Common Chameleon
Chamaeleo Chamaeleon

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Herpetology
December 5, 2007
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INTRODUCTION

Over the years, different species of animals have been forced to suffer the various occurrences of natural disasters, lack of resources, and destruction of habitats by man. One species that makes up this group is the Common Chameleon, *Chamaeleo Chamaelon*. Although it has not been classified as an endangered species, recent efforts have been made in their conservation in the coastal regions of Spain and Portugal (Miraldo et al., 2005). Not only is this species being studied for the purposes of conservation, but also for merely finding out more information about it. Some experiments have been conducted in studying their coloration in relation to reproductive behavior. They have also been popular subjects for studying habitat selection and habitat shift. Because of their unique tongue and method of apprehending prey, several studies have also been dedicated in studying the muscles in the tongue and its effectiveness. The work going into studying the Common Chameleon will give a better understanding of the lifestyle and physiology of the species, thus enabling more effectiveness in its conservation and survival.

CHARACTERISTICS

The Common Chameleon, *Chamaeleo Chamaeleon*, belongs to the family Chamaeleonidae. These Old World lizards possess unique features that make them easily distinguishable from other lizards. This includes their zygodactyl feet (Keren-Rotem et al., 2006) and laterally compressed body (Cuadrado & Loman, 1999). Their adjacent digits are fused on each foot, forming opposing grasping pads (Keren-Rotem et al., 2006). Other synapomorphies comprise the V-condition of the ulnar nerve pathway, a reduction in the number of sternal ribs, failure of the pterygoid to meet the quadrate, and the loss of both the gular fold and femoral

pores (Heying, 2003). Chameleons are well-known for their lengthy tongue and its ability to catch their prey (Herrel et al., 2000). Tongue length can be as long as the body of the chameleon itself, and during the process of capturing prey, the tongue may be extended up to twice its size (Herrel et al., 2001). Moreover, its tongue pad contains many epithelial glands and papillae that permit it to lock onto surfaces of its prey normally impossible to attain (Herrel et al., 2000). Many members also have the amazing skill in changing their coloration easily and quickly, which is controlled by hormonal cues and central nervous system (Anderson). Furthermore, they are able to move their eyes independently of one another without having to move their heads because they possess an 'all-cone' retina and crossed visual pathway, allowing them to observe two different visual domains at the same time (Bennis et al., 1994). The arboreal chameleons have prehensile tails that help them better hold onto tree branches and other types of vegetation, but may remain coiled although it is not in use (Keren-Rotem et al., 2006). Chamaeleonidae is composed of six genera, which include *Bradypodion, Brookesia, Calumma, Chamaeleo, Furcife*, and *Rhampholeon* (Myers et al., 2006).

The coloration of chameleons is specific to the mating season (Cuadrado, 2000). Cuadrado's 2000 study revealed that when not in the mating season, both male and female chameleons show cryptic coloration, but when in the mating season, distinctive social coloration is displayed. Furthermore, he found that while males present colors to attract female partners, females exhibit colors of receptivity or nonreceptivity. Colors varied with shades and patterns of green, gray, orange, brown, and yellow. Finally, he observed that their coloration during the non-mating season is adjustable to approaching prey and avoiding predation, but at the same time depends on background color, temperature, and social interactions.

In their 2002 study, Bickel and Losos examined how most species of family Chamaeleonidae possess casques, horns, and crests on their heads, which is the source for the following relative information. *C. chamaeleon* has larger plate-like scales on the face, with a row of conical scales that form a small crest on the back and a small gular crest. They also have a parietal crest that rises higher and higher towards the back. Both male and female adults generally grow up to a size of 11 inches, while most European chameleons only reach a size of 8 inches (Horgan, 2003). The average SVL, snout-vent length, is approximately 4 to 6 inches (Horgan, 2003). The Common Chameleon reaches sexual maturity when they reach one year of age, and their life expectancy has been documented to be as high as 6 years (Horgan, 2003).

HABITAT

Compared to all other chameleon species, the Common Chameleon has been documented to have the widest distribution, which was documented by Hillenius in 1978. He found a distribution spreading from Morocco and the southern Iberian Peninsula over the whole of North Africa, to the Near East, Turkey, Cyprus and Southern Arabia, to India and Sri Lanka. Species also appeared on the Mediterranean islands of Cyprus, Crete, Samos, Chios, Malta and Sicily. It is a slow-moving diurnal species that sits upon the branches of trees, anticipating its prey (Bickel & Losos, 2002). During the mating season, males actively follow their female mates closely while guarding, thus affecting their home ranges and spatial organizations (Cuadrado, 2001).

In 2006, Keren-Rotem, Bouskila, and Geffen studied the ontogenic shift of the Common Chameleon in Israel and its relation to cannibalism, which is what the following information pertains to. Their experiments revealed that juveniles actively avoided being around adults by fleeing or concealing themselves, thus showing why juveniles occurred in low grasses, and

adults in bushes and trees. In addition to cannibalism, other reasons for ontogenic shifts in habitat revolved around food availability, perch sites, thermal requirements, morphological constraints, predator avoidance, interspecific aggression, and intraspecific aggression. Several snake species, kingfishers, birds, rats, and small arboreal carnivores were noted to be the main predators of Israeli chameleons.

DIET

Just as the other genera in family Chamaeleonidae, the Common Chameleon is typically an insectivorous species. This diet consists of wasps and mantids, although some larger species have been documented to eating young birds (Schleich et al., 1996) and lizards (Herrel et al., 2001) as well. A few studies of the Common Chameleon in southeastern Spain and Malta Island showed that arthropods comprised more than three-fourths of the diet in its fecal matter (Hofer et al., 2003). As was mentioned previously, *C. chamaeleon* quietly awaits its next prey among elevated areas of vegetation. Because it practices this method of prey apprehension, it does not have a constant feeding routine. In spite of this, it has evolved to become one of the most skilled and accurate predators (Herrel et al., 2001). This is, of course, due to its ability to locate its prey not by moving its head, but by simply moving its eyes independently and in direction they choose. Its tongue is also highly developed to capturing larger prey because of its reliance on serous and mucous secretions, as well as holding the prey on the tongue after its capture (Bramble & Wake, 1985).

Experts have suggested that the Common Chameleon should be given a slightly more diverse and nutritious diet while in captivity. It should mostly be fed crickets, but it should not exceed more than 50% of its diet (Avian And Exotic Animal Care). Other insects recommended

by Avian and Exotic Animal Care are waxworms, earthworms, grasshoppers, and flies, along with collards, dandelion leaves, mustard greens, oats, broccoli, alfalfa hay, and other fruits and vegetables. Finally, all food must be sprayed or dusted with powdered vitamins, minerals, calcium, and D3 (Horgan, 2003).

BEHAVIOR

Because *C. chamaeleon* has been listed as a species of interest, there have been some studies on its behavior, though perhaps not sufficient enough to come to its full understanding. Much of its activity was recorded in the daytime, since the common chameleon is a diurnal animal. Except for *Brookesia* and *Rhampoleon*, all genera of Chamaeleonidae are shy by nature (Anderson). Therefore, common chameleons tend to keep themselves in solitary areas, fending off any intruders, including those in the same species (Anderson). Perhaps the only time of year in which they are tolerant of being around individuals of the same species is during courtship and mating. In 2001, Cuadrado found an increase in aggressiveness and mate guarding during the mating season. The following information refers to this study. Generally, male common chameleons carry out sequential polygyny, in which they mate with and guard several females during the mating season, but only one at a time (Yedlin & Ferguson, 1973). Males were observed to follow their female mates during the mating season, displaying a spatial organization that enabled them to be in close proximity to the home ranges of their mates. However, it was clear that the mating season ended once females were no longer receptive, and the males abandoned them. Some of the aggressiveness recorded were the chasing of a solitary male intruder by a guarding male, not so much by combat. In most of these encounters, the intruder would attempt to present typical courting colors, a larger body size, and aggressive behavior,

while the opponent responded with subdominant body colors. In quite a few instances, the intruder would replace a former guardian. Male reproductive success and spatial organization in the population studied depended heavily on characteristics, such as body and weight.

The coloration of the common chameleon depends on the time in relation to the mating season, as well as its response to health, temperature, and social interactions (Cuadrado, 2000). Therefore, it is important to understand chameleon coloration in order to understand its behavior. Abnormal light or dark coloration could be an indicator of illness, or more rarely, a poor response to extreme temperatures (Anderson). Since *C. chamaeleon* is found in more humid regions, they are able to withstand both humid and dry conditions (Horgan, 2003). In 2000, Dimaki, Valakos, and Legakis measured the body, substrate, and air temperatures of the African Chameleon and Common Chameleon, finding that both species were thermoconformers, since the correlation between body and air temperature was very near to each other. During the mating season, males display distinctive coloration in order to attract female mates and in response, females display colors whether they are receptive to the male or not (Cuadrado, 2001). In 1999, Cuadrado and Loman observed that these distinctive body color patterns included a leaf green background color, sometimes brown, with conspicuous yellow, orange, or green spots. The two researchers noted that females, who exhibited these color patterns were more likely to copulate than females, who did not. Once the mating season ended, females changed their color pattern to what has been concluded as nonreceptive color patterns; for example, from green or brown to black, with the yellow, orange, green, and bluish spots remaining (Cuadrado & Loman, 1999).

In Israel, *C. Chamaeleon* is active mostly during the warm months of May to November, while mating occurs during July to September (Keren-Rotem et al., 2006). It is an oviparous species, whose females produce single clutches per year from mid-July to late October

(Cuadrado, 2000). Size and age of the female (Cuadrado & Loman, 1999), along with courting, receptivity, and mating (Cuadrado, 2001) are the main factors that determine reproductive timing for females. In their study, Cuadrado and Loman also produced four explanations for delayed breeding. The first was that late breeding could have been due to a lack of maturity in younger females. The second stated that it allowed younger females to make larger clutches, since they are able to secure more resources. The third explained that late breeding could have been a result of younger females avoiding competition with larger females for more attractive males. The fourth suggested that younger females will not be courted until males discontinue courting larger females.

REPRODUCTION

Despite its preference of remaining solitary, the common chameleon must break its usual routine and find a mate once July nears. Like many other species, males must compete with other males in order for the female to select him as her mating partner. If a male is really determined to mate with a particular female, the male will make a larger effort to court her and guard her for a longer period of time (Cuadrado & Loman, 1999). Females tend to choose males with cloudy black spots on dark green body backgrounds (Cuadrado, 1998). Aside from displaying attractive color patterns, *C. chamaeleon* demonstrates other ways of courtship. Some examples include sidewise exhibitions of a laterally flattened body and tightly curled tails (Cuadrado, 1998). In order to show that she is interested, the female displays a receptive color to the male, confirming her acceptance (Cuadrado, 1998). Many times, during mate guarding, the male will attempt to mount the female, and if the female is receptive, she will allow him to do so, and copulation will

be successful (Cuadrado, 2000). If the female wishes to reject the male, she will leave, but if the situation requires more aggression, the female will bite or chase the male (Cuadrado, 1999).

In addition to studying body coloration, Cuadrado and Loman also observed its relation to the copulation between the lizards, and their results. The following information is derived from this study. The female common chameleon lays single clutches that have been observed to depend on whether she breeds at an early or late stage. Because they have more time in finding resources, younger females breed later than larger females, thus enabling them to make larger clutches. By the time autumn comes around, females dig burrows to lay their eggs underground. They normally deposit 14 to 47 eggs around October to November (Keren, 2001). Hatching usually occurs after 9 to 12 months of incubation (Cuadrado & Loman, 1999).

CONCLUSION

The Common Chameleon is not an endangered species, but due to cold summers, their numbers are reducing significantly (The Columbus Zoo & Aquarium, 2004). Much of this reduction is due to the Common Chameleon's unwillingness to disperse (Blasco et. al, 1985), habitat loss and destruction by humans, and tourism (Hódar et al., 2000). As a result, there has been an increasing awareness in efforts to conserve *C. chamaeleon* in the areas of Southern Spain (Mellado et al., 2001) and Southern Portugal (Miraldo et al., 2005). Other efforts have been dedicated to simply finding more research on the Common Chameleon, since it had been documented as "insufficiently known" in the Red List of Spanish vertebrates in 1986, and catalogued as a species of interest in Annex IV of the EU Habitat and Species Directive (Hódar et al., 2000). As a result of this, more researchers have conducted experiments regarding different aspects of *C. chamaeleon,* including habitat, coloration, eye and tongue functionality,

etc. For example, studies of the anatomical distribution of cells containing calcium-binding proteins in the retina of the common chameleon is currently leading to a better understanding of how proteins function in retinal information processing (Bennis et al., 2005). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is one of the main causes ensuring that having the common chameleon in the pet trade does not pose a threat to wild populations (Auliyah, 2003).

The more information researchers can gather about the common chameleon, the better chances there will be in conserving its species. With this information, people will have a better understanding of its physiology, behavior, and lifestyle, thus providing conservationists with more effective methods of its preservation. Obviously, this would work the other way around, because the longer *C. chamaeleon* survives, the more time researchers have to learn about it. People need to be aware of its importance as a species that maintains its ecosystem and environment in the Mediterranean and Iberian Peninsula.

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