COLORADO DESERT FRINGE-TOED LIZARD

Uma notata Baird 1858

Status Summary

Uma notata is a Priority 2 Species of Special Concern, receiving a Total Score/Total Possible of 58% (64/110). During the previous evaluation, it was also considered a Species of Special Concern (Jennings and Hayes 1994a).

Identification

Uma notata is a medium-sized lizard (7.0–12.2 cm SVL) with a moderately flattened body, a countersunk lower jaw, keeled labial scales, projecting row of pointed scales on the toes, eyelids, and ear openings that form a fringe (Cope 1894, Heifetz 1941, Stebbins 1954, Stebbins 2003). The dorsal color pattern consists of light pale yellow to cream ocelli, with dark or reddish centers over a dark ground color (Van Denburgh 1922, Stebbins 1954, Stebbins 2003). These ocelli tend to form broken lengthwise lines at the shoulders (Heifetz 1941). The dark dorsal coloration fades to reddish brown on the head and legs (Van Denburgh 1922). The undersurface is white, with prominent dark ventrolateral spots or bars on the underside of the tail and narrow diagonal lines on the underside of the throat (Stebbins 2003). An orange or pinkish stripe occurs along the lower flanks and becomes more prominent during the breeding season (Stebbins 1954).

Colorado Desert Fringe-Toed Lizard: Risk Factors

Ranking Criteria (Maximum Score)	Score
i. Range size (10)	10
ii. Distribution trend (25)	15
iii. Population concentration/ migration (10)	0
iv. Endemism (10)	0
v. Ecological tolerance (10)	7
vi. Population trend (25)	15
vii. Vulnerability to climate change (10)	7
viii. Projected impacts (10)	10
Total Score	64
Total Possible	110
Total Score/Total Possible	0.58

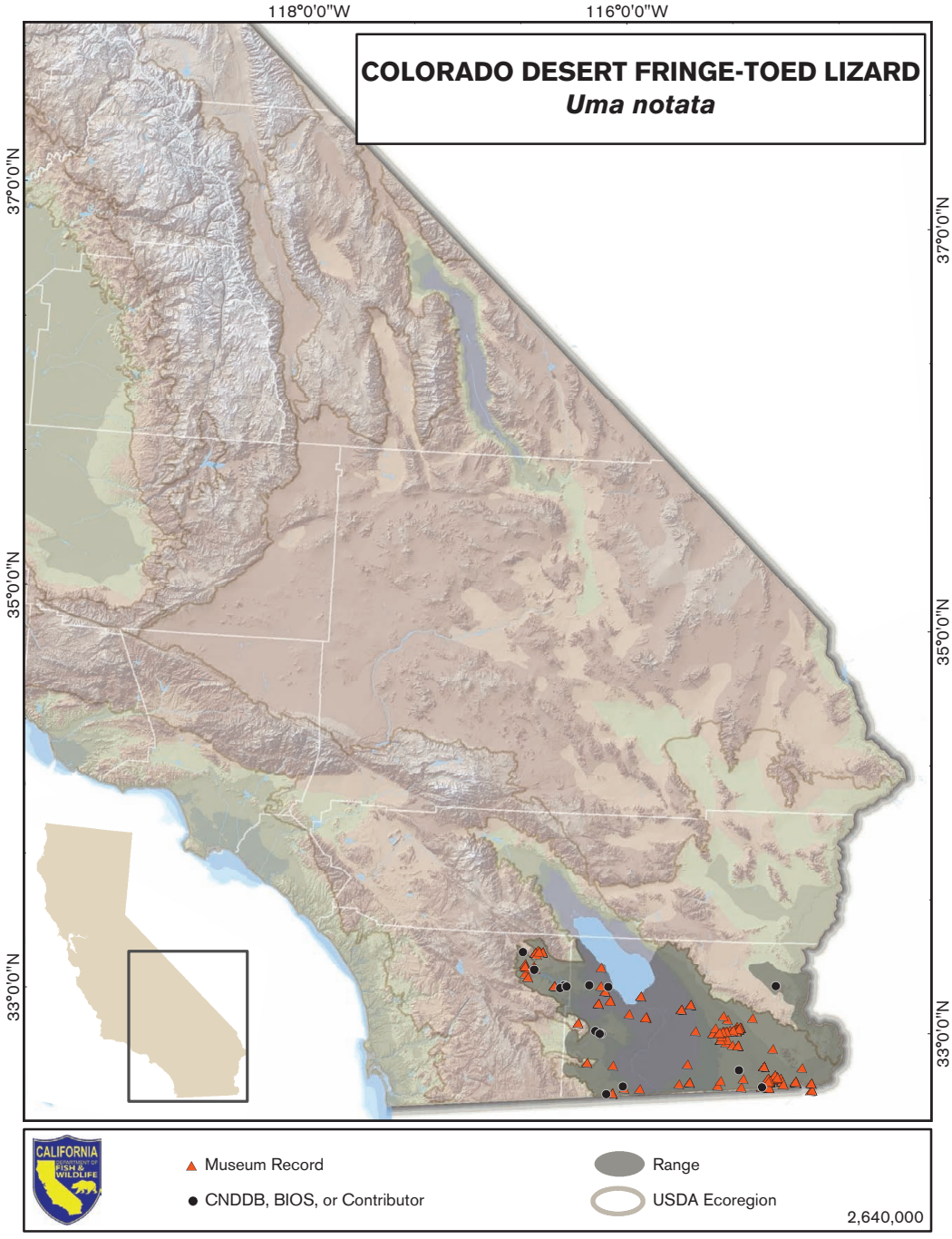

PHOTO ON PREVIOUS PAGE: Colorado Desert fringe-toed lizard, Imperial County, California. Courtesy of Adam Clause.

Orange coloration may also be present around the eye.

Uma notata can easily be confused with its congeners in California, the Coachella Valley fringe-toed lizard (*U. inornata*) and the Mojave fringe-toed lizard (*U. scoparia*), although none of these species have overlapping ranges. *Uma inornata* lacks the large and prominent blotches on the ventral surface, although small black spots may be present (Stebbins 2003). *Uma scoparia* usually has narrow lines on the throat that form chevrons and has dorsal ocelli that do not form broken lines on the shoulders (Stebbins 2003). The sympatric zebra-tailed lizard (*Callisaurus draconoides*) also has black bars on the tail, although these form bands that encircle the tail rather than being present only on the underside. *Callisaurus* also lacks fringes on both the toes and the ear openings and has an overall slimmer body shape (Stebbins 2003).

Taxonomic Relationships

The taxonomy of the fringe-toed lizards has been confusing since their original description and remains somewhat controversial. *Uma notata* was initially described from a single preserved juvenile specimen in poor condition (Baird 1858). The initial description of morphology was inadequate to diagnose the taxon and provided details on coloration specific to the poorly preserved specimen ("light pea green, spotted with darker green") and an inaccurate type locality ("Mojave Desert"). An expanded description was later provided by Cope (1894, 1895b), which helped clarify the distinctiveness of the taxon. Heifetz (1941) provided a thorough morphological analysis of the genus and concluded that *U. notata* should be treated as a species separate from the other two California species (*U. inornata* and *U. scoparia*). However, these three species are closely related and their treatment in the literature has shifted between subspecies (of *U. notata*) and full species (Stebbins 1954, Norris 1958, Mayhew 1964a, Mayhew 1964b, Adest 1977, Zalusky et al. 1980).

In addition, some authors recognize two subspecies within *U. notata*. *Uma notata rufopunctata* (Cope 1895b) ranges through Arizona and northwestern mainland Mexico, while *U. n. notata* is present only in California. Analyses of mitochondrial data suggest that these two subspecies do not form a monophyletic group. Rather, *U. n. notata* is sister to *U. inornata* to the exclusion of *U. n. rufopunctata* (Wilgenbusch and De Queiroz 2000, Trépanier and Murphy 2001). Trépanier and Murphy (2001) noted that the mitochondrial DNA implied either that *U. inornata* should be considered part of *U. notata* or that *U. n. notata* should be elevated to a full species and that *U. n. rufopunctata* contains two species (one of which is cryptic and had not previously been recognized). They preferred this latter arrangement, although this has not been formally presented to date. Here, we treat *U. notata* as a full species, separate from *U. n. rufopunctata*. Further genetic analyses using multiple independent sequence markers are needed to clarify these species boundaries, as well as the phylogenetic relationships among species and subspecies.

Life History

To the extent that it has been studied, the life history of *U. notata* is essentially identical to that of *U. scoparia*. This species specializes on fine windblown sand habitats and possesses several behavioral, morphological, and physiological adaptations allowing it to do so (see account for *U. scoparia*). This species has a yearly activity cycle that is similar to *U. scoparia*, becoming surface-active as early as February, breeding between April and July, with egg laying in May–July and young appearing in September (Stebbins 1954, Grismer 2002, Stebbins 2003). The two species also exhibit similar daily activity patterns and behavior. They are known to differ in the pattern and cadence of "pushups" used in territorial displays, which may have served as a behavioral isolating mechanism (Carpenter 1963). *Uma notata* has a generalized diet composed of leaves, flowers, seeds, and a variety of small arthropods that is similar to the diet of

U. scoparia (Stebbins 1944). See the account for *U. scoparia* for additional details.

Habitat Requirements

To the extent that they have been studied, habitat requirements are identical to those of *Uma scoparia* and are described in that species' account.

Distribution (Past and Present)

Uma notata ranges from the southeastern corner of California north and west to the Salton Sea and the northeastern corner of San Diego County. Outside of California, it ranges farther south into Baja California, Mexico, to a latitude roughly parallel with the mouth of the Colorado River (Jennings and Hayes 1994a, Grismer 2002). The species' known elevational range extends from 74 m below to 180 m above sea level (Jennings and Hayes 1994a, Stebbins 2003).

Few distributional declines have been documented, although we presume that they have occurred in some areas that have been heavily impacted by off-highway vehicular use, as well as in areas that have experienced heavy development (see the "Trends in Abundance" section). In particular, agricultural development has eliminated habitat in extensive areas around the Salton Sea (Jennings and Hayes 1994a).

Trends in Abundance

Few data regarding historical *Uma notata* population densities exist, although survey data strongly suggest that ongoing declines are occurring in areas that experience off-highway vehicle use. Luckenbach and Bury (1983) conducted surveys in paired plots at the Algodones Dunes (Imperial County, California) that had or had not experienced off-highway vehicle disturbance. *Uma notata* abundance on off-highway vehicle-impacted plots was significantly lower than nonimpacted areas.

Nature and Degree of Threat

Uma notata is experiencing many of the same threats as *U. scoparia*. Habitat loss due to off-highway vehicle damage and habitat destruction due to human activities is the greatest immediate concern. Luckenbach and Bury (1983) demonstrated major decreases in abundance from off-highway vehicle use due to direct mortality and decreasing vegetation density and quality. Off-highway vehicle use in *Uma* habitat also causes increased rates of tail loss and hearing loss, neither of which are fatal but both of which decrease individual fitness (Brattstrom and Bondello 1983, Luckenbach and Bury 1983). Climate change models for this region predict relatively sharp increases in mean temperature of up to 2°C. The impact of such increases on *U. notata* is not known but should be a high priority for future research. Other threats include increasing predation associated with human commensals and the more general problems associated with reduced population size and fragmentation. See the *U. scoparia* account for additional discussion.

Status Determination

Uma notata specializes on a habitat which is uncommon, patchy, and undergoing significant degradation, and this is the primary justification for this Priority 2 designation. Several populations of this species appear to be stable, and some of the habitat occurs on protected land; thus, a higher-priority designation is not currently justified.

Management Recommendations

The primary management need for *Uma notata* is habitat protection. Protecting sand dune habitat from the impact of off-highway vehicle use alone will significantly increase the probability of long-term survival of this species in California. Habitat conversion for housing, agriculture, and solar/wind energy may all have strongly detrimental effects on *U. notata*, and the limited distribution of the species requires that impacts be reviewed on a project-by-project basis. Over the longer term, increasing temperature and potentially decreased precipitation due to climate change (PRBO 2011) could also lead to habitat loss, which may require the development of additional management actions.

Given their strong association with windblown sand habitats, all species of *Uma* may be subject to local extirpations with limited opportunities for natural recolonization, and human-mediated gene flow may be necessary to maintain such populations.

Monitoring, Research, and Survey Needs

The monitoring needs for *Uma notata* are essentially identical to those of *U. scoparia*. Overall, less of *U. notata*'s range occurs on protected land, so these monitoring efforts (and accompanying habitat protection) are needed more urgently for this taxon than for *U. scoparia*. The impact that habitat modification may have on *U. notata* populations is an area in need of additional study. Two genetic needs are critical. First, the species boundaries of *Uma*, including the distinctiveness of the subspecies of *U. n. rufopunctata* and the resolution of the number and identity of species contained within the genus, require a multi-locus nuclear dataset to complement initial work using mitochondrial DNA (Trépanier and Murphy 2001). Second, landscape genetic analyses quantifying the extent of past and current gene flow among isolated or semi-isolated populations are needed to better understand how to manage landscapes and have the least possible impact on metapopulation dynamics and future population viability.