CHUCKWALLAS

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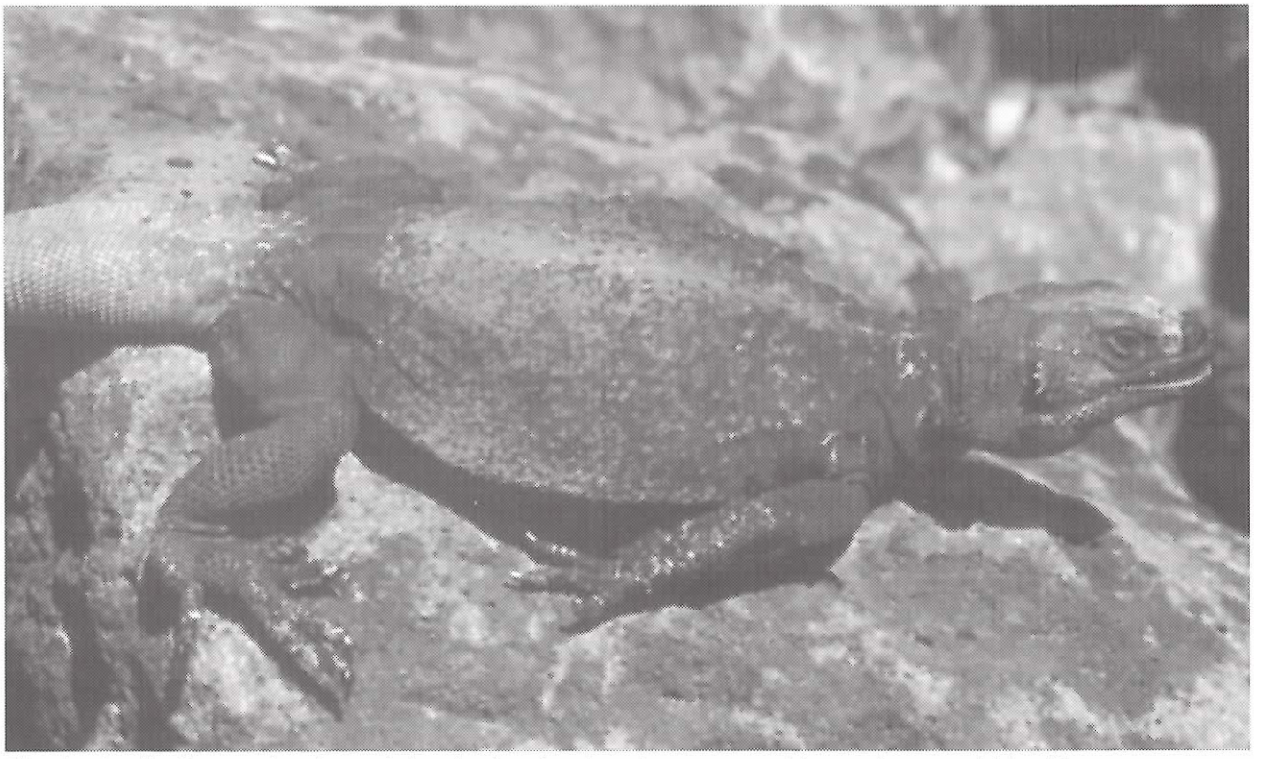
It is not uncommon while driving or walking the back roads of the American southwest to catch a glimpse of a large, dark saurian shape perched high atop a rocky outcropping or ancient crumbling lava flow. I have often attempted to approach these creatures only to have them quickly slip into one of the deep fissures or dark crevices within their rocky domain.

If you are well prepared and have thought to bring along a high-powered flashlight—the most unlikely of tools for observing diurnal lizards—you may be rewarded with the sight of the United States' largest nonvenomous lizard, the chuckwalla (*Sauromalus obesus*). By shining your light into the dark recesses of the proper crevice, you will see the chuckwalla wedged tightly inside. "Chucks" have a rough granular skin and, once inside a crevice, they can gulp air, increasing their volume by up to 53 percent, and wedge themselves tightly against the sides of their rocky retreat. Thus inflated, they are almost impossible to remove without damage to the lizard or rocky outcropping.

Description

The name "chuckwalla" (sometimes spelled "chuckawalla") is a corruption of the Mexican/Spanish name for this lizard, "chacahuala." These large lizards are second only in size in the United States to the venomous gila monster, and they reach snout-to-vent lengths of nearly 20 cm (8 inches) and overall lengths of over 38 cm (15 inches). They are heavy-bodied, robust and flattened dorsoventrally. In fact, their scientific name, *Sauromalus obesus,* means literally "fat, flat lizard."

Chuckwallas are characterized by loose folds



The chuckwalla, *Sauromalus obesus,* is locally abundant in rocky outcrops of the southwestern United States. *Photograph: Thomas A. Wiewandt.*

of skin on the neck and sides and a broad-based tail with a blunt tip. Male *S. obesus* have one or two rows of femoral pores and are generally very dark bodied with rusty red or orange sides and a buff to yellow tail. Females are normally lighter in color and often retain the dark banding pattern across the body and tail that is also characteristic of juveniles.

These saxicolous (rock dwelling) lizards inhabit nearly every lava flow and rocky hillside from the desert side of the mountains of Southern California east to central Arizona, and southward from the extreme southern portions of Nevada and Utah into northwestern Mexico in western Sonora. The creosote bush occurs throughout most of the chuckwalla's range, which also closely parallels that of its relative, the desert iguana, *Dipsosaurus dorsalis.* The desert iguana requires a different habitat, however, preferring open, flat regions and sandy washes.

Chuckwallas are members of the family Iguanidae, a group characterized by large size and the fact, rare among lizards, that they are all chiefly herbivores as adults.

Diet

"Chucks" prefer the shoots and flowers of desert annuals that appear following spring rains. Only after all the annuals die in May do they shift their diet to perennials such as sweet bushes (*Bebbia juncea*). More than 22 different species of plants have been identified as being consumed by wild chuckwallas: saguaro (fruit); palo verde, mesquite, and acacia (leaves, flowers, and beans); brittle brush (leaves and flowers); wolfberry; ironwood (leaves); creosote (flowers) and others.

Predators

Chuckwallas have numerous natural enemies in the wild, particularly when they are small. Rats are potential predators of both eggs and young, and several species of snakes are large enough to feed upon adult chucks, although that is probably rare.

In the southern part of their range, the young of some species of *Sauromalus* are eaten by the Mexican spiny-tailed iguanas (genus *Ctenosaura*). Coyotes and kit foxes take a fair number of individuals, as evidenced by the numerous remains of chuckwallas found in their droppings. Basking chucks seem very alert to anything flying overhead, including both birds and airplanes; they will often immediately dash to cover when one approaches. Some of their avian predators are believed to be red-tailed hawks, falcons, ospreys and ravens. Unfortunately, as man encroaches more and more into the chuckwalla's habitat, domestic or feral dogs and cats kill increasing numbers of these lizards each year.

Reproduction

The more northern forms of chuckwallas hibernate during the winter months, emerging in the spring when they begin their reproductive activities. Female *S. obesus* do not nest every year, producing only about one clutch of eggs every two years on average. In fact, in dry years when food resources are scarce, they may not breed at all. Even in boom years of heavier than normal rainfall and increased plant growth, only about one-third of the sexually mature females will lay eggs.

Dominant mature males establish territories averaging 0.57 ha during years of favorable conditions in order to secure mating rights with females. The females' territories are substantially smaller, averaging 0.17 ha, and several females will often be found within one male's territory. Late mornings and afternoons will often find groups of chuckwallas (but never more than one adult male) basking together on raised areas of rock and flat boulders. Size seems to be the dominant factor for males establishing territories. These territories are actively defended against other mature males, but not against females or juveniles.

By late March, the males begin to show increased interest in the females within their territories, and they begin to initiate the courtship and mating process. Intromission lasts a surprisingly long time in comparison with other iguanas, and in at least one species, *S. varius,* may occur for up to one hour! Mating activity continues throughout April and May, and by June or July the females begin to select nest sites. Nest burrows are dug by the gravid female to a depth equal to

The San Esteban chuckwalla, *Sauromalus varius,* lives on small islands in the gulf of California, and may exceed 12" snout-vent length. Large body sizes are typical of iguanas that live on islands. *Photograph: Thomas A. Wiewandt.*

about her total overall length. An enlarged terminal chamber is constructed into which the female deposits 12 to 14 eggs, averaging 20 mm long by 15 mm wide, and weighing about 8 g each.

Before refilling the nest burrow with soil, the female soaks the ground with a viscous cloacal fluid that apparently helps to keep humidity within the nest chamber at a proper level. Eggs usually hatch in September after approximately 12 weeks of incubation. Juvenile *S. obesus* grow at the average rate of 0.14 g per day for males and 0.06 g per day for females.

Taxonomic Forms

Currently, there are 11 taxa recognized within the genus *Sauromalus.* Many of these are insular forms restricted to roughly 22 islands in the Gulf of California. Most of these island forms are very similar in size and structure to *S. obesus,* but others, like *S. varius* and *S. hispidus,* reach truly "gigantic" proportions! In contrast to *S. obesus,* which attains weights of up to 385 g (0.85 pounds) and snout-to-vent lengths of about 20 cm (8 inches), the San Esteban Island chuckwalla (*S. varius*) can exceed 1.8 kg (4 pounds) in weight and has been measured at almost 33 cm (13 inches) snout-to-vent length, with overall lengths exceeding 61 cm (24 inches)!

The home of this "giant" chuckwalla, San Esteban, is a deep water island 42 km^2 in area located in the midriff island series of the Gulf of California (also known as the Sea of Cortez). This chuckwalla is listed as endangered by the United States Fish and Wildlife Service and is on Appendix I of CITES. *Sauromalus varius* is sometimes utilized as food by Seri Indians and Mexican fisherman, but its general decline in numbers in recent years is probably due to collection for commercial purposes. Today, the total population is estimated to be less than 4,500 individuals that are concentrated in one relatively small, easily accessible arroyo. The island itself has excellent anchorage. Therefore, this species is vulnerable to further exploitation.

The San Esteban Island chuckwalla differs in more ways than just its larger size from *S. obesus.* There is very little sexual dimorphism (visual difference) between males and females. Both sexes have the same color pattern and are similar in size. The only external physical differences are that

males have enlarged femoral pores and wider necks than females. Reproduction strategies also vary considerably between species. *Sauromalus varius* females nest only about once every four years, with only eight percent of the adult females nesting in any given year. In contrast to *S. obesus,* which exhibits no parental care, *S. varius* females will actively defend their nest sites against other nesting females for several weeks after laying. Clutch size is also larger, with 18 to 30 eggs, averaging 40 mm long by 28 mm wide and weighing 18 g, laid in a 60 to 80 cm deep burrow. Hatchlings are large (but not as large as you might expect considering the differences in adult size), averaging 75 mm snout-to-vent length and about 14 g in weight. They grow at almost 2 1/2 times the rate of *S. obesus* juveniles, however, averaging 0.25 g per day.

Howard Lawler with a cold-blooded companion at the Arizona Sonora Desert Museum. *Photograph: Thomas A. Wiewandt.*

Captive Chuckwallas

Chuckwallas have had a reputation for being somewhat difficult to keep in captivity. Although requiring specialized care, they may be expected to live eight or nine years in captivity if proper conditions are met. I suspect their potential life span may be twice that long.

Young animals often adjust to captive conditions better than adults. A cage at least 4 feet by 2 1/2 feet by 2 1/2 feet is recommended for an adult pair of *S. obesus.* Basking sites under full-spectrum lighting can be constructed by stacking flat rocks on top of one another to form a sloping rocky shelf. Crevices can be left between the rocks to provide hiding spots and retreats. Rocks may need to be glued in place, because adult chuckwallas are very strong and may tumble loose stones over. Day temperatures should reach 85 to 100 °F and may be obtained through use of sunlamps, spotlights or, better still, natural sunlight in outdoor enclosures. Night temperatures may drop to about 70 °F. Water bowls should not be left in the cage, but only offered twice a week to keep humidity levels low.

Captive diets should include as many natural food plants as possible. In areas where these are not available, chuckwallas will often accept chopped mustard greens, kale, collards, grated carrots, zucchini, yellow squash, cut bell peppers and green beans. A small amount of fruit may be offered, including cactus apples, grapes, strawberries, blueberries and bananas. Other foods accepted are alfalfa hay, dandelion flowers and greens, and hibiscus flowers.

A plant protein level of about 10 percent is considered adequate for chuckwallas, and little or no animal protein is necessary for proper growth and development. A small number of fortified crickets or other insects fed sparingly is perfectly acceptable, however. Daily feedings of the vegetable mixture are recommended, but offering food every other day is also acceptable.

Twice per week, a vitamin/mineral supplement should be sprinkled onto the vegetable mixture. It is particularly important that animals that are not allowed access to natural sunlight receive proper levels of vitamin D_3 supplementation, as well as calcium, in their diet.

Currently Recognized Taxa of the Genus *Sauromalus*

- *Sauromalus ater ater,* Dumeril. Distribution: The islands of Espiritu Santo, Partida, San Jose, San Francisco, San Diego and Santa Cruz in the Gulf of California.
- *Sauromalus ater klauberi,* Shaw. Distribution: Santa Catalina Island in the Gulf of California, Mexico.
- *Sauromalus ater shawi,* Cliff. Distribution: San Marcos Island in the Gulf of California, Mexico.
- *Sauromalus australis,* Shaw. Distribution: Southeastern Baja California, from Punta San Gabriel south to La Paz, Mexico.
- *Sauromalus hispidus,* Stejneger. Distribution: The islands of Angel de la Guarda, Smith, Pond, Granite, Mejia, San Lorenzo Norte and San Lorenzo Sur in the Gulf of California, Mexico.
- *Sauromalus obesus obesus* (Baird). Distribution: Desert areas of southern California east of the mountains, extreme southern Nevada and southwestern Utah, and western and central Arizona, United States.
- *Sauromalus obesus multiforminatus,* Tanner and Avery. Distribution: The Colorado River area from Glen Canyon Dam in northern Arizona, northeast to just north of Hite in southern Utah, United States.
- *Sauromalus obesus townsend,* Dickerson. Distribution: Tiburon Island in the Gulf of California and the adjacent coast of western Sonora south to Guaymas and inland to Hermosillo, northwestern Mexico.
- *Sauromalus obesus tumidus,* Shaw. Distribution: Southwestern Arizona and adjacent extreme northwestern Sonora, northwestern Arizona.
- *Sauromalus slevini,* Van Denburgh. Distribution: The islands of Monserrate, Carmen and Coronados in the Gulf of California, western Mexico.
- *Sauromalus varius,* Dickerson. Distribution: The islands of San Esteban, Lobos and Pelicano in the Gulf of California, western Mexico.

Howard Lawler, Curator of Small Animals at the Arizona Sonora Desert Museum (A.S.D.M.), has established one of the most successful breeding programs in the world for *Sauromalus* species. Animals there are maintained in large outdoor enclosures that not only allow them access to a natural photoperiod and beneficial sunlight but are spacious enough for the chuckwallas to establish a somewhat natural social organization that may be helpful in stimulating successful courtship and breeding behavior. Eggs laid in these enclosures are not removed, but left in place to incubate under fairly natural conditions. Eggs left in the nest chambers have had as high, or higher, a successful hatch rate as ones that were incubated artificially.

As soon as the hatchlings begin feeding, they are offered a small amount of feces from a healthy adult chuckwalla in order to introduce proper microflora to begin efficient digestion. Young that were not inoculated this way grew much more slowly and did not thrive. Chuckwallas, like other herbivore lizards, are hindgut fermenters and require both the proper microorganisms and sufficiently high temperatures to break down the roughage they consume. This is necessary before their bodies can utilize the nutrients contained within the food. Their droppings are elongated cylindrical pellets containing plant fibers and are often deposited around their favorite basking sites.

According to Frank and Kate Slavens' "Reptiles and Amphibians in Captivity-Breeding-Longevity and Inventory Current January 1, 1992," there were 210 chuckwallas held in 27 reporting institutions worldwide. This, of course, is only a portion of the total number actually in captivity in both public and private collections. Of those 27 institutions, only three reported the successful hatching of a total of 17 offspring in 1991. Four *S. obesus* were produced at the Royal Rotterdam Zoological Garden; three *S. o. obesus* (western chuckwallas) at Riverbanks Zoological Park, and three *S. o. tumidus* (Arizona chuckwalla) and seven *S. varius* (San Esteban Island chuckwalla) at the Arizona Sonora Desert Museum. A *S. varius* hatched at A.S.D.M. and held at the Rio Grande Zoo for many years holds the current

longevity record in captivity at 11 years, four months (hatched 9/81, died 1/93).

Few medical problems have been associated with the captive maintenance of chuckwallas. Mites (*Hirstiella pyriformis*) have been identified on both wild and captive *S. varius*. Occasional animals have developed stomatitis infections from which the bacteria *Pseudomonas* and *Neisseria* have been isolated. Abscesses from 1 to 6 mm in size have been found on wild-caught chuckwallas. These abscesses were cultured and found to contain bacteria of the genus *Serratia*.

Although captive maintenance and reproduction of chuckwallas presents a challenge, it is being accomplished with increasing frequency and can be very rewarding. Should you wish to work with *Sauromalus*, it is easier to begin with young individuals, because they often adjust better to captive conditions than do adults. Please remember that many chuckwallas are protected by state laws that place strict bag and possession limits on them, as well as require valid licenses and regulate methods by which they may be captured. Never use a pry bar or other method to break apart rock piles. This is extremely destructive to chuckwalla habitats. As always, it is best to try to acquire captive-bred animals. They acclimate easily to a captive environment and often thrive under these artificial conditions.

Acknowledgments

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