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18.11.87 - 5.1.88

Examination of the social behaviour of Agama reptiles at the Northern Quarry of Bamburi

Cement Factory at Mombasa.

Three places for observation were chosen by me:

1. Observation - place on a high rock near to plant - nursery I.
2. The bank which lies farer away from the main road near to Bamburi Beach Hotel.
3. The bank lying near the main road.

A common description of Agama reptiles:

The body and the tail are covered with strongly built scales - the teeth are standing on the edges of the jaws - the tongue is short and fleshy - the eyes seem to be more important than the sense of smell. Agama reptiles have clear eyelids covered with scales. In the quarry I have found one male with eyelashes on the eyelids (normally common for Agamas living in deserted areas). Agamas lack the large symmetrical head shields which are to be found on most lizards, these being replaced by small scales as in the case of the chameleons and the geckos. The hearing organ has mostly an outer ear-drum. 34 genus with 300 species are known.

My subject was Agama:

Agama the most common lizard at the coastline of Kenya. The differences between an intensively coloured male and a female are obvious. The male has a reddish orange head, a lightly or dark blue body and tail. Moreover the tail is white cross-striped.

The female is much more unobtrusive. She is greyish-brown coloured on the body and tail - a few red stripes or spots are spread on the back. Her head is yellow spotted. When the Agamas are still young you can not distinguish the sexes because of being same coloured (like the madjured females!). Agama agama can grow to a length of about 20 - 25 cm. The males become mostly great than the females.

The first observation of the Agama reptiles was not well thought through. I sat down on a rock-accumulation (where I had seen several Agamas in the morning) but nothing happened. It was nearly the same when I placed myself 15 m away from the rocks. On that first observation - excursion (round the quarry - area) I only succeeded in seeing four individuals of male Agamas distributing over the quarry.

Observation - place on a high rock near to plant - Nursery I:

It is a very dry place - only very few lower plants are standing between that rock-accumulation. The size of that location of the Agamas is about 80 - 100 square metres. Between the rocks exist a lot of hiding places (deeply shaded) nothing points to a place where it is easy to find some food. The place looks like somewhere in a desert. Nearby that rock-accumulation stands a high rock approximately about 5 metres high. There I climbed upon in order to sit far away from the hiding places of the Agamas. The first observation I made in the afternoon of 19.11.87. Three females came one after the other out of their hiding places.

Description for the map of the landscape:

I observed two females on rock 19 and on rock 20. The third female sat for one and a half hours motionless on rock 18. Suddenly it moved on rock 4, stayed for a short time and made then a jump on rock 2, where a butterfly had sat down. It chewed the butterfly and returned to rock 18 very quickly. A young Agama was seen by me as well approximately about 5 cm long (the madjured females were compatible to it). Later a male Agama appeared - intensively coloured. First it was seen in area 20. It moved its head up and down when it reached the top of the rock. Then it went further on, above rock 19, 17 and 15. On the rock 26 it makes a movement with its head and shook its body while changing direction. Probably it caught an insect (I was not able to realize that quick movement although I used a binocular). Afterwards it went on to area 27 before it quickly moved 10 metres further.

An observation I made in the morning of 19.11.87:

It was very cloudy and no Agamas came out of their locations. I noticed the same at the first place where I had been the day before. I think the Agamas prefer the sun like other species of lizards.

Events in the morning of 20.11.87:

The observing time lasted for about 4 hours. I only saw Agama females. This morning they behaved very nervous - they did not stay for a longer time in one place. It was impossible to distinguish the Agamas from the lizards I had seen the day before.

Hypothesis I:

The males seem to change their territories. None were seen in the observed area that day. Now it has become impossible to climb once more on the high rock because it is now so much destroyed.

Certain territorial - behaviours of the Agama - reptiles:

The most apparently made movement is the lifting of their heads. Mostly when a male Agama reaches a top of a rock or high point he stops and stretches his body while lifting his head up and down at least twice. He repeats that movement at nearly every place where he makes a stop for a while. But not only the male Agamas show that behaviour - the females and sometimes even the young do it as well. In the afternoon of 19.11.87 I saw a young Agama examining the surroundings of its hiding place. Once it jumps upon the female (I have mentioned her on rock 18). I did not notice any indications of incompatibility. I did not see any differences in frequency of nodding their heads between females and males.

2. Observation place at a bank of a pond near Bamburi Beach Hotel:

The pond is surrounded by steep rock - walls. Near to the water are standing a lot of reed-tussocks where a flock of weaver birds are living. At the upper bank a few casurina - trees are situated. All around the area are many grass-tussocks distributed.

One day I saw an escaping sand snake as well as Nukras lizards living in neighbourhood to the Agama reptiles. Many species of insects exist at the pond like dragon flies, beetles, a bees nest and a great number of grasshoppers.

Feeding behaviour of Agama reptiles:

The Agama - family I had observed came every sunny morning out of their hiding - places moving straight towards the bees nest. Sometimes the female which has her sleeping location very close to the bees hole bursted out with a sudden jump towards the bees-nest. In a very short time the female ate at least 4 - 5 bees. Every time it approached the hole very carefully - making an attack - afterwards it turned round in order to stay 20 - 30 cm away from the feeding - place. The male seems to like jumping towards the flying bees. I saw him staring at a flying bee near to his head while the bee was moving behind his head he turned round with a sudden leap - ran forward - then he turned round again and snapped the bee. The young Agamas I saw only eating ants or very slow moving insects.

Because of the great number of grasshoppers I supposed that they would be the main food of the Agama reptiles.

The attempt of feeding the lizard with grasshoppers:

I threw a dead grasshopper above the short tailed female approximately half a meter away from it. The lizard made three tries to take the grasshopper. But constantly before reaching the food the female made a break and returned back to the place where it had been before. In the end I did not succeed in feeding the female Agama.

In any way I never noticed an Agama reptile eating a grasshopper:

The main food of the Agama family living near to the pond-bank are bees, apparently. I think each of the madjured Agamas I saw ate at least 10 - 12 bees (only during the observation - time of about 5 to 6 hours). I suppose that fact could be an immense pressure against the bees -nest. That feeding - place was the most important one for the Agama family at least for that time I observed that family. At December 19th a great flock of bees left the nest (I think they booked for another living location because I was not able to find any bees a few days later), that fact would have to cause another feeding - behaviour, indeed.

Territorial behaviour of Agama reptiles:

The most obvious indication of a territorial behaviour I have already mentioned; I mean the head-noding. I think these head movements stand for several feelings of the Agama. Especially the male started behaving in such away when he became frightened (in the case of approaching him to less than a few meters). The head-nodding is also very common for sexual behaviour but the main purpose seems to be indicating to other male agamas where the borderline of the territory is. The size of the territory of the observed Agama-male is approximately 45m x 40m = 1800 square meters. The sleeping location of the Agama male is about 20 meters distant to the bees-hole. Every *morning he stayed for a while on his hiding rock before he ran straight with a few breaks towards the feeding place - the bees-hole. Only one morning (30.11.87) the male appeared at another place (a hole in the open area marked on the map). Nearly every day the Agama male walked in the same directions - first to the bees-hole where he always took a couple of bees, then he ran straight towards the west open area. After a while he returned to the bees-hole every few meters he made a stop in order to node his head. Afterwards he moved to the northern end of his territory - a long stretch of rock accumulation. I am not able to determine the shape of his territory, exactly but it must be a kind of rectangle. At that point I cannot agree any more to the hypothesis I have given in the beginning: - result: Agama reptiles do not leave their territories. They stay all the time at the same place. I think the imadjured males have the problem of being accepted by the leading male Agama. The Agama-families I observed were ruled by only one Agama male. I suppose the Agama males have to leave their families where they had been born very early to avoid any argueing with the strongest male.

Description of the Agama - attack against an approaching Agama male:

The following events happened on December 3rd at about 10 o'clock. The Agama male of my family was sitting behind the bees-hole, suddenly in a distance of 30 meters to my observation-place appeared another male Agama (very intensively coloured). It ran straight towards the bees-hole. On its way it made two breaks - the last break he made was about 2 meters away from my Agama male. With a sudden burst out the ruling Agama attacked the intruder. The intruder was chased to a distance of about 40 m away from the bees-hole.

* In the morning at 6.15 - 6.45 approximately

Now something happened what can stand for another kind of communication: the two Agama-males changed their colours totally - they became very pale. The head-colour was now dark-grey - the body was grey as well but white spotted like a female. The intruder did not show his face towards his opponent. Afterwards the intruder escaped to the rocks behind my observation - place (approximately 50m away from me). The winner of that fight followed the escaping lizard. At a high rock he (the winner) remained and started head-nodding. While he was nodding he changed his colour again (red head - blue body) It was amazing to see how quick the Agama males are able to change their colours. I think you can draw a good comparison to the chameleon having a high speed in changing their colours as well.

Territorial behaviour of Agama females:

The Agama family I observed has three female individuals. A strong built with a very short tail, a smaller one with a long tail and a still immature female of a small-thin size. Agama reptiles grow up to a year and a half before they become matured. The strong built female, I think made the best choice, - her favourite territory is around the bees-nest. Every morning the short-tailed and the long tailed Agama females came out of the same sleeping location beyond the bees-hole under a rock. The short tailed is used to approach the bees-hest, immediately. In opposite to the long tailed female running straight into northern direction.

At the hole the strong built waited for the bees-food and she did not allow the long tailed female being not far away to come near to the feeding-place. At a distance of 1 - 1.5 m (northern border) to her central territory the short tailed female started attacking. Afterwards she nodded her head (another important indication for the importance of head nodding in reference to territorial behaviour). The domination of the short tailed female is very obvious if you take a look at the ways she normally prefers to walk. The ways are distributed over the whole Agama-territory of that family. The other two females have bordered "territories of a much smaller size". And even in their "territories" they could be attacked by the short tailed female. Once I saw the short tailed female digging a hole (with her front legs) right in the long tailed female's area. When the smaller one tried to approach the other female - she was attacked at once!

Sexual behaviour of Agama reptiles:

The Agama females are able to change their colours as well as the males. But it exists a difference: the females get only more intensively coloured. For instance they get red stripes upon their shoulders or they become darker. It seems to me that the females only become darker coloured if they have a sexual feeling-time. The first time I noticed that feeling was the moment when I saw the long-tailed female making a hump. She seemed to tiptoe and lifted (stretched her tail up in the air. The male Agama followed her while he nodded his head. By the moment he approached very close the female went a bit further on. That happening the two Agamas repeated a couple of times. During these two or three days the short-tailed behaved very strange. If the long tailed female tried to cross the border of the strong built female she was pushed back as usual. In such a moment the male Agama stopped following the long tailed female. Then he started following the short tailed Agama. She did not show the sexual behaviour of the other female. The short tailed female escaped into all directions when she was chased by the male. Three times I saw her doing digging-movements with her front legs - every time at the same place. While she was digging she turned round in a circle. I think this behaviour stands for covering the layed eggs, normally. I never found any eggs at that place.

From December 7th up to December 18th the short tailed female showed a sexual behaviour. During that time she was very nice coloured and even more aggressive against the other two females. Everytime when she was approached by the male Agama she started making a hump. Sometimes she seemed to walk a few steps backwards. The amazing thing was that the male was not constantly interested in her. Sometimes he even changed his colour (pale coloured). I never saw them copulating although I tried to be at the pond at every day time.

USING OF A DUMMY TO TEST THE AGGRESSION OF THE AGAMA MALE

When I built this dummy I only took care on the colour (red head - blue body) and the size of an Agama male.

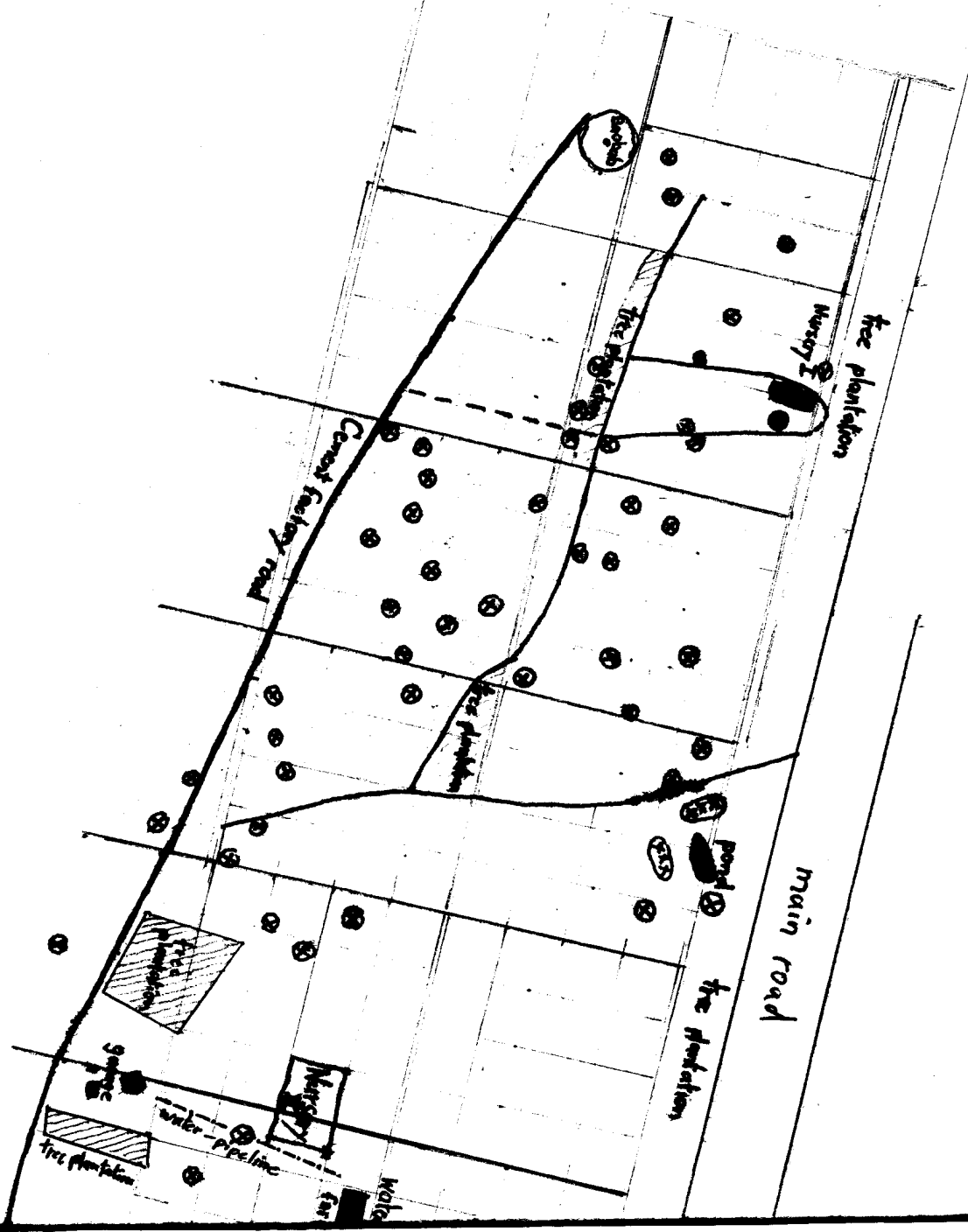
First test: I placed the dummy just in front of the bees-hole. There it stood motionless - no string was fixed.

Observations: When the Agama male arrived - he was pale coloured. Motionless he looked at the dummy. Nearly 20 minutes nothing happened. Suddenly the short tailed female appeared. He noticed her and started changing his colour, slowly. Afterwards he did not take care on the dummy, any more. Even, he jumped over the dummy in order to follow the female.

Second test: I placed the dummy at the same place - with a string fixed.

Observations: The first time the Agama male was seen by me - he was about 15 m distant to the dummy. When he approached I moved the dummy a little bit but he did not show any interest in it.

Conclusions: I think the colour without any additions is not the most important reason for attacking. I think the Agama males combine the colour of the enemy with several unknown characteristics!



Maßstab = 1:5600
1cm $\hat{=}$ 56m

⊙ = stands for a rock-accumulation
⊗ = stands for a greater hill of rocks

81 rock accumulations are marked

The plan is made by
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1987/88

