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Notes on some aspects of the ecology of *Acanthodactylus opheodurus* ARNOLD, 1980, from the United Arab Emirates

(Squamata: Sauria: Lacertidae)

Bemerkungen zur Ökologie von *Acanthodactylus opheodurus* ARNOLD, 1980 von den Vereinigten Arabischen Emiraten

(Squamata: Sauria: Lacertidae)

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KURZFASSUNG

Acanthodactylus opheodurus ARNOLD 1980 ist im Gebiet zwischen Al Ain und dem Jebel Hafit (Emirat Abu Dhabi, Vereinigte Arabische Emirate) lokal regelmäßig anzutreffen. In der heißen Jahreszeit ist die Art ausschließlich morgens (07.30 - 10.30) an der Oberfläche aktiv und erbeutet die Nahrung (vorwiegend Ameisen) sowohl aktiv jagend als auch als Lauerjäger. Zum Zweck von Thermoregulation, Beutefang und Feindvermeidung wird am häufigsten das Requisitangebot buschförmiger *Haloxylon salicornicum* und *Acacia tortilis* genutzt.

ABSTRACT

Acanthodactylus opheodurus ARNOLD, 1980 is locally common in the area between Al Ain and Jebel Hafit (Abu Dhabi Emirate, United Arab Emirates). During the hot season these lizards are exclusively active in the morning (07.30 - 10.30) and follow an active as well as sit-and-wait approach to hunting. Ants form the basis of their diet. Structures most commonly used for thermoregulation purposes as well as to secure prey and to avoid predators includes *Haloxylon salicornicum* and *Acacia tortilis* shrubs.

KEY WORDS

Squamata: Sauria: Lacertidae: *Acanthodactylus opheodurus*; ecology; behaviour; Arabia, United Arab Emirates

INTRODUCTION

Acanthodactylus opheodurus ARNOLD, 1980 occurs throughout Arabia, Sinai, Israel, Jordan and Iraq (ARNOLD 1980, 1986; BAHA EL DIN 1996; LEVITON et al. 1992; WERNER 1986, 1987) with the holotype described from the Jazir coast in the Sultanate of Oman. Though documented as being widespread in Arabia (ARNOLD 1987), *A. opheodurus* was first recorded from the United Arab Emirates (UAE) in 1989 by TIEDEMANN (1991) who found this lizard in the vicinity of Jebel Hafit at Ain Al Fayda (a spring and entertainment area on the southern periphery of Al Ain). No other records of this species presently exist anywhere else from the UAE.

Very little ecological work has been conducted on reptiles from the United Arab Emirates with this recently discovered species being no exception. This present paper deals with some aspects of the ecology of *A. opheodurus* as observed in the UAE.

STUDY AREA AND METHODS

The general area in which *A. opheodurus* is found in the UAE is located between Jebel Hafit (± 1,200 m - mountain massif straddling the UAE-Sultanate of Oman border) and the town of Al Ain in the Abu Dhabi Emirate. The soils surrounding the northern part of Jebel Hafit are fluvial deposits including various aeolian sands, wadi alluvia and infill gravel with silts and clays derived from Tertiary sedimentary rocks, mainly limestone and marls (EL GHONEMY 1985; KIRKHAM 1998). The more

frequently recorded plant communities dominating the Al Ain geomorphological zone include *Calotropis procera* (dominant) with *Haloxylon salicornicum* (co-dominant) and *Pulicaria glutinosa* (dominant) with *Acacia tortilis* (co-dominant) (BÖER & GLIDDON 1997) (figs. 1, 2).

All results reported are based on 29 observation events (n = 29) conducted on 29 *A. opheodurus* individuals during the hot season between mid May and mid July 2000. This study was conducted for twelve days (mornings and afternoons) with approximately 70 observation hours spent studying the lizards. Notes were taken from a distance of 5 - 10 m so as not to interfere in the lizard's normal activities. A binocular (8 x 40) was also used to facilitate observations. The time an individual was sighted as well as the ambient temperature was recorded. The distance from vegetation when first observed was noted, as well as the plant type. The lizards were also captured (by noosing them) measured and marked for future mark-recapture studies envisioned.

RESULTS

Distribution and microhabitat

Acanthodactylus opheodurus were located in 3 areas directly north of Jebel Hafit between the mountain and the town of Al Ain in the Abu Dhabi Emirate. They inhabited a flat area consisting mainly of hard compact soils and gravel areas with sparse vegetation cover. *Haloxylon salicornicum* and *Acacia tortilis* shrubs dominated the vegetation.

The plants the lizards were most often observed closest to are *Haloxylon salicornicum* (66 %) followed by *Acacia tortilis* (24 %), *Ochradenus baccatus* (7 %) and other (3 %). *Haloxylon salicornicum* accounted for approximately 80% of the plant species composition of the area. *Acanthodactylus opheodurus* were usually found close to vegetation as indicated by 83 % of observations closer than 1 m from vegetation when first observed while 17 % were between 1 and 2 m.

Activity pattern

In the hot season the main bout of above ground activity was registered during the morning hours (first observation - 07:30, mean - 08:25 ± 0.1 - last observation 10:00) with the ambient temperatures ranging from 35°C to 40°C (mean 38.6 ± 0.2). Sunrise was at approximately 06:00.

Acanthodactylus opheodurus foraged throughout their above ground activity period with long spells spent waiting for prey or utilising shade for thermoregulation purposes. No individual was seen during the afternoon.

Hunting technique

Acanthodactylus opheodurus followed an active as well as a sit-and-wait approach to foraging. When actively foraging they moved jerkily, seemingly following a random course, often stopping to secure prey on the soil surface. They also chased after prey when spotted at a distance. These distances approached 2 to 3 meters.

When passively hunting (usually when temperatures increased) they used the shadows of the vegetation for concealment, dashing from cover to secure their prey. They most often returned to their original ambush position, in the shade of vegetation, facing outwards. Positions were changed regularly.

Diet

Ants (17 sightings versus 2 sightings of Coleoptera) were the prey items most often observed being taken by *A. opheodurus*. When the prey item was too big to swallow immediately (in the cases where Coleoptera were taken) they subdued it by smashing the prey item, clamped securely in the jaws, on the ground.

Predator avoidance

When pursued (by the observer) they moved extremely quickly, using vegetation as cover to escape. They also doubled up, with a quick scurrying motion, and lay still using the shade of vegetation to avoid detection. When pressed continuously they

Fig. 1: Typical *Acanthodactylus opheodurus* habitat dominated by *Haloxylon salicornicum* shrubs limited to the shallow drainage lines. Note the Al Ain Cement Factory in the background.

Abb. 1: Typisches Habitat von *Acanthodactylus opheodurus*, dominiert von *Haloxylon salicornicum* Büschen, deren Vorkommen auf die seichten Senken beschränkt ist. Im Hintergrund die Zementfabrik von Al Ain.

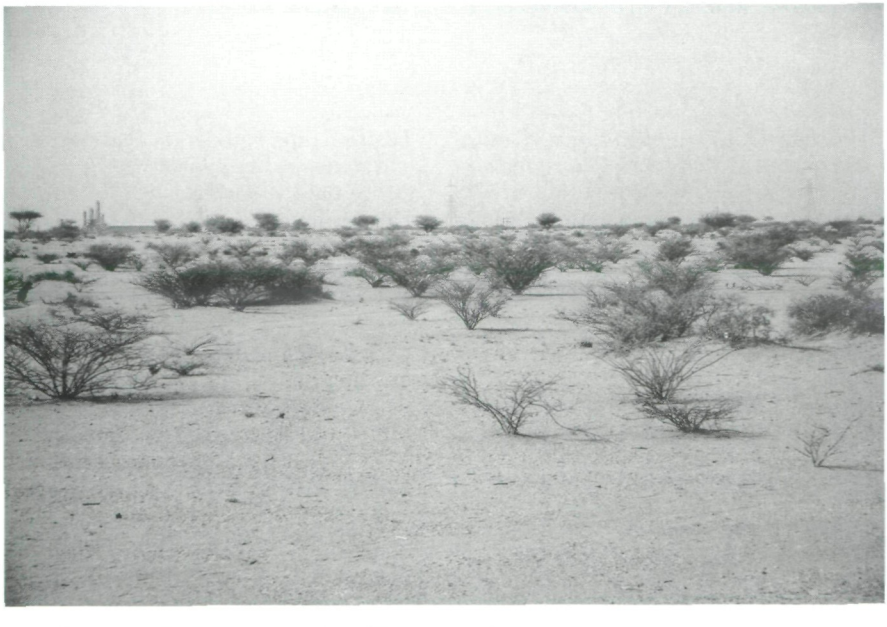

Fig. 2: *Acanthodactylus opheodurus* habitat near Al Ain dominated by *Acacia tortilis* shrubs.

Abb. 2: Von buschförmiger *Acacia tortilis* dominiertes Habitat von *Acanthodactylus opheodurus* nahe Al Ain.

made use of rodent burrows, located at the base of plants, or their own inconspicuous small burrows to escape underground. Burrows were often blocked from the inside by using the tail to dislodge sections of the entrance or by passing material from the inside to the entrance. More than one burrow was used to retreat underground. The tail, which has a reddish colour ventrally, was moved laterally from side-to-side after bouts of movement as well as when being pursued and when approached by another individual. Home-range size is roughly estimated at 200 m² with individuals typically being found within 10 - 20 m from each other.

Thermoregulation

Most of their foraging time (approximately 80 %) was spent in the shade of vegetation where overall temperatures as well as soil temperatures were much lower than in the direct sunlight. The most shady areas were regularly used to lie up in. There the body was either in direct contact with the ground with the legs spayed out or the front end of the body was raised high off the ground. When actively pursuing prey on warm surfaces they often rested their bodies on the ground and raised their forelegs momentarily. They retreated below ground once air temperatures approached 40°C.

Competitors and predators

The only other diurnal reptile species observed in the same general area were the insectivorous *Mesalina adramitana* (BOULENGER, 1917) and the herbivorous *Uromastyx aegyptia microlepis* BLANFORD, 1874. Nocturnal reptile species observed in the area were the geckos *Bunopus tuberculatus* BLANFORD, 1874 and *Stenodactylus leptocosymbotes* LEVITON & ANDERSON, 1967. Possible avian predators observed in the area include Shrikes, Rollers, and Kestrel's. According to KHAN (1998), diurnal reptilian predators known to occur in the area include *Psammophis schokari* FORSKÅL, 1775, *Malpolon moilensis* (REUSS, 1834), and *Varanus griseus* (DAUDIN, 1803).

Size of the specimens observed

No differentiation was made between the sexes during this study. The following measurements were taken (minimum mm - mean ± SD - maximum mm, n]: snout vent-length (48 - 52.6 ± 0.4 - 58, 29], tail-length (76 - 110.5 ± 2.6 - 141, 29].

DISCUSSION

The fact that *A. opheodurus* is most often associated with *Haloxylon salicornicum* and *Acacia tortilis* is certainly a result of these species being the dominant plant species in the area. According to ARNOLD (1980) there is little direct evidence on the habitat requirements of this species. He also states that as a result of certain morphological adaptations *A. opheodurus* favours neither really very soft sands nor quite hard surfaces indicating that its substrate niche is not very strict. However, it avoids the Rub al Khali sandy desert (ARNOLD 1987). WERNER (1987) includes *A. opheodurus* in a habitat described as "sand dune units" with them probably also occurring in sandy riverbeds and non-sandy soils. HORNBY (1996) describes their habitat as being gravel plains in the UAE. According to BAHA EL DIN (1996) the species was only found in wadi desert with firm gravelly substrate and moderate vegetation cover dominated by *Acacia tortilis* in the Al Ain area of the UAE.

During this study *A. opheodurus* were encountered on hard compact soils interspersed with sandy areas, especially around tufts of plants as well as gravely areas in shallow drainage lines.

Acanthodactylus opheodurus is described as a diurnal ground-dwelling lacertid (ARNOLD 1980). Being diurnal and exothermic, temperatures directly influence the lizard's above ground activities. When ambient temperatures reach 40°C, soil temperatures often approach and/or exceed 60°C, which results in *A. opheodurus* retreating below ground for the rest of the day. It still has to be determined how seasonal changes affect their activity patterns. The lack of a bimodal activity pattern (as observed for *A. scutellatus* (AUDOUIN,

1809) and *A. boskianus* (DAUDIN, 1802) by PÉREZ-MELLADO 1992, and *A. schmidti* HAAS, 1957, pers. obs.) could be ascribed to the extreme ambient and soil temperatures experienced during summer in the UAE. Morning activity might also be an advantage because energetic costs of foraging activities would be lower during the morning (PÉREZ-MELLADO 1992).

Observations during this study suggest that *A. opheodurus* are both active and passive hunters with last mentioned strategy being used when temperatures increase. According to ARNOLD (1980) and ROSS (1989) *A. schmidti*, *A. gongrorhynchatus* LEVITON & ANDERSON, 1967 and *A. haasi* LEVITON & ANDERSON, 1967 are described as active hunters. PÉREZ-MELLADO (1992) describes the foraging behavior of *Acanthodactylus* species from eastern Morocco as an active search for prey in the vicinity of vegetation and not a random search. It is thus interesting to note that *A. opheodurus* follows both an active and passive hunting strategy. It still however has to be determined how this strategy might change with the seasons.

Ants seem to be the favoured diet of *Acanthodactylus* species as indicated by ARNOLD (1984) for *A. schmidti* from the eastern UAE and PÉREZ-MELLADO (1992) for *A. boskianus*, *A. scutellatus*, and *A. longipes* BOULENGER, 1918 from Morocco. Formicidae, Isoptera and Coleoptera are often the main prey items in desert ecosystems (PIANKA 1986). Ants are possibly favoured as they are fairly common arthropods in arid zones (SALEH & SABER 1988). PÉREZ-MELLADO (1992) notes that the seasonal change in diet is negligible for *Acanthodactylus* species from Morocco.

Acanthodactylus opheodurus is a fast moving lacertid and difficult to catch (pers. obs.). ARNOLD (1980) states that they take refuge at the base of bushes when disturbed. *Acanthodactylus schmidti* is known to have a fragile tail, that can regenerate, and that could be used in predator avoidance. During this study only one *A. opheodurus* individual had a damaged tail or showed any signs of tail autotomy. They most often make use of their speed to escape and/or their rapid "doubling-up" technique, using the shade of vegetation and their camouflage to remain concealed. Retreating underground is generally used as a last resort. The use of vegetation plays an important part in lacertid predator avoidance strategy, something confirmed by ARNOLD (1984) for *A. schmidti*. The distinctive lateral movement of the tail could also be a strategy applied during predator avoidance. ARNOLD (1980) and TIEDEMANN (1991) have also documented this movement of the tail previously. Similar tail movement has also been documented for *A. gongrorhynchatus* (ROSS 1989).

No body temperature readings were taken during this study, although work by ARNOLD (1984) and PÉREZ-MELLADO (1992) indicates that body temperatures for *Acanthodactylus* species are often lower than for other reptiles inhabiting the same habitat. ARNOLD (1984) indicates that *A. schmidti* utilises shade once they have reached their normal activity temperatures with body temperatures then increasing very little over the period of activity. With the excessive soil temperatures experienced in the UAE during summer this utilisation of shade is understandable.

Meselina adramitana inhabits the same general area as *A. opheodurus* in the Al Ain study area although only a few individuals of *Mesalina* were sighted. They are generally smaller, with an average snout-vent-length (SVL) of 40 mm (n = 5) compared to a mean SVL of 52.6 ± 0.4 mm (n = 29) for *A. opheodurus*. Ecologically, competition between the two species may be reduced by their different size. ARNOLD (1980), TIEDEMANN (1991) and WERNER (1986) state that *A. boskians* is usually sympatric with *A. opheodurus*, although this was not encountered during this study.

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