

# Common side-blotched lizard

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The **common side-blotched lizard** (*Uta stansburiana*) is a species of side-blotched lizard found on the Pacific Coast of North America. It is notable for having a unique form of polymorphism wherein each of the three different male morphs utilizes a different strategy in acquiring mates. The three morphs compete against each other following a pattern of rock, paper, scissors, where one morph has advantages over another but is outcompeted by the third.<sup>[1][2][3]</sup>

The specific epithet *stansburiana* is in honor of Captain Howard Stansbury of the US Corps of Topographical Engineers, who collected the first specimens while leading the 1849-1851 expedition to explore and survey the Great Salt Lake of Utah.<sup>[4]</sup>

## Common side-blotched lizard



### Scientific classification

Kingdom:	Animalia
Phylum:	Chordata
Subphylum:	Vertebrata
Class:	Reptilia
Order:	Squamata
Suborder:	Lacertilia
Infraorder:	Iguania
Family:	Phrynosomatidae
Genus:	<i>Uta</i>
Species:	<i><b>U. stansburiana</b></i>

### Binomial name

***Uta stansburiana***

Baird & Girard, 1852

### Subspecies

- *U. s. stansburiana*  
northern side-blotched lizard
- *U. s. nevadensis*  
Nevada side-blotched lizard
- *U. s. uniformis*  
plateau side-blotched lizard
- *U. s. elegans*  
western side-blotched lizard
- *U. s. stellata*  
San Benito side-blotched lizard
- *U. s. concinna*  
Cedros side-blotched lizard
- *U. s. martinensis*

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## Systematics



Male common side-blotched lizard, with blue and yellow coloration and a characteristic dark blotch behind the forearm

The systematics and taxonomy of these widespread and variable lizards is much disputed.<sup>[5][6]</sup> Countless forms and morphs have been described as subspecies or even distinct species.<sup>[7]</sup>

- The forms which occur in most of Mexico (except Baja California) have been recognized as a very distinct species, the

eastern side-blotched lizard (*Uta steynegeri*).<sup>[8]</sup>

- Populations from San Benito and Cedros Islands were separated as distinct species *Uta stellata* and *U. concinna*, but are now included in *U. stansburiana*.
- Those of Santa Catalina Island and the Salsipuedes Islands, *U. squamata* and *U. antiqua* are sometimes included in this species, too, but this is certainly not correct in the latter case, and probably in the former also.
- Based on the same data that would give *U. squamata* species rank, the southern Baja California populations could arguably be split off (as *Uta elegans*), too.
- The proposed subspecies *martinensis* and *taylori* are probably not valid.
- The populations on Ángel de la Guarda, Mejia and Rasa Islands almost certainly constitute a separate species closer to *Uta palmeri*, and that of San Esteban Island may so too, being close to *squamata*.
- The status of the Las Encantadas group populations named as *Uta encantadae*, *U. lowei* and *U. tumidarostra* is not completely resolved; these distinct populations are of comparatively recent origin and are sometimes included in this species, but their unique adaptations to living in intertidal habitat suggest they should be considered distinct; whether as one or as three species remains unresolved.<sup>[9]</sup>

## Description

The common side-blotched lizard is a species of small iguanid lizard. Males can grow up to 60 mm (2.4 inches) from snout to vent, while females are typically a little smaller. The degree of pigmentation varies with sex and population. Some males can have blue flecks spread over their backs and tails, and their sides may be yellow or orange, while others may be unpatterned. Females may have stripes along their backs/sides, or again may be relatively drab. Both sexes have a prominent blotch on their sides, just behind their front limbs.<sup>[10]</sup> Coloration is especially important in common side-blotched lizards, as it is closely related to the mating behavior of both males and females.<sup>[1][11]</sup>

## Ecology and behavior

### Mating

#### Rock-paper-scissor mechanism

Male side-blotched lizards exhibit distinct polymorphism in their throat colors, and can be divided into three different categories. Each of these three different morphs varies in how it competes for mates, and variation

San Martin side-blotched lizard  
(disputed)

- *U. s. taylori*

Taylor's side-blotched lizard  
(disputed)



### Synonyms

*Uta concinna*

*Uta elegans*

*Uta levis*

*Uta martinensis*

*Uta stansburiana hesperis*

*Uta stellata*

*Uta wrighti*

*Uta irregularis*

*Uta lateralis*

*Uta nelsoni*

*Uta tuberculata*

within a breeding population is maintained by a rock-paper-scissors mechanism of frequency-dependent sexual selection. A cycle is created where the least common morph of one breeding season often has the largest number of mature living offspring in the next year. This is because one morph does particularly well against another, but poorly in comparison to the third.<sup>[1]</sup>

- Orange-throated males are “ultradominant”. They are the largest and most aggressive morph, defending relatively large (about 100 m<sup>2</sup> or 120 yd<sup>2</sup>) territories and keeping harems of females with which they mate. They are adept at stealing mates from blue-throated individuals, but are vulnerable to cuckoldry by the yellow-throated female mimics.<sup>[1]</sup> Orange-throated males also have significantly reduced yearly survival rates compared to the other two morphs.<sup>[12]</sup>
- Blue-throated males are "dominant". They are intermediate in size, and guard smaller territories containing only a single female. As they only have one mate to defend, they are better at catching yellow-throated sneaks, but are also susceptible to having their mates stolen by the larger, more aggressive orange-throated males.<sup>[1]</sup>
- Yellow-throated males are “sneakers”. Their coloration is similar to that of sexually mature females, and they typically mimic female “rejection” displays when they encounter dominant orange- or blue-throated males. Unlike the other morphs, yellow-throated males do not hold territories. Instead, they have wide-reaching home ranges that may overlap with several other lizards’ territories.<sup>[1][12]</sup> They rely on their mimicry to sneak matings with unattended females. This is more easily achieved among the harems kept by orange-throated males than by the single, closely guarded mate of the blue-throated males. Though orange-throated males have the highest mortality rates, yellow-throated males have higher relative rates of posthumous fertilization (posthumous birth), indicating an increased reliance on sperm competition as part of their reproductive strategy.<sup>[2]</sup> Yellow-throated males can in specific instances transform into blue-throated males over the course of the breeding season. This transformation is usually triggered by the death of a nearby dominant male, and the blue patches the yellow-throated males develop is qualitatively distinct from the blue patches of genetically blue-throated males. Not all yellow-throated males transform, but when they do, they give up their female mimicry and adopt the “dominant” morph’s behavior pattern. No transformations in the other direction, in which dominant males gain yellow-throat coloration, have been observed.<sup>[12]</sup>

Female side-blotched lizards have also been shown to exhibit behaviorally correlated differences in throat coloration. Orange-throated females are considered r-strategists. They typically produce large clutches consisting of many small eggs. In contrast, yellow-throated females are K-strategists that lay fewer, larger eggs. Like the male morphs, the frequencies of these two female morphs also cycle with time. However, the cycle is shorter – two years in comparison to the male morphs’ four- or five-year cycle – and is not a result of frequency-dependent sexual selection. Instead, orange-throated females are more successful at lower population densities, where competition for food is less fierce and less selection pressure from predation occurs.<sup>[11]</sup> When population density is high and or when predators abound, yellow-throated females tend to have higher reproductive success. In general, their larger hatchlings have higher short-term and long-term survival rates, and these advantages are magnified in times of scarcity. Side-blotched lizards show displays and aggression shortly after hatching, and even minute differences in size can lead to increased social dominance and capacity to outcompete the smaller hatchlings.<sup>[13]</sup>

### Genetic determination of throat-color polymorphism

Analysis of DNA nuclear microsatellites has provided genetic evidence for the rock-paper-scissors behavior pattern of male side-blotched lizard competition. In populations where all three morphs are present, shared paternity between yellow- and blue-throated individuals occurs at a rate significantly below random chance, while shared paternity between yellow- and orange-throated males occurs at a rate significantly above chance. In addition, blue-throated males often shared paternity with orange-throated males, despite having mostly yellow-throated neighbors.<sup>[2]</sup>

Blood plasma testosterone levels play an important role in the creation of the three male morphs both during and after development. Orange-throated males have 46-48% higher plasma testosterone levels compared to their yellow- or blue-throated counterparts. Experimental elevation of plasma testosterone levels in the other two male morphs led to increases in endurance, aggressiveness, and territory size to the degree expressed by normal orange-throated males. In addition, the transformation of yellow-throated males to blue-throated males is accompanied by an increase in their plasma testosterone levels.<sup>[12]</sup>

Throat color in side-blotched lizards is genetically determined, and has high heritability.<sup>[1]</sup> It is determined by a single Mendelian factor with three alleles. In males, the *o* allele is the dominant allele, and the *b* allele is recessive to the *y* allele. Therefore, phenotypically orange-throated males have genotypes of either *oo*, *ob*, or *oy*. Yellow-throated males have genotypes of either *yy* or *yb*, and blue-throated males are exclusively *bb*. In females, all individuals with the dominant *o* allele are orange-throated, while those lacking an *o* allele develop yellow throats.<sup>[11]</sup>



Common side-blotched lizards mating

## Reproduction

Female side-blotched lizards lay clutches with an average of 5.1 eggs and a maximum of 9 eggs in a single clutch. Smaller clutch sizes, often associated with yellow-throated females, have an increased frequency of eggs bursting upon being laid or egg binding, suggesting an upper physiological limit to how much a female can invest in each individual egg she lays.<sup>[3]</sup>

## Aggression and courtship

Dominant male side-blotched lizards are aggressive in the defense of their territories. Upon spotting another conspecific within their territories, resident individuals enter a state of heightened alertness. They perform one or more “pushups” (vertical bobbing motions), arch their backs, and extend their limbs before approaching the intruder.<sup>[10]</sup> If the intruder is another male, the resident follows up by rushing, butting, or nipping at the intruder, which will then usually proceed to run away. If it is a female, the resident will initiate courtship, which consists of circling, flank-biting, licking, smelling, shallower head-bobbing, and eventually copulation. Body shape and passivity are the main releasers for courtship activity, and males have been observed in trying to court and copulate with smaller lizards of other species, as well as smaller subordinate side-blotched lizards.<sup>[14]</sup>

Tail length is important in the determination of dominance hierarchies. Like many other lizard species, side-blotched lizards use tail autotomy as an escape mechanism. However, a reduction in tail length also confers a loss of social status for both males and females.<sup>[15]</sup> Males will autotomize their tails less readily than will females, likely due to the increased importance of social status for males. Subordinate females can still mate, but male reproductive success is directly tied to their social status.<sup>[16]</sup>

## Feeding

Side-blotched lizards display feeding behavior which can be influenced by sex or season. In a study conducted by Best *et al.*, these lizards were found to consume diets largely based upon arthropod populations within the area, within a given season. These populations vary by year, and different arthropod populations

will fluctuate seasonally. The study showed a correlation between sex and diet, giving way to a number of theories that speculate why gender has an effect on feeding behavior and diet. One mechanism proposes the behavior differences depend on gender, such as guarding territories and attracting mates, are responsible for, or a contributing factor in, feeding behavior. Alternatively, the sexual difference in feeding behavior could also act in favor of reducing intraspecific competition for resources, with individuals eating prey appropriate for their respective size (ex. small females consuming smaller prey).<sup>[17]</sup>


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## External links

- <http://www.qwantz.com/index.php?comic=1827>
- UC Santa Cruz (<http://www.ucsc.edu/currents/02-03/06-23/lizards.html>): Cooperation between unrelated male lizards adds a new wrinkle to evolutionary theory (Essay on Sinervo & Clobert 2001 paper)

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