ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC0J0E1
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Echinomastus erectocentrus* var. *acuñensis* (W.T. Marshall) Bravo
COMMON NAME: Acuña cactus, redspine fishhook cactus, red pineapple cactus
SYNONYMS: *Echinomastus acuñensis* W.T. Marshall, *Neolloydia erectocentra* var. *acuñensis* (W.T. Marshall) L. Benson, *Sclerocactus erectocentrus* var. *acuñensis* (Coulter) Taylor
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: *Echinomastus erectocentrus* var. *acuñensis* (W.T. Marshall) Bravo, Cactaceas y suculentas mexicanas 25(3): 65. 1980. *Echinomastus acunensis* W.T. Marshall, Saguaroland Bulletin. 7: 33. 1953.

TYPE LOCALITY: Organ Pipe Cactus National Monument, Pima County, Arizona.

TYPE SPECIMEN: Lectotype: DES. William Supernaugh, 02 Jan 1951.

TAXONOMIC UNIQUENESS: The HDMS follows USFWS publication use of the taxonomy *Echinomastus erectocentrus* var. *acunensis*. According to NatureServe (2004), "The USFWS uses the name *Echinomastus erectocentrus* var. *acunensis* in publications regarding this taxon's status under the U.S. Endangered Species Act. Kartesz (1999) does not recognize this variety, but it may be because the combination in *Sclerocactus erectocentrus* has not been made (it is not in the Gray Card Index, internet version, June 28, 2001).

Summary of bibliographic citation and taxon history: W.T. Marshall partially described the species in his first edition of Arizona's Cactuses (1950). Marshall validly published the species in 1953 as *Echinomastus acunensis*. Lyman Benson (1969) placed the species in the genus *Neolloydia*, making it a variety of *Neolloydia erectocentra*. Hubert Earle (1980) raised the variety to a specific level, incorrectly assigning L. Benson (1969) as the authority. H. Bravo (1980) transferred the taxon back to *Echinomastus* and left it as a variety *of E. erectocentrus*. The consensus of the International Organization of Succulents (1990) is to place all of Lyman Benson's (1982) *Neolloydia* taxa into the genus *Sclerocactus* except for *N. conoidea.*"

DESCRIPTION: Cactus with solitary stems, ovoid, gray-green in color, 4.0-16.5(-27.0) x 4.0-9.0 cm (1.6-6.5(-10.6) x 1.6-3.5 in); ribs 21; areoles 15-19mm apart along ribs. Spines are distinctive, obscuring the surface of the stem; 13-16 per areole, purplish pink or nearly white with brown tips. Radial spines (11-)12-15 per areole; abaxil (shortest) radial spine 11-20 x 0.42-0.59 mm; adaxial and lateral (longest) radial spines 22-37 mm. Central spines ascending, (1-)2-3(-4) per areole, 19-44 x 0.6-0.8 mm, longest adaxial central spine curved

toward apex of plat, or sometimes slightly so; the abaxial or only central spine 25-35 mm. (eFloras, 2011). "Upper central spines ascending and converging, giving the appearance of a "red-headed crew cut" (A. Phillips, B. Phillips and N. Brian 1982). Flowers 3.6-6.0 x 4.0-9.0 cm (1.4-2.4 x 1.6-3.5 in); inner tepals pale to bright rose-pink, proximally blotched orangish brown, chestnut, maroon, or greenish brown (petaloid perianth parts coral pink to mallow per Benson (1982), or pink to purple per Rutman (1994)). Stigma lobes red to brownish red, papillae red to green. Fruits are pale green, drying to tan with several membranous scales, 1.25 cm (0.5 in.) long; opening along a dorsal slit. Black seeds are rigose.

AIDS TO IDENTIFICATION: Single plump stem and straight central spines. *Mammillaria microcarpa* has more than one stem, and hooked central spines. *Echinocereus* spp. flowers are produced on old growth, below the apex, and usually have several stems and lighter colored spines. (A. Phillips, B. Phillips and N. Brian, 1982).

ILLUSTRATIONS:

B&W photo showing tubercles and spines (Benson 1982: 795)
Herbarium photo (*In* http://ridgwaydb.mobot.org/cpcweb/CPC_ViewProfile.asp?CPCNum=13150)
Color photo and line drawing (Falk, Jenkins et al. 2001)
Color photo (Felger 2000)

TOTAL RANGE: Historically found in southern Arizona, and northern Mexico (Sonora) on the Pinacate Biosphere Reserve. Currently found in Arizona in western Pima, Maricopa, and Pinal counties. (USFWS, 2011).

RANGE WITHIN ARIZONA: Western Pima, Maricopa, and Pinal counties. Includes Organ Pipe Cactus National Monument, Ajo, and Coffee Pot Mountain. Potential habitats exist in Sand Tank Mountains of the Barry M. Goldwater Air Force Range and the Tohono O'odham tribal lands.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Flowering occurs early March to mid-April; flowering correlated with plant size, and flower production is positively associated with winter rainfall. Fruiting April to May.

BIOLOGY: The taxon is self-incompatible, thus requiring insect vectors for pollination. The primary pollinators are polylectic bee species, especially *Megachile palmensis* and *Diadasia rinconis*, which are believed to have a maximum travel distance of 900m (2,950 feet). Like most cacti, the acuña cacti are susceptible to attacks from insects. Four native insects have been documented to impact the acuña, with the cactus longhorn beetle or the opuntia borer (*Moneilema gigas*) and the cactus weevil (*Gerstaeckeria spp*) being the most responsible for

the observed population decline. Seed predation by the pyralith moth larvae (*Yosemitia graciella*) and unknown ant species also occurs. While no specific diseases have been documented as detrimental to the cactus, the plants are exceptionally susceptible to bacterial rot after minor stem damage. A variety of small mammals can severely damage or kill both mature and young cacti during times of drought (USFWS 2012).

HABITAT: Patchy populations on open, rounded small hills, benches and flats (Holm 1997-2005). Low gravelly hills, bajadas and rocky hilltops (eFloras 2011). Restricted range occurring on well-drained knolls and gravel ridges between major washes (A. Phillips, B. Phillips and N. Brian 1982).

ELEVATION: 1,200 – 3,375 feet (365 – 1150 m), Phillips et al 1982.

EXPOSURE: Open, but up to 30% slope.

SUBSTRATE: The species is associated with various bedrock types including granite or granodiorate materials, with course to fine texture. Benson (1982) reported limestone hills and flats, and Rutman (1994) andesite (bright red to white).

PLANT COMMUNITY: Arizona Upland Subdivision of Sonoran desert scrub (Palo-Verde/ Sahuaro Association). Dominant associated species include: *Ambrosia deltoidea* (Triangleleaf bursage), *Cercidium microphyllum* (Foothill paloverde), *Encelia farinosa* (White brittlebush), *Ephedra* spp. (Mormon tea), *Fouquieria splendens* (Ocotillo), *Larrea tridentata* (Creosotebush), *Olneya tesota* (Ironwood), and *Opuntia acanthocarpa* (Buckhorn cholla). (A. Phillips, B. Phillips and N. Brian 1982). The acuña cactus is often found growing under the protective canopy of these and other species.

POPULATION TRENDS: The number of dead individuals documented within acuña cactus populations has increased greatly since monitoring began in the 1970s. Current population estimates are as follows:

- USNPS lands (Organ Pipe Cactus National Monument): 2000 plants, or 58.9% of known individuals. This population was estimated at 10,000 in 1981.
- Sonora, Mexico: 659 plants, or 19.4% of total known population. 942 dead plants were also noted during a 2009-2010 survey.
- Private lands: 48 plants, or 1.4% of total population (37 near Ajo, 11 near Florence).
- State Trust lands: 32 plants, or 0.9% of population.
- Military lands (BMGR): a single plant. (USFWS 2012).

Population numbers are down due to destruction of habitat through development which results in fragmentation and isolation of populations; past mining operations; illegal collection; and perhaps drought induced mortality. (USFWS 2011).

Kelvin Highway population was down, probably due to poaching. According to NatureServe (2004), Data collected through 1981 at Organ Pipe Cactus National Monument strongly

suggested a total population decrease since 1977 (Buskirk 1981). Since 1988, the Organ Pipe population has been declining and the number of juveniles reaching reproductive age is decreasing. In 1997, a large number of flowering individuals were uprooted by small mammals and the cactus skeletons remained (S. Rutman, pers. comm. 1998). Of all the populations, the Organ Pipe population appears the healthiest (Rutman 1988).

A 1987 trip report (Rutman 1988) from Coffee Pot Mountain indicated an unusually high mortality. This population was monitored for several years but the data has not been processed. The Sonoita (Mexico) population is reported as being extensive and healthy (Richard Felger, pers. comm.. 1998).

Johnson (1993) reported a pattern suggesting that small individuals are more susceptible to abiotic sources of mortality due to their limited water storage capacity, and because larger individuals are mostly affected by biotic factors like predation.

Past mining activities in the Ajo area have removed a significant portion of the population and the remaining plant populations have been fragmented (Falk 2002).

Mortality of more than 80% of individuals has been documented within populations that have been surveyed more than once. This loss has also occurred on protected lands with ongoing management efforts for acuña cactus (USFWS 2012).

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 2013)
[PE with CH, USDI, FWS 2012]
[C USDI, FWS 1996]
[C USDI, FWS 2002, 2004-2011]
[C USDI, FWS 1997, 1999]
[C1 USDI, FWS 1985, 1990, 1993]
[LT USDI, FWS 1975]

STATE LIST STATUS: Highly Safeguarded (ARS, ANPL 1999, 2008)

OTHER STATUS: Determined Endangered (Norma Oficial Mexicana PROY-NOM-059-ECOL-2000)

MANAGEMENT FACTORS: Threats include the destruction of habitat through development which results in fragmentation and isolation of populations; mining operations; illegal collection; border related impacts; and perhaps drought induced mortality. (USFWS 2011). NatureServe (2004) reported illegal collection and trampling as a primary threat to this cactus variety, with other threats include mining, land development, road maintenance and development, recreation, grazing, small mammal predation, and seed predation. USFWS 2012 notes that 78% of the known living acuña cacti occur within 16.5 km (10.25 mi) of the

border in either OPCNM or Sonoita, Mexico. This means that illegal activity (drug and human smuggling) as well as efforts to prevent this activity can have an impact on the species. It was also noted that non-native invasive species do not appear to pose a threat. Insects and various rodents have a negative impact, the latter especially during periods of drought. It appears that the combination of drought stress and insect attack have seriously reduced adult plant numbers, and that warmer winters may be increasing the insect attacks.

In 2012, the USFWS proposed the endangered status for the acuña cactus because they found the species to be in danger of extinction throughout its entire range due to current and ongoing modification and destruction of habitat and range from long term drought, effects of climate change, and ongoing and future border activities. Insect predation was also determined to be a serious impact, and all these threats are exacerbated at local scales by off-road excursions by cross-border violators and those charged with LE response. While there were some mechanisms in place that afford some protection, there are no regulations to address insect predation, drought and the effects of climate change. Mortality of more than 80% of individuals has been documented within populations that have been surveyed more than once. This loss has also occurred on protected lands with ongoing management efforts for acuña cactus.

CONSERVATION MEASURES TAKEN: The populations within Organ Pipe Cactus National Monument and the Sonoran Desert National Monument are protected. The taxon is also offered protection under the Arizona Native Plant Law and is listed as endangered in Mexico. As of October 2012 (USDI, USFWS) the *E. e. acunensis* was given proposed Endangered status with critical habitat, which includes a total of 21,740 ha (53,720 acres) divided into six separate units on federal (55%), State (26%), Tribal (10%) and private (8%) lands. As of October 31, 2013, the acuña cactus was listed as an endangered species.

SUGGESTED PROJECTS: All known populations should be monitored. Further research needed, focusing on reproduction, demography, and limitations on the geographic distribution of all known populations. Additional information on the effect of seed predation by the pyralid moth larvae and the opuntia borer (*Moneilema gigas*) should be gathered. More detailed soil analysis and geographical material preference should be examined. Genetic analysis of the known populations should be conducted to determine validity of variety. Efforts are needed to locate additional populations, especially on habitats existing in the Sand Tank Mountains and on the Tohono O'odham tribal lands.

Per Holm (1997-2005) for the OPCNM population: 1) Relate existing acuña data to climate data to determine relationships; analyze archived Buskirk data from 1982-1986; determine if the fluctuations in the acuña data are similar to the normal fluctuations one would see in other cacti populations. 2) Revise the acuña cactus monitoring protocol to better address factors relating to reproduction and mortality. 3) Systematically survey and map occupied habitat and compare with Buskirk and Ruffner associate maps to detect and significant expansion or contraction of distribution and range. 4) Conduct studies of predators such as cricetine rodents, *Moneilema gigas*, and *Yosemitia graciella* to better understand their relationships to acuña cactus. Determine if other species are impacting the cactus. 5) Experiment with methods to protect acuña cactus from predators such as exclosures around cacti. 6) Determine

genetic and environmental sources of variation in fruit set and low seed set. 7) Continue to discourage visitor access to population by maintaining the road as narrow and rough trail, without obvious pullouts. 8) Employ law enforcement strategies that discourage undocumented alien traffic and off-road vehicle activity in acuña cactus habitat.

LAND MANAGEMENT/OWNERSHIP BLM - Phoenix and Tucson Field Offices; NPS - Organ Pipe Cactus National Monument and Sonoran Desert National Monument; State Land Department; Private.

SOURCES OF FURTHER INFORMATION

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Cactus) and Pediocactus peeblesianus var. fickeiseniae (Fickeisen Plains cactus) Throughout their Ranges; Final Rule. Federal Register 78(190): 60608-60652.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

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Sue Rutman – Organ Pipe Cactus National Monument, Ajo, Arizona.
Peter Holm – Organ Pipe Cactus National Monument, Ajo, Arizona.

ADDITIONAL INFORMATION:

Peters: Population study since 1977 on two populations in Organ Pipe Cactus National Monument, a population on the top of Childs Mt., west northwest of Ajo. However, this habitat is wrong according to Sue Rutman. Frank Reichenbacher said it could be *E. johnsonii* which grows on black limestone.

Notes from Diversity Review, 1989, by SST. Decline of OPCNM population in past 10 years. Also, "Childs Mt. misleading (Black Mt.)" population now stable (BLM Safford District, Rare Plant Workshop 1994).

Phillips, 1982: Recommended for Federal Threatened listing

Frank Reichenbacher (Bureau of Land Management, Safford District, Rare Plant Workshop) stated that the spines get darker and longer as you go west. The Sonoran, Organ Pipe and Ajo populations are similar. The Florence population is intermediate between *E.e. erectocentrus* and *E.e. acuñensis*, having fewer central spines and occurring on granite soil.

Distribution and range on Safford District is not known. Information on poaching activity is needed.

Revised: 1989-12-27 (SST)
1994-11-28 (DBI)
1997-11-12 (SMS)
1999-12-20 (DJG)
2004-07-30 (AMS)
2004-08-19 (SMS)
2011-11-01 (SMS)
2013-10-17 (BDT)

abstract). X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.