

Taxon: *Polystachya concreta* (Jacq.) Garay & H. R. Sweet **Family:** Orchidaceae

Common Name(s): great yellow spike orchid
yellow spike orchid

Synonym(s): Basionym: *Epidendrum concretum*

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 19 Jul 2018

WRA Score: 4.0

Designation: L

Rating: Low Risk

Keywords: Epiphytic Herb, Naturalized, Shade-Tolerant, Self-Compatible, 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	?
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		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
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	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	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	y
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		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
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
	La Croix, I. F. 2008. The New Encyclopedia of Orchids: 1500 Species in Cultivation. Timber Press, Portland, OR	[Cultivated, but not domesticated] "United States (Florida), Central and South America, Asia"

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
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. Flora of China. Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Epiphytic on trees in dense forests or thickets; 600–1500 m. S Yunnan [Cambodia, India (including Nicobar Islands), Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Africa, subtropical and tropical America]."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 18 Jul 2018]	"Native Africa WESTERN INDIAN OCEAN: Madagascar Asia-Tropical INDIAN SUBCONTINENT: India, Sri Lanka INDO-CHINA: Myanmar MALESIA: Indonesia, Philippines Northern America SOUTHEASTERN U.S.A.: United States [Florida] Southern America CARIBBEAN: Dominica, Grenada, Guadeloupe, Martinique, Montserrat, Puerto Rico, St. Kitts and Nevis, [St. Kitts] St. Vincent and Grenadines [St. Vincent] CENTRAL AMERICA: Nicaragua NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador, Peru"

Qsn #	Question	Answer
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 18 Jul 2018]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. Flora of China. Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Epiphytic on trees in dense forests or thickets; 600–1500 m."
	Lok, A. F. S. L., Ang, W. F., & Tan, H. T. (2011). The rediscovery in Singapore of <i>Polystachya concreta</i> (Jacq.) Garay & HR Sweet (Orchidaceae). <i>Nature in Singapore</i> , 4: 19-24	" <i>Polystachya concreta</i> has a large altitudinal amplitude and can be found growing from sea level to about 1500 m (Comber, 1990 & 2001; Seidenfaden & Wood, 1992; Cootes, 2001; Chen et al., 2009). Because of its extremely wide distribution, it can be found in a myriad of habitats, growing as an epiphyte on tree trunks and branches in lowland tropical forest, in montane forest (Seidenfaden & Wood, 1992; Cootes, 2001), in cultivated teak forest in moist areas of Java (Comber, 1990), in open woodlands (Demissew et al., 2004), in cypress swamps, in hammocks and mangroves in Florida (Romero-González et al., 2003), and in thickets in South Yunnan (Chen et al., 2009). <i>Polystachya concreta</i> is also sometimes found growing terrestrially on podosolic soils under <i>Leptospermum</i> trees and <i>Baekia</i> shrubs in North Sumatra (Comber, 1990, 2001), and lithophytically (Cootes, 2001)."

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 18 Jul 2018]	"Native Africa WESTERN INDIAN OCEAN: Madagascar Asia-Tropical INDIAN SUBCONTINENT: India, Sri Lanka INDO-CHINA: Myanmar MALESIA: Indonesia, Philippines Northern America SOUTHEASTERN U.S.A.: United States [Florida] Southern America CARIBBEAN: Dominica, Grenada, Guadeloupe, Martinique, Montserrat, Puerto Rico, St. Kitts and Nevis, [St. Kitts] St. Vincent and Grenadines [St. Vincent] CENTRAL AMERICA: Nicaragua NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador, Peru"

Qsn #	Question	Answer
	Oppenheimer, H. 2016. New Hawaiian Plant Records for 2015. Bishop Museum Occasional Papers 118: 23–28	"Previously known as a naturalized epiphyte on O‘ahu (Staples et al. 2003: 17) and West Maui (Oppenheimer 2013: 18), this orchid was found locally common in lowland wet forest on Moloka‘i."
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	"The orchid enjoys a pan-tropical distribution (Sathish Kumar and Manilal 1994) involving southern Yunnan in China, Indochina, Thailand, Malaysia, India, Sri Lanka, Africa and tropical and subtropical America (Chen and Wood 2009), and it has been assigned over 50 botanical names (Seidenfaden 1999)."

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[Widespread natural distribution. Uncertain how much it has been introduced outside broad native range] "The orchid enjoys a pan-tropical distribution (Sathish Kumar and Manilal 1994) involving southern Yunnan in China, Indochina, Thailand, Malaysia, India, Sri Lanka, Africa and tropical and subtropical America (Chen and Wood 2009), and it has been assigned over 50 botanical names (Seidenfaden 1999)."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Oppenheimer, H. 2013. New Hawaiian plant records for 2012. Bishop Museum Occasional Papers 114: 17–20	"First collected on O‘ahu (Staples et al. 2003: 17), this epiphyte had not been previously documented in Hawai‘i. on West Maui, it is found growing 1.5–3.0 m above ground level, mostly on <i>Dodonaea viscosa</i> Jacq., and less frequently on <i>Metrosideros polymorpha</i> Gaudich., in degraded <i>Metrosideros/Dicranopteris</i> lowland Wet Forest. As on O‘ahu, the site is also in the vicinity of a hiking trail but is obviously not under cultivation. All size classes are present. it has also been observed recently in Hilo (F. duvall, pers. comm.). <i>Polystachya</i> Hook. is a genus of 150–200 species (laCroix 2008: 376), and <i>P. concreta</i> is possibly the most widespread orchid known (Shuttleworth et al. 1989: 83), with its distribution reported to be Brazil to Florida and the Caribbean, Africa, and parts of Asia (Pridgeon 2006: 238). As such, it apparently has the potential to be weedy, and its distribution in Hawai‘i seems to support this assumption. Material examined. MAUI: West Maui, Lahaina distr, Pu‘u Ka‘eo, between Honolua Valley & Mokupe‘a Gulch, 396 m, epiphytic on dying <i>Dodonaea viscosa</i> , 7 Aug 2010, J. Ward & K. Marchello 1 (BiSH); leeward slope of Pu‘u Ka‘eo, 500 m, 3 Sep 2010, Oppenheimer H91005."

Qsn #	Question	Answer
	Staples, G. W., Imada, C.T. & Herbst, D. R. 2003. New Hawaiian plant records for 2001. Bishop Museum Occasional Papers. 74: 7-21	"Native across a vast area in tropical America and Asia, this variable species has an extensive synonymy that reflects multiple namings in various places where it was "discovered" (Bechtel et al., 1992). This smallish epiphyte has slender pseudobulbs 4–6 cm tall with 2–4 joints; 3 or 4 oblong-lanceolate leaves 5–14 cm long; and terminal racemes of small, fleshy, green (or pinkish, or dull red) flowers about 0.75 cm across, with a white lip, bearing 4 pollinia on the column. It is the only exclusively epiphytic orchid so far documented as naturalized in the Hawaiian Islands. The collector's notes state that the plant was growing epiphytically on a dead tree trunk about 2 m above the ground. The plant was in flower when collected; the flowers were green. However the plant was kept alive in a terrarium for some time before it was brought to Bishop Museum for identification; there were no flowers remaining by the time it was delivered. How this unobtrusive orchid came to be growing in mixed native forest along a hiking trail is unknown. Collectors are encouraged to look for this and other naturalized orchid taxa. Material examined. O'AHU: Wahiawä Distr., Schofield-Waikäne trail, in mixed native forest, 30 Apr 1998, M. Furuya, M. Sakamoto & S. Riley s. n. (BISH 652756)."
	Imada, C., Clifford, P. & Lau, J. (2011). 2010 Rare Plant Survey, O'ahu Forest National Wildlife Refuge, Waip'ō, O'ahu. Bishop Museum Technical Report 55. Honolulu, HI	" <i>Polystachya concreta</i> , an epiphytic orchid first noted as naturalizing in the Ko'olaus in 1998 along the Poamoho Trail (Staples et al. 2003), was also noted along this stretch of Kipapa Trail; it has since been vouchered as far south as Kalihi Valley in the Ko'olaus, and in the Wai'anaes at East Makaleha (Bishop Museum Herbarium database, accessed 2011)."
	Oppenheimer, H. 2016. New Hawaiian Plant Records for 2015. Bishop Museum Occasional Papers 118: 23–28	"Previously known as a naturalized epiphyte on O'ahu (Staples et al. 2003: 17) and West Maui (Oppenheimer 2013: 18), this orchid was found locally common in lowland wet forest on Moloka'i. Consistent with the reports from O'ahu and Maui, it seems to be an obligate epiphyte. Material examined. MOLOKA'I: Wailau Valley, Pūlena Stream, S side tributary, 406 m, 13 Jul 2015 Oppenheimer et al. H71513; loc. cit., 391 m, 16 Jul 2015, Oppenheimer et al. H71525."

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 to date

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 to date

304	Environmental weed	
	Source(s)	Notes

Qsn #	Question	Answer
	Staples, G. W., Imada, C.T. & Herbst, D. R. 2003. New Hawaiian plant records for 2001. Bishop Museum Occasional Papers. 74: 7-21	[Collected in mixed native forest. Could possibly compete with native epiphytes] "It is the only exclusively epiphytic orchid so far documented as naturalized in the Hawaiian Islands." ... "The collector's notes state that the plant was growing epiphytically on a dead tree trunk about 2 m above the ground. The plant was in flower when collected; the flowers were green. However the plant was kept alive in a terrarium for some time before it was brought to Bishop Museum for identification; there were no flowers remaining by the time it was delivered. How this unobtrusive orchid came to be growing in mixed native forest along a hiking trail is unknown."
	Oppenheimer, H. 2013. New Hawaiian plant records for 2012. Bishop Museum Occasional Papers 114: 17–20	[Growing in degraded native forest. Could possibly compete with native epiphytes] "this epiphyte had not been previously documented in Hawai'i. on West Maui, it is found growing 1. –3.0 m above ground level, mostly on <i>Dodonaea viscosa</i> Jacq., and less frequently on <i>Metrosideros polymorpha</i> Gaudich., in degraded <i>Metrosideros/Dicranopteris</i> lowland Wet Forest." ... "P. <i>concreta</i> is possibly the most widespread orchid known (Shuttleworth et al. 1989: 83), with its distribution reported to be Brazil to Florida and the Caribbean, Africa, and parts of Asia (Pridgeon 2006: 238). As such, it apparently has the potential to be weedy, and its distribution in Hawai'i seems to support this assumption."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence to date

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

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. Flora of China. Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Plants 10–29 cm tall. Pseudobulbs usually slightly compressed, ovoid to conic, 1–2 × 0.5–1.5 cm, with 2 or 3 nodes. Leaves 3–5, narrowly oblong or narrowly ovate-lanceolate, 7– 18 × 1.2–3.4 cm, base narrowed into a petiole and then decurrent into a sheath, apex obtuse or unequally shallowly 2-lobed."

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. Epiphytic

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. Flora of China. Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Epiphytic on trees in dense forests or thickets" [Orchidaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. Flora of China. Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Palatability unknown] "Epiphytic on trees in dense forests or thickets"

405	Toxic to animals	n
	Source(s)	Notes
	Pridgeon, A. M., Cribb, P. J., Chase, M. W. & Rasmussen, F. N. (2014). Genera Orchidacearum Volume 6: Epidendroideae Part 3. Oxford University Press, Oxford, UK	[No evidence] "In West Africa, pseudobulbs of many species of <i>Polystachya</i> were reportedly used in the preparation of aphrodisiacs (Lawler 1984). Occasionally the showier species such as <i>P. bella</i> Summerh., <i>P. galeata</i> (Sw.) Rchb.f., and <i>P. pubescens</i> are available in the horticultural trade."
	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 in genus

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Zettler, J. A., Zettler, L. W., & Richardson, L. W. (2012). Pestiferous scale insects on native epiphytic orchids in South Florida: a new threat posed by introduced species. <i>Southeastern Naturalist</i> , 11(1), 127-134	"The presence of soft scales (<i>Pulvinaria</i> sp.) and mealybugs (<i>Ferrisia</i> sp.) on the Ghost Orchid in 2009, coupled with the recovery of scales on epiphytic orchids at all three sites the following year, suggests that these pests have gained a foothold in the Big Cypress Basin eco-region." ... "Of the three scale species collected (Brown Soft Scale, Orchid Pit Scale, Boisduval Scale), all are exotic. Brown Soft Scale is an Old World polyphagous pest with a cosmopolitan distribution (Miller et al. 2005). The Boisduval and Orchid Pit Scales are both from tropical America (Balachowsky 1954, Stumpf 2000) and commonly infest orchids in cultivation. Direct feeding by scale insects can weaken and kill orchid plants (Johnson 2010), and introduced scale species are of considerable concern (Miller et al. 2005)." ... "one orchid seedling (<i>P. concreta</i>) was found to be infested with scales in such an area (Cochran Lake)."
	Zettler, J. A., Adams, K., Frederick, B., Gutting, A., Ingebretsen, N., Ragsdale, A., & Schrey, A. (2017). Genetic structure of <i>Pseudococcus microcirculus</i> (Hemiptera: Pseudococcidae) populations on epiphytic orchids in south Florida. <i>Journal of Genetics</i> , 96(1), 33-38	"Within the Fakahatchee (site F), mealy bugs were collected from <i>E. rigidum</i> , <i>P. concreta</i> , and the reintroduced cigar orchid <i>Cyrtopodium punctatum</i> (L.) Lindl. At McBride's pond, mealy bugs were found on <i>P. concreta</i> plants."

407	Causes allergies or is otherwise toxic to humans	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[No evidence] "Herbal Usage: The tuber is used to treat arthritis by tribals of the Niyamgiri Hills in Orissa, India. Approximately 100 mg. of fresh tuber is boiled in 500 ml. water until the volume is reduced to 100 ml, and 3–4 ml of this decoction is taken with 7–8 drops of honey twice daily on an empty stomach as treatment for arthritis (Dash et al. 2008)." ... "Fifteen species of <i>Polystachya</i> were tested for the presence of alkaloids and all the tests read negative (Luning 1974a, b). Although the orchid is present in China, it has no medicinal usage there."
	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 in genus

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Lok, A. F. S. L., Ang, W. F., & Tan, H. T. (2011). The rediscovery in Singapore of <i>Polystachya concreta</i> (Jacq.) Garay & HR Sweet (Orchidaceae). <i>Nature in Singapore</i> , 4: 19-24	[No evidence. Unlikely as an epiphyte to contribute significantly to fuel load] "Because of its extremely wide distribution, it can be found in a myriad of habitats, growing as an epiphyte on tree trunks and branches in lowland tropical forest, in montane forest (Seidenfaden & Wood, 1992; Cootes, 2001), in cultivated teak forest in moist areas of Java (Comber, 1990), in open woodlands (Demissew et al., 2004), in cypress swamps, in hammocks and mangroves in Florida (Romero-González et al., 2003), and in thickets in South Yunnan (Chen et al., 2009)."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	African Orchids. (2013). Cultivation of <i>Polystachya concreta</i> (Jacq.) Garay & H.R.Sweet. http://www.africanorchids.dk . [Accessed]	"Light: 2500-3500 fc. Light should be filtered or diffused, and plants should not be exposed to direct midday sun. Strong air movement should be provided at all times."
	Leighton Photography & Imaging. (2018). Yellow helmet orchid. <i>Polystachya concreta</i> . https://leightonphotography.photoshelter.com . [Accessed 19 Jul 2018]	"Spectacular specimen of yellow helmet orchid in an isolated pond in Collier County, Florida. These orchids are usually found in wetlands with lots of shade."
	Lok, A. F. S. L., Ang, W. F., & Tan, H. T. (2011). The rediscovery in Singapore of <i>Polystachya concreta</i> (Jacq.) Garay & HR Sweet (Orchidaceae). <i>Nature in Singapore</i> , 4: 19-24	[Epiphyte & sometimes grows under trees. Likely tolerant of both light & shade] "Because of its extremely wide distribution, it can be found in a myriad of habitats, growing as an epiphyte on tree trunks and branches in lowland tropical forest, in montane forest (Seidenfaden & Wood, 1992; Cootes, 2001), in cultivated teak forest in moist areas of Java (Comber, 1990), in open woodlands (Demissew et al., 2004), in cypress swamps, in hammocks and mangroves in Florida (Romero-González et al., 2003), and in thickets in South Yunnan (Chen et al., 2009). <i>Polystachya concreta</i> is also sometimes found growing terrestrially on podosolic soils under <i>Leptospermum</i> trees and <i>Baekia</i> shrubs in North Sumatra (Comber, 1990, 2001), and lithophytically (Cootes, 2001)."

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Lok, A. F. S. L., Ang, W. F., & Tan, H. T. (2011). The rediscovery in Singapore of <i>Polystachya concreta</i> (Jacq.) Garay & HR Sweet (Orchidaceae). <i>Nature in Singapore</i> , 4: 19-24	[Primarily an epiphyte] "it can be found in a myriad of habitats, growing as an epiphyte on tree trunks and branches" ... " <i>Polystachya concreta</i> is also sometimes found growing terrestrially on podosolic soils under <i>Leptospermum</i> trees and <i>Baeckia</i> shrubs in North Sumatra"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. <i>Flora of China</i> . Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Plants 10–29 cm tall. Pseudobulbs usually slightly compressed, ovoid to conic, 1–2 × 0.5–1.5 cm, with 2 or 3 nodes." ... "Epiphytic on trees in dense forests or thickets" [An epiphyte, but growth form is not vining. No evidence that this plant smothers supporting vegetation]

412	Forms dense thickets	n
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. <i>Flora of China</i> . Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Epiphytic on trees in dense forests or thickets"

501	Aquatic	n
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. <i>Flora of China</i> . Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Epiphytic on trees in dense forests or thickets"

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 18 Jul 2018]	Family: Orchidaceae Subfamily: Epidendroideae Tribe: Vandaeae

503	Nitrogen fixing woody plant	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 18 Jul 2018]	Family: Orchidaceae Subfamily: Epidendroideae Tribe: Vandaeae

Qsn #	Question	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[Herbaceous, with tuberous root, but grows as an epiphyte] "Pseudobulbs are short, with a few internodes and 3–4 leaves which are oblong-lanceolate, 8–20 by 1–2.5 cm" ... "It is epiphytic on trees in dense forests" ... "The tuber is used to treat arthritis by tribals of the Niyamgiri Hills in Orissa, India."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[No evidence] "The orchid enjoys a pan-tropical distribution (Sathish Kumar and Manilal 1994) involving southern Yunnan in China, Indochina, Thailand, Malaysia, India, Sri Lanka, Africa and tropical and subtropical America (Chen and Wood 2009),..."

602	Produces viable seed	y
	Source(s)	Notes
	Oppenheimer, H. 2013. New Hawaiian plant records for 2012. Bishop Museum Occasional Papers 114: 17–20	"All size classes are present." [Presumably produces seeds]
	Ackerman, J. 2012. Orchids gone wild. Orchids, 81(2): 88-93	"Except for localized vegetative reproduction, propagule pressure is directly related to pollination success. Fruit production is high in <i>Polystachya concreta</i> , which will likely become one of the most common naturalized species in Hawaii."
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[General description] "Orchid seeds are present by the thousands in many orchid fruits. Wind dispersal is capable of distributing such seeds across long distances, so theoretically they should become established over vast areas, wherever suitable ecological conditions are present."

603	Hybridizes naturally	
	Source(s)	Notes
	Russell, A., Samuel, R., Klejna, V., Barfuss, M. H., Rupp, B., & Chase, M. W. (2010). Reticulate evolution in diploid and tetraploid species of <i>Polystachya</i> (Orchidaceae) as shown by plastid DNA sequences and low-copy nuclear genes. <i>Annals of Botany</i> , 106(1), 37-56	[Unknown if natural hybridization occurs] "A combination of cloning duplicate gene copies in allotetraploids and consensus network comparison of gene trees allowed a phylogenetic framework for reticulation in <i>Polystachya</i> to be built. There was little evidence for homoploid hybridization, but our knowledge of the origins and relationships of three groups of allotetraploids are greatly improved by this study. One group showed evidence of multiple long-distance dispersals to achieve a pantropical distribution; another showed no evidence of multiple origins or long distance dispersal but had greater morphological variation, consistent with hybridization between more distantly related parents."

604	Self-compatible or apomictic	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Pansarin, E. R., & Amaral, M. D. C. E. (2006). Reproductive biology and pollination of two species of <i>Polystachya</i> Hook. in southeastern Brazil: evidence of pseudocleistogamy in <i>Polystachyaeae</i> (Orchidaceae). <i>Brazilian Journal of Botany</i> , 29(3), 423-432	" <i>Polystachya estrellensis</i> and <i>P. concreta</i> are self-compatible. The majority of flowers of <i>P. estrellensis</i> (96,7%) is cleistogamous, while <i>P. concreta</i> produces only chasmogamous flowers."

605	Requires specialist pollinators	Y
	Source(s)	Notes
	Pridgeon, A. M., Cribb, P. J., Chase, M. W. & Rasmussen, F. N. (2014). <i>Genera Orchidacearum Volume 6: Epidendroideae Part 3</i> . Oxford University Press, Oxford, UK	"Deceit pollination is the rule in nectarless <i>Polystachya</i> and specifically generalized food deception." ... "Goss (1977) described the pollination of <i>P. flavescens</i> (Blume) J.J.Sm. (= <i>P. concreta</i>) by female halictid bees of the species <i>Dialictus creberrimus</i> . They landed on the hinged lip and lateral sepals and collected pseudopollen for a few seconds, storing it in their scopae, and then backed out of the flower. The pollinarium was deposited on the thorax of the bee. On later visits to another flower, the pollinarium was deposited on the stigma. Goss observed 10% seed-set, attributing none of it to autogamy."
	Van Der Cingel, N.A. 2001. <i>An atlas of orchid pollination: America, Africa, Asia and Australia</i> . A.A. Balkema, Rotterdam, Netherlands	"This genus of about 100 species is primarily African, with secondary centres in Asia and America. It is known to be pollinated by small bees that gather pseudopollen from the lip." ... "This genus is known to be pollinated by small bees that gather pseudopollen. According to Dressler this is probably the pollination system of most species. For the pollination of the widespread <i>Polystachya flavescens</i> , see North America. This epiphytic species is in the tropics (Surinam) often found on <i>Curatella americana</i> . <i>P. concreta</i> (= <i>P. lu-teola</i> , - <i>P. flavescens</i>) is autogamous in the West Indies. <i>P. foliosa</i> of Puerto Rico is also self-pollinating "

Qsn #	Question	Answer
	Pansarin, E. R., & Amaral, M. D. C. E. (2006). Reproductive biology and pollination of two species of <i>Polystachya</i> Hook. in southeastern Brazil: evidence of pseudocleistogamy in <i>Polystachyaeae</i> (Orchidaceae). <i>Brazilian Journal of Botany</i> , 29(3), 423-432	[Pollinated by solitary and social small native bees. Pollinator dependent] "Phenology, floral biology, pollinators, breeding system and natural fruit set of <i>Polystachya estrellensis</i> Rchb. f. and <i>P. concreta</i> (Jacq.) Garay & H. R. Sweet were studied in mesophytic forests at Serra do Japi, and in mangroves at a seashore plain at Picinguaba, respectively. Both study areas are natural reserves in southeastern Brazil. Both species flower in summer, are epiphytes and produce terminal inflorescences with up to 150 non-resupinate flowers. The flowers produce a citric fragrance, mainly in the warmest hours of the day. Both species are pollinated by solitary and social small native bees, which collect pseudopollen from the lip of the flowers. The pollinarium is placed frontally on the head of the bees, when they are collecting pseudopollen. <i>Polystachya estrellensis</i> and <i>P. concreta</i> are self-compatible. The majority of flowers of <i>P. estrellensis</i> (96,7%) is cleistogamous, while <i>P. concreta</i> produces only chasmogamous flowers. The cleistogamous flowers of <i>P. estrellensis</i> present dimensions and number of floral elements identical to the chasmogamous, a phenomenon called pseudocleistogamy. The chasmogamous flowers of <i>P. estrellensis</i> , as well as all flowers of <i>P. concreta</i> are pollinator dependent. The natural fruit set of <i>P. estrellensis</i> was higher than that of <i>P. concreta</i> as a consequence of pseudocleistogamy. In mesophytic forests of the Serra do Japi, in which the fruit set of several orchid species is low, mainly because of pollinator scarcity, the strategy presented by <i>P. estrellensis</i> is an important factor that increases the reproductive success of this species, compared with to the non-autogamous members of <i>Epidendroideae</i> that occur in the same region."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Wu, Z. Y., Raven, P. H. & Hong, D. Y. eds. 2009. <i>Flora of China</i> . Vol. 25 (Orchidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Unknown if plant spreads vegetatively] "Plants 10–29 cm tall. Pseudobulbs usually slightly compressed, ovoid to conic, 1–2 × 0.5–1.5 cm, with 2 or 3 nodes."

607	Minimum generative time (years)	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown

Qsn #	Question	Answer
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[Unlikely. Although seeds may be small & easily dispersed by wind, they are not likely to be inadvertently dispersed to epiphytic substrates attached to clothing, or equipment] "It is epiphytic on trees in dense forests at 600–1500 m and very common in the hills of Tamil Nadu above 1200 m (Matthew 1995). In Sri Lanka, it is found in montane forests and also on imported or domesticated trees like Samanea saman (rain tree), Hevea brasiliensis (rubber), Mangifera indica (mango) and Artocarpus heterophyllus (jackfruit) (Jayaweera 1981)."
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	La Croix, I. F. 2008. The New Encyclopedia of Orchids: 1500 Species in Cultivation. Timber Press, Portland, OR	Cultivated as an ornamental
703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. If cultivated with other ornamental plants, small, wind-dispersed seeds could theoretically be moved in soil with potted plants. Evidence lacking to date
704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Russell, A. (2010). Molecular phylogeny, genome evolution and biogeography of <i>Polystachya</i> (Orchidaceae). PhD Dissertation. University of Vienna, Wien, Austria	"Orchid seeds are released in great quantities. They are small with an internal air space reducing their density, and appear well-adapted for wind-dispersal."
	Teoh, E. S. (2016). Medicinal Orchids of Asia. Springer, Switzerland	[Family description] "Orchid seeds are present by the thousands in many orchid fruits. Wind dispersal is capable of distributing such seeds across long distances, so theoretically they should become established over vast areas, wherever suitable ecological conditions are present."
705	Propagules water dispersed	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Although small, wind-dispersed seeds could probably be moved by water, they are unlikely to establish in suitable epiphytic sites.

Qsn #	Question	Answer
706	Propagules bird dispersed	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unlikely. Small, wind-dispersed seeds establish in epiphytic sites & could potentially be dispersed by adhering to birds.
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unlikely. Small, wind-dispersed seeds could possibly adhere to birds or bats & establish in appropriate epiphytic sites, but this is probably a rare event.
708	Propagules survive passage through the gut	n
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unlikely to be consumed or to survive gut passage
801	Prolific seed production (>1000/m ²)	y
	Source(s)	Notes
	Ackerman, J. 2012. Orchids gone wild. <i>Orchids</i> , 81(2): 88-93	"Except for localized vegetative reproduction, propagule pressure is directly related to pollination success. Fruit production is high in <i>Polystachya concreta</i> , which will likely become one of the most common naturalized species in Hawaii."
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown
803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2018. 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
	WRA Specialist. 2018. Personal Communication	Unknown

Qsn #	Question	Answer
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

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized on Oahu, Molokai, & Maui (Hawaiian Islands)
- Establishes in native forest; could potentially compete with native epiphytes
- Shade-tolerant
- Reproduces by seeds
- Self-compatible
- Seeds dispersed by wind & intentionally by people
- Prolific seed production
- Gaps in biological & ecological information may limit accuracy or risk prediction

Low Risk Traits

- Despite naturalization, no reports of negative impacts to date
- Unarmed (no spines, thorns, or burrs)
- Ornamental
- Requires specialized pollinators (although fruit production apparently not limiting factor in Hawaiian Islands)

Second Screening Results for Herbs or Low Stature Shrubby Life Forms

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