Taxon: Etlingera littoralis (J. Koenig ex Retz.) Giseke **Family:** Zingiberaceae

Common Name(s): earth ginger
kedungkel
tepus

Synonym(s): Achasma megalocheilos Griff.
Amomum littorale J. Koenig ex Retz.
Amomum megalocheilos (Griff.)

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 8 Jun 2016

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

Keywords: Tropical, Ornamental, Rhizomatous, Shade-tolerant, Pollinator-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	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	?
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed		
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	y=1, n=0	n
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

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
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		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
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	y
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**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	No evidence

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. 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**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forest floors; 200--300 m. Hainan [Indonesia (Borneo, Java, Sumatra), Malaysia, Thailand]."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	"The results indicate that E. littoralis is widely distributed in southern Thailand, both in the Gulf of Thailand and Andaman Sea coasts; particularly, the upper part of southern Thailand. Normally, E. littoralis can grow in different habitats, from lowland to high elevation. They grow along logging roads, river banks, damp and humid shady places. They are also frequently found in secondary forests, areas along jungle trails and in secondary and primary forests. Some species can be fully exposed to the sun."
	Jansen, P.C.M., Jukema, J., Oyen, L.P.A. & van Lingen, T.G., 1991. Etlingera littoralis (Koenig) Giseke[Internet] Record from Proseabase. Verheij, E.W.M. and Coronel, R.E. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	[Elevation range exceeds 1000 m in tropical latitudes] "In primary forests and teak forests, common in Peninsular Malaysia, rare in Indonesia, up to 1300 m altitude."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forest floors; 200--300 m. Hainan [Indonesia (Borneo, Java, Sumatra), Malaysia, Thailand]."

205	**Does the species have a history of repeated introductions outside its natural range?**	**?**
	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 8 Jun 2016]	"Locations: Waimea Arboretum & Botanical Garden" [Cultivated in the Hawaiian Islands]
	WRA Specialist. 2016. Personal Communication	Cultivated & sold commercially, but history of introduction outside native range unknown

301	**Naturalized beyond native range**	**n**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2016. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm. [Accessed 8 Jun 2016]	[To date, only Etlingera cevuga (Seem.) R. M. Sm. has been documented as naturalized on Oahu, Hawaiian Islands] "Etlingera cevuga (Seem.) R. M. Sm. Status: Naturalized Distribution: O (Ko: Pu`ulanihuli)"
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

302	**Garden/amenity/disturbance weed**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Green Culture. 2005. Top 5! Weedy Zingiberaceae. Posted 17 July 2005. http://www.greenculturesg.com/forum/index.php?/topic/1595-top-5-weedy-zingiberaceae/. [Accessed 8 Jun 2016]	" Etlingera littoralis literally runs as it doesn't clump and its spreads by long rhizomes!!" [Identified as potentially weedy in a garden or landscape setting]
	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
	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 [Etlingera elatior naturalized in several locations, but no negative impacts have been documented to date]

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Pseudostems 2–3 m. Ligule oblong, 6–13 mm, apex acu-minate; petiole 0.5–3 cm; leaf blade abaxially light brown when dry, oblong to oblong-lanceolate, 50–70 × 9–15 cm, glabrous except hairy along midvein and at margin abaxially, base sub-rounded or attenuate, oblique, apex shortly acuminate."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	Unknown

Qsn #	Question	Answer
403	**Parasitic**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes creeping. Pseudostems robust." [Zingiberaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	[Palatability to animals unknown. Palatable to humans] "In Sabah, Malaysia, the hearts of young shoots, inflorescences and fruits of E. littoralis are consumed by the indigenous communities as condiment, consumed raw or cooked as vegetable.[15] In Thailand, the fruits are edible and the young stem, after removing the outer parts, yields an aromatic tender core that is eaten raw or cooked. [16] A decoction of rhizomes has been used to treat stomach ache, and as carminative and heart tonic."

405	Toxic to animals	n
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	Ibrahim, H.& Setyowati, F.M., 1999. Etlingera Giseke [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	"Diseases and pests No serious diseases and pests are known to affect Etlingera. In cultivation trials in Sarawak some leaf-cutting insects were observed, but without significant damage to the crop."

Qsn #	Question	Answer
407	**Causes allergies or is otherwise toxic to humans**	**n**
	Source(s)	**Notes**
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	[No evidence. Edible uses] "In Sabah, Malaysia, the hearts of young shoots, inflorescences and fruits of E. littoralis are consumed by the indigenous communities as condiment, consumed raw or cooked as vegetable.[15] In Thailand, the fruits are edible and the young stem, after removing the outer parts, yields an aromatic tender core that is eaten raw or cooked.[16] A decoction of rhizomes has been used to treat stomach ache, and as carminative and heart tonic."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence in genus

408	**Creates a fire hazard in natural ecosystems**	**n**
	Source(s)	**Notes**
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	[No evidence. A herbaceous plant of wet environments] "Normally, E. littoralis can grow in different habitats, from lowland to high elevation. They grow along logging roads, river banks, damp and humid shady places. They are also frequently found in secondary forests, areas along jungle trails and in secondary and primary forests."

409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forest floors; 200--300 m."
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	"They grow along logging roads, river banks, damp and humid shady places."

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	
	Source(s)	**Notes**
	Fayaz, A. 2011. Encyclopedia of Tropical Plants - Identification and Cultivation of over 3,000 Tropical Plants. Firefly Books Ltd., New Zealand	"plants in this genus generally prefer a sunny position and a moist but well-drained, fertile, humus rich soil"
	Ibrahim, H.& Setyowati, F.M., 1999. Etlingera Giseke [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	"Soils rich in organic matter are preferred."

Qsn #	Question	Answer
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	[Possibly. Found across a variety of habitats, but soil requirements unspecified] "Normally, E. littoralis can grow in different habitats, from lowland to high elevation. They grow along logging roads, river banks, damp and humid shady places. They are also frequently found in secondary forests, areas along jungle trails and in secondary and primary forests."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes creeping. Pseudostems robust."

412	Forms dense thickets	
	Source(s)	**Notes**
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	[Unknown] "The results indicate that E. littoralis is widely distributed in southern Thailand, both in the Gulf of Thailand and Andaman Sea coasts; particularly, the upper part of southern Thailand. Normally, E. littoralis can grow in different habitats, from lowland to high elevation. They grow along logging roads, river banks, damp and humid shady places. They are also frequently found in secondary forests, areas along jungle trails and in secondary and primary forests."

501	Aquatic	n
	Source(s)	**Notes**
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Forest floors;200–300 m."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 7 Jun 2016]	"Family: Zingiberaceae Subfamily: Alpinioideae Tribe: Alpinieae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 7 Jun 2016]	Zingiberaceae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	"Etlingera littoralis (J. König) Giseke produces thick subterranean rhizomes of 3–3.5 cm in diameter.[1]"
	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	"This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes" [E. hemisphaerica is rhizomatous, and can likely can spread vegetatively]

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	"The species is common in lowland forests throughout Peninsular Malaysia and found growing together with other Etlingera species. [1,5] It also occurs in Southern Thailand and Indonesia.[16]"

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	"Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Khlong Klai Basin, Khao Nan National Park, Nakhon Si Thammarat Province, was investigated using hand and open pollination in 3 stations (A, B and C). Stations A and B are located inside the National Park area, whereas station C is outside the National Park area. Stingless bees were the only pollinators observed at station C. The number of seeds initiated from the handpollinated flowers were compared to those of seeds initiated from open-pollinated flowers. The results showed that there was a pollen limitation in stations A (T = 2.802, Sig 2-tailed = 0.012) and B (T = 2.524, Sig 2-tailed = 0.021) on mean seeds/ovules (S/O) ratios. In station A, pollen limitation was slightly greater (mean difference = 0.547) than station B (mean difference = 0.501). In station C, pollen limitation was not significant (T = 0.410, Sig 2-tailed = 0.550) because there was small stingless bees, Trigona sp. that pollinated the flowers. However, a resource limitation in station C was found on mean ovules per flower (mean difference A,B = 9.893, mean difference A,C = 31.734 and mean difference B,C = 21.841)."
	Useful Tropical Plants Database. 2016. Etlingera littoralis. http://tropical.theferns.info/viewtropical.php?id=Etlingera+littoralis. [Accessed 8 Jun 2016]	"Propagation Seed - Division of the rhizomes[974]."

603	**Hybridizes naturally**	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Luc-Cayol, F., & Fereol, L. 1997. X Alpingera martinica (Zingiberaceae): an intergeneric hybrid between Alpinia purpurata and Etlingera elatior. HortScience, 32(5): 914-915	"Artificial intergeneric crosses between Alpinia purpurata and Etlingera elatior (Zingiberaceae) have produced hybrids." [Artificial hyrbidization possible in genus, but unknown if natural hybridization occurs in any Etlingera species]

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Sabu, A.K.M. & Smisha, K. P. 2013. Reproductive biology of Etlingera elatior (Jack) R. M. Sm. Ornamental Torch Ginger. International Journal of Plant, Animal and Environmental Sciences (4): 75-80	[Unknown. Related species E. elatior is self-compatible, but with low fruit set] "There was no apomixis, as none of the emasculated and bagged flowers set fruit. To determine if the species is self-incompatible both self and cross pollinations were carried out. Bagged flowers without manual pollination did not set fruits, confirmed the absence of autogamy in the species. Bagged flowers was pollinated by pollen from another flower of the same plant resulted 8 % fruit set and pollinated with pollen from another plant resulted 24 % fruit set."

605	Requires specialist pollinators	y
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	"The pollination guild of E. littoralis could be assigned to Halictidpollinated guild that comprises small, 9.8 - 10.4 mm in length and 2.8 - 3.1 width, bee pollinators [5]. When visiting the flowers, Trigona sp. landed on the lip near the anther and walked shortly into the corolla tube. It forages for pollen as a source of food from one flower to another. The pollen grains that are deposited on its head and hind legs, are the promoting source of cross pollination. This suggests that the morphology of the flower limits the type of pollinator."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Green Culture. 2005. Top 5! Weedy Zingiberaceae. Posted 17 July 2005. http://www.greenculturesg.com/forum/index.php?/topic/1595-top-5-weedy-zingiberaceae/. [Accessed 8 Jun 2016]	" Etlingera littoralis literally runs as it doesn't clump and its spreads by long rhizomes!!"
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	"Etlingera littoralis (J. König) Giseke produces thick subterranean rhizomes of 3–3.5 cm in diameter.[1]"

Qsn #	Question	Answer
607	**Minimum generative time (years)**	**2**
	Source(s)	**Notes**
	Ibrahim, H.& Setyowati, F.M., 1999. Etlingera Giseke [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	"Etlingera starts flowering in the second year after planting a piece of rhizome." [Probably longer if propagated from seeds]

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[No means of external attachment] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Plant Group Hawai'i. 2016. Etlingera. http://www.plantgrouphawaii.com/#!etlingera/cxsl. [Accessed 8 Jun 2016]	"Etlingera littoralis 'Golden Star' $10.00" [Sold commercially as an ornamental]

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Ibrahim, H.& Setyowati, F.M., 1999. Etlingera Giseke [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	"Etlingera is propagated chiefly by rhizome fragments, but sometimes by seed as well." [No evidence, and seed may be rare in cultivation]
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[No evidence. Unlikely] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	"Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

705	**Propagules water dispersed**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Chongkraijak, W., Ngamriabsakul, C., & Poulsen, A. D. (2013). Morphological Diversity and Distribution of Etlingera littoralis (König) Giseke (Zingiberaceae) in Southern Thailand. Walailak Journal of Science and Technology, 10(6), 643-656	"They grow along logging roads, river banks, damp and humid shady places." [Distribution suggests potential dispersal by water]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[No evidence] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

707	Propagules dispersed by other animals (externally)	
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[Possibly cached or carried by rodents] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

708	Propagules survive passage through the gut	
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[Possibly cached or carried by rodents] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[Unknown. Probably No] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil, and are therefore difficult to spot. We suspect that the fruits are sources of food for small rodents, seed dispersal vectors of the plant species."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Kittipanangkul, N., & Ngamriabsakul, C. (2011). Pollen and pollinator limitation of seed initiation in Etlingera littoralis (J. König) Giseke (Zingiberaceae) in Klong Klai Basin, Khao Nan National Park, Thailand. Walailak Journal of Science and Technology, 3(2), 207-217	[Longevity & persistence unknown] "Hard and thick shelled fruits of E. littoralis are usually buried under the soil"

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Ibrahim, H.& Setyowati, F.M., 1999. Etlingera Giseke [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 8 Jun 2016]	"Etlingera is propagated chiefly by rhizome fragments, but sometimes by seed as well." [This and other Etlingera species are able to regrow from rhizomes after cutting]
	Chan, E. W., Lim, Y. Y., & Wong, S. K. (2013). Botany, uses, phytochemistry and pharmacology of selected Etlingera gingers: A review. Pharmacognosy Communications, 3(4): 3-12	"Etlingera littoralis (J. König) Giseke produces thick subterranean rhizomes of 3–3.5 cm in diameter.[1]"

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m in tropics
• Thrives in tropical climates
• Described as weedy in gardens or landscape settings by some growers
• Shade tolerant
• Spread by rhizomes & seeds
• Seeds & propagules possibly dispersed by rodents & intentionally by people
• Spreads vegetatively
• Able to resprout after cutting
• Limited ecological information makes accurate risk prediction difficult

Low Risk Traits
• No reports of invasiveness or negative impacts
• Unarmed (no spines, thorns or burrs)
• Non-toxic
• Ornamental
• Requires specialized bee pollinators (may limit seed set outside native range)

Second Screening Results for Low Stature Shrubby Life Form

(A) Reported as a weed of cultivated lands? No
Outcome = Accept (Low Risk)