**Taxon:** Calathea crotalifera S. Watson **Family:** Marantaceae

**Common Name(s):** bijagüillo
hoja blanca
rattlesnake plant

**Synonym(s):** Calathea insignis Petersen
Calathea quadratispica Woodson
Calathea sclerobractea K.Schum.

**Assessor:** Chuck Chimera **Status:** Assessor Approved **End Date:** 27 Jun 2016

**WRA Score:** 8.0 **Designation:** H(HPWRA) **Rating:** High Risk

**Keywords:** Tropical Herb, Naturalized, Ornamental, Cut Flowers, Suckers

| 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 | y |
| 301 | Naturalized beyond native range | y = 1*multiplier (see Appendix 2), n= question 205 | y |
| 302 | Garden/amenity/disturbance weed | n=0, y = 1*multiplier (see Appendix 2) | n |
| 303 | Agricultural/forestry/horticultural weed | n=0, y = 2*multiplier (see Appendix 2) | n |
| 304 | Environmental weed | n=0, y = 2*multiplier (see Appendix 2) | n |
| 305 | Congeneric weed | | |
| 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 |
| 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) | y=1, n=0 | n |
| 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 | y=1, n=-1 | y |
| 605 | Requires specialist pollinators | y=-1, n=0 | y |
| 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) | | |
| 702 | Propagules dispersed intentionally by people | y=1, n=-1 | y |
| 703 | Propagules likely to disperse as a produce contaminant | | |
| 704 | Propagules adapted to wind dispersal | y=1, n=-1 | n |
| 705 | Propagules water dispersed | | |
| 706 | Propagules bird dispersed | | |
| 707 | Propagules dispersed by other animals (externally) | y=1, n=-1 | y |
| 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 | | |
| 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** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | [No evidence of domestication] "Native from Mexico to Bolivia; in Hawai'i cultivated for its attractive inflorescences that are used in flower arrangements, now naturalized on O'ahu" |

| | | |
|---|---|---|
| **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** |
| | USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Jun 2016] | "Native:<br>Northern America<br>Southern Mexico: Mexico - Chiapas, - Oaxaca<br>Southern America<br>Mesoamerica: Belize; Costa Rica - Puntarenas, - San Jose; El Salvador; Guatemala - Alta Verapaz, - Escuintla, - Izabal, - Retalhuleu, - San Marcos, - Solola, - Suchitepequez; Honduras; Nicaragua - Zelaya; Panama<br>Northern South America: Venezuela - Tachira<br>Western South America: Colombia - Antioquia, - Meta, - Choco; Ecuador - Azuay, - Bolivar, - Chimborazo, - Cotopaxi, - El Oro, - Esmeraldas, - Los Rios, - Manabi, - Morona-Santiago, - Napo, - Pastaza, - Pichincha, - Sucumbios; Peru - Amazonas, - Ayacucho, - Loreto, - Madre de Dios, - San Martin, - Ucayali" |

| | | |
|---|---|---|
| **202** | **Quality of climate match data** | **High** |
| | **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 23 Jun 2016] | |

| | | |
|---|---|---|
| **203** | **Broad climate suitability (environmental versatility)** | **y** |

| Qsn # | Question | Answer |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | "Calathea crotalifera has a wide distribution from southern Mexico to Argentina and from sea level to 5,000', usually in open or disturbed habitats." |
| | Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY | [Elevation range exceeds 1000 m, demonstrating environmental versatility] "Habitat: Moist to very wet regions, open sites, forest gaps, edges, flood plains. Altitude: Sea level to 1800 m." |

| 204 | Native or naturalized in regions with tropical or subtropical climates | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Acevedo-Rodríguez, P. & Strong, M.T. 2005. Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium 52: 1-415 | "General distribution: widespread and common in moist lowlands of Central and tropical South America." |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Native from Mexico to Bolivia; in Hawai'i cultivated for its attractive inflorescences that are used in flower arrangements, now naturalized on O'ahu" |

| 205 | Does the species have a history of repeated introductions outside its natural range? | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | "Rattlesnake plant is commonly cultivated in tropical countries for its leaves, which are used as thatch material, tamale wrappers, and basket liners. It is also a landscape plant in more urbanized areas of the tropics." |

| 301 | Naturalized beyond native range | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Acevedo-Rodríguez, P. & Strong, M.T. 2005. Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium 52: 1-415 | "Distribution in Puerto Rico: Recorded only from Río Grande, where it has become naturalized in secondary forest. Its time and mode of introduction to Puerto Rico are not known." |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Native from Mexico to Bolivia; in Hawai'i cultivated for its attractive inflorescences that are used in flower arrangements, now naturalized on O'ahu, where it is known only from a single extensive population below Pu'ulanihuli in Kane'ohe (K. Nagata 3486, HLA)." |
| | Parker, J. L. & Parsons, B. 2010. New plant records from the Big Island for 2008. Bishop Museum Occasional Papers 107: 41–43 | "Previously recorded as naturalized in Kāneʻohe, oʻahu (Wagner et al. 1999), rattlesnake plant is grown for its dark green foliage and contrasting yellow or bronzy inflorescences, which are sold both fresh and dried in the cut-flower market (Staples & Herbst 2005). The following specimen was collected from a large population in Nānāwale Forest Reserve, near Lava Tree State Park, in the Puna District. Material examined. HAWAIʻI: Puna Distr, Nānāwale For Res, significant population growing under canopy of Falcataria moluccana, 200 m, 11 Jul 2008, K. Bio, J. Parker & R. McGuire BIED6." |

| Qsn # | Question | Answer |
|---|---|---|
| | Oppenheimer, H. & Bustamante, K.M. 2014. New Hawaiian plant records for 2013. Bishop Museum Occasional Papers 115: 19–22 | "This large ornamental herb was documented as naturalized on O‘ahu (Wagner et al. 1999: 1464) and Hawai‘i (parker & parsons 2010: 42). On windward East Maui it was found to be locally common in disturbed sites in secondary lowland forest. Material examined. MAUI: East Maui, Hāna Distr., Wakiu, N of Olopawa, 183 m, 24 Jan 2013, Oppenheimer & Perlman H11304." |

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

| 303 | Agricultural/forestry/horticultural weed | n |
|---|---|---|
| | **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 | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | Possibly. Several species listed as naturalized or as weeds of unspecified impacts |

| 401 | Produces spines, thorns or burrs | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI. | [No evidence] "Caulescent perennial herbs 1.5-3 m tall, with 3-5 basal leaves and I cauline leaf per aerial shoot. Leaves dark green with paler green area along midrib on upper surface, lower surface grayish green and often tinged purple along margins, chartaceous, ovate, 30-110 em long, 15-55 cm wide, upper surface glabrate, apex obtuse or subacuminate, petioles 20-185 cm long, glabrate or minutely tomentose, pulvinus glabrous, slightly swollen, sheath tomentose at least along margins." |

| Qsn # | Question | Answer |
|---|---|---|
| **402** | **Allelopathic** | |
| | **Source(s)** | **Notes** |
| | WRA Specialist. 2016. Personal Communication | Unknown |

| **403** | **Parasitic** | **n** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Caulescent perennial herbs 1.5-3 m tall, with 3-5 basal leaves and 1 cauline leaf per aerial shoot." [No evidence. Marantaceae] |

| **404** | **Unpalatable to grazing animals** | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Langlois, H. C. (2004). Ethnobotanical analysis of different successional stages as sources of wild edible plants for the Guaymi people in Costa Rica. MS Thesis, University of Florida, Gainesville, FL | [Palatable to humans. Palatable to animals unknown] "The edible part of the plant is the unopened shoots, similar to those of the Heliconia. These are taken out and eaten and have a very pleasant flavor without the silky fibers of Heliconia. The amount of food obtained per plant is minimal though, and it takes a lot of plants to get out a significant quantity. Nevertheless, krigo has a very important role related to food. Its leaves are preferred by the Guaymi to wrap food. Whether it is fruits, shoots, or medicinals collected in the wild or cooked meals from home to be taken out into the field, krigo leaves are always used in preference to other similar leaves (banana, heliconia, etc.)." |

| **405** | **Toxic to animals** | **n** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Pillay, V.V. (2012). Modern Medical Toxicology. Jaypee Brothers Publishers, New Delhi, India | "Table 10.1: Non-Toxic Houseplants" [Includes Calathea species] |
| | 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** | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Blanchett, S. 2010. Growing your Calathea crotalifera seed. http://www.members.westnet.com.au/wackos/PDFs/Growing%20your%20Calathea%20crotalifera%20seed.pdf. [Accessed 24 Jun 2016] | "The only major pests of this plant are chewing insects such as Grasshoppers and Caterpillars, these can simply be crushed or sprayed with the insecticide Carbaryl if the infestation is heavy. In locations with poor air movement, Mealy Bug can cause trouble" |

| **407** | **Causes allergies or is otherwise toxic to humans** | **n** |
|---|---|---|

| Qsn # | Question | Answer |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Langlois, H. C. (2004). Ethnobotanical analysis of different successional stages as sources of wild edible plants for the Guaymi people in Costa Rica. MS Thesis, University of Florida, Gainesville, FL | [No evidence] "Calathea crotalifera (Krigo, Krigo bogon, bijagua). This common herbaceous plant can be found growing abundantly in the under story of primary and old secondary forests. Sometimes it will also be found in early secondary growth were there is enough shade to block out direct sunlight. The edible part of the plant is the unopened shoots, similar to those of the Heliconia. These are taken out and eaten and have a very pleasant flavor without the silky fibers of Heliconia. The amount of food obtained per plant is minimal though, and it takes a lot of plants to get out a significant quantity. Nevertheless, krigo has a very important role related to food. Its leaves are preferred by the Guaymi to wrap food. Whether it is fruits, shoots, or medicinals collected in the wild or cooked meals from home to be taken out into the field, krigo leaves are always used in preference to other similar leaves (banana, heliconia, etc.)." |
| | 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 |

| 408 | Creates a fire hazard in natural ecosystems | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY | "Large herb 1.6–3 m tall, sometimes to 5 m, often in large clumps." ... "Habitat: Moist to very wet regions, open sites, forest gaps, edges, flood plains." [No evidence. Growth form & habitat unlikely to increase fire risk] |

| 409 | Is a shade tolerant plant at some stage of its life cycle | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Langlois, H. C. (2004). Ethnobotanical analysis of different successional stages as sources of wild edible plants for the Guaymi people in Costa Rica. MS Thesis, University of Florida, Gainesville, FL | "Calathea crotalifera (Krigo, Krigo bogon, bijagua). This common herbaceous plant can be found growing abundantly in the under story of primary and old secondary forests. Sometimes it will also be found in early secondary growth were there is enough shade to block out direct sunlight." |
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | "Heliconia is hummingbird pollinated whereas Calathea is pollinated by bees. Both species have been considered moderately shade tolerant," |
| | Jenny's Garden. 2016. Calathea crotalifera. http://jennysgarden.com/Calathea_crotalifera.html. [Accessed 24 Jun 2016] | "Light: Sun-part shade/filtered shade" |

| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | n |
|---|---|---|

| Qsn # | Question | Answer |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Mazza, G. 2016. Calathea crotalifera. http://www.photomazza.com/?Calathea-crotalifera. http://www.photomazza.com/?Calathea-crotalifera. [Accessed 27 Jun 2016] | "It requires a soil rich of organic substance, draining, maintained constantly humid." |
| | Learn 2 Grow. 2016. Calathea crotalifera. http://www.learn2grow.com/plants/calathea-crotalifera/. [Accessed 27 Jun 2016] | "They prefer rich, evenly moist, organic soil with good drainage and filtered light." ... " Soil type Loam, Sand" |

| 411 | Climbing or smothering growth habit | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Acevedo-Rodríguez, P. & Strong, M.T. 2005. Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium 52: 1-415 | "Caulescent herb 1.5 m tall or more, bearing 2- 5 basal leaves and 1 cauline leaf above a stem internode; leaf blades ovate, chartaceous, 30-90 × 15-55 cm, rounded to minutely acuminate at the apex, the base rounded or subtruncate, lighter beneath, often tinged purple along margins; petioles elongate." |

| 412 | Forms dense thickets | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Parker, J. L. & Parsons, B. 2010. New plant records from the Big Island for 2008. Bishop Museum Occasional Papers 107: 41–43 | "significant population growing under canopy of Falcataria moluccana" |
| | WRA Specialist. 2016. Personal Communication | Unknown if rhizomatous growth can result in dense stands |

| 501 | Aquatic | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY | [Terrestrial herb] "Habitat: Moist to very wet regions, open sites, forests gaps, edges, flood plains." |

| 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 23 Jun 2016] | Marantaceae |

| 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 23 Jun 2016] | Marantaceae |

| Qsn # | Question | Answer |
|---|---|---|
| **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. Plant Protection Quarterly, 25(2): 56-74 | "This question relates to perennial plants with tubers, corms or bulbs. This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes/ stolons" |
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | [Rhizomatous] "Calathea reproduces sexually and asexually and several clonal shoots arise from a sympodially branched rhizome near the ground (Kennedy, 1973), resulting in greater spatial spread among leaves on a ramet," |

| | | |
|---|---|---|
| **601** | **Evidence of substantial reproductive failure in native habitat** | **n** |
| | **Source(s)** | **Notes** |
| | Rodríguez, A., Monro, A. K., Chacón, O., Solano, D., Santamaría, D., Zamora, N., Gonzalez, F. & Correa, M. (2011). Regional and global conservation assessments for 200 vascular plant species from Costa Rica and Panama. Phytotaxa, 21(1), 1-216 | "Calathea crotalifera ... Terrestrial herbs, flowers bisexual, cultivated as an ornamental. Global distribution: Mexico to Bolivia. Known in Costa Rica and Panama from 220 herbarium collections. Elevational range for Costa Rica and Panama 0–1800 m, and the proportion of the regional Extension of Occurrence in protected areas: 28%. • Regional threat category: Least Concern (LC)" |

| | | |
|---|---|---|
| **602** | **Produces viable seed** | **y** |
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Capsules yellow, obovoid, 11-13.5 mm long, the calyx persistent. Seeds dark blue with white aril." |
| | Jenny's Garden. 2016. Calathea crotalifera. http://jennysgarden.com/Calathea_crotalifera.html. [Accessed 24 Jun 2016] | "Propagation:  Seeds, rhizome divisions" |
| | Blanchett, S. 2010. Growing your Calathea crotalifera seed. http://www.members.westnet.com.au/wackos/PDFs/Growing%20your%20Calathea%20crotalifera%20seed.pdf. [Accessed 24 Jun 2016] | "Sow your seeds on a well drained medium such as 75% sand and 25% Peat moss, or a potting mix with 50% coarse sand added to it. Keep them in a very bright, filtered light location and maintain consistent moisture levels, not sopping wet, just nice and moist. It may take up to a month for all the seed to germinate, don't throw them out!" |

| | | |
|---|---|---|
| **603** | **Hybridizes naturally** | |
| | **Source(s)** | **Notes** |
| | Kennedy, H. (1978). Systematics and Pollination of the "closed flowered" Species of Calathea (Marantaceae). University of California Publications in Botany Volume 71. University of California Press, Berkeley and Los Angeles, CA | [Unknown. Natural hybrids documented in genus] "Near the La Lola Cacao Institute (Milla 28) Lim6n Province. Costa Rica. a natural hybrid between C. warscewiczii; and C. marantifolia was found by Dr. R. L. Dressler" |

| | | |
|---|---|---|
| **604** | **Self-compatible or apomictic** | **y** |

| Qsn # | Question | Answer |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Fornoni, J., Ordano, M., Pérez-Ishiwara, R., Boege, K., & Domínguez, C. A. (2015). A comparison of floral integration between selfing and outcrossing species: a meta-analysis. Annals of Botany, doi:10.1093/aob/mcv166 | "self-incompatible species were considered outcrossers, as were those self-compatible with specific pollinator species and with sophisticated pollination mechanisms (e.g. Calathea crotalifera and Sprekelia formosissima)," |

| 605 | Requires specialist pollinators | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wilson, K. & Morrison, D. (eds.). 2000. Monocots: Systematics and Evolution. CSIRO Publishing, Collingwood, Australia | "How many or few pollinators visit a particular species is determined. by a variety of factors, including corolla tube length. quantity of nectar, number of flowers per inflorescence, density of the population and habitat. Widespread species. as expected. have a larger number of pollinators than more restricted ones. Calathea crotalifera S. Watson is an excellent example. ranging from sea level to 1600 m and from southern Mexico to Bolivia. It is known to be pollinated by three different genera of euglossine bees (Eulaema, Euplisia, and 16 different species of Euglossa (R. L Dressler & C. H. Dodson. pers. comm.)), Bombus (Bumblebees) and a ground dwelling bee, Thygater. The later two genera were observed only al the higher elevations. The variation in tube length in different areas allows (he species to exploit a wider range of pollinator species and may partially explain its successful wide distribution." |
| | Acevedo-Rodríguez, P. & Strong, M.T. 2005. Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium 52: 1-415 | "Inflorescence rarely simple, usually a synflorescence of 2-4 spikes, the first one terminal, subsequent ones fasciculate in the axil of the cauline leaf. Spikes rectangular, laterally flattened, 10-25 × 3.5-6.5 cm, on peduncles 11-55 cm long, these minutely appressed tomentose at the apex. Bracts conduplicately folded, broadly reniform, glabrous or minutely tomentulose at base and along margins. Sepals glabrous, 12-21 mm long; corolla tube pilose to glabrous, mostly 18-25 mm long; staminal tube 3-5 mm long, the lobes subequal; outer staminode obovate, emarginate, cream to yellow, occasionally tinged purple, 9-13 mm long. Ovary glabrous, ca. 3.5 mm long." |
| | Fornoni, J., Ordano, M., Pérez-Ishiwara, R., Boege, K., & Domínguez, C. A. (2015). A comparison of floral integration between selfing and outcrossing species: a meta-analysis. Annals of Botany, doi:10.1093/aob/mcv166 | "self-incompatible species were considered outcrossers, as were those self-compatible with specific pollinator species and with sophisticated pollination mechanisms (e.g. Calathea crotalifera and Sprekelia formosissima)," |

| 606 | Reproduction by vegetative fragmentation | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | "Calathea reproduces sexually and asexually and several clonal shoots arise from a sympodially branched rhizome near the ground (Kennedy, 1973), resulting in greater spatial spread among leaves on a ramet, compared to Heliconia." |

| 607 | Minimum generative time (years) | |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | [Time to first flowering unknown, but plants may be able to reproduce vegetatively at an earlier age] "Calathea crotalifera is a perennial, herbaceous understory monocot that is also rhizomatous, and ramets grow 1-3 m tall. Inflorescences possess yellow, erect floral bracts (reminiscent of a rattlesnake's rattle) that grow up to 25 cm long. Calathea reproduces sexually and asexually and several clonal shoots arise from a sympodially branched rhizome near the ground (Kennedy, 1973)," |

| 701 | **Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)** | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Capsules yellow, obovoid, 11-13.5 mm long, the calyx persistent. Seeds dark blue with white aril." [Seeds lack means of external attachment, but may be small enough to stick to surfaces in mud] |

| 702 | **Propagules dispersed intentionally by people** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | "Rattlesnake plant is commonly cultivated in tropical countries for its leaves, which are used as thatch material, tamale wrappers, and basket liners. It is also a landscape plant in more urbanized areas of the tropics. In Hawaii it is grown as an ornamental for its dark green foliage and contrasting yellow o bronzy inflorescence, and for the cut flower market, with both fresh and dried inflorescences used. Because it retains its interesting shape and does not discolor when dried, it has a wide market." |

| 703 | **Propagules likely to disperse as a produce contaminant** | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | "In Hawaii it is grown as an ornamental for its dark green foliage and contrasting yellow to bronzy inflorescence, and for the cut flower market, with both fresh and dried inflorescences used. Because it retains its interesting shape and does not discolor when dried, it has a wide market." [Unknown, but it may be possible that seeds could be accidentally dispersed as a contaminant of floral arrangements] |

| 704 | **Propagules adapted to wind dispersal** | **n** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Capsules yellow, obovoid, 11-13.5 mm long, the calyx persistent. Seeds dark blue with white aril." [No evidence] |

| Qsn # | Question | Answer |
|---|---|---|
| **705** | **Propagules water dispersed** | |
| | **Source(s)** | **Notes** |
| | Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY | "Habitat: Moist to very wet regions, open sites, forest gaps, edges, flood plains." [Seeds might be produced by water when occurring in flood plains] |

| 706 | **Propagules bird dispersed** | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Capsules yellow, obovoid, 11-13.5 mm long, the calyx persistent. Seeds dark blue with white aril." |
| | Zuchowski, W. 2007. Electronic Field Guide to Native Ornamental Plants of Monteverde, Costa Rica. University of Massachusetts, Boston, http://efg.cs.umb.edu/. [Accessed 24 Jun 2016] | "Fruit Dispersal: Bird" |
| | 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 | "Most species with arillate seeds are probably myrmecochorous." [In contrast to sources which claim it is bird-dispersed] |
| | Imada, C., Lau, A., Frohlich, D. & Kennedy, B. (2007). Botanical Inventory of Board of Water Supply Lands, Waihe'e and Kahalu'u Valleys, Windward O'ahu. Hawaii Biological Survey, Bishop Museum, Honolulu, HI | [Suspected of being bird dispersed. No direct observations of ornithochory] "Calathea crotalifera (rattlesnake plant)ƒThis tall, clumping, gingerlike herb was well established in Kahalu'u but not noted in Waihe'e. This species is widely cultivated but previously documented in the State as naturalized only from the slopes above Ko'olau Golf Club in Käne'ohe, below the Pali Lookout (K. Nagata 3486, 12 May 1986, BISH). The species is apparently bird dispersed in the valley, since sightings of individual, widely dispersed plants in out of the way locations were made." |

| 707 | **Propagules dispersed by other animals (externally)** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Capsules yellow, obovoid, 11-13.5 mm long, the calyx persistent. Seeds dark blue with white aril." |
| | 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 | "Most species with arillate seeds are probably myrmecochorous." [Likely yes, if seeds are produced] |

| 708 | **Propagules survive passage through the gut** | |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Imada, C., Lau, A., Frohlich, D. & Kennedy, B. (2007). Botanical Inventory of Board of Water Supply Lands, Waihe'e and Kahalu'u Valleys, Windward O'ahu. Hawaii Biological Survey, Bishop Museum, Honolulu, HI | [Suspected of being bird dispersed. No direct observations of ornithochory] "Calathea crotalifera (rattlesnake plant)ƒThis tall, clumping, gingerlike herb was well established in Kahalu'u but not noted in Waihe'e. This species is widely cultivated but previously documented in the State as naturalized only from the slopes above Ko'olau Golf Club in Käne'ohe, below the Pali Lookout (K. Nagata 3486, 12 May 1986, BISH). The species is apparently bird dispersed in the valley, since sightings of individual, widely dispersed plants in out of the way locations were made." |

| 801 | Prolific seed production (>1000/m2) | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | "Calathea flowers are yellow-white and produce seed capsules containing one dark blue seed surrounded by white flesh, and do not persist on the inflorescence." |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | "Most species in the Hawaiian Islands rarely set fruit unless hand-pollinated." |

| 802 | Evidence that a persistent propagule bank is formed (>1 yr) | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Dalling, J. W., Swaine, M. D., & Garwood, N. C. (1998). Dispersal patterns and seed bank dynamics of pioneer trees in moist tropical forest. Ecology, 79(2): 564-578 | [Other species form a persistent seed bank] "Most seeds of Calathea ovandensis, a gap-dependent herb, can persist for several years in the soil under natural conditions (Horvitz and Schemske 1994)." |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | [Possibly] "In the wild, the seeds develop and are shed during the rainy season but do not germinate until the following rainy season, surviving the dry season in dormancy." |

| 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 | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Westerband, A. C. (2016). Plasticity and Ontogeny in Dynamic Environments: A Case Study of Two Neotropical Understory Herbs. PhD Dissertation. University of Miami, Coral Gables, FL | "Calathea reproduces sexually and asexually and several clonal shoots arise from a sympodially branched rhizome near the ground (Kennedy, 1973), resulting in greater spatial spread among leaves on a ramet" [Unknown. Possible that mechanical damage to rhizomes may result in resprouting] |

| 805 | Effective natural enemies present locally (e.g. introduced biocontrol agents) | |
|---|---|---|

| Qsn # | Question | Answer |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI | [Unknown] "In Hawaii it is grown as an ornamental for its dark green foliage and contrasting yellow o bronzy inflorescence, and for the cut flower market, with both fresh and dried inflorescences used. Because it retains its interesting shape and does not discolor when dried, it has a wide market." |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI. | [Unknown] Native from Mexico to Bolivia; in Hawai'i cultivated for its attractive inflorescences that are used in flower arrangements, now naturalized on O'ahu..." |

**Summary of Risk Traits:**

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives in tropical climates
• Naturalized on Oahu, Hawaii, and Maui islands, as well as Puerto Rico & potentially elsewhere
• Shade tolerant
• Reproduces by seeds & vegetatively by rhizomes
• May be self-compatible
• Seeds dispersed by ants, possibly by birds & intentionally by people
• Seeds, if produced, may persist in the soil

Low Risk Traits
• No reports of invasiveness
• Unarmed (no spines, thorns or burrs)
• Ornamental
• Non-toxic
• Requires specialized pollinators
• Limited seed production may reduce risk of inadvertent dispersal