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Morphology of the Embryo of the Spiny-Tailed Lizard, *Uromastix microlepis* Blanford 1874

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ABSTRACT. **Eggs of the spiny-tailed lizard *Uromastix microlepis* were laid in one sequence and the number varied from 8 to 16 eggs with an average size of 5 cm in length and 3.3 cm in greatest diameter. Eggs, when laid, contained well developed embryos all of which appeared to be at the same stage of development. Embryos at this stage bore close resemblance to stage 29 of *Calotes versicolor* embryo.**

Extensive research work has been conducted over several decades in the field of embryology of Fishes, Amphibians, Birds and Mammals, while such studies are relatively limited and less comprehensive in Reptiles. Therefore, the embryos of *Uromastix microlepis*, commonly called spiny-tailed lizard, have been selected to investigate the embryonic development of this species.

Uromastix microlepis is a diurnal lizard inhabiting arid regions from North Central India to extreme North Western Africa including Saudi Arabia and its neighbouring countries. The animal has a long elliptical tail covered with hard spiny scales arranged in rings (Schmidt and Inger 1957). It digs its burrow 1 to 2 meters deep and hibernates during the winter period living off fat reserves (Purvis 1915). There are at least 6 well known species of *Uromastix, viz, U. aegyptius, U. hardwicki, U. thomasi, U. microlepis, U. acanthinurus* and *U. loricatus*. *U. microlepis* is commonly found in the deserts of Saudi Arabia and is known by its native name «Dhab». It is a herbivorous

agamid lizard whose tail exceeds body length and is divided into 21 rings (Eissa and El-Assy 1975).

A clear description of embryonic developmental stages is available for the lizards *Lacerta agilis* (Peter 1904), *Lacerta vivipara* (Dufaure and Hubert 1961), *Xantusia vigilis* (Miller 1963) and for *Calotes versicolor* (Muthukkaruppan *et al.* 1970). Reproductive cycles of a number of squamate reptiles have also been studied (Whilhoft and Quay 1961, Licht and Gorman 1970, Goldberg 1971 a, b, Callard *et al.* 1972 a, b, Arslan *et al.* 1972, 1976).

Material and Methods

The investigation was initiated by collecting gravid female samples of *U. microlepis* from areas around Riyadh, Central Saudi Arabia. They were maintained in the laboratory in wooden cages with sandy bottoms and fed daily with fresh lettuce leaves. Eggs after being laid were collected, washed in balanced saline solution and cleaned from adhering sand particles using a fine brush. Embryos were dissected from eggs in petri dishes containing saline solution washed several times to remove yolk and fixed in Bouin's solution for 24 hr. Fixed embryos were then washed in running tap water overnight and 70% alcohol several times and stored in 70% alcohol until required for further investigations. The general technique of paraffin sectioning and eosin-haematoxylin staining was employed for histological studies.

Results

The gravid female was found to lay all its mature eggs in one sequence. The number of eggs in each clutch varied from 8 to 16. On an average eggs measured 5 cm in length and 3.3 cm in greatest diameter, resembled a rugby ball in shape and were covered by a leathery white shell. The shell often appeared creamy white in colour due to the presence of large amount of yellow yolk (Fig. 1). The shell was soft, elastic

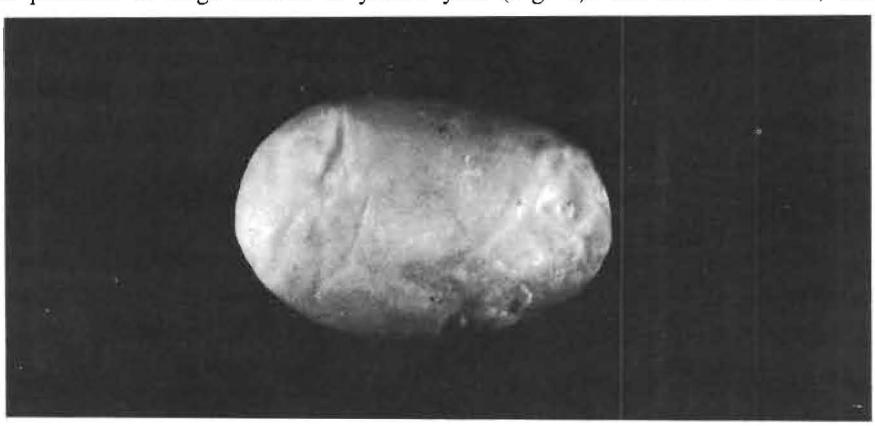

Fig.1. Photograph of freshly laid egg of *Uromastix microlepis*, life size.

and was devoid of pigments. All eggs of the clutch contained embryos at the same stage of development at the time the eggs were laid. Nearly 2/3 of the egg volume contained yellow yolk and the rest empty space. There was no white albumin. The embryo could be seen through the semi-transparent egg-shell as a reddish pink circular mass. Total volume of yolk per egg was approximately 15 cc.

An ovoviviparous animal, *Uromastix microlepis* lays eggs containing small distinct embryos comparable to those at stage 29 of *Calotes versicolor* (Muthukkaruppan *et al.* 1970). The external morphology of the embryo surrounded by its membranes, embryo without membranes and a camera lucida drawing of the embryo without membranes are represented by Fig. 2 to 4. It is obvious that embryonic development has proceeded to an advanced stage by the time the egg is laid. The embryo has 49 pairs of somites, five gill pouches and the eye is covered by a membrane possessing a circular margin on its inner surface. Both arm buds and leg buds are apparent at this time. Epiphysis, nasal pit and auditory vesicle are also seen at this stage. The heart region appears as an enlarged pouch and the belly stalk projects ventrally posterior to the mid point of the embryo. Rudiments of internal organs are seen in sections of embryo drawings which were made with the aid of a Reichert's 'Visopan' projection microscope (Fig. 5,6 and 7).

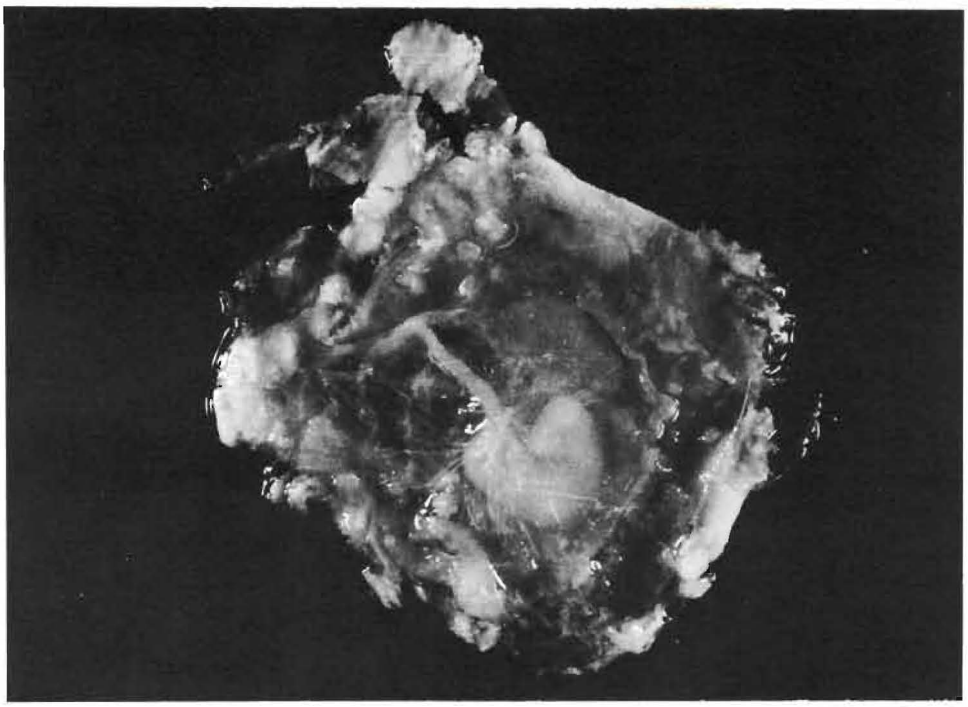

Fig.2. Photograph of a normal embryo of *Uromastix microlepis*, with its surrounding membranes, dissected out from just laid egg. × 4.75.

Fig.3. Photograph of a normal embryo of *Uromastix microlepis*, after removing its surrounding membranes. × 18

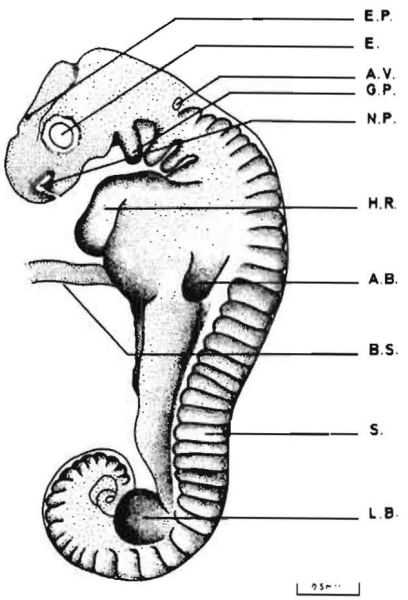

Fig.4. Camera lucida drawing showing the external morphology of a normal embryo of *Uromastix microlepis*, from just laid egg. × 16.7. Epiphysis (E.P.); eye (E); auditory vesicle (A.V.), gill pouch (G.P.); nasal pit (N.P.); heart region (H.R.); arm bud (A.B.); belly stalk (B.S.); somite (S); and leg bud (L.B.).

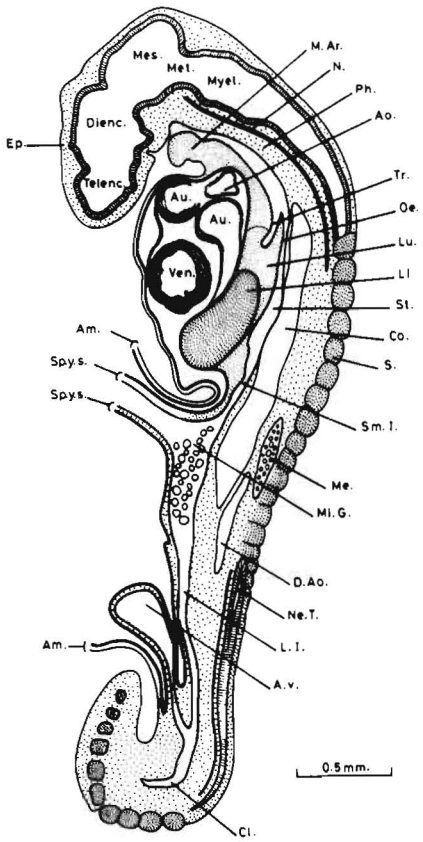

Fig.5. Visopan projection microscope drawing of median longitudinal section of a normal embryo of *Uromastix microlepis* from just laid egg, showing the external organs. × 25.5. Telencephalon (Telenc.); diencephalon (Dienc.); mesencephalon (Mes.); metencephalon (Met.); myelencephalon (Myel.); mandibular arch (M.Ar.); notochord (N.); Pharynx (Ph.); Aorta (Ao.); Trachea (Tr.); Oesophagus (Oe.); Lung (Lu.); Liver (Li.); Stomach (St.); Coelom (Co.); Somite (S.); Small intestine (Sm.I.); Mesonephros (Me.); Mid-gut (Mi.G.); Dorsal Aorta (D.Ao.); Neural tube (Ne.T.); Large intestine (L.I.); Allantoic Vesicle (A.V.); Cloaca (Cl.); Amnion (Am.); Splanchnopleure of Yolk-Sac (Sp.Y.S.); Ventricle (Ven.); Auricle (Au.); and epiphysis (Sp.Y.S.).

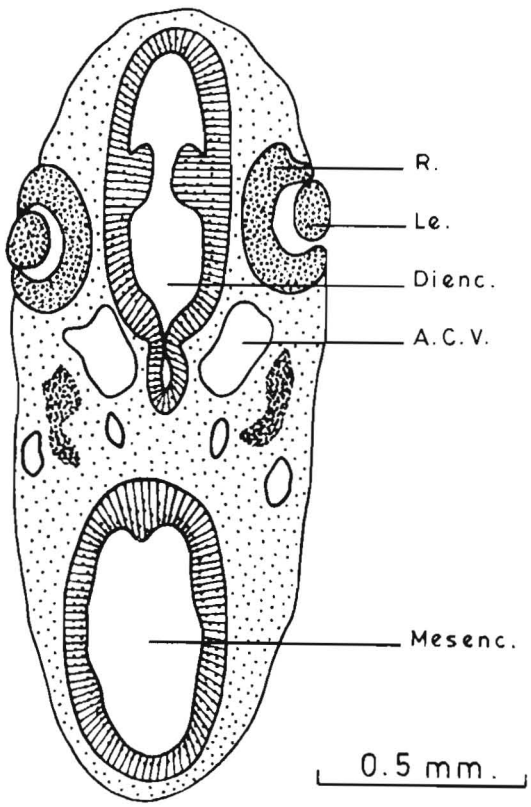

Fig.6. 'Visopan' projection microscope drawing from transverse section passing through the head region of a normal embryo of *Uromastix microlepis*, from just laid egg, showing the development of eyes. × 56. Retina (R.); Lens (Le.); Diencephalon (Dienc.); Anterior Cardinal Vein (A.C.V.); and Mesencephalon (Mesenc.).

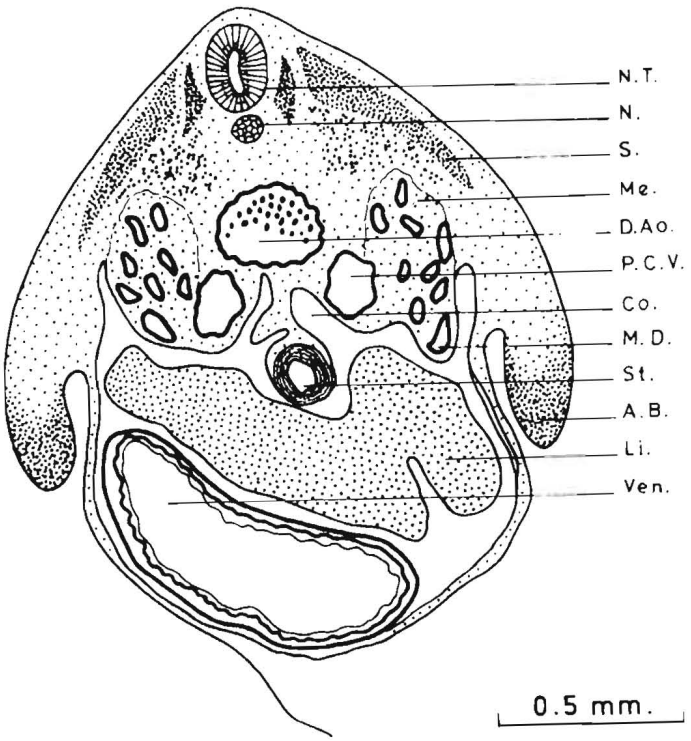

Fig.7. 'Visopan' Projection microscope drawing of transverse section passing through the lower part of the heart region of a normal embryo of *Uromastix microlepis* from just laid egg, showing the development of internal organs. × 49. Neural tube (N.T.); Notochord (N.); Somite (S.); Mesonephros (Me.); Dorsal Aorta (D.Ao.); Posterior Cardinal Vein (P.C.V.); Coelom (Co.); Mesonephros duct (M.D.); Stomach (St.); arm bud (A.B.); Liver (Li.) and Ventricle (Ven.).

Discussion

It has been shown by Arslan *et al.* (1976) that breeding activity of the spiny-tailed lizard *Uromastix hardwicki* and maturation of eggs and ovulation occur in the month of April. They also found that eggs were retained in the oviduct for 10 to 15 days and considerable embryonic development has, therefore, been completed prior to egg deposition. Similar events were noticed for *U. microlepis*.

Except for a variance in the number of somites between embryos of *U. microlepis* and embryos at stage 29 of *Calotes versicolor* (Muthukkaruppan *et al.* 1970), there is much morphological similarity between the two species. Embryos of *U. microlepis* ex-

hibit 49 somites while those of *C. versicolor* show 31. This variation in somite number might be due to genetic variation between these two unrelated species, or to the size of the embryo and distinct ecological differences between the two species.

Retention of eggs over a longer period of time within the oviduct and the subsequent development of embryos to an advanced stage (ovoviviparity) by the time eggs are laid, could be interpreted as an adaptation of *Uromastix microlepis* to severe heat conditions of the desert.

Reptilian ontogeny has been studied to a lesser degree in comparison with other groups of vertebrates and there is no evidence of embryological studies having been conducted on *U. microlepis*. We have considered, in this paper, a brief description of embryos collected from just laid eggs. Studies are being continued on the earlier and later developmental stages of the embryos of this species.

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مورفولوجية جنين السحلية شوكية الذيل «يوروماستكس ميكروليبس»

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قسم علم الحيوان - كلية العلوم - جامعة الملك سعود

لقد بينت الدراسة أن وضع البيض للسحلية شوكية الذيل (يوروماستكس ميكروليبس) يتم بخروج البيضة تلو الأخرى وبشكل متتابع. ويتراوح العدد فيما بين ٨ إلى ١٦ بيضة، أما متوسط حجم البيضة فيبلغ ٥ سم طولاً و٣,٣ سم عرضاً. يحتوي البيض حديث الوضع على أجنة حسنة التكوين وفي مرحلة متشابهة من التطور. الأجنة، عند هذه المرحلة، تشبه إلى حد كبير جنين كالوتس فيرسيكولر عند مرحلة ٢٩ من التطور.