

THE SKIN OF THE RHACHITOMOUS AMPHIBIAN *ERYOPS*.

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ABSTRACT. The skin of a "mummified" specimen of *Eryops* is described; its surface consists of a pattern of oval elevations which are scales ossified incompletely in a series of concentric rings.

IN most instances little is known of the dermal covering of fossil amphibians. In this class of vertebrates the continuous bony armor of the ancestral crossopterygians has been greatly reduced. In the living orders bony scales have been completely lost, apart from deeply-buried vestiges in the coelilians and occasional secondary ossifications, and the skin is typically smooth except for accretions of horny material in the more terrestrial anurans. In fossil members of the class the ventral bony scales were retained, and transmitted to the reptiles, in the reduced form of gastralia or abdominal ribs. In a few of the smaller Carboniferous types, such as *Ophiderpeton* (Steen, 1931, p. 876; 1938, p. 222) impressions of presumed dorsal scales have been preserved. In general, however, we have no data concerning skin texture or composition in fossil amphibians. Such a common form as *Eryops* has been restored with the skin shown in variable fashion from a smooth condition to a rough and warty one.

In recent months one of us (R. V. W.) has been engaged in the preparation of a nearly complete articulated skeleton of *Eryops* (M. C. Z. 1539) collected by L. I. Price in the Belle Plains Formation near Fulda, Baylor Co., Texas. The specimen was found, as is commonly the case, in a variegated clay. Over much of the axial skeleton, there was further present close to the bone a thin layer of yellow-brown grainy matrix of a resistant nature. This covered nearly the entire surface of the neural spines and the outer surfaces of the ribs but (significantly, it now appears) was absent from the inner surfaces of the ribs. No particular attention was paid to this material during preparation of the trunk elements. However, while cleaning the tail (found complete and articulated) it was discovered that when the matrix was given a routine treatment by hydrochloric acid followed by vigorous brushing with a fine

steel wire brush, there appeared in bold relief a pattern of raised oval areas almost hexagonal in shape. This pattern was most easily observed in the region of caudals 9-11, illustrated in the plate. These ovals measure about 1 cm. in longest diameter; those situated more dorsally, covering the spines, are slightly larger than those covering the ventral chevron region. The more dorsal ovals tend to be so oriented that the long axis is parallel to the longitudinal axis of the tail; the more ventral elements are oriented parallel to the chevrons.

Unfortunately the matrix had been removed from the greater part of the skeleton before this arrangement of ovals was discovered but examination of some trunk fragments still uncleaned, such as part of the right scapula and a few ribs, indicated that this oval pattern had been originally preserved over all major portions of the trunk; no indications of such a covering were, however, present on skull or lower jaws. During the concurrent preparation of some *Eryops* material from another locality (Geraldine, Archer Co.) similar markings were seen on a few vertebral spines, but their preservation was too poor for detailed observation.

Obviously, in the main specimen described above, we are dealing with an individual which had become mummified before burial, and the supposedly commonplace matrix actually formed a cast of the skin surface of the cadaver. We may therefore interpret *Eryops* as having been covered by a hide bearing a superficial pattern of such oval eminences.

One might tend to assume that these ovals consisted of cornified epidermis by analogy with the "warty" skin of the toads. This, however, is not the case. Upon treatment with a methylic bone stain, clear indications of bony structure were revealed. The ovals are thus to be considered as primarily dermal in nature, with but a thin epidermal covering. The ossifications take the form of "squamulae," tiny, flat plates of bony tissue, somewhat irregularly placed but with suggestions of an arrangement in concentric circles. These groups of squamulae may be reasonably interpreted as bony scales which have undergone partial phylogenetic reduction so that much of the originally solid scale is here represented by fibrous connective tissue.

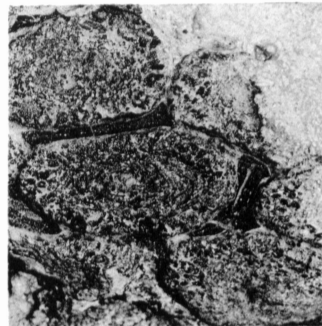
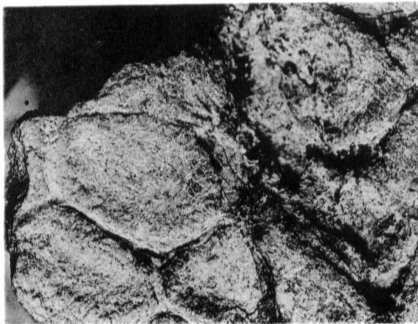
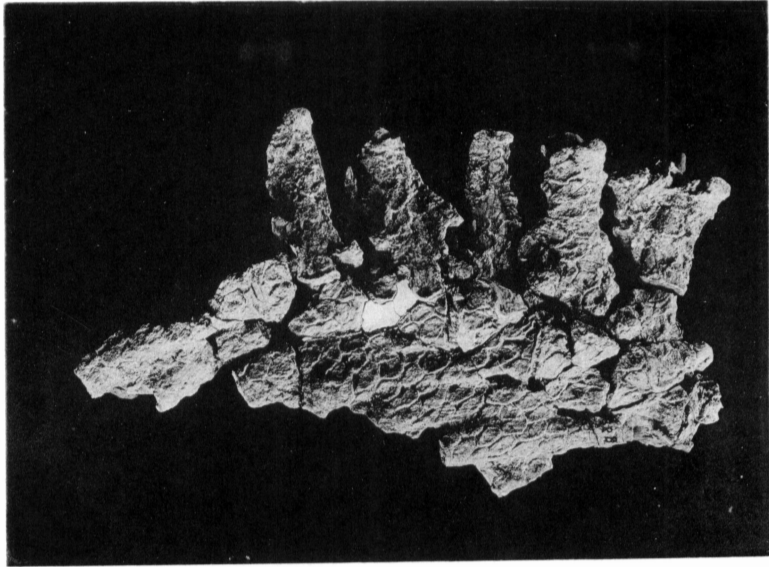
Similar scales are known in both fossil and recent amphibians. In the little labyrinthodont *Discosaurus* (Credner 1890, pls. 10, 11, etc.) circular scale impressions are known with a structure

of concentric rings arranged in a perfect geometric pattern. These scales were presumed to be abdominal in nature, but were found scattered and may possibly have formed part of a general squamous covering. In the coecilian *Ichthyophis* a rather similar type of scale is found (Sarasin, 1890, pl. 9, etc.). Here the arrangement of the squamulae is not as regular and is highly comparable to that seen in *Eryops*. Quite possibly this type of scale may prove to have been a common one in the skin of early amphibians.

LITERATURE CITED

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The skin of *Eryops*. *Above*, part of the proximal caudal region of M.C.Z. 1539, showing typical squamation. The vertebrae included are caudals 9-13 and the corresponding chevrons. Oval scale outlines are clearly seen ventrally, less distinctly in the region of the spines. (X 2/5)

Lower left, several scales from another portion of the tail, enlarged (X 3).

Lower right, several scales stained to show bone, and exhibiting concentric rings of squamulae. The dark areas are part of the underlying chevron. (X 3)