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PALÆONTOLOGICAL NOTES.

No. III.

The Skull of *Sthenurus occidentalis* Glauert.

By

C. ANDERSON, M.A., D.Sc., C.M.Z.S.,
Director, The Australian Museum.

(Plates xlv-xlvi and Figures 1-6.)

In 1910 L. Glauert described this new species of *Sthenurus*, the type being a nearly complete mandible, with all the teeth in place, from the Mammoth Cave, Western Australia.¹ Later B. H. Woodward announced the discovery at the same place of two skulls of the new species, which, however, were not described.²

Being engaged on a revision of the macropod genera *Sthenurus* and *Procoptodon*, I desired to examine these skulls, and, on my communicating with Mr. Glauert, he very generously forwarded the two specimens for examination and description. I am also indebted to Mr. H. H. Scott,³ Curator of the Queen Victoria Museum, Launceston, for the loan of a damaged skull from King Island, Tasmania, which supplements in an important manner the data obtained from the two Western Australian specimens. I am very grateful to these two gentlemen, and to the governing bodies of the Western Australian Museum and the Queen Victoria Museum for the privilege of examining the skulls, and also for their kind permission to extract the permanent premolar, which is of diagnostic importance.

It is unfortunate that the three skulls are those of comparatively young animals, though the chief features of the skull and of the maxillary teeth can be fully made out. In view of the paucity of even partially complete macropod skulls of Post-Tertiary age, these specimens are of great interest, particularly as the genus to which they belong differs somewhat from typical macropods in cranial and mandibular characters.

For purposes of description the larger skull from Western Australia will be referred to as A, the smaller B, while the Tasmanian specimen, which so strongly resembles the others that it may fairly be referred to the same species, will be distinguished as C.

The largest skull is nearly complete, but lacks the left zygomatic arch, part of the nasals, and the incisor teeth, only the roots of i^1 and i^2 being preserved;

¹ Glauert.—Bull. Geol. Surv. W. Austr., 36, 1910, pp. 53-64; Rec. W. Austr. Mus., I, 1, 1910, pp. 31-36.

² Woodward.—Rec. W. Austr. Mus., I, 3, 1914, p. 252.

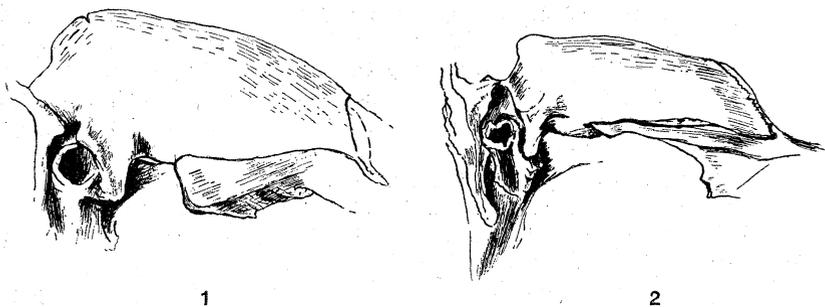
³ Scott.—Memoir on *Procoptodon rapha*, Vict. Mus., Launceston, 1906; Brochure Mus. Launceston, No. 6, 1917, pp. 2-3.

in B (Pl. xlv, fig. 1), which is intermediate in size, the zygoma of the left side is missing, also the tips of the nasals, but the two lateral incisors are present on each side. In C (Pl. xlv, fig. 2) the brain case is lacking, but the nasals are practically complete and the three incisors of one side and i^1 , i^2 of the other are fortunately preserved.

Skull.—This is remarkable for its shortness and depth (Pl. xlvi, fig. 2) and its generally robust character even in the young animal; in its proportions it has a resemblance to that of the Koala, *Phascolarctus*. The facial portion and diastema are relatively much shorter than is usual in macropods living or extinct, although *Procoptodon*, of which, however, no skulls are known, resembles it in this respect. The dorsal profile is practically straight from the lambdoidal crest to the nasals, which are short, wide (their greatest breadth going about two and a half times in their length) and inflated, particularly in A and B. The naso-premaxillary suture is to the naso-maxillary (in C) approximately as 5 to 3. The naso-frontal suture curves evenly forwards from the median line. The frontal has no post-orbital process, but, particularly in B and C, overhangs the temporal fossa, the projection having a rather sharp edge. The interorbital space is practically flat in A and B, but shows a slight median concavity in C, the youngest individual. As one would expect in young animals, the intertemporal constriction is not marked.

The anterior palate has rounded edges and in A its least breadth is approximately three-fifths of the diastemal length; this proportion would, of course, be different in a fully adult animal. The incisive foramina are short, but extend backwards into the maxilla; the inter-alveolar⁴ are situated nearly opposite the posterior ends of the incisive foramina. The palatal vacuities are large, extending forward level with or beyond the posterior lobe of p^4 ; as in recent forms the extent of these vacuities varies somewhat

The zygoma is deep and strong, the jugal extending backwards without diminution in depth until it reaches the glenoid fossa, which, viewed from the side, appears as a deep notch (Fig. 1) as in *Phascolarctus*; in recent macropods the jugal tapers posteriorly and reaches the shallow glenoid fossa as a thin splint, slightly thickened at the end (Fig. 2).



Figures 1-2.

Fig. 1.—Zygoma of *Sthenurus occidentalis* Glauert, Specimen A.

Fig. 2.—Zygoma of *Macropus giganteus*.

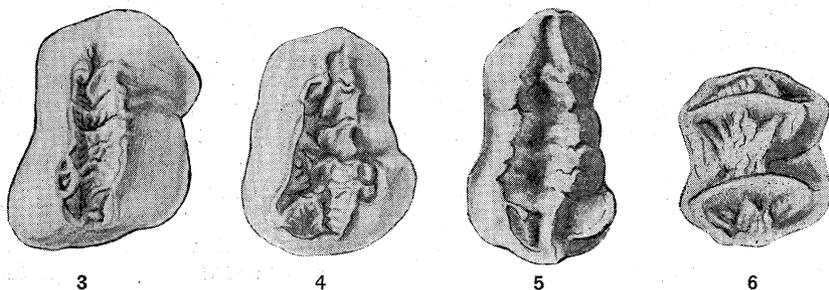
One-half natural size.

Miss J. Allan, del.

⁴ Anderson.—Rec. Austr. Mus., XVII, 1, 1929, p. 36.

Dentition.—The Western Australian specimens have a complete set of juvenile cheek teeth on each side, though in B the last molar is not fully up; in C only the deciduous teeth and m^1 - m^3 are present.

The median incisor is of moderate size, sub-cylindrical at the base and roughly triangular in section at the tip; it does not develop a cutting edge, but the termination is excavated by wear against the lower incisor. The second incisor is remarkable for its slenderness, especially in B; it is sub-triangular in section, expands slightly at the tip, and with i^2 forms a stop for the lower tooth. The third incisor is long antero-posteriorly, as in *Macropus giganteus*, compressed laterally, the anterior edge expanded somewhat medially; it has no vertical groove.



Figures 3-6.

Fig. 3.—*Sthenurus occidentalis*; fourth left upper premolar of Specimen A.

Fig. 4.—*Sthenurus occidentalis*; fourth left upper premolar of Specimen C.

Fig. 5.—*Sthenurus atlas* Owen; fourth left upper premolar (Aust. Mus. Reg. No. F.29556).

Fig. 6.—*Sthenurus occidentalis*; third upper molar of Specimen B.

Enlarged.

Miss J. Allan, *del.*

The deciduous premolar is stout and pear-shaped, wider posteriorly, and has one or two slight vertical grooves on each side near the middle, so that it shows a partial division into anterior and posterior lobes. The crown is worn in all the specimens, but it evidently has a shallow longitudinal depression. The permanent premolar (Figs. 3, 4) is a large strong tooth, almost rectangular in shape, though narrower in front. The crown is excavated longitudinally, but the depression is not deep and is filled with irregularly disposed but generally transverse ridges and folds, which in the centre do not rise as high as the side walls; they are more strongly developed on the external wall. There is a basal swelling in front, from which a groove runs to the crest, where it notches the front of the tooth and joins the longitudinal excavation. On the buccal aspect the base of the tooth bulges outwards and three or four vertical grooves notch the outer wall, which therefore has a denticulated crest. The inner wall is thinner, more even in outline, and slightly lower than the outer; the excavation is open to the rear. On the postero-external angle in B and C a small cusp is partially separated from the main body of the tooth. In general, the tooth has a strong resemblance to the permanent upper premolar of *Procoptodon goliath* Owen, though in the latter the postero-external cusp is more strongly developed.

The molar's are short and wide, the lophs comparatively low, their crests thin and slightly concave backwards and downwards, the teeth being viewed in the prone position as figured (Pl. xlv, figs. 1, 2, and Fig. 6). The prebasal

ledge is narrow and bounded anteriorly by a low ridge which is a continuation of a fold which sweeps downwards from the external angle (paracone) of the anterior loph. In B and C, on the front of the anterior loph, somewhat medial to its middle point, another slight fold joins the loph to the prebasal ridge, and between these folds the front of the loph is traversed by a number of low folds or flutings, which in B extend on to the prebasal ledge. In A the central ridge is not developed and the flutings extend over practically the whole front of the loph, though they are less distinct on the medial third. There is no well-marked mid-link connecting the two lophs, but from the paracone a ridge extends towards the base, partially closing the mid-valley, and a less distinct ridge proceeds obliquely outwards from the protocone towards the base, crossing the mid-valley slightly medial to its middle point. The sub-triangular area thus defined shows a number of distinct branching folds, which also appear on the front of the hind loph, in which, however, the medial third is almost smooth. The posterior surface of the hind loph is occupied by a sub-triangular area bounded by two folds, which converge from the angles of the loph to meet and form a low crescentic ridge, or slight hind talon. Like the similar area on the posterior surface of the front loph, this is occupied by a series of branching folds and flutings.

Measurements made on the three skulls are here tabulated in millimetres; the breadth of the premolars was measured across the wider posterior portion, of molars across the anterior loph. Some measurements of the maxillary teeth of *Sthenurus atlas* Owen and *S. oreas* De Vis are included for comparison.

	A.	B.	C.	F.29556.	11204.
Basal length	173.0	152.0			
Height at m ³ (inclusive)	91.0	81.0			
Zygomatic breadth	136.0	115.0			
Nasals, greatest length (approximately)			48.0		
Nasals, greatest breadth		50.0	37.4		
Intertemporal Constriction	39.0	38.0			
Palate, greatest breadth outside m ²	60.2	58.4	52.0		
Palate, greatest breadth inside m ²	36.5	36.0	29.4		
Diastema	30.4	23.6	29.4		
Incisive foramen, length i ¹ , antero-posterior diam.		12.0	7.0		
i ² , antero-posterior diam.		3.5	4.0		
i ³ , antero-posterior length		11.0	10.8		
p ³	10.5 × 10.0	10.8 × 9.9	10.2 × 9.6	10.0 × 8.0	
mp ⁴	10.0 × 9.5	10.0 × 9.6	10.0 × 9.4	10.4 × 8.5	
p ⁴	17.5 × 13.5	17.0 × 12.5	17.0 × 12.5	18.7 × 9.7	15.2 × 11.0
m ¹	10.7 × 11.0	11.1 × 10.7	11.0 × 10.7	12.0 × 10.7	13.0 × 12.0
m ²	11.8 × 11.8	12.5 × 11.1	11.4 × 11.4	13.2 × 11.9	14.5 × 13.1
m ³	12.2 × 12.2	12.1 × 11.2	12.6 × 11.5	14.3 × 12.5	
m ⁴	11.8 × 11.7	11.8 × 10.9			
m ¹ - m ³	34.7	35.7	35.0	39.5	

A, B, C: *Sthenurus occidentalis*.
 F. 29556: *S. atlas*, Australian Museum.
 11204: *S. oreas*, Queensland Museum.

The described species of *Sthenurus* consist of *S. atlas* Owen,⁵ *S. oreas* De Vis,⁶ *S. pales* De Vis,⁷ and *S. occidentalis* Glauert. De Vis has united Owen's two

⁵ Owen.—In Mitchell's "Three Expeditions into the Interior of Eastern Australia", II, 1838, p. 359 (*Macropus*).

⁶ De Vis.—Proc. Linn. Soc. N.S.W., (2), X, 1894, p. 96.

⁷ De Vis.—*Loc. cit.*, p. 94.

genera *Sthenurus* and *Procoptodon*,⁸ but it is considered preferable to retain both at present, though undoubtedly they are closely related. All four species are based on mandibular specimens, but Lydekker has recognized upper jaw fragments of *S. atlas*,⁹ and De Vis has on good grounds associated maxillary specimens with his type jaw of *S. oreas*. The teeth of *S. pales* (if this is indeed a *Sthenurus*) are so large and distinctive that it cannot be confused with any other, and there can be little doubt but that the skulls here described are those of *S. occidentalis*.

Lydekker states that in *Sthenurus* the molars have no vertical enamel folds and apparently this is true of the mandibular molars of *S. atlas*. In the Australian Museum there is a small number of maxillary specimens, which in other respects closely resemble *S. atlas* as described by Owen and Lydekker, and have no vertical flutings or puckerings on the molars, or only faint indications of these. In these specimens the fourth premolar is distinctly narrower than that of *S. occidentalis*, and the postero-external cusp is much more distinct, being separated by a deep cleft from the rest of the tooth (Fig. 5). In *S. atlas* the molars are larger, the lophs higher, and the ridge which joins the outer angle of the prebasal ridge to the anterior loph does not reach the crest of the paracone, but ends on the front of the loph, a little distance medial to the buccal margin.

To Mr. H. A. Longman, Director of the Queensland Museum, I am indebted for the loan of some examples of *S. oreas* named by De Vis. In this species the fourth upper premolar is similar in form to that of *S. occidentalis*, but smaller. The upper molars are about the same size as those of *S. atlas*, or slightly larger, but, like those of *S. occidentalis*, they show vertical folds and flutings.

EXPLANATION OF PLATES.

PLATE XLV.

Sthenurus occidentalis Glauert.

Fig. 1.—Skull; palatal view of Specimen B, Mammoth Cave, Western Australia. About $\frac{2}{3}$ natural size.

Fig. 2.—Skull; palatal view of Specimen C, King Island, Tasmania. About $\frac{3}{4}$ natural size.

Fig. 3.—Skull; lateral view of Specimen C. About $\frac{3}{4}$ natural size.

PLATE XLVI.

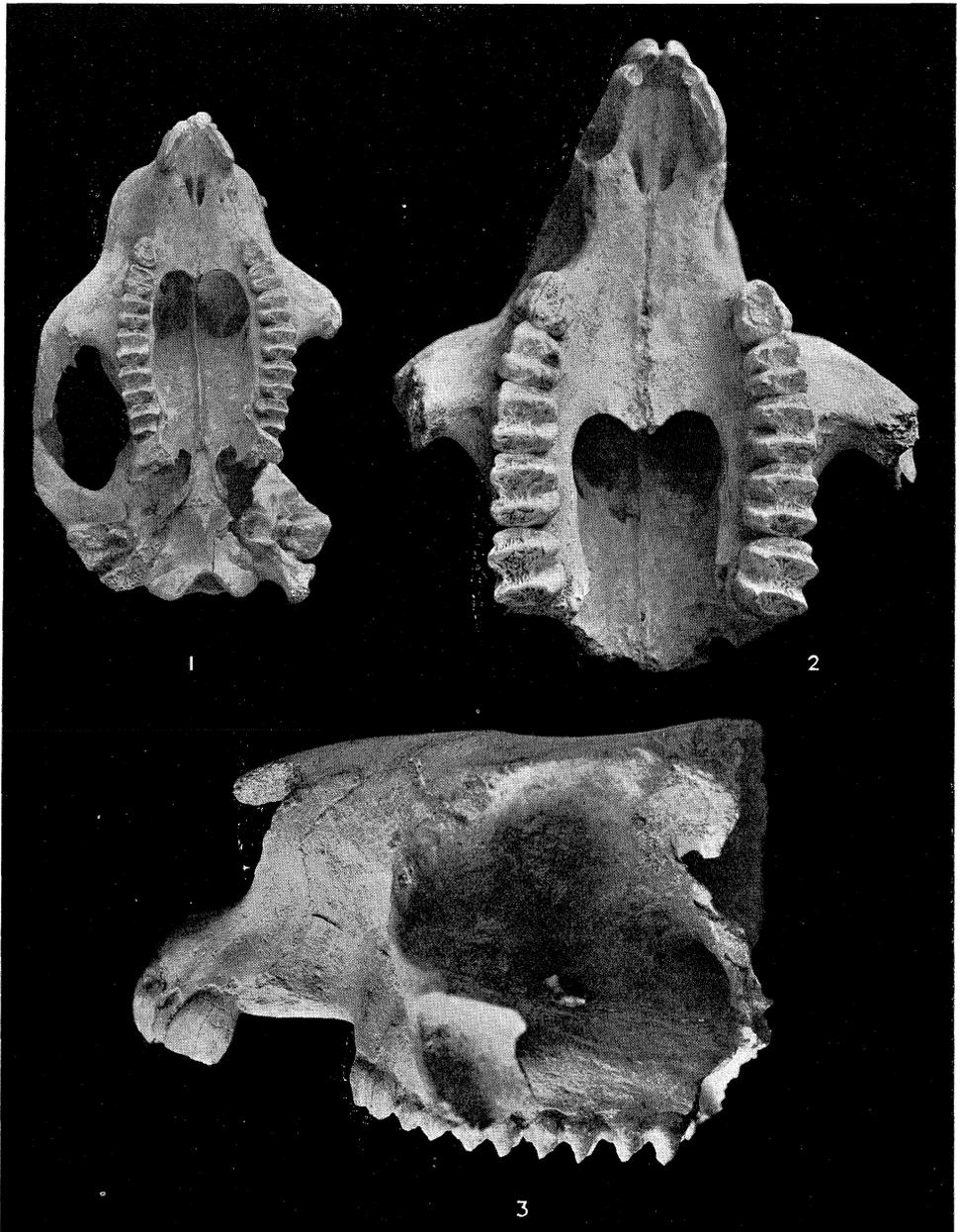
Sthenurus occidentalis Glauert.

Fig. 1.—Skull; top view of Specimen C, King Island, Tasmania. Natural size.

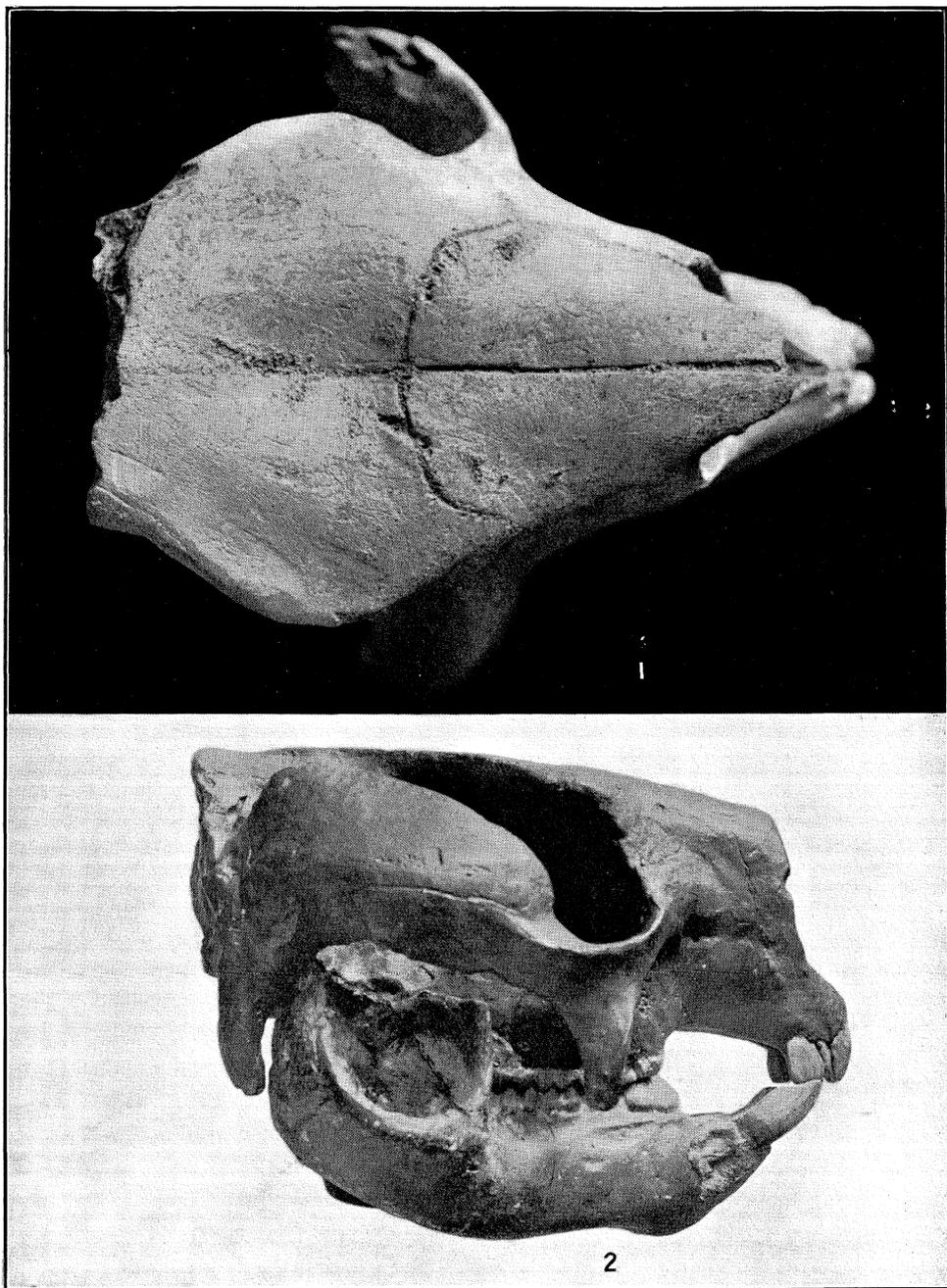
Fig. 2.—Skull and mandible. From casts of Specimen A and of type mandible. About $\frac{1}{2}$ natural size.

⁸ De Vis.—*Loc. cit.*, pp. 38, 93.

⁹ Lydekker.—*Brit. Mus. Cat. Foss. Mamms.*, Part V, 1887, p. 232.



G. C. CLUTTON, photo.



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