J., Kollmann, J., & Fleischmann, K. 2003. Life history evolution in <i>Lodoicea maldivica</i> (Arecaceae). <i>Nordic Journal of Botany</i> , 22(2): 227-238	"In the 2001 survey in the Vallee de Mai by the Forestry Division, the numbers of developing fruits on each female tree were counted as a basis for estimating seed production. The mean number of developing fruits per female was 7.03, but there was enormous variation between trees. The largest percentages of plants had one or no fruits, and there were steadily declining percentages with larger numbers (Fig. 3); 3% of trees had 20 or more fruits, the maximum being 32. On the assumption that it takes 7 years for the fruits to mature, and that most fruits contain only one seed, the mean value of 7.03 represents the extraordinarily low reproductive output of one seed per female per year. According to the estimates of Savage & Ashton (1983), a female tree with a 20 m trunk is 131 years old and has been mature for a little over 100 years. The lifetime reproductive output of this individual would therefore be about 100 seeds. In view of the fact that few females grow to such a size, the reproductive output of most plants reaching maturity is probably much lower."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Squire, D. 2007. <i>Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating</i> . Ball Publishing, Batavia, Illinois	"Sow fresh seed, which takes up to 18 months to germinate and is best sown in its growing position."
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 5 Aug 2014]	"Storage Behaviour: No data available for species or genus. Of 107 known taxa of family ARECACEAE, 28.97% Orthodox(p/?), 27.10% Recalcitrant(?), 11.21% Intermediate(?), 32.71% Uncertain"

803	Well controlled by herbicides	
	Source(s)	Notes
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	[No information on herbicide efficacy or chemical control of this endangered species] " <i>Lodoicea maldivica</i> is categorised in the IUCN Red List of Threatened Species as Endangered (categories B1ab [ii, iii, v] + 2ab [ii, iii, v]) [21], a status to which it was recently upgraded. The major threat to the species is long-term over-exploitation of the nuts, which has had a significant detrimental effect upon natural recruitment and regeneration, thought to be affecting the demographic structure of whole stands [20, 22]."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Rist, L., Kaiser-Bunbury, C. N., Fleischer-Dogley, F., Edwards, P., Bunbury, N., & Ghazoul, J. 2010. Sustainable harvesting of coco de mer, <i>Lodoicea maldivica</i> , in the Vallée de Mai, Seychelles. <i>Forest Ecology and Management</i> , 260(12): 2224-2231	"In the early 20th century much <i>L. maldivica</i> habitat was destroyed by burning and cultivation (Bailey, 1942), and populations have been reduced more recently through poaching of nuts as well as anthropogenic fire, soil erosion and development."
	Blackmore, S., Chin, S. C., Chong Seng, L., Christie, F., Inches, F., Winda Utami, P., Watherston, N. & Wortley, A. H. 2012. Observations on the Morphology, Pollination and Cultivation of Coco de Mer (<i>Lodoicea maldivica</i> (JF Gmel.) Pers., Palmae). <i>Journal of Botany</i> 2012: 1-13. doi:10.1155/2012/687832	[Does not tolerate fire] "Fire is another major threat which has repeatedly impacted on one small Praslin Island population, at Fond Ferdinand."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Thrives in tropical climates
- Shade tolerant
- Tolerates many soil types
- Capable of forming dense stands (at least formerly in native range)
- Seeds dispersed intentionally by people

Low Risk Traits

- No reports of invasiveness or naturalization
- Unarmed (no spines, thorns or burrs)
- Non-toxic
- Ornamental
- Dioecious
- Not reported to spread vegetatively
- Very slow growth rate. Reaches maturity after 25+ years
- Large fruit & seeds severely limit dispersal ability