

Taxon: <i>Aristolochia ringens</i> Vahl	Family: Aristolochiaceae
Common Name(s): gaping dutchman's pipe	Synonym(s): <i>Aristolochia globiflora</i> Mutis <i>Aristolochia turbacensis</i> Kunth <i>Howardia ringens</i> (Vahl) Klotzsch

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 20 Jul 2018
WRA Score: 8.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Tropical Vine, Naturalized, Weedy, Shade-Tolerant, Wind-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	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)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed		
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		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
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	y
412	Forms dense thickets	y=1, n=0	n
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	n
606	Reproduction by vegetative fragmentation		
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	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	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)		
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
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	[No evidence of domestication] "Status: Exotic, uncommon, cultivated and escaped. Distribution: On roadsides and in open areas. Native to Brazil; widely cultivated in the Neotropics."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. 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. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	"Native Southern America NORTHERN SOUTH AMERICA: Venezuela [Amazonas] BRAZIL: Brazil [Amazonas] WESTERN SOUTH AMERICA: Peru [Loreto]"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Trade Winds Fruit. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . http://www.tradewindsfruit.com/content/gaping-dutchmans-pipe.htm . [Accessed 20 Jul 2018]	"It is quite adaptable and can be grown in subtropical areas, tropical areas, and any place where temperatures don't frequently drop below 30F. It also does well in low light conditions and can be grown indoors. Will tolerate high humidity or arid climates with little rain, although irrigation should be provided. Grow in full sun or shade."
	Tropicos.org. 2018. Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 20 Jul 2018]	Collected from 10 - 20 m elevation, 09°05'00"N latitude, to 2150 m [Colombia, latitude unspecified]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	"Native Southern America NORTHERN SOUTH AMERICA: Venezuela [Amazonas] BRAZIL: Brazil [Amazonas] WESTERN SOUTH AMERICA: Peru [Loreto] Cultivated (also cult. in tropics) Naturalized Africa WEST-CENTRAL TROPICAL AFRICA: Zaire WEST TROPICAL AFRICA: Cote D'Ivoire, Nigeria Asia-Tropical INDO-CHINA: Thailand Northern America SOUTHEASTERN U.S.A.: United States [Florida (s.)] Southern America CARIBBEAN: Cuba, Dominican Republic, Guadeloupe, Jamaica, Puerto Rico"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	De Groot, H., Wanke, S., & Neinhuis, C. (2006). Revision of the genus <i>Aristolochia</i> (Aristolochiaceae) in Africa, Madagascar and adjacent islands. <i>Botanical Journal of the Linnean Society</i> , 151(2), 219-238	"ARISTOLOCHIA RINGENS VAHL Voucher specimens: DEMOCRATIC REPUBLIC OF THE CONGO: Leopoldville Prov., Thysville Terr., MVuazi, v.1960, P. Compère 2073 (K). IVORY COAST: Adiopodoumé, 16 km W of Abidjan (naturalized), 8.ix.1963, W. de Wilde 875 (K). NIGERIA: 3–4 miles NW of Ibadan, 200 m (naturalized), xi.1936, R.J. Newberry & A.E. Etim s.n. (K)."
	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 20 Jul 2018]	" <i>Aristolochia ringens</i> Vahl Locations: Waimea Arboretum & Botanical Garden"
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	"Cultivated and naturalized in Puerto Rico; probably a native to South America, found in Florida, the Greater Antilles, Guadeloupe, Central America."

Qsn #	Question	Answer
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Distribution: On roadsides and in open areas. Native to Brazil; widely cultivated in the Neotropics."
	Wunderlin, R.P. 1982. Guide to the Vascular Plants of Central Florida. University Press of Florida, Gainesville, FL	"Disturbed tropical hammocks. Rare; Miami-Dade Co. Native to South America. Escaped from cultivation."
	Werren, G. 2001. Environmental Weeds of the Wet Tropics Bioregion: Risk Assessment & Priority Ranking. Rainforest CRC, Cairns, Australia	List of exotic plants that have naturalised within the Wet Tropics Bioregion [Australian list includes <i>A. ringens</i>]

301	Naturalized beyond native range	y
	Source(s)	Notes
	Pfeifer, H. (1966). Revision of the North and Central American Hexandrous Species of <i>Aristolochia</i> (Aristolochiaceae). <i>Annals of the Missouri Botanical Garden</i> , 53(2), 115-196	" <i>Aristolochia ringens</i> is naturalized in Florida. I suspect it is a native of South America and only secondarily introduced in our area."
	De Groot, H., Wanke, S., & Neinhuis, C. (2006). Revision of the genus <i>Aristolochia</i> (Aristolochiaceae) in Africa, Madagascar and adjacent islands. <i>Botanical Journal of the Linnean Society</i> , 151(2), 219-238	"ARISTOLOCHIA RINGENS VAHL Voucher specimens: DEMOCRATIC REPUBLIC OF THE CONGO: Leopoldville Prov., Thysville Terr., MVuazi, v.1960, P. Compère 2073 (K). IVORY COAST: Adiopodoumé, 16 km W of Abidjan (naturalized), 8.ix.1963, W. de Wilde 875 (K). NIGERIA: 3–4 miles NW of Ibadan, 200 m (naturalized), xi.1936, R.J. Newberry & A.E. Etim s.n. (K)."
	Wunderlin, R.P. 1982. Guide to the Vascular Plants of Central Florida. University Press of Florida, Gainesville, FL	"Disturbed tropical hammocks. Rare; Miami-Dade Co. Native to South America. Escaped from cultivation."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	"Naturalized Africa WEST-CENTRAL TROPICAL AFRICA: Zaire WEST TROPICAL AFRICA: Cote D'Ivoire, Nigeria Asia-Tropical INDO-CHINA: Thailand Northern America SOUTHEASTERN U.S.A.: United States [Florida (s.)] Southern America CARIBBEAN: Cuba, Dominican Republic, Guadeloupe, Jamaica, Puerto Rico"
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Status: Exotic, uncommon, cultivated and escaped."
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	Cultivated and naturalized in Puerto Rico; probably a native to South America, found in Florida, the Greater Antilles, Guadeloupe, Central America."
	Werren, G. 2001. Environmental Weeds of the Wet Tropics Bioregion: Risk Assessment & Priority Ranking. Rainforest CRC, Cairns, Australia	List of exotic plants that have naturalised within the Wet Tropics Bioregion [Australian list includes <i>A. ringens</i>]

302	Garden/amenity/disturbance weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Werren, G. 2001. Environmental Weeds of the Wet Tropics Bioregion: Risk Assessment & Priority Ranking. Rainforest CRC, Cairns, Australia	[A rainforest weed of unspecified impacts] "A weed risk assessment system (RAS) has been designed explicitly to consider alien environmental weed risks to the Wet Tropics bioregion."... "The RAS allocates relative scores with respect to the above components providing a relative ranking to a maximum of 100, with higher environmental weed risk directly proportional to the numeric score."... "the sample yielded an intermediate to high mean score (44.3) but with large range (20-76) indicative of a range of impacts that extend to the very high impact categories" [<i>Aristolochia ringens</i> - Score = 38. Lower than the mean score for all vines, suggesting it is relatively lower risk.]
	Adesina, G. O., Akinyemiju, O. A., & Ola, O. T. (2012). Assessment of frequency, density and abundance of weed species in different Cropping Systems. Journal of Natural Sciences Research 2(9): 107-119	[Identified as a weed of cashew plantations. Impacts unspecified] "It was observed that among the fifty-seven weed species, only two were almost present in all the fields (<i>Panicum maximum</i> and <i>Vigna gracilis</i>) except in cocoa plantation where they are absent. Three (<i>Hippocratea indica</i> , <i>Stachytapheta angustifolia</i> and <i>Tithonia diversifolia</i>) were present in fallow land only (Table 5). Weeds that were present in maize plot only are <i>Acalypha</i> spp., <i>Celosia trigina</i> , <i>Oldenlandia corymbosa</i> , and <i>Sida corymbosa</i> . <i>Anelienna beniniensis</i> , <i>Aristolochia ringens</i> , <i>Diodia scadens</i> , <i>Ipomea mauritiana</i> , and <i>Mimondia cherantia</i> are only present in cashew plantation." ... "Table 5: weed species occurrence in different cropping system at the Teaching and farm" [<i>Aristolochia ringens</i> - Cashew plantation]
	Dave's Garden. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . https://davesgarden.com/guides/pf/go/63662/ . [Accessed 20 Jul 2018]	[Regarded as an aggressive, undesirable plant in the landscape] "On May 27, 2009, deba114620 from Rochester, NY wrote: Where I grew up all of the American Foursquare houses had a Dutchman's Pipe on the trellis that was usually contained by a sidewalk or next to a driveway. I love the plant and planted it on the side of my porch in a north west side of my house. I regret this. It has very strong runners and they are very invasive-I still love the heart shaped leaves but they are out of scale for my cottage house. I have been digging it out and would not recommend it UNLESS you plant it somewhere where it can't run under the ground-like a sidewalk or driveway. It grows very quickly and covers a trellis quickly and keeps growing and growing. I looked an looked for this palnt as I remember it from when I was young but be careful where you put it - it definitely is not for a smaller garden/house."
	WRA Specialist. 2018. Personal Communication	In this assessment, conservatively classified as a weed of unspecified impacts, but with potential to affect agriculture (see 3.03) & the natural environment (see 3.04). To date, not reported to be naturalized or invasive in the Hawaiian Islands

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes

Qsn #	Question	Answer
	Adesina, G. O., Akinyemiju, O. A., & Ola, O. T. (2012). Assessment of frequency, density and abundance of weed species in different Cropping Systems. Journal of Natural Sciences Research 2(9): 107-119	[Identified as a weed of cashew plantations. Impacts unspecified] "It was observed that among the fifty-seven weed species, only two were almost present in all the fields (<i>Panicum maximum</i> and <i>Vigna gracilis</i>) except in cocoa plantation where they are absent. Three (<i>Hippocratea indica</i> , <i>Stachytapheta angustifolia</i> and <i>Tithonia diversifolia</i>) were present in fallow land only (Table 5). Weeds that were present in maize plot only are <i>Acalypha</i> spp., <i>Celosia trigina</i> , <i>Oldenlandia corymbosa</i> , and <i>Sida corymbosa</i> . <i>Anelienna beniniensis</i> , <i>Aristolochia ringens</i> , <i>Diodia scadens</i> , <i>Ipomea mauritiana</i> , and <i>Mimondia cherantia</i> are only present in cashew plantation." ... "Table 5: weed species occurrence in different cropping system at the Teaching and farm" [<i>Aristolochia ringens</i> - Cashew plantation]

304	Environmental weed	
	Source(s)	Notes
	Werren, G. (2003). A bioregional perspective of weed invasion of rainforests and associated ecosystems: focus on the Wet Tropics of north east Queensland. Eds) Grice, AC and Setter, MJ Weeds of rainforests and associated ecosystems. Cairns, 9-18	[A rainforest weed of unspecified impacts] "A weed risk assessment system (RAS) has been designed explicitly to consider alien environmental weed risks to the Wet Tropics bioregion."... "The RAS allocates relative scores with respect to the above components providing a relative ranking to a maximum of 100, with higher environmental weed risk directly proportional to the numeric score." ... "the sample yielded an intermediate to high mean score (44.3) but with large range (20-76) indicative of a range of impacts that extend to the very high impact categories" [<i>Aristolochia ringens</i> - Score = 38. Lower than the mean score for all vines, suggesting it is relatively lower risk.]

305	Congeneric weed	y
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	" <i>A. elegans</i> is listed in the Global Compendium of Weeds as "agricultural weed, cultivation escape, environmental weed, garden thug, naturalized, noxious weed, sleeper weed, weed" (Randall, 2012). It received a very high PIER risk score of 13 (reject for import) (PIER, 2015). The species is invasive in several parts of Asia Pacific and Cuba (Oviedo-Prieto et al, 2012; Randall, 2012), is known to be detrimental to native biodiversity in Australia, where it is one of the 50 worst invaders in Queensland (Queensland DAFF, 2015), and is a Category II invasive species in Florida (Florida Exotic Pest Plant Council, 2013). It is used in traditional medicine but, like other <i>Aristolochia</i> species, is associated with an increased incidence of cancer (DeBelle et al, 2008; Krell and Stebbing, 2013; Michl et al., 2013). The light seeds are easily spread by wind and water (Weeds of Australia, 2015)."

Qsn #	Question	Answer
	<p>Queensland Government. (2017). Weeds of Australia. <i>Aristolochia elegans</i>. http://keyserver.lucidcentral.org. [Accessed 20 Jul 2018]</p>	<p>"Dutchman's pipe (<i>Aristolochia elegans</i>) is regarded as an environmental weed in Queensland and New South Wales, and as a potential environmental weed or "sleeper weed" in many other regions of Australia. It is of most concern in south-eastern Queensland, and it was recently ranked among the top 50 most invasive plants in this region. It is also regarded as a potentially serious environmental weed in north-eastern New South Wales. Like many other species of exotic vines, Dutchman's pipe (<i>Aristolochia elegans</i>) competes with and replaces native plants via its smothering growth. It readily invades dry rainforests, lowland rainforests and riparian vegetation, replacing native vines and preventing the growth and regeneration of other native plants. Community groups are trying to eradicate this plant from several environmentally significant locations in Queensland (e.g. in Burleigh Heads National Park). However, Dutchman's pipe (<i>Aristolochia elegans</i>) is more well known for its impact on the Richmond birdwing butterfly (<i>Ornithoptera richmondia</i>). This butterfly is listed as a vulnerable species under Queensland legislation and the invasion of remnant habitat by Dutchman's pipe (<i>Aristolochia elegans</i>) is a serious contributing factor to its decline. Birdwing vine (<i>Pararistolochia praevensosa</i>), a similar plant that is native to northern New South Wales and southern Queensland, is the sole food plant of the Richmond birdwing butterfly (<i>Ornithoptera richmondia</i>). This native vine is being replaced by Dutchman's pipe (<i>Aristolochia elegans</i>) making it hard for the female adult butterflies to find. Because the exotic vine is so similar, the female butterflies are also fooled into laying their eggs on it. However, Dutchman's pipe (<i>Aristolochia elegans</i>) is toxic to the larvae and when they hatch they are unable to feed and eventually perish. Therefore, removal of this weed is one of the primary strategies of the Richmond Birdwing Recovery Network. The larvae of other native butterflies are also known to perish on Dutchman's pipe (<i>Aristolochia elegans</i>), including the big greasy (<i>Cressida cressida</i>) and the red-bodied swallowtail (<i>Pachlopta polydorus</i>)."</p>

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	[No evidence] "Slightly woody vine, twining, attaining 5 m in length. Stems cylindrical, slender, glabrous, with the pith hollow. Leaves alternate; blades 5- 16 × 6-18 cm, broadly ovate, reniform or orbicular, chartaceous, with prominently reticulate venation, the apex obtuse or rounded, the base deeply cordate, the margins entire; upper surface dark green, dull; lower surface glaucous, glabrous, with numerous scattered dots; petioles 3-11 cm long, sulcate or compressed, broadened at the base; pseudostipules foliaceous, ovate-rounded, 2.5-5 cm long. Flowers solitary, pendulous; peduncle 7.5-17 cm long; utricle obovoid, 5-7 × 2.5-4 cm, the tube straight, 3-4 cm long, almost forming a right angle with the utricle; limb bilabiate, yellowish with a cardinal red reticulum, the upper lip spatulate, 6-9 cm long, the lower lip lanceolate, 10-15 cm long. Capsule 6-11 cm long, oblong or oblanceolate, with 6 ribs, the apex mucronate, the base acute; seeds numerous, rhomboid, winged, 7-15 mm long."

402	Allelopathic	
	Source(s)	Notes
	Avchar, B. K., & Deokule, S. S. (2007). Allelopathic influences of <i>Aristolochia bracteolata</i> Lam. on seed Germination and Seedling growth of <i>Cucumis sativus</i> L. <i>Geobios</i> (Jodhpur), 34(2/3), 182-186	"Abstract: The allelopathic influences of <i>Aristolochia bracteolata</i> Lam. was examined on seed germination and seedling growth of <i>Cucumis sativus</i> L. The allelopathic pattern varied in each of the tests and this depends upon type of test material. Seed germination, root and hypocotyl growth were more hampered by root extract, water soluble with volatile substances(s) and root leachates. The plant is chemically analyzed and the presence of Aristolochic acid and a triterpenoids by HPTLC method is confirmed."
	Gatti, A. B., Perez, S. C. J. G. D., & Lima, M. I. S. (2004). Allelopathic activity of aqueous extracts of <i>Aristolochia esperanzae</i> O. Kuntze in the germination and growth of <i>Lactuca sativa</i> L. and <i>Raphanus sativus</i> L. <i>Acta Botanica Brasílica</i> , 18(3), 459-472	[Congener may be allelopathic] "This work analyzed the effects of aqueous extractsof <i>Aristolochia esperanzae</i> organs in the germination and initial growth of lettuce and radish...The extract concentration was the main responsible for the promotion or inhibition caused on lettuce and radish seedlings growth."
	WRA Specialist. 2018. Personal Communication	No information for <i>A. ringens</i> , but possible as other members exhibit allelopathic properties.

403	Parasitic	n
	Source(s)	Notes
	Pfeifer, H. (1966). Revision of the North and Central American Hexandrous Species of <i>Aristolochia</i> (Aristolochiaceae). <i>Annals of the Missouri Botanical Garden</i> , 53(2), 115-196	"Stout, glaucous liunas." [Aristolochiaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes

Qsn #	Question	Answer
	Trigo, J. R. (2000). The chemistry of antipredator defense by secondary compounds in neotropical Lepidoptera: facts, perspectives and caveats. <i>Journal of the Brazilian Chemical Society</i> , 11(6), 551-561	"Aristolochic acids (Figure 4, 14) have been found only in plants belonging to the family Aristolochiaceae; biosynthetically, they are nitrophenanthrenes derived from aporphine alkaloids. The unpalatability of these compounds has been postulated by several authors, but only one bioassay has been done with pure aristolochic acid, where the Japanese tree sparrow <i>Passer montanus</i> rejected rice grains treated with these compounds. However, the authors pointed out that aristolochic acids alone have lower activity than that the total osmeterium secretion from the Asiatic Troidini <i>Atrophaneura alcinous</i> , which also contains sesquiterpenes and a complex mixture of more polar components, possibly sequestered from the host plant (<i>Aristolochia debilis</i>)."
	Arannilewa, S. T., Ekrakene, T., & Akinneye, J. O. (2006). Laboratory evaluation of four medicinal plants as protectants against the maize weevil, <i>Sitophilus zeamais</i> (Mots). <i>African Journal of Biotechnology</i> , 5(21): 2032-2036	"From this study, it is becoming evident that <i>Ar. ringens</i> and <i>Al. sativum</i> displayed some potential as antifeedants, food poisons, contact poisons and repellents. The results therefore strongly suggest the possibility of using the extracts of these plants as toxicants, repellents and food poisoning agents against <i>S. zeamais</i> ."
	WRA Specialist. 2018. Personal Communication	Unknown for vertebrate herbivores, but chemical in <i>Aristolochia</i> spp. may make plant unpalatable.

405	Toxic to animals	
	Source(s)	Notes
	Arannilewa, S. T., Ekrakene, T., & Akinneye, J. O. (2006). Laboratory evaluation of four medicinal plants as protectants against the maize weevil, <i>Sitophilus zeamais</i> (Mots). <i>African Journal of Biotechnology</i> , 5(21): 2032-2036	[Unknown for <i>A. ringens</i> , but <i>Aristolochia</i> spp. may contain chemicals that are toxic to animals.] "From this study, it is becoming evident that <i>Ar. ringens</i> and <i>Al. sativum</i> displayed some potential as antifeedants, food poisons, contact poisons and repellents. The results therefore strongly suggest the possibility of using the extracts of these plants as toxicants, repellents and food poisoning agents against <i>S. zeamais</i> ."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Sunshine Seeds. (2018). <i>Aristolochia ringens</i> . http://www.sunshine-seeds.de . [Accessed 20 Jul 2018]	"Pests: Spider mites > especially under glass"

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

Qsn #	Question	Answer
	Schaneberg, B. T. and Khan, I. A. (2004). Analysis of products suspected of containing Aristolochia or Asarum species. <i>Journal of Ethnopharmacology</i> 94(2-3): 245-249	"Abstract: Aristolochia species have been administered by those trained in traditional Chinese medicine (TCM) for centuries. After determining Aristolochia fangchi was an adulterant that caused death due to renal failure in a number of patients at a Belgian weight loss clinic, many countries took steps to regulate products containing Aristolochia fangchi as well as other Aristolochia species. The US FDA issued a Consumer Advisory 'advising consumers to stop using any products that may likely contain aristolochic acid'. The Aristolochia and Asarum genera both have been found to contain aristolochic acids. A number of websites have been found from which individuals can order products containing either Aristolochia or Asarum as an ingredient through US merchants. We purchased 25 products from such sites and analyzed them for the presence of anstolochic acid I and II by HPLC with PDA. Six of the products contained detectable amounts of I and II."
	Osemeobo, G. J. and Ujor, G. (1999). The Non-Wood Forest Products of Nigeria. Federal Department of Forestry, Abuja, Nigeria	"Chewsticks: In terms of volume of wood content, chewsticks are the most expensive wood in Nigerian forests. The widely used plants for chewsticks are given in Table 10. These species are intensively harvested in the rainforests zones of Edo, Ondo, Oyo, Ekiti and Osun states. The common species used as chewsticks and medicine include the roots of:...Aristolochia ringens - for stomach disorders...These species improve the health of the teeth and prevent snake bites."
	Kuete, V. (2014). Toxicological Survey of African Medicinal Plants. Elsevier, London	[Used medicinally] "Several Aristolochia species are used as medicinal plants in Africa. Some of them include Aristolochia ringens (Vahl.) (used in Nigeria and several African countries for the management of snakebite venom, gastrointestinal disturbances, rheumatoid arthritis and insomnia, among others)"
	WRA Specialist. 2018. Personal Communication	Ingestion of plant parts may result in poisoning. No evidence that Aristolochia spp. cause allergies or are toxic upon contact.

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	No evidence that it occurs in fire prone habitats, although it could potentially act as a fuel ladder. Genus not identified as a fire risk

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Trade Winds Fruit. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . http://www.tradewindsfruit.com/content/gaping-dutchmans-pipe.htm . [Accessed 20 Jul 2018]	"It also does well in low light conditions and can be grown indoors. Will tolerate high humidity or arid climates with little rain, although irrigation should be provided. Grow in full sun or shade."
	Dave's Garden. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . https://davesgarden.com/guides/pf/go/63662/ . [Accessed 20 Jul 2018]	"Sun Exposure: Full Sun Sun to Partial Shade Light Shade Partial to Full Shade"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Llamas, K.A. 2003. Tropical Flowering Plants. Timber Press, Portland, OR	"Average, well-drained soil"
	Rarexoticseeds. (2018). Aristolochia Ringens Seeds. http://www.rarexoticseeds.com/en/aristolochia-ringens-seeds-gaping-dutchman-s-pipe-seeds.html . [Accessed 20 Jul 2018]	"It grows best in rich, well-drained soil. It requires only average soil to look good. The plant does well in light sandy soils."
	NParks Flora&FaunaWeb. (2018). Aristolochia ringens. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=1318 . [Accessed 20 Jul 2018]	"This species grows relatively quickly and is highly adaptable. It tolerates dry to wet soils and shade to full sun."
	WRA Specialist. 2018. Personal Communication	Minimal information on soil types for this species

411	Climbing or smothering growth habit	y
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Slightly woody vine, twining, attaining 5 m in length. Stems cylindrical, slender, glabrous, with the pith hollow."

412	Forms dense thickets	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Slightly woody vine, twining, attaining 5 m in length."

501	Aquatic	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	[Terrestrial vine] "Slightly woody vine, twining, attaining 5 m in length." ... "On roadsides and in open areas."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	Family: Aristolochiaceae Subfamily: Aristolochioideae

503	Nitrogen fixing woody plant	n
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jul 2018]	Family: Aristolochiaceae Subfamily: Aristolochioideae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Slightly woody vine, twining, attaining 5 m in length." [No evidence]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	[No evidence. Widely distributed] "Native Southern America NORTHERN SOUTH AMERICA: Venezuela [Amazonas] BRAZIL: Brazil [Amazonas] WESTERN SOUTH AMERICA: Peru [Loreto] Cultivated (also cult. in tropics) Naturalized Africa WEST-CENTRAL TROPICAL AFRICA: Zaire WEST TROPICAL AFRICA: Cote D'Ivoire, Nigeria Asia-Tropical INDO-CHINA: Thailand Northern America SOUTHEASTERN U.S.A.: United States [Florida (s.)] Southern America CARIBBEAN: Cuba, Dominican Republic, Guadeloupe, Jamaica, Puerto Rico"

602	Produces viable seed	y
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"Capsule 6-11 cm long, oblong or oblanceolate, with 6 ribs, the apex mucronate, the base acute; seeds numerous, rhomboid, winged, 7-15 mm long."
	Trade Winds Fruit. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . http://www.tradewindsfruit.com/content/gaping-dutchmans-pipe.htm . [Accessed 20 Jul 2018]	"Propagation - By seeds."

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	Pfeifer, H. (1966). Revision of the North and Central American Hexandrous Species of <i>Aristolochia</i> (Aristolochiaceae). <i>Annals of the Missouri Botanical Garden</i> , 53(2), 115-196	[Unknown. No evidence of natural hybridization.] " <i>Aristolochia ringens</i> and <i>A. lubiata</i> probably hybridize to form <i>A. cynbifera</i> Mart. & Zucc."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Bliss, B. J. et al. (2013). Characterization of the basal angiosperm <i>Aristolochia fimbriata</i> : a potential experimental system for genetic studies. <i>BMC plant biology</i> , 13(1), 13	[Documented in related taxa & suspected for <i>A. ringens</i> . Confirmation needed] "We demonstrated self-compatibility for <i>Aristolochia elegans</i> and <i>A. fimbriata</i> ," ... "Several species of <i>Aristolochia</i> had been reported to be self-compatible (<i>A. fimbriata</i> , <i>A. elegans</i> , <i>A. ridicula</i> , <i>A. ringens</i>) and generally protogynous [42], having a receptive stigma before the anthers dehisce."
	Rizzini, C. (1960). <i>Flora of Panama</i> . Part IV. Fascicle III. <i>Annals of the Missouri Botanical Garden</i> , 47(4), 263-359	[Generic description. Functionally self-incompatible] "The flowers are protogynous. With pollination, the anthers dehisce and the rigid hairs in the tube wilt, allowing the flies to escape and carry pollen to another bloom."
	Hou, D. (1983). <i>Florae malesianae praecursores LXV</i> . Notes on <i>Aristolochiaceae</i> . <i>Blumea</i> , 29(1): 223-249	[Isolated <i>A. ringens</i> reported to produce fruit] "Petch (1924) made detailed observation on the species of <i>Aristolochia</i> cultivated in Sri Lanka(Ceylon). According to him, isolated plants of <i>A. ringens</i> bear abundant fruits. He also reported that <i>A. gigas</i> (= <i>A. grandiflora</i>) is self-sterile: isolated plants of this species do not bear fruits, but fruits will be produced if two or several plants are grown together. Self-sterility in <i>A. grandiflora</i> was also found by Cammerloher (1923)."

Qsn #	Question	Answer
605	Requires specialist pollinators	n
	Source(s)	Notes
	Sakai, S. (2002). <i>Aristolochia</i> spp.(Aristolochiaceae) pollinated by flies breeding on decomposing flowers in Panama. <i>American Journal of Botany</i> , 89(3), 527-534	"In all <i>Aristolochia</i> species studied so far, flies of different families, including Anthomyiidae, Chloropidae, Milichiidae, Phoridae, Sarcophagidae, and Syrphidae, have been recorded as pollinators (Cammerloher, 1923; Petch, 1924; Brues, 1928; Lindner, 1928; Brantjes, 1980; Costa and Hime, 1983; Wolda and Sabrosky, 1986; Hall and Brown, 1993)."
	Hou, D. (1983). <i>Florae malesianae praecursores LXV. Notes on Aristolochiaceae</i> . <i>Blumea</i> , 29(1): 223-249	"The flowers of <i>Aristolochia</i> have a putrid or fetid smell and also a colour to attract small flies and have also a well modified (sometimes conspicuous) perianth to trap them. They are well adapted to insect- or cross-pollination."
	Rizzini, C. (1960). <i>Flora of Panama. Part IV. Fascicle III. Annals of the Missouri Botanical Garden</i> , 47(4), 263-359	"The flowers ostensibly are pollinated by various species of Diptera...The Diptera, doubtless attracted by the color and odor of the blooms, are trapped within the utricle since they are able to pass only inward over the hairs. The flowers are protogynous. With pollination, the anthers dehisce and the rigid hairs in the tube wilt, allowing the flies to escape and carry pollen to another bloom."
	WRA Specialist. 2018. Personal Communication	Although <i>Aristolochia</i> spp. have specialized pollination syndromes, the flowers attract generalist insect pollinators.

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Dave's Garden. (2018). <i>Gaping Dutchman's Pipe - Aristolochia ringens</i> . https://davesgarden.com/guides/pf/go/63662/ . [Accessed 20 Jul 2018]	"Unknown. No evidence from natural populations] "Propagation Methods: From herbaceous stem cuttings"
	Bailey, L. H. & Bailey, E. Z. 1976. <i>Hortus</i> . 3rd ed. Macmillan General Reference, NY	<i>Aristolochia</i> species can also propagate vegetatively

607	Minimum generative time (years)	
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. <i>Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483</i> . Smithsonian Institution, Washington, D.C.	"Phenology: Flowering and fruiting throughout the year." [Time to maturity unknown]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. <i>Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483</i> . Smithsonian Institution, Washington, D.C.	"Capsule 6-11 cm long, oblong or oblanceolate, with 6 ribs, the apex mucronate, the base acute; seeds numerous, rhomboid, winged, 7-15 mm long." [No evidence. Seeds lack means of external attachment]

702	Propagules dispersed intentionally by people	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"widely cultivated in the Neotropics."
	Trade Winds Fruit. (2018). Gaping Dutchman's Pipe - <i>Aristolochia ringens</i> . http://www.tradewindsfruit.com/content/gaping-dutchmans-pipe.htm . [Accessed 20 Jul 2018]	[Ornamental and medicinal plant] "Commonly grown for its ornate flowers."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	No evidence found to date

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"seeds numerous, rhomboid, winged, 7-15 mm long."
	Gonzalez, F. 1999. A Phylogenetic Analysis of the Aristolochioideae (Aristolochiaceae). PhD Dissertation. City University of New York	"Seeds of many species of <i>Aristolochia</i> are adapted to at least two different dispersal mechanisms, anemochory and zoochory. Winged, flattened seeds are found in a number of species."

705	Propagules water dispersed	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown whether or not seeds are buoyant

706	Propagules bird dispersed	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"seeds numerous, rhomboid, winged, 7-15 mm long." [Winged seeds adapted for wind dispersal]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	"seeds numerous, rhomboid, winged, 7-15 mm long." [Seeds lack means of external attachment]

708	Propagules survive passage through the gut	n
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Qsn #	Question	Answer
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unlikely that seeds would be eaten by animals. Adapted for wind dispersal

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Acevedo-Rodríguez, P. 2005. Vines and Climbing Plants of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium Volume 51: 1-483. Smithsonian Institution, Washington, D.C.	[Seeds numerous. Densities unknown] "Capsule 6-11 cm long, oblong or oblanceolate, with 6 ribs, the apex mucronate, the base acute; seeds numerous, rhomboid, winged, 7-15 mm long."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Olaloye, O. O., & Oke, S. O. (2016). Soil Seed Bank Dynamics of a Riparian Forest and its Adjacent Upland Vegetation. <i>Notulae Scientia Biologicae</i> , 8(1), 118-124	"Table 4. Mean density (seeds/m2) and percentage contribution of each species in the seed bank of upland vegetation in both dry and rainy season at 0-15 cm and 15-30 cm depth" [Aristolochia ringens seeds present in seed bank, but longevity unspecified]
	Baskin, C.C. & Baskin, J.M. 2014. Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination. Second Edition. Academic Press, San Francisco, CA	Unknown. Several Aristolochia species have seeds with morphological dormancy.

803	Well controlled by herbicides	
	Source(s)	Notes
	Queensland Government. 2016. Dutchman’s pipe. <i>Aristolochia elegans</i> . Restricted invasive plant. The State of Queensland, Department of Agriculture and Fisheries, Queensland, AU	[Unknown. Herbicides used on <i>Aristolochia elegans</i> , but efficacy unspecified] "Herbicides are most effective if sprayed before plants reach maturity. There is no herbicide currently registered for control of Dutchman’s pipe in Queensland; however, an off-label use permit allows the use of various herbicides for the control of environmental weeds in non-agricultural areas, bushland and forests."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	My Rare Plants. 2011. <i>Aristolochia</i> . http://myrareplants.blogspot.com/2011/10/aristolochia.html . [Accessed 20 Jul 2018]	[Unknown. Related plants regrow after dying back] " <i>Aristolochia elegans</i> ... In frost free areas it grows continuously. In areas where the vine freezes it will regrow vigorously in the spring"

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability, Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Widely naturalized (but no evidence from Hawaiian Islands to date)
- A weedy vine with potential impacts to agriculture & the natural environment
- Other *Aristolochia* species are invasive weeds
- Medicinal, & potentially toxic, properties
- Shade tolerant
- Climbing & potentially smothering habit
- Reproduces by seeds
- Seeds dispersed by wind & intentionally by people

Low Risk Traits

- Cultivated, but not naturalized or invasive in Hawaiian Islands to date
- Unarmed (no spines, thorns, or burrs)
- Ornamental