Preliminary results on the feeding ecology of the African Chameleon *Chamaeleo africanus* Laurenti, 1768 from the southwestern Peloponnese, Greece.

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Abstract

The African Chameleon *Chamaeleo africanus* Laurenti, 1768 is a new species for the Greek and European herpetofauna. In this study, data on its feeding ecology are presented for the first time. The stomach contents of 35 individuals and the faeces of 8 individuals were analyzed and the results of the analysis are discussed.

According to our results the African Chameleon feeds mainly on arthropods. The most prevalent prey categories found in the stomachs were Coleoptera, plant remains, Hemiptera and Hymenoptera. The range of number of prey items found in each examined stomach was 1-49 and the mean was 14.

The diet of the African Chameleon tends to differ between the two sexes. Differences in the prey composition among different chameleon species have been reported.

In autumn more seeds were found in the stomachs, however the arthropod diet of the African Chameleon does not seem to change significantly between summer and autumn.

Introduction

The distribution of the African Chameleon *Chamaeleo africanus* Laurenti, 1768 ranges from the Red Sea to western Mali (Central Africa) (Böhme, 1985) reaching northwards to Egypt, Anderson (1898) first recorded the presence of this species at Ramleh, close to Alexandria in Egypt.

Quite recently the African Chameleon was recorded in Europe; particularly it has been observed only at Divari lagoon, Gialova near Pylos, in the southwestern Peloponnese, Greece (21° 40′E, 36° 58′N), (Böhme *et al.*, 1998), where it shows a limited range of about 20 ha.

Information on the diet of the African Chameleon is completely lacking. Few records about feeding ecology of the genus *Chamaeleo* exist. Blasco *et al.* (1985) and Pleguezuelos *et al.* (1999) have analyzed the food habits of the Common Chameleon *C. chamaeleon* in Spain, Burmeister (1989) in Northern Libya and Luiselli & Rugiero (1996) in Malta. Burrage (1973) has analyzed the food habits of *Bradypodium pumilum* and *C. namaquensis* and Bourgat (1971) of *C. pardalis.*

In the present paper data on the feeding ecology of this species from Greece are presented. Sex and seasonal differences in some dietary parameters are also given. Feeding ecology data of other *Chamaeleo* species coming from the literature were compared with our results.

Materials and Methods

For the present study, the stomach contents of 35 individuals (18 males and 17 females) and the feces of 8 individuals (3 males, the rest of unknown sex) were examined. Faecal analysis provides accurate information on diet and permits dietary analysis without killing the animals (Hódar & Pleguezuelos, 1999). The 35 examined animals were found recently killed (most of them by cars) during the period 1996-1999. Twenty-five of the total specimens were found in the summer (June-August), 16 in autumn (September-November), one in the spring (May) and the other unknown. The specimens are deposited at the Goulandris Natural History Museum, no catalogue numbers have been given yet.

The stomach and faecal prey items of each specimen were counted and examined under a dissecting microscope provided with a micrometer scale in the objective lens. We identified whole prey items or their recognizable body parts to order level. Each lizard's sex was recorded on the basis of the presence of hemipenes in males and ovaries in females.

Diet was determined in two ways: a) as a proportion of the total number of prey items in all the stomachs examined (%N) and b) as a proportion of individuals eating a certain prey category (F).

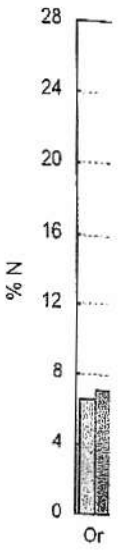
Feeding niche breadth (H') was calculated using the Shannon-Wiener index:

$H' = -\sum p_j \log p_j$ (where pj is the proportion of individuals having eaten the prey category j). A statistical analysis was carried out using descriptive statistics and x^2-tests.

Results

According to our results the African Chameleon feeds mainly on arthropods. Insects were 70% of all the identified prey items. The prey items represented 10 insect orders. The most frequently encountered prey in the stomachs and faeces were Coleoptera (24%), Hemiptera (16.5%), Hymenoptera (14.2%) and Orthoptera (6.9%). Plant pieces were very important as they appear with a percentage of 19.4%. In Table 1 are shown the results of the diet analysis.

We found a mean of 14 food pieces in the stomachs and faeces but we don't know if they are one day's catch. The maximum number of stomach and faeces items we found were 49 from a male in August. The minimum number of stomach and faeces items was recorded as a single item from a female in October.



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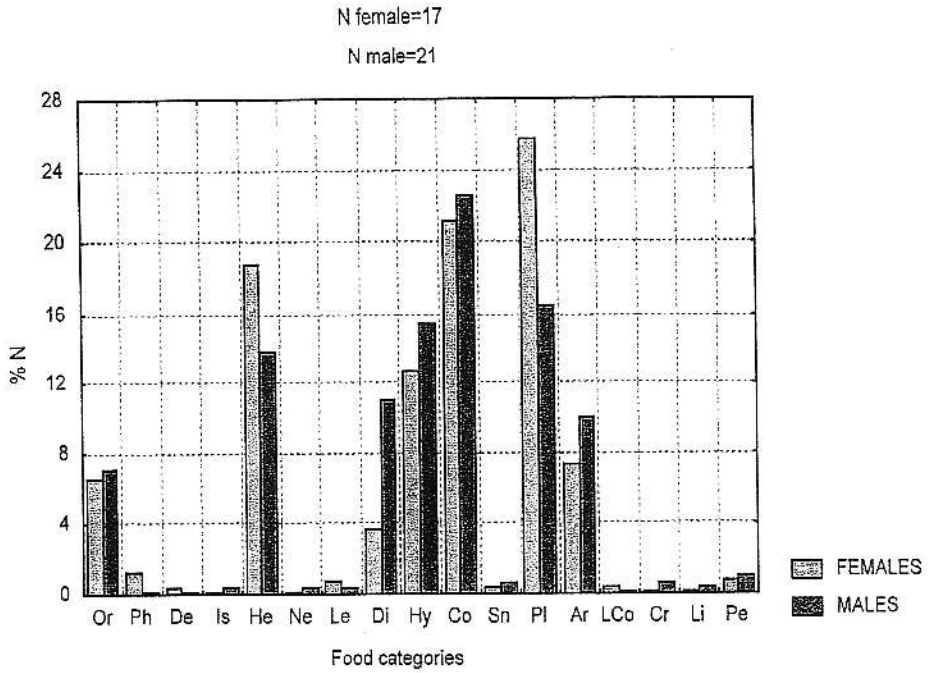

Fig. 1. Prey composition of the two sexes of the African Chameleon during the examined seasons. Or: Orthoptera, Ph: Phasmida, De: Dermaptera, Is: Isoptera, He: Hemiptera Ne: Neuroptera, Le: Lepidoptera, Di: Diptera, Hy: Hymenoptera, Co: Coleoptera, Sn: Snails, Pl: Plant remains, Ar: Araneae, LCo: Larvae (Coleoptera), Cr: Crabs, Li: Lizard's sloughs, Pe: Pebbles.

The composition of the diet of the African Chameleon tends to differ between the two sexes. However there is no statistically significant difference between the total number of prey items of the two sexes (t-test, t=0.16 p=0.87), (Figure 1). The most frequent category taken by males was Coleoptera (22.6%) followed by plant remains (16.5%) and Hymenoptera (15.5%). The most important prey categories for females were plant remains (25.7%), Coleoptera (21.2%) and Hemiptera (18.8%).

In autumn more seeds were found in the stomachs and faeces, but the arthropod diet of the African Chameleon does not seem to change significantly between summer and autumn (t-test t=1.40, p=0.170). (Fig. 2). There is no difference between the number of prey items in the two seasons (t-test t=0.91, p=0.369).

The niche breadth was H'=0.874 which means that this species uses a wide variety of prey. This result agrees with that for the Common Chameleon, which has been found to be euryphagous (Blasco *et al.*, 1985).

The niche breadth of the examined population of the African Chameleon does not seem to change, neither between the compared seasons (summer H'=0.848, autumn H'=0.906) nor between the two sexes (female H'=0.844, male H'=0.886).

However we found many insect eggs, and in two stomachs snail remains. In the field a chameleon was observed trying to catch a snail.

A cestode worm found in a single stomach is likely to have been a parasite.

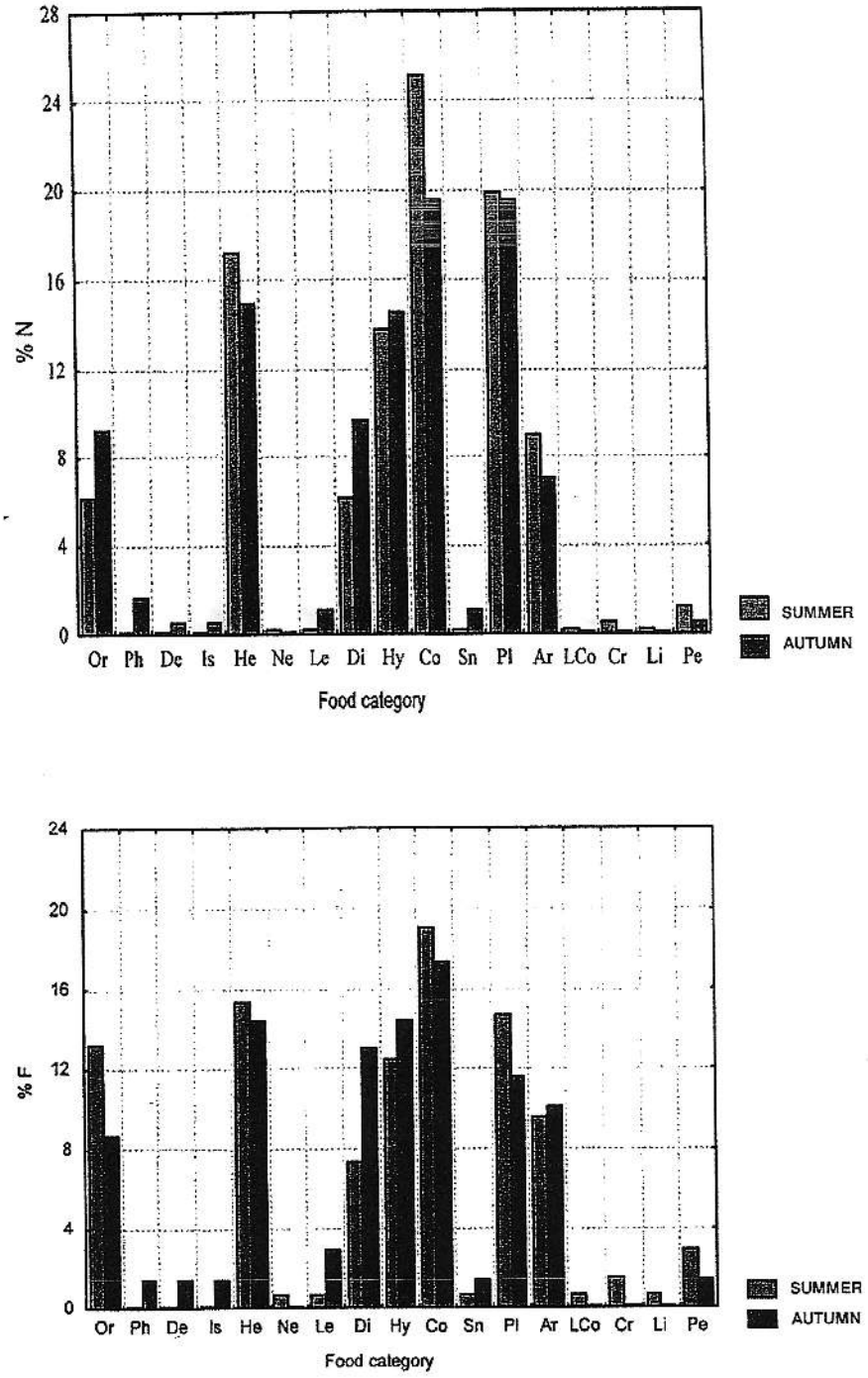

Fig.2. A comparison of food intake between summer and autumn. Number of examined specimens in summer: 21, in autumn: 15, number of prey items in summer: 413, in autumn: 185. Abbreviations as in fig. 1.

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Discussion

Most chameleon species feed mainly on arthropods, especially insects, although some species like *C. dilepis* and *C. melleri* from South and East Africa, take mice and birds (Schmidt & Inger, 1965). According to our results *C. africanus* feeds mainly on arthropods.

Differences in the prey composition among different chameleon species have been reported (Burrage, 1973). However, it is not certain whether these differences are due to the preference of the species, the composition and availability of the local prey fauna or the season.

In Spanish population of *C. chamaeleon* the dominant prey taxa during all year are Orthoptera, Lepidoptera, Hymenoptera, Diptera and Hemiptera (Blasco *et al.*, 1985), while according to Pleguezuelos *et al.* (1999) are Diptera, Hymenoptera, Orthoptera and Heteroptera. In Northern Libya the dominant taxa of prey items for *C. chamaeleon* are Hymenoptera, Coleoptera and Diptera (Burmeister, 1989) and in Malta are Orthoptera, Cicadidae and Cimicomorpha (Luiselli & Rugiero, 1996).

The principal prey for *C. namaquensis* are small locustids and large tenebrionids (Burrage, 1973).

In *C. chamaeleon* there is no sexual difference in diet (Pleguezuelos *et al.*, 1999). This is not the case with *C. africanus*.

In autumn more seeds were found in the stomachs of the *C. africanus*, however the arthropod diet does not seem to change significantly between summer and autumn. In *C. chamaeleon* the diet is different between the seasons (Blasco *et al.*, 1985; Pleguezuelos *et al.*, 1999). In the spring the most encountered prey item is Lepidoptera, at the start of the summer Hemiptera and in the summer Hymenoptera and Diptera (Blasco *et al.*, 1985), while according to Pleguezuelos *et al.* (1999) Orthoptera were commonest in summer and autumn than in spring. This is also the case of some lacertid species; the diet varies slightly with the season (Chondropoulos *et al.*, 1993).

The mean (14 items) and range of number of items (1-49) found in each examined stomach of *C. africanus* falls within the range of other chameleon species. Namely, according to Blasco *et al.* (1985) *C. chamaeleon* can eat up to 16-20 items each day, according to Pleguezuelos *et al.* (1999) 5-74 (mean 23.5±15.8), while *C. pardalis* eats 7-8 items (Bourgat, 1971) and *C. namaquensis* 5-15 items (Burrage, 1973).

Many plant remains were found in the stomach and faeces of *C. africanus* (19.4%) (seeds, branchlets and leaves) which is in accordance with the presence of plant materials in the stomach contents of other chameleon species and Lacertids (Pérez-Mellado & Corti, 1993). Plant and inorganic matter are ingested by *C. chamaeleon* (Burmeister, 1989), *C. namaquensis* (Burrage, 1973) and in *C. pardalis*, 30% of the diet are vegetables (Bourgat, 1972). We presume that plant material is a regular dietary component of *C. africanus*.

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We found pebbles and sand at a percentage of 1.1%. This is not uncommon for a chameleon. *C. namaquensis* has been observed ingested small stones, gravel and sand (Burrage, 1973). Johnson (1966) and Sokol (1971) suggest that deliberate lithophagy is common in lizards because it hastens the penetration of digestive juices into the bodies of the ingested insect prey. Faecal analysis of 3 chameleons that were kept in terraria revealed a piece of a leaf and two small stones, not present in their food container.

The presence of other food material such as crab legs and lizard sloughs in the diet of *C. africanus* is not uncommon for a chameleon. *C. namaquensis* has been observed catching reptiles such as geckos and a *Bitis peringueyi* (Burrage, 1973) also *Podarcis filfolensis* has been found in stomachs of *C. chamaeleon* on Malta (Luiselli & Rugiero, 1996). The lizard slough we found did not actually belong to a chameleon and we consider the possibility that it was accidentally consumed together with the prey.

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