

Taxon: <i>Alpinia carolinensis</i> Koidz.	Family: Zingiberaceae
Common Name(s): Caroline alpinia chifiif leu ieu luiu titif tu al kiuid tuarechelid	Synonym(s): Languas babeldaobensis Kaneh. Languas carolinensis (Koidz.) Kaneh.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 14 Feb 2019
WRA Score: 5.0	Designation: EVALUATE	Rating: Evaluate

Keywords: Giant Ginger, Shade Tolerant, Medicinal Uses, Rhizomatous, Bird-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	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)	y
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

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
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		
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people		
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	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
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
	Costion, C. M., & Lorence, D. H. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. <i>Micronesica</i> , 43(1), 51-100	[No evidence] "Many species of <i>Alpinia</i> are popular as ornamentals. Micronesia's endemic, "giant ginger" has for the most part, not been exploited in this regard though many plant enthusiasts express utter amazement at its size. It is one of the largest species in the entire ginger family, reaching up to 8 meters (26 feet) tall. It is a common component of the forest understory on the volcanic islands."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2019). 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
	Costion, C. M., & Lorence, D. H. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. <i>Micronesica</i> , 43(1), 51-100	"Micronesia's endemic, "giant ginger" has for the most part, not been exploited in this regard though many plant enthusiasts express utter amazement at its size. It is one of the largest species in the entire ginger family, reaching up to 8 meters (26 feet) tall. It is a common component of the forest understory on the volcanic islands."
	Mueller-Dombois, D. & Fosberg, F. R. 1998. <i>Vegetation of the tropical Pacific islands</i> . Springer-Verlag, New York, NY	"The Caroline Islands are spread out from Belau (Palau) in the west, at 134° E longitude, to Kosrae almost 3200 km eastward, at 163° E longitude" ... "The Carolines are in the humid equatorial region, where the climate is very warm and wet year-round (between 3000 and 5000 mm mean annual rainfall). Rainfall becomes more seasonal westward, but typical tropical rain forest climate still prevails in Belau" ... "Vegetation on Babeldaob and the Nearby Islands with Volcanic Soils" ... "Ravine and Riparian Forest. In places the forest is rather open and merges with savanna. Along streams and in ravines, the forest is thicker and richer in species." ... "The giant ginger, <i>Alpinia carolinensis</i> , standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."

Qsn #	Question	Answer
202	Quality of climate match data	High
	Source(s)	Notes
	Mueller-Dombois, D. & Fosberg, F. R. 1998. Vegetation of the tropical Pacific islands. Springer-Verlag, New York, NY	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Mueller-Dombois, D. & Fosberg, F. R. 1998. Vegetation of the tropical Pacific islands. Springer-Verlag, New York, NY	"The Caroline Islands are spread out from Belau (Palau) in the west, at 134° E longitude, to Kosrae almost 3200 km eastward, at 163° E longitude" ... "The Carolines are in the humid equatorial region, where the climate is very warm and wet year-round (between 3000 and 5000 mm mean annual rainfall). Rainfall becomes more seasonal westward, but typical tropical rain forest climate still prevails in Belau" ... "Vegetation on Babeldaob and the Nearby Islands with Volcanic Soils" ... "Ravine and Riparian Forest. In places the forest is rather open and merges with savanna. Along streams and in ravines, the forest is thicker and richer in species." ... "The giant ginger, <i>Alpinia carolinensis</i> , standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Wagner, W. L., D. R. Herbst, M. W. Tornabene, A. Weitzman, and D. H. Lorence. 2012. Flora of Micronesia website. http://botany.si.edu/pacificislandbiodiversity/micronesia/index.htm . [Accessed 13 Feb 2019]	" <i>Alpinia carolinensis</i> Koidz. Common Names: tuarechelid (Palau) Distribution: Caroline Islands - Belau (Babeldaob, Beliliou, Ngerukeuid), Pohnpei (Pohnpei), Truk Islands (Fefan), Yap Islands (Yap)."
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 13 Feb 2019]	"Distribution: <i>Alpinia</i> is the largest and most widespread genus in the ginger family. It has approximately 230 species distributed in the Asia-Pacific region, though recent studies indicate that it is a polyphyletic genus (Kress et al. 2005); a polyphyletic taxon is composed of unrelated organisms descended from more than one ancestor, whereas a monophyletic taxon is one that includes a group of organisms descended from a single ancestor. <i>Alpinia carolinensis</i> , a native ginger species on the volcanic islands of the Western Caroline Islands of Micronesia where it is a common component of the forest understory (e.g., see Costion and Lorence 2012:70)."

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 14 Feb 2019]	" <i>Alpinia carolinensis</i> Koidzumi Locations: Harold L. Lyon Arboretum Ho'omaluhia Botanical Garden Waimea Arboretum & Botanical Garden"

Qsn #	Question	Answer
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	[Limited evidence of cultivation] " <i>A. carolinensis</i> , Micronesia's "giant ginger," is endemic to some high islands in Micronesia, but has, for the most part, not been exploited as an ornamental cultivated species though many plant enthusiasts express unreserved astonishment at its size. <i>A. carolinensis</i> plants are more or less aromatic because of their essential oils. "

301	Naturalized beyond native range	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as naturalized in Pohnpei. Other references list Pohnpei within the native range of this species
	Wagner, W.L., Herbst, D.R. & Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/ . [Accessed 14 Feb 2019]	No evidence to date

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2019). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. zerumbet is listed as an 'environmental weed' and 'cultivation escape' in the Global Compendium of Weeds (Randall, 2012). The species forms dense thickets and can reproduce through rhizome fragmentation or by seed, producing as many as 1000 seeds per square foot (PIER, 2013). A. zerumbet is listed as a "potential transformer" in South Africa, invading watercourses, forest margins, roadsides, and urban open space (Henderson, 2001). In Hawaii, it is generally an occasional escape from cultivation (Wagner et al., 1999) but invasive on Moloka'i and Maui Islands (Oppenheimer, 2008). A. zerumbet is listed as native to northeastern India, Burma (Myanmar), Indo-China, China and Japan, and has been actively cultivated as an ornamental across Southeast Asia and many tropical and subtropical countries (Ibrahim, 2001). It is considered a noxious weed in Cuba (Oviedo Prieto et al., 2012), and invasive in many Pacific countries including Fiji, French Polynesia, Palau, and New Caledonia (PIER, 2013). The Global Invasive Species Programme lists A. zerumbet as an invasive weed in South Africa (Macdonald et al., 2003)."
	Foxcroft, L. C., Richardson, D. M., & Wilson, J. R. 2008. Ornamental plants as invasive aliens: problems and solutions in Kruger National Park, South Africa. <i>Environmental Management</i> , 4 (1): 32-51	"Considerable effort was also invested in educating residents as to the damage caused by invasive alien species. This included some species present in these villages and not yet invasive in South Africa but invasive elsewhere in the world. Despite this, problems were still experienced when scheduling removal of established alien plants from gardens; especially well established or large plants that formed prominent features in gardens (e.g. <i>Alpinia zerumbet</i> [shell ginger],..."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	A number of species are listed as naturalized, and a few are included in references of weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	[No evidence] " <i>Alpinia carolinensis</i> is a giant herbaceous species, one of the largest of the ginger family, Zingiberaceae. Like other gingers, <i>A. carolinensis</i> plants lack true stems, but the false or pseudostems of <i>A. carolinensis</i> , which are composed of overlapping leaf sheaths, can reach heights up to about 8 m (25 ft) tall. Its leaves are lanceolate to oblong in shape, and the plant produces large clusters of rounded, dry or fleshy capsule-shaped fruits that turn from green to bright red."

Qsn #	Question	Answer
402	Allelopathic	
	Source(s)	Notes
	Xuan, T. D., & Teschke, R. (2015). Dihydro-5, 6-dehydrokavain (DDK) from <i>Alpinia zerumbet</i> : Its Isolation, Synthesis, and Characterization. <i>Molecules</i> , 20(9), 16306-16319	[Unknown. Potential allelopathic chemical identified in other members of genus] "Kavalactones have been identified in other <i>Alpinia</i> species such as <i>Alpinia kumatake</i> [37], <i>Alpinia galangal</i> [38,39], and <i>Alpinia oxyphyllae</i> ... However, DDK and DK coexist only in <i>Alpinia zerumbet</i> [18,19] and <i>Alpinia kumatake</i> [37], and not in <i>Alpinia galangal</i> and <i>Alpinia oxyphyllae</i> [39,40];" ... "It can be proposed that DDK and DK may play an important role in allelopathy of <i>alpinia</i> to suppress growth of other plants in its vicinity and expands its population in the plant ecosystem."

403	Parasitic	n
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	" <i>Alpinia carolinensis</i> is a giant herbaceous species, one of the largest of the ginger family, Zingiberaceae. Like other gingers, <i>A. carolinensis</i> plants lack true stems, but the false or pseudostems of <i>A. carolinensis</i> , which are composed of overlapping leaf sheaths, can reach heights up to about 8 m (25 ft) tall. Its leaves are lanceolate to oblong in shape, and the plant produces large clusters of rounded, dry or fleshy capsule-shaped fruits that turn from green to bright red." [Zingiberaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. Several <i>Alpinia</i> species are consumed by humans

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

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. Other <i>Alpinia</i> species are sometimes affected by generalist chewing insects & sucking insects

407	Causes allergies or is otherwise toxic to humans	n
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Qsn #	Question	Answer
	Source(s)	Notes
	<p>People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604. [Accessed 14 Feb 2019]</p>	<p>[No evidence] "Uses in Yap: Known as Chifciif or Tifif in Yap, <i>A. carolinensis</i> has been reportedly used medicinally in some areas of Yap. Indeed, some parts of this herb are said to have been used alone or mixed with parts from other plant species for treating colds, sarcoma cancer and as an emetic or antiemetic (see Okabe in Defilipps et al. 1988:11). Uses in Pohnpei: Known as luiu, lou iou or leu ieu on Pohnpei, <i>A. carolinensis</i>, grows wild on this high island in the eastern Carolines, and provides a source of food for the local lorikeet. The large, banana-like leaves of this plant are utilized as plates by people to cover the earth oven, uhmw, as well as for lining pits used to produce fermented breadfruit, Mahr. Therapeutically, <i>A. carolinensis</i> is also reported to have used on Pohnpei for treating arthritis and painful swollen joints, physical ailments said to be brought on by spells associated with a type of ghost sickness; <i>A. carolinensis</i> has other medicinal uses as well (Balick 2009)."</p>
	<p>Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i>. CRC Press, Boca Raton, FL</p>	<p>No evidence</p>

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	<p>Mueller-Dombois, D. & Fosberg, F. R. 1998. <i>Vegetation of the tropical Pacific islands</i>. Springer-Verlag, New York, NY</p>	<p>[No evidence. A herbaceous plant of moist forests understory] "The giant ginger, <i>Alpinia carolinensis</i>, standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."</p>

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	<p>Costion, C. M., & Lorence, D. H. (2012). <i>The Endemic Plants of Micronesia: A Geographical Checklist and Commentary</i>. <i>Micronesica</i>, 43(1), 51-100</p>	<p>"It is a common component of the forest understory on the volcanic islands." [Understory plant and presumably shade tolerant]</p>
	<p>Donnegan, J. A., Butler, S. L., Kuegler, O., & Hiserote, B. A. (2011). <i>Federated States of Micronesia's forest resources, 2006</i>. Resour. Bull. PNW-RB-262. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR</p>	<p>"Table 8—Average understory vegetation cover on Forest Inventory and Analysis field subplots by species" [<i>Alpinia carolinensis</i> in understory plots]</p>

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	<p>Costion, C. M., & Lorence, D. H. (2012). <i>The Endemic Plants of Micronesia: A Geographical Checklist and Commentary</i>. <i>Micronesica</i>, 43(1), 51-100</p>	<p>[Soil types unspecified] "Micronesia's endemic, "giant ginger" has for the most part, not been exploited in this regard though many plant enthusiasts express utter amazement at its size. It is one of the largest species in the entire ginger family, reaching up to 8 meters (26 feet) tall. It is a common component of the forest understory on the volcanic islands."</p>

Qsn #	Question	Answer
411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Costion, C. M., & Lorence, D. H. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. <i>Micronesica</i> , 43(1), 51-100	"It is one of the largest species in the entire ginger family, reaching up to 8 meters (26 feet) tall."

412	Forms dense thickets	
	Source(s)	Notes
	Mueller-Dombois, D. & Fosberg, F. R. 1998. Vegetation of the tropical Pacific islands. Springer-Verlag, New York, NY	[Unknown if this ginger excludes other vegetation] "The giant ginger, <i>Alpinia carolinensis</i> , standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."

501	Aquatic	n
	Source(s)	Notes
	Mueller-Dombois, D. & Fosberg, F. R. 1998. Vegetation of the tropical Pacific islands. Springer-Verlag, New York, NY	[Terrestrial] "The giant ginger, <i>Alpinia carolinensis</i> , standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 14 Feb 2019]	Family: Zingiberaceae Subfamily: Alpinioideae Tribe: Alpinieae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 14 Feb 2019]	Family: Zingiberaceae Subfamily: Alpinioideae Tribe: Alpinieae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes" [<i>Alpinia carolinensis</i> is rhizomatous, and can likely can spread vegetatively]

601	Evidence of substantial reproductive failure in native habitat	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Mueller-Dombois, D. & Fosberg, F. R. 1998. Vegetation of the tropical Pacific islands. Springer-Verlag, New York, NY	"The giant ginger, <i>Alpinia carolinensis</i> , standing 4 to 5 m or more tall, locally forms a macrophyllous herbaceous understory."
	MacLean, C. D., Cole, T. G., Whitesell, C. D., Falanruw, M. V., & Ambacher, A. H. (1986). Vegetation survey of Pohnpei, Federated States of Micronesia. Resource bulletin PSW-18. US Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA	[Common] "Small trees under 15 m (5Q ft) in height include <i>Pandanus cominsii</i> , <i>Aglaia ponapensis</i> , <i>Pandanus</i> spp., <i>Eugenia stelechantha</i> , <i>Ptychosperma</i> spp., <i>Glochidion marianum</i> , <i>Claoxylon carolinianum</i> , and <i>Discocalyxponapensis</i> . The tall herb <i>Alpinia carolinensis</i> is also common."

602	Produces viable seed	y
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	[Presumably Yes] "Its leaves are lanceolate to oblong in shape, and the plant produces large clusters of rounded, dry or fleshy capsule-shaped fruits that turn from green to bright red." ... "The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)."

603	Hybridizes naturally	
	Source(s)	Notes
	Liu, S. C., & Wang, J. C. (2009). New natural hybrid, <i>Alpinia</i> × <i>ilanensis</i> (Zingiberaceae) in Taiwan. <i>Taiwania</i> , 54 (2), 134-139	[Unknown. Hybridization documented in genus] "The genus <i>Alpinia</i> in Taiwan was very impressed by its frequent hybridization. Four out of 6 indigenous species in Taiwan proper have been reported to be involved in a reticulate hybridization. This paper describes and illustrates a new natural hybrid <i>A.</i> × <i>ilanensis</i> , putatively derived from <i>A. japonica</i> and <i>A. pricei</i> , which is supported by morphological and ecogeographical evidences. Based on sparse distribution mode and serious fertility reduction in these hybrid individuals, we suppose that the hybridization events between <i>A. japonica</i> and <i>A. pricei</i> have been independently occurred multiple times in field. This newly discovered hybrid reveals that all 6 independent species in this island possess the ability to cross each other."

604	Self-compatible or apomictic	
	Source(s)	Notes

Qsn #	Question	Answer
	Yu-Wen, C. U. I., & Qing-Jun, L. I. (2015). Autonomous Self-pollination under Dominant Flexistylous Outcrossing Mechanism in <i>Alpinia galanga</i> (Zingiberaceae). <i>Plant Diversity</i> , 37(06) 793-800	[Unknown. Other species apparently self-compatible, but with mechanisms to prevent selfing] "Here, we studied the breeding system of <i>Alpinia galanga</i> , the results show that (1) <i>Alpinia galanga</i> is self-compatible in which inbreeding depression occurs to some degree; (2) The anaflexistylous (ANA) morph of <i>Alpinia galanga</i> allocates more resource into outcrossing than the CATA morph; (3) The P/O ratio of the ANA morph is significantly lower than that of the CATA morph, as <i>Alpinia galanga</i> has constant six ovules in each ovary, the significant difference in P/O value reflects the contrast in pollen production." ... "In summary, autonomous self-pollination exists in <i>Alpinia galanga</i> , and while flexistylous functions to avoid unnecessary self-pollination and sexual interference, it also provides advantages for delayed autonomous self-pollination as a necessary reproductive assurance and preventing conflict among these three major features by controlling the time of autonomous self-pollination. This peculiar mechanism in <i>Alpinia galanga</i> thoroughly demonstrates its adaptation to unfavorable surrounding during the evolutionary process."
	Wang, Y., Zhang, D., & Chen, Z. (2004). Pollination biology of <i>Alpinia hainanensis</i> (Zingiberaceae). <i>Acta Phytotaxonomica Sinica</i> , 43(1), 37-49	[Unknown. Self-compatibility documented in genus] "Field experiments indicate that the fruit sets are significantly high in both artificially out-crossed and self-pollinated flowers, while no fruit set was observed in bagged emasculated flowers and the unpollinated bagged flowers. These facts exhibit that <i>A. hainanensis</i> is self-compatible and there is no self-pollination and agamospermy in the species."

605	Requires specialist pollinators	
	Source(s)	Notes
	Wang, Y., Zhang, D., & Chen, Z. (2004). Pollination biology of <i>Alpinia hainanensis</i> (Zingiberaceae). <i>Acta Phytotaxonomica Sinica</i> , 43(1), 37-49	[Unknown. Other species pollinated by carpenter bees] "The fruit set by hand pollination is much higher than that under natural condition. This means that <i>A. hainanensis</i> is dependent upon insects for pollination, and insufficiency of pollinators limited fruit set under natural condition. The effective pollinators were <i>Amegilla</i> sp. and two species of carpenter bees (<i>Xylocopa</i> sp.). However, only fewer insects at a lower frequency visited flowers of <i>A. hainanensis</i> in nature."
	Kress, W. J., Liu, A. Z., Newman, M., & Li, Q. J. (2005). The molecular phylogeny of <i>Alpinia</i> (Zingiberaceae): a complex and polyphyletic genus of gingers. <i>American Journal of Botany</i> , 92(1), 167-178	[Unknown] "Although most alpinias are pollinated by large bees, some species attract birds and even bats as pollinators (Zhang et al., 2003; Kress and Specht, in press)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume IV. Flowering plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae). Springer-Verlag, Berlin, Heidelberg, New York	"Herbs, often large, from well-developed rhizome." [Generic description. Presumably able to spread vegetatively by rhizomes]

Qsn #	Question	Answer
607	Minimum generative time (years)	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	"The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)." [No evidence]

702	Propagules dispersed intentionally by people	
	Source(s)	Notes
	Costion, C. M., & Lorence, D. H. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. <i>Micronesica</i> , 43(1), 51-100	"Many species of <i>Alpinia</i> are popular as ornamentals. Micronesia's endemic, "giant ginger" has for the most part, not been exploited in this regard though many plant enthusiasts express utter amazement at its size."
	WRA Specialist. (2019). Personal Communication	Not widely cultivated, but introduced to the Hawaiian Islands

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	"The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)." [No evidence]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume IV. Flowering plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae). Springer-Verlag, Berlin, Heidelberg, New York	"Fruit indehiscent, globose or ellipsoid; seeds arillate." [Generic description]
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	"The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)."

705	Propagules water dispersed	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Possible that seeds, if produced, or rhizome fragments could be moved by water if plant grows in riparian areas

Qsn #	Question	Answer
706	Propagules bird dispersed	y
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 13 Feb 2019]	"The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)."
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	"The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)."
708	Propagules survive passage through the gut	y
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 13 Feb 2019]	[Presumably Yes] "The ripe fruits of this large native ginger are eaten and presumably dispersed by birds, especially the Pohnpei Lory (<i>Trichoglossus rubiginosus</i>) and fruit bats (<i>Pteropus</i> spp.)."
801	Prolific seed production (>1000/m ²)	
	Source(s)	Notes
	People and Plants of Micronesia. (2017). <i>Alpinia carolinensis</i> Koidz. http://micronesianplants.net/taxa/index.php?taxon=4604 . [Accessed 14 Feb 2019]	"Its leaves are lanceolate to oblong in shape, and the plant produces large clusters of rounded, dry or fleshy capsule-shaped fruits that turn from green to bright red." [Seed densities unknown]
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 14 Feb 2019]	Unknown. Some <i>Alpinia</i> species are documented to have orthodox seed storage
803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. (2019). 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

Qsn #	Question	Answer
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume IV. Flowering plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae). Springer-Verlag, Berlin, Heidelberg, New York	"Herbs, often large, from well-developed rhizome." [Generic description]
	WRA Specialist. (2019). Personal Communication	Would likely be able to resprout from rhizomes if aboveground vegetation was cut

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Thrives in tropical climates
- Other *Alpinia* species have become invasive
- Shade tolerant (able to grow in intact forest understory)
- Reproduces by seeds and vegetatively by rhizomes
- Seeds dispersed by birds, fruit bats, and intentionally planted by people (limited ornamental use)
- Limited information reduces accuracy of risk predication

Low Risk Traits

- No reports of invasiveness or naturalization, but no evidence of widespread introduction outside native range
- Unarmed (no spines, thorns, or burrs)
- Non-toxic

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Yes. Understory ginger presumably tolerant of shade

(B) Bird or clearly wind-dispersed?> Yes. Dispersed by birds

(C) Life cycle <4 years? Unknown

Outcome = Evaluate further