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It is critical for biological, legal, and political reasons, to know the exact taxonomic status of a species

or population that is to be listed by conservation or government agencies as sensitive, rare, threatened, or endangered. A study on the status, distribution and biology of the San Diego Horned Lizard, *Phrynosoma coronatum blainvillii* for the California Department of Fish and Game (CDFG) led me to investigate the status of the subspecies of *P. coronatum* and the closely related *P. cerroense*. *Phrynosoma c. blainvillii* was listed as a "Species of Special Concern" by the CDFG and a candidate for listing as a Category II species by the Federal Government. I report here my observations, which suggest that there are no valid subspecies of *Phrynosoma coronatum*.

The Coast Horned Lizard, *Phrynosoma coronatum*, occurs from the Sacramento Valley southward to the tip of Baja California. Jennings (1988a) recognized five subspecies although neither Stebbins (1985) nor Grismer and Mellink (1994) recognized subspecies. The closely related *P. cerroense* occurs on Cedros Island on the Pacific side of Baja California. The latter was considered a species by Jennings (1988b) by virtue of its isolated island distribution and short tail with only 19 caudal vertebrae (Presch, 1969).

The San Diego Horned Lizard, *P. c. blainvillii*, (SDHL) occurs from northwestern Baja California, Mexico into California in San Diego, Orange, Riverside, Los Angeles and San Bernardino Counties. In northwestern Los Angeles County, *P. c. blainvillii* intergrades with the northern subspecies *P. c. frontale*.

The San Diego Horned Lizard is found only in the California coastal and inland regions from sea level to 8000 feet, hence from grasslands and Coastal Sage Scrub (CSS) vegetation to pine forest. The SDHL occurs in sandy, open areas, but also in dense, old growth chaparral on 70° slopes (Brattstrom, unpubl. data). It is the only horned lizard within its range. It meets the Desert Horned Lizard, *P. platyrhinos*, at the high desert edge north of the San Gabriel Mountains from Palmdale to Adelanto. The ranges of the two species apparently do not overlap as the SDHL is restricted here to the Juniper-Desert Chaparral habitat and the Desert Horned Lizard is found mostly in creosote bush scrub vegetation. A similar close proximity may occur in the little San Bernardino Mountains and in northwestern Joshua Tree National Monument. The SDHL is separated by range and habitat from the other two California horned lizards; *P. mcallii* of the low desert and *P. douglassii* of the Modoc-Klamath plateau area (Sherbrooke, 1981; Stebbins, 1985).

The first problem was to determine what criteria have been used to separate and diagnose the recognized subspecies of *Phrynosoma coronatum*. Table 1 presents the characteristics used by previous authors to characterize the subspecies. The named populations are presented in Table 1 in a north to south order with *P. cerroense* placed last. It is clear from Table 1 that none of these characteristics appear to be very distinctive. The number of enlarged gular scale rows is 3 for all populations, the number of temporal spines is 5 or $4 + 1 = 5$ for all populations and the other characters are either vague, variable, or poorly defined (Postribral scale, projection of temporal spines, and the location of the subribral scale in relation to the chin shield). I then examined a large number of *Phrynosoma coronatum* from the collections of the San Diego Natural History Museum of the named subspecies (*P. c.*

TABLE 1. Characteristics used to distinguish between the subspecies of *Phrynosoma coronatum* and between them and *P. cerroensis*. Data and characteristics from Jennings, 1988a, b; Klauber, 1936; Reeve, 1952.

Character	Subspecies					
	<i>frontale</i>	<i>blainvillii</i>	<i>schmidti</i>	<i>jamesi</i>	<i>coronatum</i>	<i>cerroensis</i>
Gular scale: rows enlarged	3+	3+	3	3+	3+	3
Postriatal scale	large, spine-like	large	moderate	moderate	small, moderate or absent	moderate
Number of temporal spines	5	5	5	4 + 1 = 5	5	4 + 1 = 5
Temporal spines project	posterior	posterior	laterally	laterally or anteriorly	laterally	posterior
Frontal scales	small, pointed, rugose	large, rounded, smooth, drab	rugose & light	plate-like, light edged, dark	plate-like, rugose, light edged, black, striated	medium, flat, rugose, brown to black
Subriatal scale in relation to chin shield	above	above	above	above	in line or above	in line

coronatum: 29; *schmidti*: 152; *frontale*: 20; *jamesi*: 33; *blainvillii*: 96). I could not "key out" all specimens to their presumed correct subspecies based on the criteria in Table 1. Many specimens seemed to have been assigned to a subspecies by virtue of their collection site. In other words, not all specimens labeled *P. c. coronatum* or *P. c. schmidti* had all, or even any, of the presumed diagnostic characteristics. For example, the character "temporal spines project", which is supposed to be laterally in some subspecies and posteriorly in *P. c. blainvillii* and *P. c. frontale* was so variable that anterior, lateral, and posteriorly projecting spines could be found in all named subspecies. In these two named subspecies, the character states for the postriatal scale were equally variable, with small, moderate, and large scales found in both subspecies. None of the other characters were, in themselves, distinct (Table 1).

To check further on the presumed distinction between *P. c. blainvillii* and *P. c. frontale*, a point of legal concern for conservation and enforcement purposes, characteristics of the frontal scale were tallied for several populations (Table 2). The characters of size, rounded, pointed, smooth, spinose-rugose were so variable (Table 2) and so other-character dependent that they were meaningless for any characterization of a subspecies. The size of the head scales was extremely variable. Some individuals had large frontal scales, while others in the same population (Table 2) had small frontal scales. Sometimes (see Table 2 for numbers) all were large; sometimes all were small. In some individuals one or two mid-line scales were large and the rest small, so that the character for frontal scale size was variable within a single individual. Some individuals had large and small scales intermixed. While large scales are often smooth, they are also flat, pitted at the edges, or spinose. Small scales are often rugose, spiny, or pitted, but many lizards had combinations of characteristics on their heads. None of these characters individually, or in combination, allowed for the separation of population *P. c. blainvillii* for *P. c. frontale*; two subspecies which are supposed to be distinct, based on characters of the frontal scale (Table 1). While not tallied, the degree of darkness on the head (and head scales) varied, from individuals having heads all light colored, to other individuals that had heads all dark, and still others had heads partly light and partly dark. Other characteristics, such as width of the mid-dorsal line stripe, the ventral spotting, and other dorsal body coloration characteristics, were extremely variable in all populations and none could be used to characterize any of the presumed subspecies.

Populations of *P. coronatum* from small geographic areas (for example, western Riverside County, coastal San Diego County, or the Sacramento area) seemed to have a certain suite of characters in common, presumably due to inbreeding in local populations. Table 2 shows that even these populations were variable.

Based on my analysis of the data on scale characters, I was unable to distinguish the subspecies of *P. coronatum*. Therefore, I conclude that *P. coronatum* is a highly variable species and, while local inbreeding populations may have some characteristics in common, there is no taxonomic or biological basis for recognizing any of the subspecies of *P. coronatum*. Grismer and Mellink (1994), in their suggestion to sup-

TABLE 2. Population variation in characteristics of frontal scale that are often used to characterize subspecies of *Phrynosoma coronatum* based on specimens from the San Diego Natural History Museum. Some specimens may have two or more characteristics, hence some columns may add up to more than 100%.

Subspecies	Population	Sample #	Size			Character		
			Large	Small	Round	Point	Smooth	Spinose-Rugose
<i>blainvillii</i>	San Diego Co.	9	5	4	6	3	3	6
<i>blainvillii</i>	Riverside Co.	13	12	1	5	7	5	1
<i>blainvillii</i>	N. Baja, CA.	17	12	5	12	5	6	5
	TOTAL =	39	29	10	23	15	14	12
	PERCENT =	—	74	26	58	38	36	31
<i>schmidti</i>	N. Baja, CA.	11	2	9	2	9	2	9
	PERCENT =	—	18	82	18	82	18	82
<i>frontale</i>	Sacramento Co.	4	3	3	—	2	—	4
<i>frontale</i>	Monterey Co.	2	—	2	—	1	—	2
<i>frontale</i>	Kern Co.	10	3	7	3	3	—	7
<i>frontale</i>	San Bernardino Co.	2	—	2	1	—	—	1
<i>frontale</i>	Merced Co.	2	2	—	—	—	—	2
	TOTAL =	20	8	14	4	6	—	16
	PERCENT =	—	40	70	20	30	—	80

press the subspecies of *P. coronatum*, argued that the populations are pattern classes in a cline which provide no phylogenetic information. I interpret the variation in the species to have a variety of states for each character and these states separately, or interacting with other characters, appear over and over again as modes throughout the range of the species.

None of the scale characters of *P. cerroense* are truly diagnostic (Table 1). The only other character used to separate *P. cerroense* is an osteological one. Presumably *P. cerroense* differs from *P. coronatum* by having a shorter tail as reflected in having only 19 caudal vertebrae (Presch, 1969; Jennings, 1988b). Presch (1969) had only one specimen of *P. cerroense* and the character of 19 caudal vertebrae falls within the range of 14–23 caudal vertebrae for *P. coronatum*. Presch (pers. comm.) agrees with me that there are no known characters to distinguish *P. cerroense* from *P. coronatum*. Grismer and Mellink (1994) also rejected the specific and subspecific allocation of *P. cerroense* and placed the name into the synonymy of *P. coronatum*.

I conclude that the above indicates that *P. cerroense* is not a valid species or subspecies and that there are no valid subspecies of *Phrynosoma coronatum*. I, therefore, concur with Grismer and Mellink (1994) and place the names *frontale*, *blainvillii*, *jamesi*, *schmidti*, and *cerroense* in the synonymy of *P. coronatum*. These observations and conclusions also caution conservationists to be sure of the taxonomic distinctness of the populations they propose for legal protection.

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