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Gow, C. E.

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OWENETTA IN PERSPECTIVE

by

C. E. Gow

ABSTRACT

This paper adds detail to the existing description of the small procolophonid *Owenetta rubidgei* Broom. The relationships of this animal are assessed with reference to other South African procolophonids and pareiasaurs. All are broadly related but a mosaic of characters precludes any direct phyletic relationships.

INTRODUCTION

The order Cotylosauria is represented in the Karroo beds of South Africa by the Millerettidae (Gow, 1972) and the Procolophonidae and Pareiasauridae. The common well-known lower Triassic genus *Procolophon* and the poorly-known and rare upper Permian genus *Owenetta* are included by Romer (1956) within a subfamily Procolophoninae, to distinguish them from the supposedly related and more primitive Nycteroleterinae and Nyctiphruretinae.

Procolophonids and pareiasaurs are distinguished from other cotylosaurs by having a large tabular which projects posteriorly, and in lacking a supratemporal. The palate is broad and typically has a distinctive, short, rounded interpterygoid vacuity. The basal articulation is said to be fused (Romer op. cit.): this is true of pareiasaurs and old *Procolophon*, but *Owenetta* and young *Procolophon* have a free articulation (personal observation). Procolophonids are typified by having the posterior border of the orbit emarginated, parieasaurs by their much larger size and rugose dermal skull bones.

The small upper Permian procolophonid *Owenetta rubidgei* has not been restudied since its description by Broom in 1939. Due perhaps to their small size and delicate construction these animals are not common in the fossil record; however, there are seven skulls in the collection of this Institute, and these all contribute to the reconstructions presented here. This paper presents more details of the cranial anatomy of *Owenetta*, and offers certain interpretations regarding its biology. Comparisons are made with the well-known procolophonids and pareiasaurs, resulting in a better understanding of the relationships between these animals.

MATERIALS AND METHODS

Following are the field numbers of the skulls of *Owenetta* used in this study: BPI 301; 1175 (two); 1395; 1396; 3819 and 4195b. A particularly well-preserved skull of *Procolophon trigoniceps* was used for comparison, number BPI 4014.

As well as being extremely thin and delicate the finer elements of the skull of *Owenetta* tend to be translucent (a condition which is aggravated by moisture). The matrix in some cases was not homogeneous, tending to break along parting planes. For these reasons preparation has been mechanical, using fine needles.

CRANIAL ANATOMY

The various elements of the skull do not require formal description — relationships are clear from the figures. *Owenetta* (fig. 1) has the same emargination of the posterior borders of the orbit so characteristic of procolophonids. The form of the maxilla, very high just behind the external nares, is also typically procolophonid, though *Owenetta* lacks the depression for a maxillary gland (Ivachnenko, 1973) seen in other procolophonids (stippled area in fig. 2). In *Owenetta* there is a gap between the posterior border of the jugal and the quadratojugal, a feature apparently unique to this genus among procolophonids; the jugal is pitted as shown for the attachment of a connective tissue sheet in this region.

Despite overall similarity there are pronounced differences in the skull roof between *Owenetta* and *Procolophon*. The postfrontal in *Procolophon* is a thin sliver of bone held out of contact with the postorbital by the parietal, which enters the posterior border of the orbit. (In some specimens this

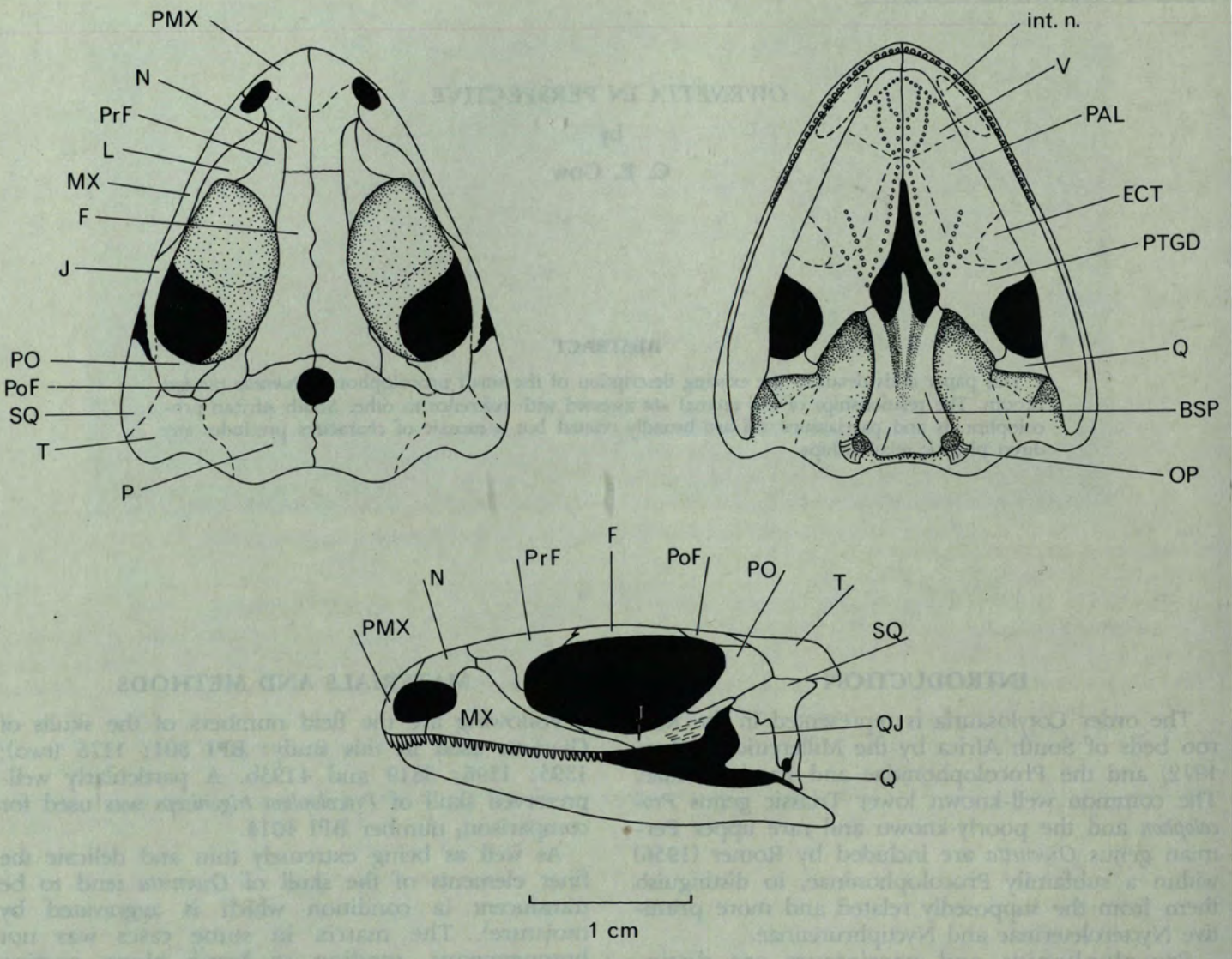


Figure 1. *Owenetta rubidgei*. Skull reconstruction. Dorsal, ventral and lateral views.

relationship may be obscured by the tabular extending forward to the orbit.) In *Owenetta* the position and relationships of the postfrontal are typically cotylosaurian. This suggests that emargination of the skull roof behind the orbit has proceeded further in *Procolophon*.

In *Owenetta* there are eight teeth in the premaxilla and 25 in the maxilla, twice as many as in the smallest known *Procolophon* (Gow, 1977). These teeth are slender, circular in section, and slightly recurved at the tips. Lower teeth occlude within the upper arcade as in pareiasaurs and quite unlike the tooth to tooth occlusion in procolophonids. The arrangement of the palatal bones, with a long palatal vacuity reaching almost to the vomers, is typical of primitive captorhinomorphs and contrasts with the palates of typical procolophonids and pareiasaurs. Tooth fields on the palate are primitive, except that teeth are absent from the pterygoid flanges as in *Procolophon* (these are still present in pareiasaurs).

Boonstra (1932) described the pareiasaurian hyoid apparatus (fig. 3 A). One of the *Procolophon* skulls examined in the present study has a very similar hyoid apparatus (BPI 2504, fig. 3 B) while several of the *Owenetta* skulls have the hyoid apparatus in position (fig. 3 C). These bones in the three forms are strikingly similar, comprising in each case an ossified hyoid body with obvious points of attachment for two ceratobranchial arches, and the proximal portions of ceratobranchials I.

DISCUSSION

(a) Ecologic

Pareiasaurs and procolophonids were undoubtedly herbivorous. *Owenetta* was almost certainly insectivorous, which was the primitive condition in cotylosaurs as a group. The skull of *Owenetta* is reminiscent of modern geckos. *Owenetta* may well have been a cryptic nocturnal animal, as there is no hint of the defensive structures common to procolophonids (spiny cheeks) and pareiasaurs (dense bone and dermal armour; sheer size).

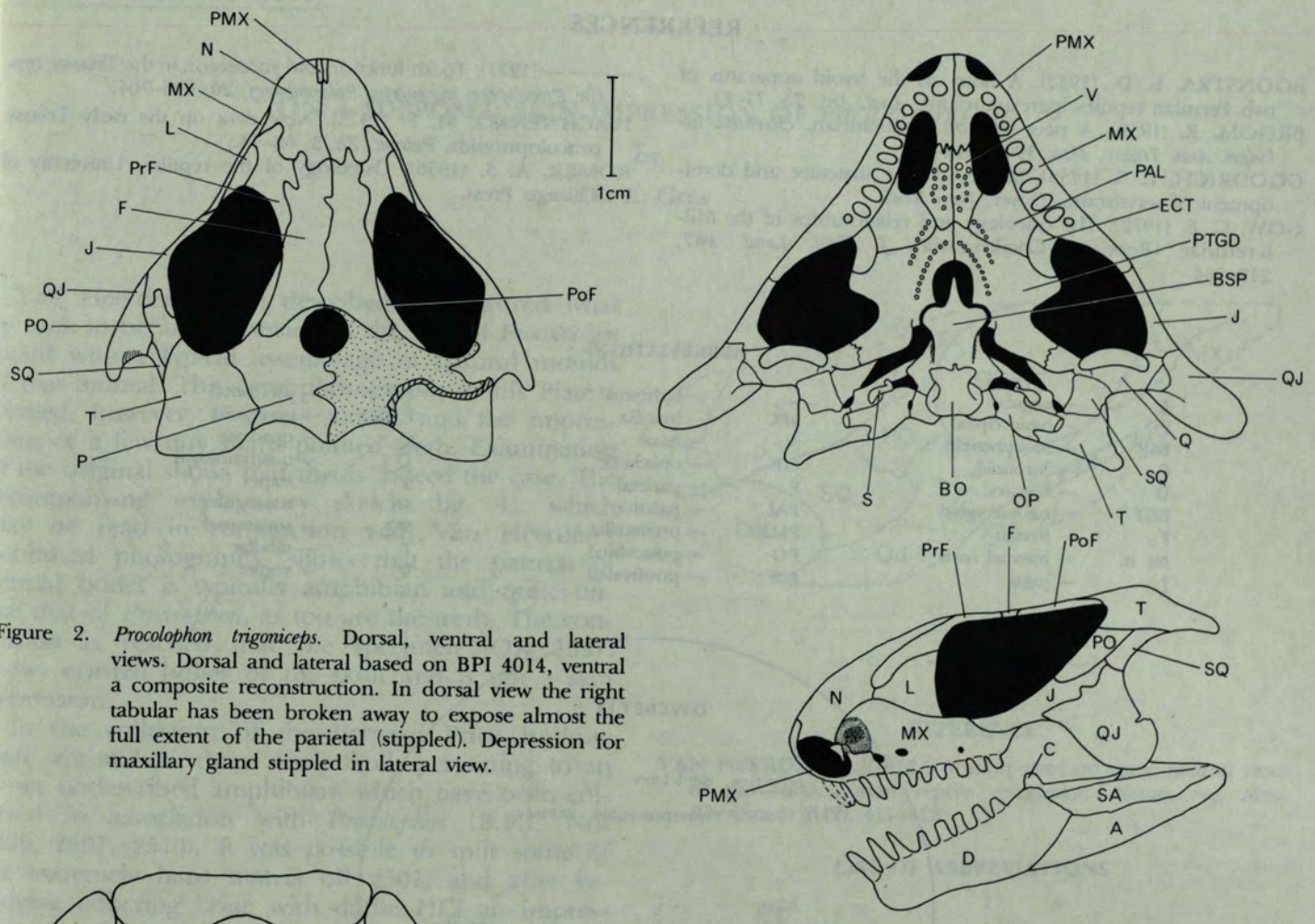


Figure 2. *Procolophon trigoniceps*. Dorsal, ventral and lateral views. Dorsal and lateral based on BPI 4014, ventral a composite reconstruction. In dorsal view the right tabular has been broken away to expose almost the full extent of the parietal (stippled). Depression for maxillary gland stippled in lateral view.

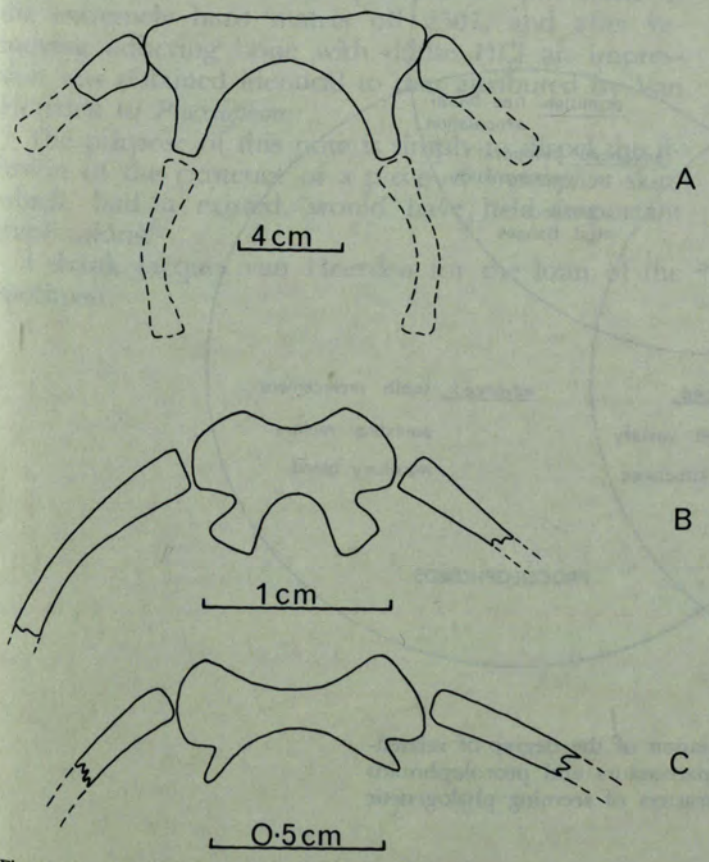


Figure 3. Hyoid apparatus of:
(a) Pareiasaur (after Boonstra, 1932)
(b) *Procolophon* (BPI 2504)
(c) *Owenetta* (BPI 1395, 1396).

(b) Phylogenetic

Owenetta is discussed here in comparison with South African procolophonids and pareiasaurs (which are in all essentials similar to Russian and other described forms). As regards the more primitive forms, from published illustrations *Nyctiphruretus* is very similar to *Owenetta* but more primitive in having toothed pterygoid flanges and unmodified jugal and quadratojugal. If *Nycteroleter* is representative of a form ancestral to all procolophonids and pareiasaurs as suggested by Romer and as seems quite acceptable, and if its large amphibian type otic notch is primitive, which also seems likely, then these animals may have originated independently of other cotylosaurian groups.

All characters of seeming phylogenetic importance in *Owenetta*, procolophonids and pareiasaurs are schematised in Figure 4. All three share a distinctive, apparently unique, hyoid apparatus. (Here comparative information is scanty, but of all described hyoid elements this is closest to that of the Chelonia (e.g. Romer, 1956; Goodrich, 1958) which typically consists of an ossified hyoid body, two ossified ceratobranchials, and a much reduced cartilagenous lingual process.) Other characters can be divided as shown into those shared by any two of the three groups and those which are found in only one.

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ABBREVIATIONS

A	— angular	L	— lachrymal	PrF	— prefrontal
BO	— basioccipital	MX	— maxilla	PTGD	— pterygoid
BSP	— basisphenoid	N	— nasal	Q	— quadrate
C	— coronoid	OP	— opisthotic	QJ	— quadratojugal
D	— dentary	P	— parietal	S	— stapes
ECT	— ectopterygoid	PAL	— palatine	SA	— surangular
F	— frontal	PMX	— premaxilla	SQ	— squamosal
int. n.	— internal naris	PO	— postorbital	T	— tabular
J	— jugal	PoF	— postfrontal	V	— vomer

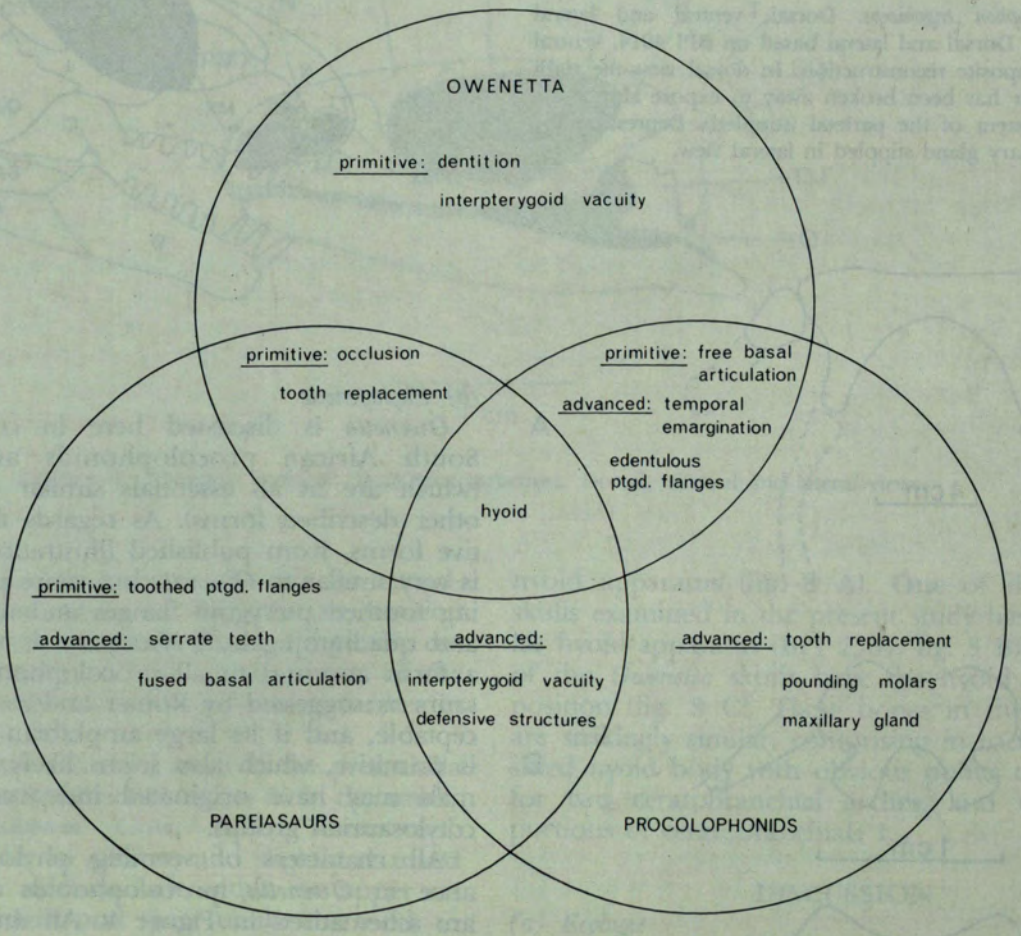


Figure 4. Diagrammatic presentation of the degree of relatedness of *Owenetta* to pareiasaurs and procolophonids using only those characters of seeming phylogenetic importance.