MORPHOLOGY OF OVARIAN CHANGES IN THE LIZARD UROMASTYX AEGYPTIA

By

E. M. Hammouda, H. Ghorab, M. El Gohary

and

M. El-Ghandour

Zoology Departments, Faculties of Science, Al-Azhar, Ain Shams, King Abdul-Aziz and Riyadh Universities.

INTRODUCTION

1— *Morphological aspects :*

Early description of the adult reptilian ovary include those of Von leydig (1853), Waldeyer (1870), Braun (1877), and Loyez (1900, 1906). In turtles and lizards the ovaries are round and plump; in snakes, elongated; in the immature alligator, flat and rather long (Reese, 1915, Van den Brock, 1933; Forbes, 1937).

The right ovary in the lizards and snakes is more anterior in position than that of the left side (Wiedersheim, 1886). The disappearance of one ovary or its failure to develop fully, which is typical of some reptiles and most birds, is apparently due to the fact that at the stage of migration the majority of primordial germ cells colonise only the dominate gonad (Witschi, 1935; Stanley and Witschi, 1940; Pasteels, 1953). An explanation for the uneven distribution of primordial germ cells between the two avian ovaries is that the right ovary is destined to be nonfunctional receives fewer primordial germ cells than the left one It is poorly vascularized at the early stages of development (Dentschakoff, 1931, cited by Franchi *et al.*, (1962).

However, the ovaries of the non-breeding adult female lacertans are somewhat oval to elongated, thin walled structure, situated as two suspended structures on the dorsal body wall (Loyez, 1906; Weekes, 1934, 1935; Boyd, 1940; Miller, 1948; Panigel, 1956; Carpenter, 1960; Jonson, 1960; Varma, 1970; Hoffman, 1970; Ortiz and Morales, 1974). The ovaries of the ophidians are much longer than those of lizards. In the diamond-backed water snake, Natrix rhombifera (Betz, 1963), the ovaries extend from the level of the oviduct infundibulum to the posterior limits of the kidney. Each ovary of Natrix is suspended by a mesovarium in the pleuro-peritoneal cavity with a mean length of 122.5 mm. and 74.7

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mm. for the right and left ovaries respectively.

2— Reproductive patterns :

There is a general pattern of reproduction in the reptiles to which most species conform, breeding in spring or summer and experiencing a single ovarian cycle annually. Exceptions to this common pattern are notable. Thus the javanese house geckos, Cosymbotus platyurus, Hemidactylus frenatus and Peroups multilatus, which live under the relatively uniform climatic conditions of west Java (Church, 1962), are capable of breeding at any time of the year with no defined seasonal cycle.

One of the few detailed studies of the breeding habits of tropical lizards was made by Baker (1945) on Emoia cyanura and Emoia werneri in the New Hebrides. These islands are always wet and there is no dry season, and there is little variation in the length of the day (the longest day exceeding the shortest by about two hours). Under these conditions Baker found that the diurnal Emoia reproduce continuously except for two hours). Under these conditions egg-laying almost ceased. The reproductive cycle of the Indian house gecko, Hemidactylus flaviviridis is probably continuous from February to October (Machendra, 1936). Copulation generally starts in March and continues for several months and oviposition usually occurs within 24 days of the copulation. The breeding season of Anolis carolinensis, «American chameleon», is also an extended one (Hamlett, 1952). Anolis breed at any time from mid-spring until the end of summer. Mature ova are produced throughout the late spring and all of summer, with ovulations of single eggs in regular succession.. It was found that the mature ova were discharged singly, at intervals of about two weeks, taking probably 18 to 19 days to pass down the oviduct before laying. Consequently. before one egg has completed its tubal journey, a second one has been ovulated and fertilized. All the members of the genus Anolis are of particular interest because of this unique pattern of reproduction and ovulation which could be a signficant factor in the evolutionary success of these lizards in the tropics (Ortiz and Morales, 1974; Smith *et al.*, (1972 and 1973).

In contrast to the above metioned examples which have contiuous or prolonged breeding seasons, which can be related to constancy of enviromental factors, many lizards have a very short breeding season in the spring or the summer, which does not appear to be directly related to their distribution or climatic environment, Thus the two genera of Saharan lizards, Acanthodactylus and Uromastyx, occupy similar habitats in the same locality, but the former breeds twice and the latter only once in the summer months (Kehl, 1944). Similarly, the

viviparous lizard Lygosoma quoyi of Australia breeds only once a year, whereas the oviparous species Amphibolurus muricatus of similar distribution breeds twice annually with an interval of 6 to 7 weeks between ovulations (Weekes, 1934). From the latter exemple it is obvious that, among reptiles, the length of the breeding season and the mode of reproduction may not be diretly affected by the climatic conditions. On the other hand, related genera which are in different climatic situations may have different modes of reproduction.

It seems useful to give here an account of the morphology as well as the morphological changes of the ovary of U. aegyptia, which is not done before, in an attemp to illustrate these problems.

MATERIAL AND METHODS

The animals used in the present investigation were the desert lizard, Uromastyx aegyptia. Adult female specimens of U. eagyptia were collected monthly from Saudi Arabian desert (Khoreis) road about 58 Kilometers east to Riyadh). The total specimens examined at this work all over the year were 70 females.

Specimens are carefully dissected where the urinogenital system is well exposed. Different measurements as well as weights of the ovaries are carried out in each of the dissected specimen. Data are tabulated where the means of lengths and weights are recorded in the accompanied table where it is also used for the detection of the different curves. Photographing as well as drawing of the dissected material are carried out using normal camera and camera lucida respectively.

RESULTS

Uromastyx aegyptia (Fig. 1) is widely distribued in the Saudi Arabian desert. It is a terrestial, diurnal lizard belonging to order Squamata, sub-order Sauria (or Lacertilia) and family Agamidae. It is abundant all over the year except for about four months, from November to February when it hibernates in a deep underground burrows.

The spiny tailled lizard U. aegyptia is oviparous, have only one period of sexual activity during the year. The process of vitellogenesis begins in March and it appears that June and July are the periods of egg-laying.

The feeding of the Agamid lizard U. aegyptia was found to have a daily as well as a seasonal cycle. The latter covers a period falling between late March and early September. Winter is passed underground with inactivity. These limits are, however, subject to slight changes in either direction governing activity at all time. U. aegyptia were observed outside burrows as early as March, but true activity feeding commenced much later, reaching its

maximum in May and June. The appearance of the animal is very rare during the noon hours, and normalising to certain optimum hours before and after noon. U. aegyptia never feed or drink water in captivity where food and water were available. The most preferred plants consumed in nature was Moltokiopsis ciliata (Family; Boraginaceae) followed by Artemisia species (Family; Compositae); Fagonia glutiosa (Family; Zygophyllaceae) and Convolvulus species (Family; convolvulaceae).

A— Macroscopical observalions on the urinogenital organs :

In female Uromastyx, Mullerian ducts function as oviducts. They are paired undulating muscular tubes which open ot their anterior ends via the ostium (Os.) (Fig. 2) and posteriorly into the cloaca (Cl.) Every oviduct is differentiated into 3 regions, the anterior, mid and posterior regions. The anterior or ostial region (Os.) is a thin walled region which opens distally in the body cavity. The musculature is very thin to an extent that its wall is a semi-transparent one. The 2nd or the mid region (T) is the main part of the oviduct, it is folded and pleated with very thick muscle layer, specially during the breeding season to increase the space for the accommodation of the very big vitaellogenic eggs. The proximal region of the oviduct which is connected to the cloaca is the posterior region. This region is thick and unfolded. Both the posterior regions of the two oviducts were found to open separately in the cloaca (Fig. 2 G.O.)

The adult kindey (K) is metanephros, its surface is strongly lobated and folded with wrinkles. The kidney is bilobed, every lobe is situated one side laterally and externally beside the oviduct oviduct. The two lobes are fused posteriorly and extend medially to the level of the pelvic girdle. The kidney is drained by two ureters (U) which extend along the entire structure of the two lobes and continue posteriorly to open into the cloaca by separete urinary papillae which terminate by two uriary openings (U.O.). The urinary bladder (U.b.) is a small median blind sac which opens on the ventral side of the cloaca.

In female U. aegyptia, there are 14 to 16 femoral glands on the anterior surface of each thigh. The glands lie just under the skin and open by way of a short duct which penetrates a conical elevation of the skin and terminate by femoral pores (Fig. 1, F.P.). The golden yellow secretion of the glands is abundant during the breeding season.

Gross ovarian morphology :

The ovaries of the inactive Dabb-lizard U. aegyptia are elonagted grape like structures containing a number of eggs at different stages of developement enclosed in a thin

transparent walls. It is saccular with a very irregular surface due to the presence of the different egg size. Each ovary in Uromastyx is lying postero-dorsally in the body cavity, supported by a mesovarium developed from the dorsal abdominal wall. The left ovary is higher than the right one which is a general character for almost all the reptiles. The adrenal gland (A) can be seen between the ovary and the oviduct as a yellow longitudinal strand (Fig. 2).

Table 1

Seasonal variations in length and weight of the ovaries of Uromastyx aegyptia.

Month	Mean length of the left and right ovaries	Mean weight of the left and right ovaries
December	1.35 cm.	0.114 gm.
March	1.50 cm.	0.141 gm.
April	2.75 cm.	1.284 gm.
May	5.00 cm.	7.635 gm.
June	2.50 cm.	0.474 gm.

The left and rght ovaries attain their minimal length and weight in winter especially at December. It is about 1.35 cm. length and 0.113gm. weight (Table 1). The ovaries contain from 14 to 24 visible follicles. Some of them are very small whitish transparent bodies, while the bigger ones are opaque. The thin transparent membranous ovarian epithelium permits the indivdual follicles to be seen by the naked eye or by a dissecting microscope The colour of the growing ovarian eggs changes gradually from whitish opaque at the begining of vitellegenesis to pale yellow. As yolk deposition continues they become more yellowish.

Figure 3 and 4 show that there is a slight increase in length and weight of the left and right ovaries from December to March followed by a sharp increase of both length and weight from March to April. In May the ovary (the left and right ones) attains its maximal length and weight due to increase of follicular size when most of yolk deposition occurs. In this month the increase of ovarian length and weight was followed by a sharp decrease from

May through June, when minimal length and weight of the ovary occurs (Table 1). This decrease in ovarian length (2.50 cm). and weight (0.474 gm.) in June is attributed to the discharge of mature eggs from the ovary to the oviduct (Fig. 5,6). Specimens collected in June have oviductal eggs, however, in some females oviductal eggs persist until July. Oviductal eggs vary in number in a single individual from 5—35 as determined from an examination of 20 females. Late June and July appear to be the most important periods for egg-laying and from August to the next April, the ovaries were found to contain small previtellogenic follicle.

DISCUSSION

Uromastyx aegyptia is a terrestial lizard which is abundant is Saudi Arabia all over the year except for about four months (November — February) when it hibernates in a deep underground burrows. It is very difficult, like many reptiles, to breed in captivity. It never feed or drink water in captivity where food and water were available.

It is oviparous, breeds once a year. The process of vitallogenesis begins in March. It occupies two to three months (from March to May). June and early July are th periods of egg-laying. Most species breed in spring or summer and experience a single ovarian cycle annually. There are notable exceptions to this common pattern, and the general habit of the species is not always related to its distribution. Thus the two genera of Saharan lizards Acanthodactylus and Uromastyx occupy similar habitats in the same locality, but the former breeds twice and the latter only once in the summer months (Kehl, 1944). Similarly, the viviparous lizard Lygosoma quayi of Australia breeds once a year whereas the oviparous species Amphibolurus muricatus, of similar distribution, breeds twic annually with an interval of 6 to 7 weeks between the ovulations (Weekes, 1934). Conversely, variation of the breeding habit within a species, in accordance with the environment, appears to occur in the turtle Pseudemys acripta and in the rattle snage Crotalus viridis (Rahn, 1942).

In U. Aegyptia, the ovary grows from 0.11 gm. during hibernation to 1.28 gm. at April and then increases to 7.63 gm. at May. The ripe follicles rupture before the end of June and the ovarian weight was decreased to 0.47 gm. It was found that follicular development and yolk formation are retarded or halted during winter hibernation and completed by rapid growth in Spring. A similar growth of ova occurs in Acanthodactylus (Kehl, 1944), in the lizard Sceloporus (Woodbury and Woodury) 1945) and in the Indian lizard Hemidactylus flaviridis.

SUMMARY

Uromastyx aegyptia is a terrestial lizard belonging to order squamata,

sub-order Sauria and family Agamidae.

It is abundant all over the year except for about four months, from November to February when it hibernates in a deep characteristic underground burrows and it very difficult to breed in captivity.

It is oviparous, have only one period of sexual activity during the year and the process of vitellogenesis begins in March. June and early July are the periods of egg-laying.

In female U. aegyptia there are 14 to 16 femoral glands on the anterior surface of each thigh. The glands lie just under the skin and open by way of a short duct which penetrates a conical elevation of the skin and terminate by femoral pores and the golden yellow secretion of the glands is abundant during the breeding season.

The ovaries of U. aegyptia are elongated grape like structure containing a number of eggs at different stages of development enclosed in a thin transparent walls. It is saccular with a very irregular surface due to the presence of different egg sizes. The left ovary is higher than the right one. The adrenal gland can be seen between the ovary and the oviduct as a yellow longitudnal strand.

The left and right ovaries attain their minimal length and weight in winter especially at December There is a slight increase in their length and weight from March to April and in May the ovary attains its maximal length and weight. It was found that follicular development and yolk formation are retarded or halted during winter hibernation and completed by rapid growth in spring.

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LEGENDS FOR FIGURES

Fig. 1 : External features of female **Uromastyx aegyptia** (It is very hard to distinguish between the two sexes externally and the only difference is the presence of the hemipenis on the ventral side).

Fig. 2 : A drawing to illustrate the urinogenital system of female Uromastyx aegyptia.

Fig. 3 : Changes of ovarian length during hibernation and sexual activity.

Fig. 4 : Changes of ovarian weight during hibernation and sexual activity.

Fig. 5 : Photomicrograph showin inactive (non-vitellogenic) ovaries of **U.** aegyptia during the month of December (winter).

Fig. 6 : Photomicrograph showing active ovaries of **U. aegyptia** during sexual activity (June). Notice the decrease in ovarian size due to the discharge of mature eggs to the oviduct.

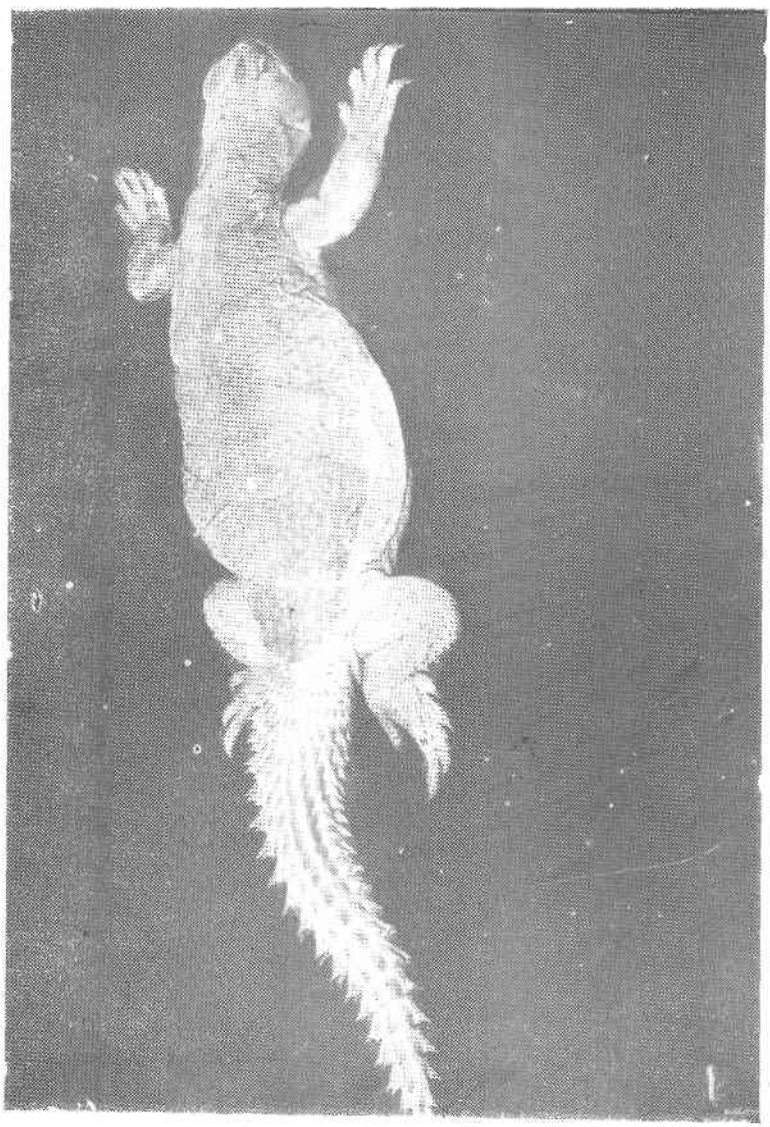


Fig (1)

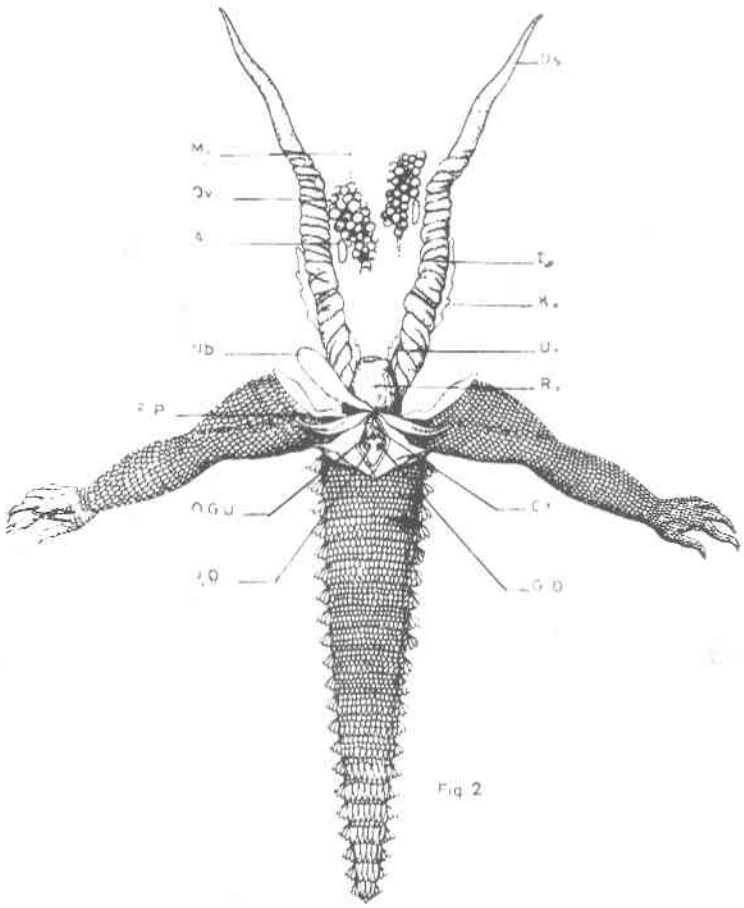
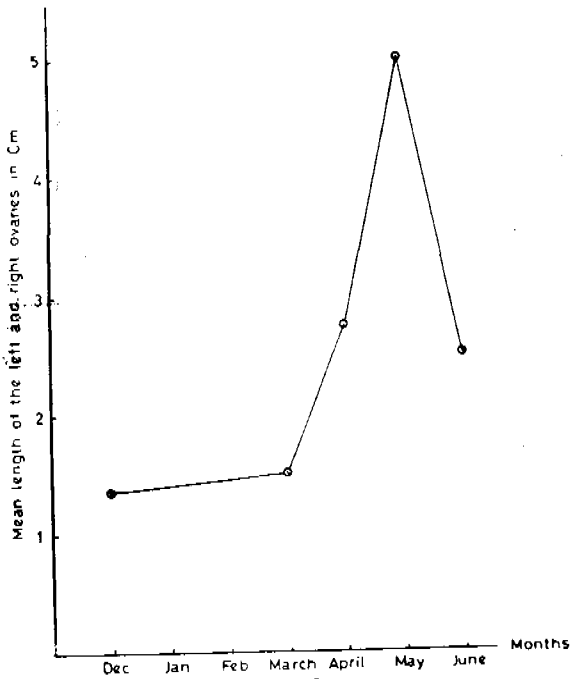


Fig. (2)


Mean length of the left and right ovaries in Cm
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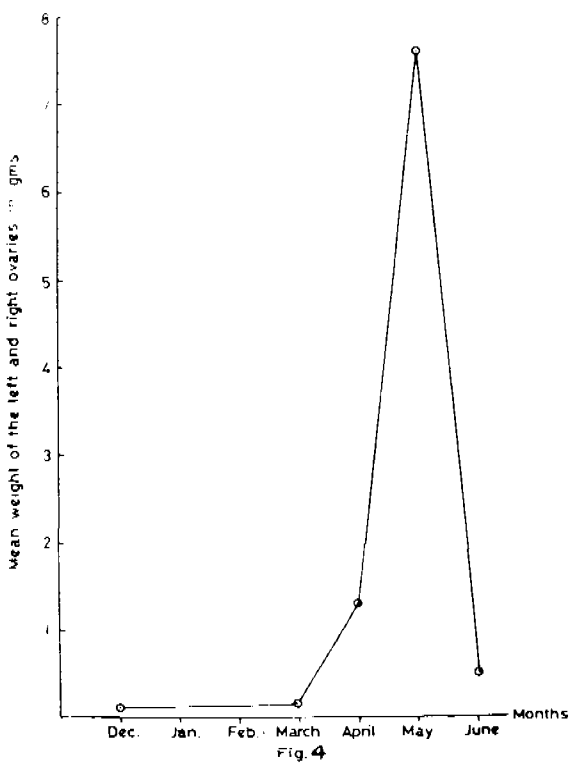
4
3
2
1
Months
Dec
Jan
Feb
March
April
May
June
Fig. 3


Mean weight of the left and right ovaries in gms
6
5
4
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2
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Months
Dec.
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March
April
May
June
Fig. 4

Fig. (5)

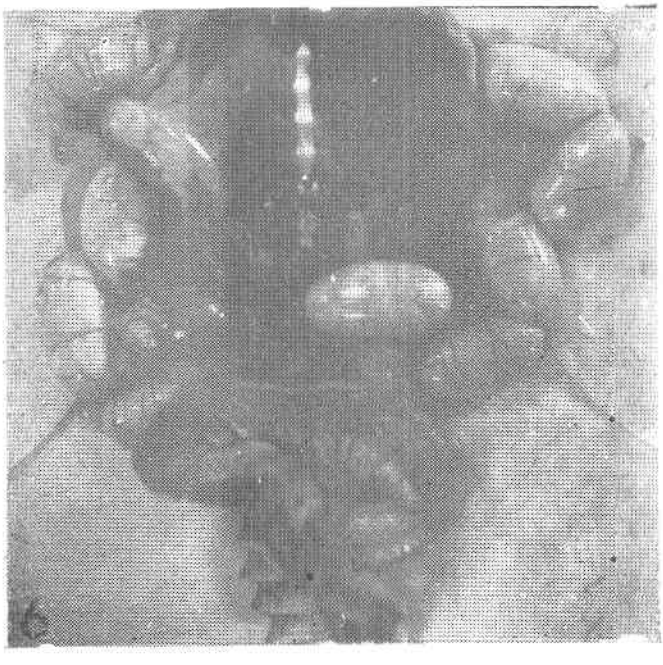

Fig. (6)

ABBREVIATIONS USED IN FIGURE (2)

A.	Adrenal gland
Cl.	Cloaca
G.o.	Genital opening
F. P.	Femoral pore
K.	Kidney
M.	Mesovarium
O.G.U.	External opening of gut and urinary bladder
Os.	Ostium
Ov.	Ovary
R.	Rectum
T.	Tube portion of the oviduct (mid oviduct)
U.	Ureter
Ub.	Urinary bladder
U.o.	Urinary opening