ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PMORC1C060
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Hexalectris colemanii* (Catling) A.H. Kennedy and L.E. Watson
COMMON NAME: Coleman's coral-root
SYNONYMS: *Hexalectris revoluta* var. *colemanii* Catling, *Bletia colemanii* (Catling) Sosa & M.W. Chase
FAMILY: Orchidaceae

AUTHOR, PLACE OF PUBLICATION: *Hexalectris colemanii* (Catling) A. H. Kennedy & L. E. Watson, Systematic Botany 35(1), 2010, p. 74. *H. revoluta* var. *colemanii* Catling, 2004 The Native Orchid Conference Journal 1(2): 5-25.

TYPE LOCALITY: U. S. A. Arizona: Pima County. Northern Santa Rita Mountains, McCleary Canyon, elevation 5,000', T18S, R16E.

TYPE SPECIMEN: *Steven P. Mclaughlin 344*, 3 May 1986 (holotype: ARIZ!).

TAXONOMIC UNIQUENESS: The species *Hexalectris colemanii* is one of four species of *Hexalectris* that occurs in Arizona, and one of nine in the United States and Mexico. The other three *Hexalectris* in Arizona are *H. arizona, H. parviflora* and *H. warnockii*. The species *H. colemanii* previously was considered a variety of *H. revoluta*, but based on phylogenetic work by Kennedy and Watson (2010), they concluded that *H. colemanii* belongs under its own species and not be placed under *H. revoluta*. Some individuals in the scientific community are in general agreement that populations referred to as *H. colemanii* should be circumscribed within their own taxon, but other scientists feel that there are not enough data to properly place the taxon as a species opposed to a variety; still others suggest subspecies as appropriate. Dr. Marc Baker (2012) believes that until there is evidence to the contrary, *H. colemanii* be recognized as a species. He believes that the correlation between morphological characteristics and geographic isolation (more than 500 km between populations of *H. colemanii* and *H. revoluta*) alone is compelling (Baker 2012). Sosa and Chase (2020) proposed the new name combination of *Bletia colemanii* (Watson) Sosa & M.W. Chase for this species but this proposed change has not been widely adopted.

DESCRIPTION: Herbaceous perennial forming a short segmented, nearly white, vertical rhizome, about 1 cm in diameter. At each segment base, there is a sheath clasping nearly the entire circumference of the rhizome. Small branches often arise from one or more segments. After several years, flowering stems develop, reaching 55 cm in height. They are erect, cream to pale pink in color, with up to six reduced leaves or bracts that are well spread along the stem below the inflorescence. Bracts are brown and end in a narrowly triangular tip, and are

turned about 90° with respect to each other. Flowers, up to 19, occur along the upper one third of the stem; each turned about 90° from the one below it. Each flower is subtended by a bract that is up to 12 mm long and ends in a narrow tip. The narrow ovary occurs below the sepals and is attached to the stem with a short stalk. Flowers are turned 180° by the twisting of the flower stock, as in most orchids. Sepals and petals have a base color of almost white, but are variously tinged with pink and yellow. The veins are pale shades of maroon, which generally bleeds into the spaces between them. The sepals are narrow (to 5 mm broad), up to 25 mm long, often slightly more yellow tinged than the petals, and coiled back onto itself in the upper half. The two upper (toward the top of the plant at flowering time) petals are slightly shorter than the sepals and coiled in a similar manner. The lower lip or petal appears dark magenta to maroon from copious amounts of color along and between the veins, the nearly white color showing primarily between the veins toward the base of the lip. There is a broad, short lobe on each side and toward the base of the lip and often a very narrow low ridge along the center of the lip. The stamens and pistil (as in all orchids) are fused into a single structure called a column, which in this case is almost white, slightly curved, thick, narrow, and about 15 mm long. A small flap of tissue derived from a sterile stigma lobe called a rostellum, occurs on the lower surface of the column near its tip. The rostellum separates the fertile stigma lobes from the stamens, creating a preventative barrier to self fertilization (Baker 2012).

AIDS TO IDENTIFICATION: "Within the genus, individuals of *Hexalectris arizonica, Hexalectris parviflora* and *H. warnockii* have been recorded within the range of *H. colemanii* (Kennedy and Watson 2010). Individuals of *H. colemanii* differ from those of *H. arizonica* in having thinner perianth parts and an acute instead of rounded apex of the central lobe of the lip and in bearing a rostellum. Individuals of *H. warnockii*, which generally flowers in August (July at the earliest), are very unique with pronounced keels that are irregularly scalloped and broken toward the apex of the midlobe. Also their petals are purple or maroon, linear- or lanceolate-falcate, and not revolute." (Baker 2012).

ILLUSTRATIONS:

Photos and line drawings of flower and lip (Coleman 1999).
Color photos of flower, habit and habitat (R.A. Coleman, 2002, Plate 12 as *H. revoluta*)
Color photos of flower, habit and habitat (P.M. Catling, 2004, Figures 11-13 as *H. revoluta* var. *colemanii*)
Color photos of plants and habitat (in Baker, 2012, Appendix 2.)
Color photos of plants and habitat (Westland Resources, Inc., 2012, Appendix B.)
Color photos of plants: https://swbiodiversity.org/seinet/taxa/index.php?taxon=168071

TOTAL RANGE: Sky Islands of southeastern Arizona (Cochise, Pima and Santa Cruz counties), and extreme southwest New Mexico (Hidalgo County).

RANGE WITHIN ARIZONA: Before 2010, populations were known from the Baboquivari Mountains, Dragoon Mountains, and Santa Rita Mountains. Recent attempts by Ron Coleman to find individuals in the original Toolin site in the Baboquivari Mountains

were unsuccessful (Baker 2012). Surveys conducted from 2010 to 2012 by Westland Resources, Inc., Coleman, and Baker (Baker 2012, Westland Resource, Inc. 2012), have re-confirmed populations in the Dragoon and Santa Rita mountain ranges. Additionally, Baker and Westland Resources found new populations in the Peloncillo, Chiricahua, Patagonia, and Whetstone mountains (Westland Resources, Inc., 2012).

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Terrestrial, mycoheterotrophic.

PHENOLOGY: Adapted to arid and hot conditions, individuals remain underground in the form of tubers for most of the year and send out above-ground spikes from mid-May to mid-June. The variability in numbers of individuals found among survey years in any one site may best be explained by inflorescence production. Inflorescence production is generally unpredictable, and varies greatly based on temperature, nutrient availability, and rainfall, or a mixture of these factors (Hill 2007).

BIOLOGY: As with other species in *Hexalectris*, *H. colemanii* is an obligate mycoheterotrophic, meaning they obtain carbon exclusively from mycorrhizal fungi. Many of these mycorrhizal relationships are species specific, which seems to be the case with *H. colemanii* and the host plant *Quercus* (Kennedy et al. 2011, Taylor et al. 2003). The number of above ground stems that appear in a population is apparently very variable and can fluctuate greatly from one year to the next. Individuals of *H. colemanii* possess a rostellum that prevents the kind of self-pollination characteristic of *H. arizonica* (Catling 2004). Surveyors have observed a lack of insect visitors, which leads to possible night time pollination of flowers. Research on predation by insects and animal herbivory is lacking.

Recent molecular work has demonstrated that within the *Hexalectris* genus, the loss of photosynthetic capabilities has occurred independently among members of the genus as many as five times (Barrett et al. 2019); specifically for *H. colemanii,* photosynthetic losses has occurred within the past 10 million years.

Other recent phylogenetic analyses (Sosa et al. 2016) suggest that Mexico and Central America are the ancestral areas for *Hexalectris*; their recent expansion into the arid west most likely occurred as a result of (and was enabled by) their shift from epiphytism to a terrestrial life form.

HABITAT: Occupied habitats for *H. colemanii* are similar throughout the range of the species in terms of elevation and vegetation type (Madrean oak woodland). *H. colemani*i occurs most commonly in well developed stands of *Quercus arizonica*/*Quercus grisea* (Arizona white oak), where forb and grass densities are low, and areas of oak leaf litter is high (mean leaf litter depth was 4.5 cm per Westland Resources, Inc. (2012)). Individuals occur primarily on moderate to steep, rocky slopes at all aspects in canyons and drainages, where they generally are found close to bottoms of small canyons where water flows only after significant rains.

ELEVATION: Elevation occupied by *H. colemanii* ranges between 4,315 – 5,990 ft (1,315 – 1,826 m) (Baker 2012).

EXPOSURE: All aspects, with 10-64% canopy cover (Westland Resources, Inc. 2012).

SUBSTRATE: According to Baker (2012), "soils among sites varied dramatically but are generally well-drained and with the water table more than 2 m from the surface." For example, soils consist of Keysto-Riverwash Complex Stream alluvium and/or mixed fan alluvium in the Baboquivari Mountains. In the Santa Rita Mountains, soil types include Chiricahua cobbly sandy loam Residuum weathered from granodiorite and/or granite, and Tortugas-Rock outcrop complex alluvium derived from limestone. In the Whetstone Mountains, soils include gravel deposits from the Quaternary and Tertiary, and the Barkerville-Gaddes association derived from granite.

PLANT COMMUNITY: *Quercus grisea* woodland (= *Q. arizonica* woodland) and occasionally *Q. emoryi*, *Q. oblongifolia*, or *Q. rugosa* woodland. *Quercus grisea* is the most frequent and abundant vascular plant associate (Baker 2012), while according to Westland Resources, Inc. (2012), perennial grasses were the closest vascular plant, with the shrub *Rhus choriophylla* second.

Vascular plant associates of *Hexalectris colemanii* include: *Acacia biuncifera* (catclaw), *Agave palmeri* (Palmer's century plant), *Bothriochloa barbinodis* (cane bluestem), *Bouteloua curtipendula* (sideoats grama), *Bouvardia glaberrima* (firecracker bush), *Cercocarpus montanus* (mountain mahogany), *Chilopsis linearis* (desert willow), *Choisya arizonica* (Mexican orange), *Cylindropuntia spinosior* (cane cholla), *Dalea* sp., *Dasylirion wheeleri* (common sotol), *Fallugia paradoxa* (Apache plume), *Garrya wrightii* (Wright's silktassel), *Juglans major* (Arizona walnut), *Juniperus coahuilensis* (redberry juniper), *J. deppeana* (alligator juniper), *Lotus* sp., *Mimosa biuncifera* (catclaw mimosa), *Muhlenbergia emerselyi* (bullgrass), *Nolina microcarpa* (beargrass), *Opuntia chlorotica* (dollarjoint pricklypear), *O. engelmannii* (cactus-apple), *O. phaeacantha* (brown-spined pricklypear), *Pinus cembroides* (Mexican pinyon), *Prosopis velutina* (velvet mesquite), *Ptelea trifoliata* (hoptree), *Quercus emoryi* (Emory oak), *Q. grisea* (Arizona white oak), *Q. hypoleucoides* (Silverleaf oak), *Q. rugosa* (netleaf oak), *Q. toumeyanna* (Toumey oak), *Rhamnus californica* (California buckthorn), *Rhus aromatica* (skunkbush), *R. choriophylla* (sumac), *R. virens* (evergreen sumac), *Robina neomexicana* (New Mexico locust), *Sideroxylon lanuginosum* (gum bully), *Symphoricarpus oerophilus* (snowberry), *Yucca madrensis* (Schott's yucca), and *Ziziphus obtusifolia* (graythorn) (Baker 2012).

POPULATION TRENDS: Trends are unknown. Populations occur in small numbers and are somewhat geographically isolated from one another, primarily occurring in small canyons of sky island mountain ranges. Baker (2012) reports 18 general localities in Arizona and New Mexico, while Westland Resources, Inc. (2012) reports a total of 26 subpopulations. Westland

Resources, Inc. (2012) recorded a total number of 147 shoots throughout Arizona in 2012, including those found in the Peloncillo Mountains.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None

STATE STATUS: Salvage Restricted (ARS, ANPL 2016), under general protection for family Orchidaceae

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, FS Region 3 1999, 2007) as *H. revoluta*]

MANAGEMENT FACTORS: *Hexalectris colemanii* is known from only eight mountain ranges in Arizona. Overall, very little disturbance has occurred within known occupied habitat. There is very little, if any, threat from off-road vehicles, due to the remote, very rocky, and often steep locations. According to Hill (2007, in Baker 2012), "The subterranean tubers of *Hexalectris colemanii* may be subject to predation by rodents and feral pigs, while above ground portions of the plant may be vulnerable to grazing by rabbits, deer and cattle." The Rosemont Copper Company plans to open a mine that would potentially impact populations of *H. colemanii* in the Santa Rita Mountains (FS 2011, in Baker 2012). Wildfires are a threat to populations, as documented by the loss of a sizeable population due to the Lizard Fire in the Dragoon Mountains (Embrey 2022). Urban and residential developments are not thought to be a threat to the species. Specific research is lacking on the impacts of exotic species upon individuals and habitat of *H. colemanii* (Baker 2012).

Small population size poses a significant threat to its continued survival due to the potential environmental events such as prolonged drought or flooding, which may wipe out entire populations (Shaffer 1981, in Baker 2012). Kennedy and Watson (2010) noted that these orchids need specific fungi to grow and reproduce. Any factors that affect the fungus or fungi would affect the orchid, including moisture levels within the soil/leaf litter layer.

CONSERVATION MEASURES TAKEN: *Hexalectris colemanii*, under *H. revoluta* var. *colemanii* was listed "Forest Service Sensitive" in 1999 and 2007.

SUGGESTED PROJECTS:

- Continue to monitor known populations and search areas of suitable habitat for new populations.
- Effects of fire is not documented, although *Quercus* woodlands generally survive ground fires. Baseline sampling before controlled burns followed by yearly post-fire sampling may be crucial for conservation efforts. Additionally, since *Quercus grisea* and related woodlands do recover after hotter fires, it may prove fruitful to conduct surveys in these

areas if and when habitat appears similar to that of known occupied habitats of *H. colemanii* (Baker 2012).
- Evidence is lacking that grazing has had negative effects on individuals of *H. colemanii*, further research in this regard may facilitate conservation efforts. If grazing proves not to be an issue (Hill 2007), then future political ramifications may be avoided.
- Small exclosures may provide protection not only from cattle, but other herbivores as well. Human impacts such as camping, hiking, and vehicle travel may be addressed in a similar fashion.
- "Very little is known about pollination in *Hexalectris*, much less in *H. colemanii*, and research in this regard is crucial for the understanding of the orchid's life cycle" (Baker 2012).
- "The further understanding of other elements of *Hexalectris colemanii* biology, such as the average life-span of an individual, specific mycorrhizal relationships, adequate substrate conditions, rate of rhizome growth, seed germination requirements, and seed dispersal mechanisms are important for conservation efforts. Research relating to some of these areas, however, would be invasive to the orchid individuals and their habitat." **"The necessary prudence must be taken when designing research projects." (Baker 2012).

LAND MANAGEMENT/OWNERSHIP: BIA - Tohono O'Odham Nation, USFS - Coronado National Forest, Private.

SOURCES OF FURTHER INFORMATION

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Ron Coleman – Tucson, Arizona.
Dr. Marc Baker – Chino Valley, Arizona.
Teague Embrey – Tucson, Arizona.

ADDITIONAL INFORMATION:

Coleman's coral-root is named in honor of Ronald A. Coleman, author of *The Wild Orchids of California* and *The Wild Orchids of Arizona and New Mexico*. According to Catling (2004), Ron Coleman provided much of the information necessary to characterize the new taxon.

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