In a world where life is found in abundant shapes and sizes, we often overlook those that do not acutely impact our lives. Organisms exist that we don’t know about although ample information is available. The Coast Horned Lizard, *Phrynosoma coronatum*, is among the thousands of lizards that exist today. “Based on specimens collected by Paolo Emilio Botta in “California”, *P. coronatum* was named and described by H. M. D. de Blainville in 1835” (Montanucci 2004). The horned lizard is commonly referred to as “horny toads” or “horny frogs” due to their rounded body and blunt snout characteristics, which give them a superficial resemblance to a toad or frog (Pianka and Hodges). Sherbrooke explains that most herpetologists classify the horned lizards as members of the Iguanidae family, Phrynosomatinae subfamily, and genus *Phrynosoma*. Other herpetologists divide Iguanidae into 8 families by modifying subfamilies to become separate families, placing *P. coronatum* in the Phrynosomatidae family and genus *Phryosoma* (Sherbrooke 2003). To date, 3 phylogenetic hypotheses have been offered concerning the relationships among (Montanucci 2001) the 13 living species in the genus *Phrynosoma* (Sherbrooke 2003). 6 subspecies are recognized: *P.c. frontale*, *P.c. blainvillii*, *P.c. schmidtii*, *P.c. jamesi*, *P.c. cerroense*, and *P.c. coronatum* (Montanucci 2004). There has been discrepancies among authors, beginning in the mid 1900’s up until today, over the classification of *P. coronatum* and it’s subspecies. Montanucci recently reexamined the genetic and morphological characters that were used to classify *P. coronatum* and it’s subspecies. “The multivariate assessment of the
differential characters reveals that these groups form discrete clusters, with few intermediates, which strongly suggest that they represent independent evolutionary lineages that are little affected by gene exchange.” In addition to distinct color patterns, his study showed significant variation in length of horns and position of horns among subspecies (2004).

Found only in North America, they are dispersed throughout the western-central and southwestern areas of California (Fisher et al. 2002). From Shasta county, west of the deserts and the Sierra Nevada down to Baja California (except the northeastern areas), their elevational range extends from sea level up to 8,000 ft. (Stebbins 2003). P. coronatum occurs in terrestrial habitats such as grassland, shrubland/chapparal, semi-arid desert fringe, woodlands- conifer, mixed and hardwood, and savannas. (NatureServe Explorer 2006). Fisher et al. determined that the lizards were more common in areas with little or no Argentine ants, increased chaparral vegetation, and porous soils (2002). Key elements to suitable habitat are open areas with scattered shrubs for refuge, lots of sunlight and loose sand where it can bury itself (NatureServe Explorer 2006).

The horned lizards are easily recognizable by the horns surrounding their head, distinguishable from each other by the arrangement and number of occipital and temporal horns (Sherbrooke 2003). Fig. 01 (Pianka and Hodges)
Their length ranges from 2.5-4.5 snout-to-vent length (Stebbins 2003).

Numerous horns and spiny scales function as a defense against predators. *P. coronatum* possess two rows of lateral abdominal fringe scales, two occipital spines (10 in fig. 2), 4-5 temporal spines (5, 6, 7, 8, 12 in fig. 2), 2-3 rows of scales on each side of the throat and smooth scales on the forehead and ventral surface (Pianka and Hodges). Only the horns on its head, not the spiny scales on its body, are rigid.

The occipital horns at the back of the head are longer than surrounding spines, project backward, do not come into contact at the base, and function as a defense against predators (Bryant 1911). Experiments done by Young et al. showed that “natural selection by loggerhead shrikes favors longer horns”, one factor in driving the evolutionary trend towards longer horns. The remains of killed lizards revealed surviving lizards had horn lengths 10% longer than those that were preyed upon (2003).

Sherbrooke explains that *P. coronatum*’s distinctive oval dorsoventrally flattened body, cryptic coloration, and sedentary nature make them inconspicuous against their background. He goes on to say that their flattened body shape “provides them with a large, flat surface that is used for rapid heating, capturing raindrops, or warding off predators.” Their flat bodies lie close to the ground, eliminating any shadow that could disclose their presence. This feature allows for their cryptic, sit-and-wait foraging
behavior to succeed. The marginal/fringe scales also aid in camouflage by concealing the outline of their body. On the other hand, their body shape limits their movement, making rapid movement difficult (2003). Dorsal coloration depends on the substrate, as *P. coronatum* is able to change their color to match their habitat (Eichhorst 2001). The dorsal pattern begins with two large, dark colorations on the neck, followed by broad bands on the body and several smaller bands continuing on the tail. The ventral coloration consists of various shades of brown, cream or yellow with cream-colored spots around the outer fringe scales (Sherbrooke 2003).

The horned lizards (genus *Phrynosoma*) represent a group of specialized ant-eating lizards. *P. coronatum* feeds on native ants of California, preferring the larger harvester ants that make up the majority of their diet (Suarez 2000). Meyers et al. noted that morphological specializations have been associated with myrmecophagous diets, most evident is a shortened length of the mandible and a reduction in the number of teeth. A higher percentage of ants in the diet seemed to result in a trend toward the decrease in the number of teeth. Little or no mechanical processing of consumed ants were observed, therefore, reduction of food processing morphology may be a response to disuse (2004).

Previously believed to exhibit simplified and infrequent behavioral displays, more studies have shown that *P. coronatum* employs various courtship, defensive, and intra- and interspecific actions (Tollestrup 1981). Tollestrup has noted a number of behaviors: In observing male-female interactions, it was not possible to differentiate between actions that were courtship behaviors and those that were not. Courtship behavior was not recognized unless the male mounted the female. Both sexes used head bobs and push-ups, but females would often raise their tail and rock its body back and forth. Males
scratched and tongue-flicked in the presence of a female. Males grasped the female’s hind limbs and flipped her over on her back, then inserted his hemipenes in mating behavior. Male-male interactions showed frequent head bobs, push-ups, rocking and a raised tail while running towards each other. Confrontation of another species produced similar behaviors seen in the male-male interactions (1981).

Coast horned lizards, a diurnal animal undergo regular sequential daily activities. In the morning, they emerge from the sand, but still remain partly buried with only their heads exposed (Heath 1962). “As the animal’s body temperature rises, its head is always 5 to 9 degrees F warmer than its body. Warm blood leaving the head in major veins loses some of its heat to cooler blood passing it in adjacent parallel arteries and entering the head,” explains Sherbrooke. Warm blood circulating back to the head keeps it slightly warmer (2003). When the sun is out, they bask by raising their bodies toward the sun and then flatten their bodies against the hot substrate. Later they alternate between the sun and shade, engaging in feeding (harvester ants, other native ants and other non-ant arthropods), reproduction and other activities (Heath 1962). During the hottest parts of the day, Sherbrooke explains that the lizard will burrow into the sand by arching its back and using its horny head to bury headfirst until it is submerged. Respiration can be difficult due to the displaced soil particles from inhalation. Limiting respiration to the underside of the body solves this problem. Soil particles are prevented from entering the nasal passage by raised nasal valves, which filter soil particles but allow breathing (2003). Although movement in and out of sunlight is believed to be the primary means of temperature regulation in lizards, *P. coronatum* is able to alter its color. Pigment cells called “melanophores” found in their skin allows them to move black pigment granules
closer, thus resulting in a darker skin color. Moving the black pigments farther from the
skin surface produces a lighter color (Klauber 1936). Other methods for regulating body
temperature are panting, cloacal discharge, orienting the bodies in relation to the sun, and
changing body shape. Panting and cloacal discharge are methods used to lower body
temperature from a maintained, elevated temperature. The lizard will push their ribs
backwards, slimming their bodies in order to reduce their exposed surface area or direct
its dorsal surface away from sunlight, if their body temperature gets too high (Heath
1962). The activities of *P. coronatum* in the afternoon, mirror morning activities, but in
reverse order. The lizard burrows itself in the sand/soil for the night, until the next
morning where it will commence the same cycle (Klauber 1962).

Predators of the coast horned lizard include: rattlesnakes, sidewinders, cats, dogs,
foxes, roadrunners, several hawk and owl species, kites and coyotes (Brown). Utilizing a
number of different defense mechanisms help the coast horned lizard avoid predators
Their first line of defense is to employ their cryptic behavior, which includes
camouflaging their dorsal surfaces, burying in the sand, and remaining motionless
(Pianka and Hodges). Utilizing their formidable body armor, if threatened they will
sometimes inflate their bodies to ward off predators (Brown). Although uncommon, they
can be provoked mainly by canids to squirt blood from its eyes (Sherbrooke 2001). The
contraction of a pair of internal jugular constrictor muscles, surrounding the internal
jugular veins, produce engorgement of the large ocular sinuses (with blood) in the head.
A high enough pressure can propel blood by the contraction of the muscles in the eyes
and eyelids (Heath 1966). “The blood breaks through the orbital sinus wall into the
membranes of the eyelids. The blood apparently picks up a substrate from the eye
membranes or Harderian gland which causes irritation to predators,” explains Burleson (1942). The success of this blood-squirting defense depends on efficiency and accuracy of the blood squirted as well as the hunting behaviors of the canid (Sherbrooke 2001).

Oviparous lizards that generally produce one clutch per year, *P. coronatum* differs from other species in the genus *Phrynosoma* because of their unique belly-to-belly mating behavior (Sherbrooke 2003). Males tend to emerge first from winter hibernation during March-April and stay active until July. Females emerge a little later in April and stay active until September (Tollestrup 1981). Upon emergence from hibernation, males and females use their energy reserves to prepare for reproduction (Sherbrooke 2003). The male flips the female onto her back while holding on to her throat. If he is unable to flip her, he turns her onto her side where he holds on to her nuchal horn while (Tollestrup 1981). Hatchlings appear July/August and stay active until November (Brown). A clutch of 6-49 eggs are laid between April and July (Stebbins 2003). Sherbrooke describes males usually possessing a few enlarged scales under their tail behind the vent, while the female lacks them. Barely visible in the females are femoral pores that line the back of the thigh, but are easily discernable in males. Hemipenes in the male results in a wider tail base than the female (2003). Zamudio reports that the coast horned lizard displays sexual dimorphism, specifically female-biased sexual size dimorphism. “Female-biased sexual size dimorphism is uncommon among vertebrates and traditionally has been attributed to asymmetric selective pressures favoring large fecund females (the fecundity-advantage hypothesis) and/or small mobile males (the small-male advantage hypothesis).” Results of Zamudio’s study support the small-male advantage hypothesis. He focuses on two explanations: smaller males can begin reproducing earlier and have an
easier time moving around to find reproductive females, therefore possessing higher reproductive success. Also, since coast horned lizards are not territorial, they do not need a larger body size to protect their areas by combating with another males (1998).

The coast horned lizard, once common, has declined in numbers due to several contributing factors. Habitat loss, fragmentation, and degradation from grazing agriculture and urbanization is the main cause of their decline (Czech and Krausman 1997). As ant specialists favoring native harvester ants, coast horned lizards are especially vulnerable to changes in their diet. If harvester or other native ants are not available or abundant, they will also prey upon other insects such as beetles, termites, flies, and grasshoppers (Stebbins 2003). The introduced Argentine ant (*Linepithema humile*), which is believed to have entered the United States over 100 years ago, has successfully proliferated in California (Suarez 2002). The Argentine ant’s successful displacement of native ants is largely attributable to a lack of competition and predators, as well as its aggressive foraging and mobbing behaviors (Suarez 2000). Suarez et al. have observed that in areas with no Argentine ants, native ants accounted for more than 98% of *P. coronatum*’s diet. In invaded areas, the horned lizard did not incorporate the Argentine ant into its diet, rather, ate a smaller percentage of native ants. Also, captive lizards fed only Argentine ants would lose weight, implying that Argentine ants are not an appropriate substitute food source. The aggressive Argentine ant, forcing the coast horned lizard to switch from eating harvester ants to smaller native ants and other insects, is displacing native ants. This may cause the lizard to spend more time and energy searching for food since it has to eat more often (smaller ants) and non-ant arthropods are not as abundant nor are their behaviors as predictable (2002). The Argentine ant problem
only complicates and intensifies the problems of habitat loss. Harvester ants play an important role in the ecosystem, not only providing food to lizards, but they disperse seeds of various plants. The Argentine ant, on the other hand, does very little to maintain the native vegetative community (Suarez 2000).

In the past, these spiny lizards were highly valued in the pet and curio (mainly in San Diego) trade until collecting was banned in 1981 (Jennings and Hayes 1994). Many were caught and shipped to other states and countries to be utilized as a method of ant control, but failed to propagate because of unfavorable environments (Eichhorst 2001). Jennings and Hayes’ report on the status of *P. coronatum* has described populations under severe declines, especially *P.c. blainvillii* and *P.c. frontale*. 45% of *P.c. blainvillii* and 35% of *P.c frontale* populations have disappeared from their range habitat. The lizard’s immobile defensive behavior makes them especially vulnerable to domestic pets, capture by humans and vehicles. Currently the coast horned lizard is a Federal Special Concern Species (FSC) and in California, a Special Concern species. The goal now is to preserve remaining habitats as well as gathering more information on remaining populations (1994).
References


