

Tracking Rare Orchids (Orchidaceae) in Arizona

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Abstract: Twenty-six native orchid species occur in Arizona, and 14 are considered rare with fewer than 100 occurrences in the state. The author is conducting three studies covering four of the wild orchids: *Stenorrhynchos michuacanum*, *Hexalectris revoluta*, *Malaxis porphyrea*, and *M. tenuis*. The studies are ongoing so only interim results are available. Interim results indicate that plants of *S. michuacanum* and *H. revoluta* do not bloom every year, and in the latter case do not come up every year. The study on *Malaxis* is looking at recovery rates in damaged habitat, but is still in its first year.

Twenty-six native orchid species in 13 genera occur in Arizona. Fourteen are considered rare in the state, using the Nature Conservancy's ranking of relative rareness, with rankings of S1, S2, or S3 being considered rare. A ranking of S1 implies 5 or fewer occurrences in the state; S2 implies 6 to 20 occurrences; and S3 implies 21 to 100 occurrences. A list of all of the native orchids in Arizona and their rarity ranking is in Table 1. I am conducting multiyear studies on 4 of the 14 rare taxa, looking into population dynamics, flowering sequences, dormancy patterns, and recovery trends. None of the studies is complete, so only partial results are reported here, and only interim conclusions can be drawn at this stage.

Stenorrhynchos michuacanum, *Hexalectris revoluta*, *Malaxis porphyrea*, and *M. tenuis* were selected for this study for multiple reasons. Proximity to the University of Arizona in Tucson was a major reason. All of the colonies under study are less than a 2.5 hour drive from Tucson, and thus can be visited multiple times during the flowering season. A second reason was that all of these taxa are rare in the United States, and very little is known about their blooming and reproductive patterns. A third reason, although it did not apply to all the species selected, is threat of habitat destruction due to development (*H. revoluta*) or recreational (*M. tenuis* and *M. porphyrea*) use.

Methods and Results

Stenorrhynchos michuacanum (Lexarza) Lindley blooms between late September and late October on an inflorescence between 25 and 58 cm tall, with 10–30 pale green flowers with dark green stripes on the sepals, petals and lip. It grows between 1,500 and 2,134 m elevation in Madrean evergreen woodland, primarily in association with alligator juniper (*Juniperus deppeana* Steud.) A blooming plant has either three or four leaves,

from 15 to more than 20 cm long and up to 3 cm wide. Plants that do not bloom the following year are often reduced in size to one or two leaves under 10 cm in length. A common companion, essentially an indicator plant, is *Milla biflora*.

Stenorrhynchos michuacanum is distributed widely in Mexico, and it is named after the Mexican state of Michoacan. It is historically rare in the United States, occurring only in Big Bend National Park in Texas and in the southeastern Arizona counties of Cochise, Pima, and Santa Cruz.

I staked and numbered a total of 50 plants in four different colonies and have been monitoring them since 1995. The objective of this study is to determine flowering frequency and the effect flowering has on the plants. The plants are observed several times each year, and size, vigor, and bloom status are recorded.

The survey started in 1995 with 30 plants and was expanded to 50 plants in 1996 upon the discovery of additional colonies. Thirty-three plants have attempted to bloom in the 6 years the study has been ongoing, with a total of 59 blooming attempts. A blooming attempt is defined as the initiation of an inflorescence, which may or may not survive to maturity, due primarily to herbivory before anthesis. Only about 40 percent of the plants that attempted to bloom each year also tried to flower the following year, as shown in Table 2.

Seven plants bloomed 2 years in a row; three bloomed 3 years in a row, and one plant bloomed 4 years in a row. One plant that bloomed 3 years in a row and the one that has bloomed 4 years in a row bloomed in the year 2000. It is possible that successive blooms may continue in these individuals. Gaps between blooming attempts are as great as 5 years, as one plant bloomed only in the first year of the survey.

Hexalectris revoluta Correll blooms from late May to early June in canyon bottoms and on sides

Table 1. Relative rarity of Arizona's native orchids.

Species	Relative rarity*
<i>Calypso bulbosa</i> var. <i>americana</i>	AZ
<i>Coeloglossum viride</i>	
<i>Corallorhiza maculata</i>	AZ
<i>Corallorhiza striata</i>	
<i>Corallorhiza wisteriana</i>	
<i>Cypripedium parviflorum</i>	
<i>Epipactis gigantea</i>	AZ
<i>Goodyera oblongifolia</i>	
<i>Goodyera repens</i>	AZ
<i>Hexalectris revoluta</i>	W
<i>Hexalectris spicata</i> var. <i>arizonica</i>	AZ
<i>Hexalectris spicata</i> var. <i>spicata</i>	
<i>Hexalectris warnockii</i>	W
<i>Listera convallarioides</i>	AZ
<i>Malaxis corymbosa</i>	US
<i>Malaxis porphyrea</i>	W
<i>Malaxis soulei</i>	US
<i>Malaxis tenuis</i>	
<i>Platanthera limosa</i>	US
<i>Platanthera purpurascens</i>	W
<i>Platanthera sparsiflora</i>	
<i>Platanthera zothecina</i>	
<i>Schiedeella arizonica</i>	
<i>Spiranthes delitescens</i>	W
<i>Spiranthes romanzoffiana</i>	US
<i>Stenorrhynchos michuacana</i>	

AZ = rare in Arizona

US = rare in United States

W = rare throughout its range

Table 2. Repeat bloom attempts for *Stenorrhynchos michuacana*.

Year	Number attempting bloom	Percent attempting repeat bloom in next year
1996	20	30
1997	8	50
1998	12	42
1999	10	40
Avg repeat bloom attempts		40.5

of canyons between 1370 and 1525 m elevation, under oaks and mesquite, often in association with Arizona walnut. Like all members of *Hexalectris* Rafinesque, it is a mycotrophic plant that appears above ground only to bloom. Up to 20 tan to pinkish flowers appear on a slender spicate, sparsely flowered, pale cream to tan leafless stem that ranges from 20 to more than 50 cm tall. Four to five bracts sheath the stem. Each flower is approxi-

mately 2 cm x 2 cm. The sepals and petals are free and spreading and are rolled back along the outer third of their length to form a tight circle, a feature that can be used to distinguish it from any of the other *Hexalectris* in Arizona and New Mexico. The three-lobed lip is whitish tan to rose tan. The lateral lobes have distinct purple veining. The central lobe has five to seven raised purple ridges running its entire length, from near the column to the apex.

Hexalectris revoluta is extremely rare throughout its range, which is limited to portions of northern Mexico, the Big Bend area of Texas, and southeastern Arizona. It was discovered only relatively recently in Arizona. Voucher specimens of *H. revoluta* from Pima County deposited at the University of Arizona Herbarium in Tucson were collected in Baboquivari Canyon by Toolin and Reichenbacher in 1981 and in McCleary Canyon by McLaughlin in 1986. Both were originally identified as *H. spicata* based on keys in published floras of Arizona available at the time. The flowers of *H. spicata* and *H. revoluta* are similar and dried specimens are sometimes difficult to distinguish. After studying fresh material in the field, the plants were identified as *H. revoluta* (Coleman 1999). There are now three documented locations of *H. revoluta* in Arizona, although the plant has not been observed at the Baboquivari location since the original discovery, despite repeated searches.

The discovery of *H. revoluta* in Arizona represents a western range extension of approximately 290 miles (483 km) and a northern range extension of approximately 210 miles (350 km) from Big Bend National Park in Brewster County, Texas. It is not known from New Mexico. *Hexalectris revoluta* is not currently a candidate for federal endangered species status, but should be considered for listing due to rareness across its range. The McCleary Canyon location was included within the boundaries of land being considered for trade from the Forest Service to a mining developer, but that trade was not completed.

I have been studying blooming patterns at two sites of *H. revoluta* since 1996: the McCleary Canyon site in Pima County, and the Sawmill Canyon site in Santa Cruz County. The number of plants appearing above ground fluctuates widely from year to year as shown in Table 3, but has been going monotonically downward since 1997. Rarely does a plant bloom 2 years in a row. The reason for the decreasing number of plant appearances could possibly be the lack of winter rainfall over the past several years. Other mycotrophic orchids in the

Table 3. Blooming patterns of *Hexalectris revoluta* at two sites in Arizona.

	1996	1997	1998	1999	2000
Site 1	1	19	9	2	1
Site 2	–	30	12	8	0

Note: Site 2 not found until 1997.

southwestern United States are also down significantly over that same period.

Five species of the genus *Malaxis* Swartz grow in the southwestern United States. All five appear above ground after the onset of the summer monsoon rains and bloom from about mid-July to early September. *Malaxis wendtii* Salazar has the smallest penetration into the United States, occurring only in the Big Bend area of Texas. *Malaxis soulei* L. O. Williams is the most numerous and widespread. It occurs in west Texas and in mountainous regions of New Mexico and Arizona, often in dense colonies. In the United States *M. corymbosa* (S. Watson) Kuntze occurs only in southeastern Arizona, but it is more widespread in Mexico. The remaining two species in the Southwest, *M. porphyrea* (Ridley) Kuntze and *M. tenuis* (S. Watson) Ames, are the subjects of a study initiated in the spring of 2000.

Malaxis porphyrea shows up in current floras as *M. ehrenbergii* (Reichenbach f.) Kuntze. Todsen (1997) established that the correct name is *M. porphyrea*. The 15–35 cm tall plants have a single ovate, acute leaf partway up the stem and a terminal spicate inflorescence. The purple flowers are the smallest orchid flowers in Arizona. The sepals, petals, and lip are covered with tiny raised bumps, or half-spheres. The sagittate lip has a cream to whitish yellow central portion, with the margins purple. The tiny translucent petals are wispy and all but invisible to the unaided eye.

Malaxis porphyrea grows in northern Mexico and in Arizona and New Mexico in mixed oak, fir, and pine forest between 2100 and 2800 m elevation. Its most common habitat is near damp, mossy, or grassy places in slightly open areas in the forest and on the edges of meadows, usually in association with iris species.

Malaxis tenuis grows in the same habitat as *M. porphyrea*, but is much more restricted in distribution. *Malaxis tenuis* occurs only in the Catalina and Chiricahua mountain ranges in Arizona, and only from three historical locations in New Mexico. Two of the New Mexico locations are probably extirpated, with only a few plants at the remaining location in Catron County. Its situation in Arizona

is only slightly more secure. There are less than two dozen plants in the Santa Catalina Mountains, although there are several hundred in the Chiricahua Mountains.

Malaxis tenuis gets up to 18 cm tall with a single ovate leaf about 6 cm from the ground. The spicate terminal inflorescence is cylindrical, 3–5 cm in length. Most of the tiny green flowers are held horizontally with the lip pointing outward, but others face up, down, and sideways. The flowers are about 1 cm long, but only 2 mm wide. The sagittate lip has four dark green stripes, one on each edge and two toward the middle. The dorsal sepal is solid green, but the lateral sepals have faint dark green striping. The tiny petals are filiform and translucent, and they fold behind the dorsal sepal.

The greatest concentration of both *M. porphyrea* and *M. tenuis* in the United States is in the Chiricahua Mountains in Cochise County, Arizona. I have monitored the plants there every year since 1995. One of the meadows near the burn limit of the Rattlesnake Canyon fire had the highest concentration of these two species in the United States. In 1998 I observed campers parked on the meadow with their vehicle, tent, and equipment directly on top of the area with the highest density of plants. In late summer of 1999 that same area was significantly damaged, most likely by foraging deer or human excavation, with 20–30 cm of top soil removed from several square meters of meadow, and slightly less, but still major damage to adjacent square meters of the orchid colony. The plants had not been counted prior to the damage so the number lost is not known. I estimate that nearly half of the colony was lost, approximately 100 plants.

The Coronado National Forest granted permission to establish a study plot at the site. The objectives of the study are to determine recovery rates in the damaged area, and to try to deduce information on the rate of spread of the orchids. I staked out a double perimeter, with the inner perimeter enclosing the area of total damage, and the outer area partial damage. The total damage

area had top soil removed to a depth greater than 4 cm, greater than the depth of the orchids' rhizomes, so no orchids could have survived. The outer perimeter marked the area where the soil was disturbed, but not to as great a depth, so orchids may have survived. An undisturbed area will also be monitored as a control.

In the summer of 2000 only one orchid came up in the study area, and it did not bloom. This may indicate that the area of total damage is much larger than first estimated. However, orchids take a long time to reproduce, and it will be many years before results are available from this study on *M. porphyrea* and *M. tenuis*.

Discussion

Except for the long-term study on *Spiranthes delitescens* conducted by the Nature Conservancy

on their Canelo Hills Reserve (McClaran and Sundt 1992), orchids in the Southwest have received little formal study. Given the rarity of orchids in this fragile environment, more studies such as those reported here should be undertaken. These preliminary monitoring studies will identify blooming patterns and recovery rates in damaged areas. These data should prove of value for making land management decisions.

Literature Cited

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