ON TWO NEW SPECIMENS OF LYSTROSAURUS-ZONE CYNODONTS

By A. S. Brink

Abstract

In this paper the skulls of two new specimens of *Lystrosaurus*-zone cynodonts are described. One is a skull of *Notictosaurus luckhoffi* Broom, and it is pointed out that the other two species, *N. gracilis* and *N. trigonocephalus*, are respectively the young and the adult of the genotype. N. *gracilis* was described on only one small skull amongst more than three skulls and skeletons intimately associated in one block with the skull and skeleton of the adult, only the skull of which was subsequently described as *N. trigonocephalus*. At the time of description this block was in different fragments and the authors of the new species were not conscious of their association. The second new specimen is a close ally, but different enough to be recognised as a separate genus. While it cannot satisfactorily be contrasted with *Cynosuchoides whaitsi*, it is identified and described as belonging to this genus and species. Our knowledge thus far of this form is based on one imperfectly preserved skull.

Introduction

In February 1964, on passing through the Lootsberg Pass near Bethesda Road, between Graaff Reinet and Middelburg, Cape Province, Mr J. W. Kitching recovered the skull and some fragments of the skeleton of a cynodont. Three months later, in May, he found an occasion to search the same area and, amongst others, recovered a second cynodont specimen. Both these specimens were found in *Lystrosaurus*-zone strata, the latter larger specimen at the *Cistecephalus*-zone contact and the former smaller specimen some 400 ft. higher. On preparation the larger specimen turned out to be a galesaurid and while it cannot be conclusively contrasted with *Cynosuchoides whaitsi*, it is described as such, even though this genus and species is inadequately known and described on an unsatisfactory skull.

The first, smaller specimen from the higher level is a good example of *Notictosaurus luckhoffi*. The genotype was described by Broom in 1936 on a skull and lower jaw collected by R. Luckhoff (this specimen was at first accommodated in the Luckhoff Collection, which was subsequently incorporated into the Rubidge Collection, and is numbered L1/R.C.107). The type is from *Cistecephalus*-zone beds six miles east of Bethesda Road station, hence not far removed from the locality of the new specimen.

In 1946 Mr J. W. Kitching collected two specimens from exactly the same locality on the farm Elim in the Burghersdorp district (*Lystrosaurus*-zone), and confusion immediately arose when they were recorded in the Field Catalogue under separate numbers, 472 from Elim and 478 from Honingkrans, which is a different name for the same farm. Only in 1952 when Mr Kitching returned to the same farm did he recover the block from which the two skulls were derived. This block contains in addition to the skeletons of the skulls already

recovered, also the skulls and skeletons of at least two additional immature specimens. This block was recorded in our Field Catalogue as No. 2513. At the time the two skulls were described it was not known that they had been intimately associated and that there was more material available.

Broom and Robinson described the smaller of the two original skulls in 1948 as *Notictosaurus gracilis* (Field No. 472, Museum No. 5). Brink and Kitching described the larger skull in 1951 as *Notictosaurus trigonocephalus* (Field No. 478, Museum No. 223). It was only when the block containing the rest of the material was discovered in 1952 that the relationship between these two specimens could be established. Quite obviously the whole specimen comprises a mother with several of her young. Not only could it be established that *N. gracilis* (one of the young) and *N. trigonocephalus* (the mother) belong to the same species but, in the light of the new specimen described below, it is quite definite that they belong to the genotype *N. luckhoffi*.

Notictosaurus luckhoffi Broom (1936)

(Figure 44 and 45)

1936, Broom, R., *Ann. Transv. Mus.*, xviii, p. 382, figs. 28-30.

1948, Broom, R. & Robinson, J. T. (*N. gracilis*), *Proc. zool. Soc. Lond.*, p. 406, figs. 11, 12.

1951, Brink, A. S. & Kitching, J. W. (*N. trigonocephalus*), *Ann. Mag. Nat. Hist.*, (12) iv, p. 1227, figs. 8, 9.

Type. Skull with lower jaw collected by R. Luckhoff in *Cistecephalus*-zone beds six miles east of Bethesda Road station, now housed in the collection of Dr S. H. Rubidge on the farm Wellwood, Graaff Reinet (No. L1/R.C. 107).

Additional described specimens. A female(?) adult intimately associated with several of her young in one block, with reasonably complete skeletons, the adult (Field No. 478/Museum No. 225) having been described as *N. trigonocephalus*, and one of the immature skulls (Field No. 472/Museum No. 5) having been described as *N. gracilis*, while the rest, contained in one block (Field No. 2513), has not yet been referred to in description.

Present specimen. Skull without lower jaw, damaged posteriorly where both squamosals and the articular regions are missing, catalogued under Field No. 3892/Museum No. 0000 in the collection of the Bernard Price Institute. It was discovered by Mr J. W. Kitching in *Lystrosaurus*-zone beds 400 ft. above the *Cistecephalus*-zone contact in the Lootsberg Pass between Graaff Reinet and Middelburg, not far from Bethesda Road station.

Generic and specific diagnosis. *Lystrosaurus*-zone galesaurid cynodont of the same size as and very similar to *Thrinaxodon*, but less advanced; snout broader and secondary palate shorter and wider, cleft as in the procynosuchids; palate behind secondary palate wide and traversed by insignificant pterygopalatine ridges; parietal region broader than in *Thrinaxodon*, as in the procy-

nosuchids, and as in the latter a parietal crest is apparent only behind the moderately oval pineal foramen; lachrymals large and extend far forward; septomaxillaries insignificantly small; no interpterygoid vacuity; dentaries as advanced as in *Thrinaxodon*; dental formula i4 : c1 : pc9 for the upper jaw, with one less incisor in the lower jaw; teeth moderately tricusped, smaller and narrower than in *Thrinaxodon*; lumbar ribs interlock as extensively as in *Thrinaxodon*, but thoracic ribs have insignificant and apparently ineffective overlapping processes, unlike those of *Thrinaxodon*.

Measurements. The following table lists the measurements of the new specimen, the type, the specimen described as *N. trigonocephalus*, and the specimen described as *N. gracilis*. All measurements are given in millimeters and those marked with a questionmark are obtained indirectly through reconstruction figures.

	New specimen	*Type*	*"N. trigonocephalus"*	*"N. gracilis"*
Total length of skull	90	68	99·5	70
Length to squamosal notches ..	86·5	68	87	69
Length to interparietal notch ..	76·5	?60	75	62
To middle of pineal foramen ..	65·5	?50	66	48
Length of snout to anterior borders of orbits	37	?28	37·5	26·5
Maximum breadth of skull	58·5	42	60	48
Breadth of snout	25	?16	27	19
Minimum breadth across parietals	12·5	?7	13	10
Interorbital width	20·5	?17	21	17

Measurements pertaining to the palate are not given, because these can only be obtained from the present specimen and can be derived from the accompanying figure. Although the palates of both immature specimens are exposed, their structure has been rendered obscure through damage.

From the above table it can be seen that the new specimen is only slightly smaller than the specimen described as *N. trigonocephalus*, while the type is slightly smaller than the immature specimens described as *N. gracilis*. Broom's figures for the type are not reproduced 1½ times natural size, as indicated, but slightly larger, while Broom and Robinson's figures for *N. gracilis* are reconstructed about 5% larger than natural size. The latter specimen is about 5% larger than the other specimens in the litter, indicating that perhaps it is a male's.

Description

The *basioccipital* is well reduced between the exoccipitals, leaving the latter to form two distinctly separate condyles of rather typical mammal-like shape. This is a distinctive feature of the galesaurids and it contrasts slightly

with the more crescent-shaped structure found in lower cynodonts, therocephalians and scaloposaurians; even in the higher cynognathids and gomphodonts the condyles are not quite as mammal-like.

Forward of the condyles the basioccipital barely contributes to the margins of the jugular foramina and passes about 2 millimeters short of the fenestrae ovales. It wedges deeply forward medianly into the parasphenoid, with which it forms a loose non-interlocking suture. Most of the other sutures similarly suggest that the specimen is not fully mature.

The basioccipital is not described for the type, nor displayed in the other specimens at hand, and no useful comparisons can be drawn.

The *exoccipitals* are not well demarcated from the basioccipital, opisthotics and supraoccipital; sutures are well fused even though most other sutures are conspicuously clear. They seem to pass very little beyond the condyles. They form more than half of the circumferences of the jugular foramina, posteriorly, and extend some short distance outward across the posterior faces of the paroccipital processes. It is not clear how much they contribute to the lateral margins of the foramen magnum, but it would appear to be not much. The specimens at hand certainly do not suggest such elaborate extensions either side of the foramen magnum as Broom observed in the type.

The *supraoccipital* is high and narrow. It is not broader than the foramen magnum. Above it wedges into the interparietal. The breadth of the supraoccipital, as illustrated by Broom for the type, is certainly not borne out by the specimens at hand.

The *opisthotics* form the anterior halves of the jugular foramina, the posterior halves of the fenestrae ovales, and extend laterally as the paroccipital processes. The post-temporal fossae are, as in *Thrinaxodon*, very small and round, and the paroccipital processes are separated from them by the tabulars, which completely encircle them. The paroccipital processes are stout and ventrally they are not excavated to form dome-like roofs over the middle ear regions as in higher cynodonts. On the whole the paroccipital processes are very similar to those of *Thrinaxodon*.

The *pro-otics* are not exposed in any of the specimens.

The *tabulars* arise prominently either side of the supraoccipital and fan out laterally to support the occipital crests from behind as widely as possible. Ventro-laterally they curve around the post-temporal fossae and enclose them completely, as Broom also observed in the type—this being also a feature of *Thrinaxodon*. On re-investigation this was found to be also the condition in "*N. trigonocephalus*", unlike Brink and Kitching's original interpretation.

The *interparietal* is lodged in a deep depression above the elevated regions covered by the tabulars and supraoccipital. As is typical of the galesaurids, its wedge-like penetration between the parietals can clearly be seen in dorsal view, for some distance along the parietal crest. Here, too, there is no significant difference between the different specimens of this genus and species.

The *parietals* would appear to be conspicuously different in the various

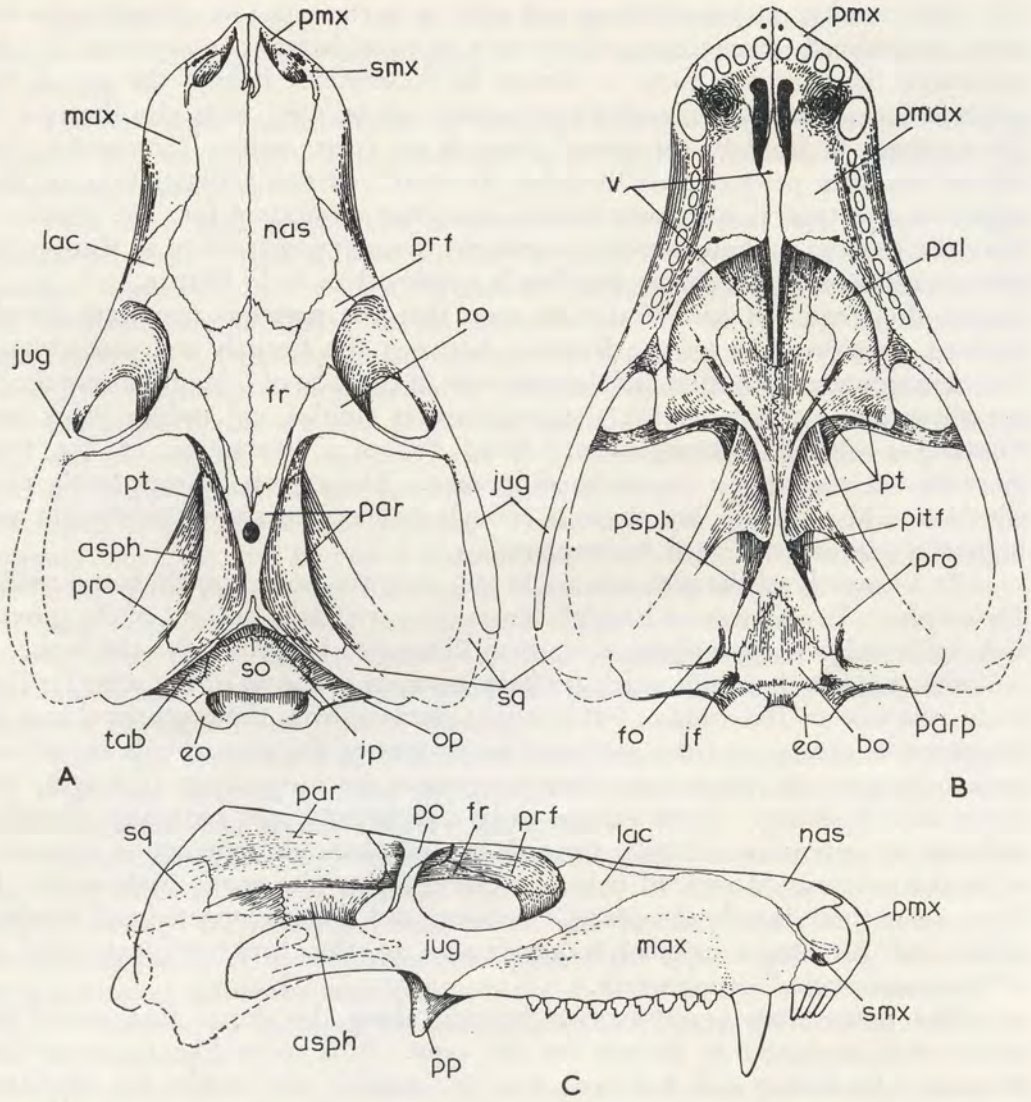


Figure 44

A—Dorsal, B—Ventral and C—Side view of the skull of *Notictosaurus luckhoffi*, natural size.

Abbreviations: asph—alisphenoid; bo—basioccipital; eo—exoccipital; fo—fenestra ovalis; fr—frontal; ip—interparietal; jf—jugular foramen; jug—jugal; lac—lachrymal; max—maxillary; nas—nasal; op—opisthotic; pal—palatine; par—parietal; parp—paroccipital process; pitf—pituitary fossa; pmax—palatal plate of the maxillary; pmx—premaxillary; po—postorbital; pp—pterygoidprocess; prf—prefrontal; pro—prootic; psph—parasphenoid; pt—pterygoid; smx—septomaxillary; so—supraoccipital; sq—squamosal; tab—tabular; tr—transversebone; v—vomer.

specimens of this species, but the apparent differences are due to bad preservation, preparation and interpretation. The actual arrangement for all the specimens is as illustrated in the accompanying figures.

The pineal is moderately large and oval, as in the type; its elongation in the other two described specimens may be due to some lateral compression. In the specimens they are not quite as narrow as illustrated. Behind the pineal the parietals form a crest, along which no suture can be seen, as is also the case in *Thrinaxodon*. In front of the pineal there is no crest, unlike *Thrinaxodon*; the region becomes progressively broader forward. Broom's illustration of this region in the type is too narrow and somewhat misleading for "*N. gracilis*". Here the crest as a whole is more prominent, conspicuously more so than in the other specimens in the litter, but this is apparently a male feature.

In this region it can clearly be seen that the parietals penetrate deeply forward on either side of the frontals, between the frontals and postorbitals. This arrangement cannot be clearly made out in the case of "*N. trigonocephalus*", but there are indications that the structure is similar and unlike Brink and Kitching's original interpretation. From Broom's description of the type there would also appear to be no difference. The region is imperfectly preserved in "*N. gracilis*", but there is enough evidence to show that Broom and Robinson's interpretation is incomplete.

At a lower level the parietals are broad, as in the procynosuchids and unlike *Thrinaxodon*. The narrowest breadth across the parietals is in front of the pineal, and this breadth is appreciably more than illustrated by Broom for the type.

The *postorbitals* do not reach far back towards the level of the pineal. This is also the case in *Thrinaxodon*, but here the distance from the postorbital bars to the pineal is greater and the posterior extensions of the postorbitals are consequently longer. In *Notictosaurus* these extensions are insignificant in length, but appreciable in depth. There appears to be a slight backward extension dorsally, and also an extension ventrally towards the alisphenoids, but not as extensive as in the specimen described below as belonging to the genus *Nythosaurus*. In *Thrinaxodon* there is only the dorsal extension, and this is elongated and slender. Brink and Kitching's original interpretation of this backward extension in "*N. trigonocephalus*" is incorrect.

The postorbitals reach farther forward along the dorsal margins of the orbits than suggested by Broom for the type. It is more like the condition illustrated by Broom and Robinson for "*N. gracilis*" and unlike the condition illustrated by Brink and Kitching for "*N. trigonocephalus*", the latter being a misinterpretation as a result of damage.

The postorbitals contribute their share to rather delicate postorbital bars, which curve backward in all the specimens, except "*N. trigonocephalus*" where they are straight, but this is evidently due to some distortion.

On the whole there would appear to be no difference between the postorbitals in the various specimens.

The *frontals* are also similar in all the specimens. They are larger than in *Thrinaxodon*. Together they wedge forward between the nasals and they also penetrate slightly between the nasals and prefrontals. They are extensively flanked from behind by the parietals.

The *prefrontals* constrict the frontals along their anterior halves. The *post-orbitals* form small wedges penetrating the prefrontals on the dorsal borders of the orbits.

The *lachrymals* reach broadly forward for a distance which can be taken as peculiar to this genus. The condition in the other described specimens is unfortunately not clear.

The *nasals* are, unlike the condition in *Thrinaxodon*, not conspicuously broader posteriorly than anteriorly. They are also not greatly constricted in the middle. Anteriorly they are not extensively flanked by the septomaxillaries, but the premaxillaries penetrate deeply between them. In *N. gracilis* the nasals have fallen away, exposing an intranarial cast traversed by very deep grooves. These grooves indicate the presence of well developed fronto-nasal turbinals.

The *premaxillaries* are well preserved, including an intact internarial bridge, as is also the case in "*N. trigonocephalus*". In both the latter and the new specimen the whole region of the external nares is conspicuously similar. There is not much height above the incisors. There are four small incisors and the foramen above the first incisor is distinct on either side. On the inside, behind the incisors, the palatal contributions of the premaxillaries are as figured. There are long slender extensions flanking and supporting the anterior end of the vomer, with the elongated anterior palatal openings either side. The premaxillaries also flank the palatal plates of the maxillaries for short distances along the lateral margins of these openings.

There are small but well defined and deep excavations for the reception of the lower jaw canines, and the premaxillaries form their anterior walls. This structure can only be seen in the new specimen.

The *septomaxillaries* are conspicuously small—much more so than in *Thrinaxodon;* very little is seen of them on the surface. A very delicate extension is lodged between the nasals and maxillaries, and they stop short on contact with the premaxillaries. The only substantial part of the septomaxillaries, other than parts extending inside the nasal cavity, is the shelf across the lower regions of the nares, but these are damaged on both sides. Conditions are exactly similar in "*N. trigonocephalus*".

The *maxillaries* carry a normal sized canine and nine post-canine teeth on each side. All the teeth in the present specimen are extremely fragile and could not be satisfactorily exposed; in an endeavour to do so some of the teeth have been damaged. Others not properly exposed suggest a structure of a main cusp with a smaller cusp in front and behind, as Broom observed in the type. The teeth are all sectorial. The anterior and posterior teeth seem to be smaller with less distinctly developed cusps, but the gradation in size is perfectly even; all the teeth seem to be erupted to their full extent and there is no sign of tooth replacement.

The palatal plates of the maxillaries do not meet in the midline and the result is a typical cleft palate structure that is more characteristic of the procynosuchids and unlike the more typical galesaurid condition as found in *Thrinaxodon*.

The palatal plates of the maxillaries reach closer to the midline posteriorly than anteriorly, where they leave room for the elongated anterior palatal openings.

While the lachrymals place restrictions on the expansion of the maxillaries across the lateral faces of the snout, they nevertheless extend boldly backward to a level beyond the middle of the orbits, and to well beyond the last teeth.

The *transverse bones* are highly reduced and confined to the angles between the pterygoids and jugals, which is a typical higher cynodont feature.

The *jugals* extend far forward below the orbits and across the posterior extensions of the maxillaries. There is a definite angle to the ventral margin of the jugal below the orbit. This has not been noticed in previously described specimens, but judging from those at hand these angles have been damaged through weathering or bad preparation. The zygomatic arch is missing on the left while on the right only the jugal's contribution is preserved.

Both *squamosals* are missing, together with the hinge bones and stapes, but these are in fair condition in "*N. trigonocephalus*". Here it can be seen that the squamosals contribute boldly to the zygomatic arches, with the major contribution dorsally, extending far forward and partly covering the jugal contribution laterally. In addition there is an extension reaching forward ventrally to the jugal. On the posterior face there is a fair amount of sculpturing to produce an external auditory meatus groove.

The *quadratojugal* and *quadrate* in "*N. trigonocephalus*" are quite in line with Broom's interpretation for the type. The quadratojugal, with a portion of the quadrate below it, are visible in lateral view, but not to the same extent as in the procynosuchids.

The *vomer* is a flat vertical plate anteriorly, where it is extensively clasped by processes of the premaxillaries. Farther back, between the palatal plates of the maxillaries, its ventral edge becomes broader and exceeds in width the cleft in the palate. This is contrary to the procynosuchid cleft palate, where the cleft is wider than the vomer's ventral margin. Still farther back the vomer becomes a sharp keel again, reducing in depth until it peters out as a partition on reaching the pterygoids. In this region, behind the secondary palate, the vomer is broadly expanded dorsally to contribute to the roof area over the internal nares.

The *palatines* contribute meagrely to the secondary palate—not extending its length effectively. It is also normal, in procynosuchids and galesaurids, for the palatines to extend substantially backward and inward across the pterygoids, across bold ridges to even bolder bulges, but in the present specimen these extensions are very elementary indeed. The ridges and bulges are also not at all prominent. The whole region behind the secondary palate is very wide and shallow.

The *pterygoids* are average, as illustrated, lacking the prominent bulges and ridges with which the palatines are normally associated (they are present, but very small indeed). A very conspicuous feature is the definite absence of an interpterygoid fossa. The extension to the quadrate is exposed on the right side, ventrally only, and the region of the basipterygoid processes is covered by a vertebra.

The *alisphenoids* are broad and not very high. A distinct groove extends across the alisphenoid-parietal suture, the same groove which in procynosuchids extends across the lateral face of the parietal at a much higher level. The anterior free margin of the alisphenoid is deeply concave, the upper projection reaching far forward to meet the lower, backward projecting angle of the postorbital. The lower anterior projection reaches as far forward, above the basipterygoid process. The posteroventral projection, below the large foramen for the fifth nerve, seems to cover the lateral face of the quadrate extension of the pterygoid quite extensively for a great distance. Dorsally to the foramen for the fifth nerve the alisphenoid forms an intricate suture with the prootic, suggesting that there is very little overlap.

The *parasphenoid* is obscured by a vertebra lying intimately across the basipterygoid region. Farther back it expands in the normal fashion in the direction of the fenestrae ovales, with the basioccipital penetrating it deeply from behind.

The *lower jaw* is missing in the present specimen. In "*N. trigonocephalus*" it is present, complete, but somewhat distorted and not yet satisfactorily cleaned. While the dentaries do not extend much farther back than in the procynosuchids, their posterior regions are more advanced in the style of the higher cynodonts, showing a distinct differentiation between angular, articular and coronoid projections. The coronoid projection reaches farthest back, as illustrated for this specimen by Brink and Kitching, and unlike Broom's interpretation for the type. The angular process is small but very pronounced. The articular process is feeble, but nevertheless distinct. Anteriorly the symphysis is short and there is a distinct chin in side view. The poorly preserved dentition can be interpreted as being perfectly in line with that of the type.

The other lower jaw bones are poorly preserved and unsatisfactorily exposed. The general impression is that the whole post-dentary structure is similar to that of *Thrinaxodon*.

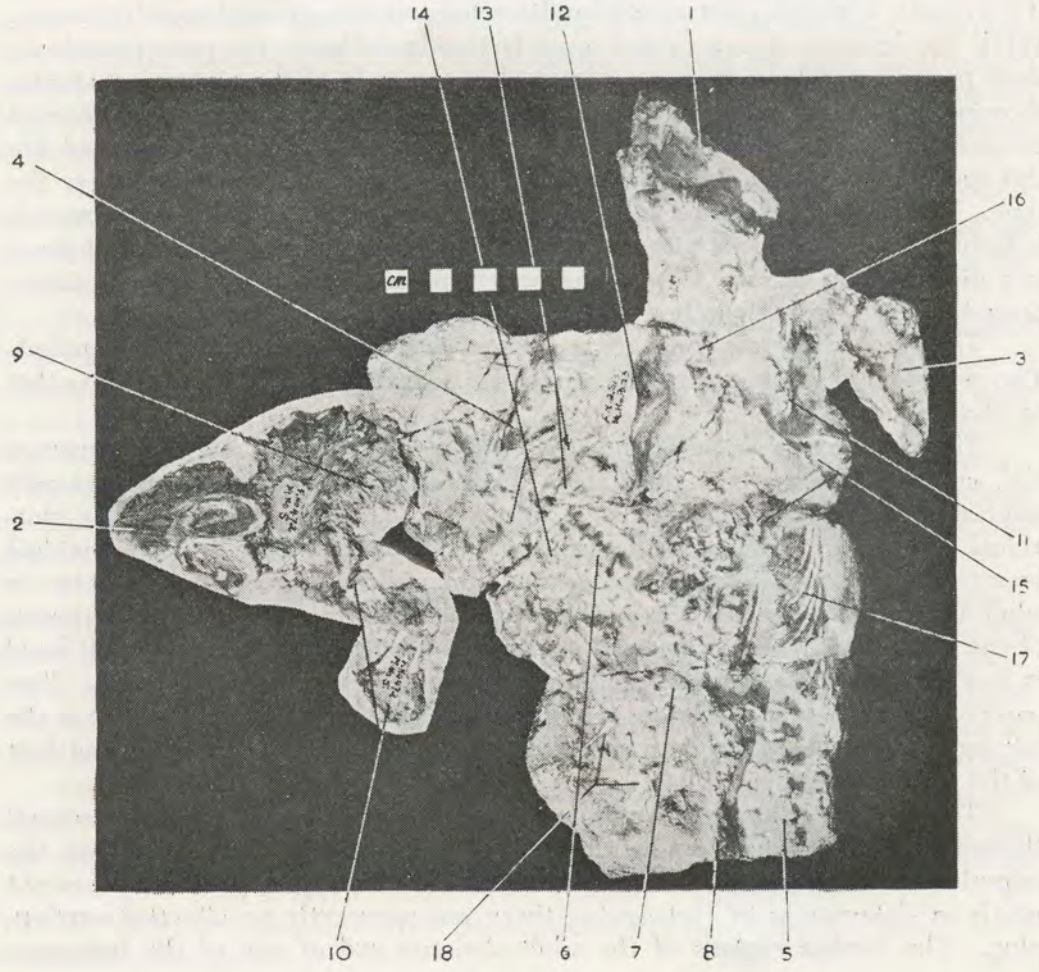
The *postcranial skeletons* of the adult "*N. trigonocephalus*" and her immature "*N. gracilis*" young are in a fair state of confusion where they are haphazardly associated in one block of matrix. It would be a laborious task to prepare individual bones for satisfactory description. However, most of the individual bones can be recognised and several lend themselves for comparison between adult and young. There is a beautifully exposed left front leg, and the humerus of the right side, which obscures the radius and ulna of its side. The left hand is in a fair condition, but the right hand's bones are somewhat scattered. Two paws of the immature specimens are preserved in fair condition. The one is the left foot of one individual and the other would appear to be also the hind foot of the second specimen.

The thoracic ribs of the adult are exposed only distally, but from several thoracic ribs belonging to one of the immature specimens, exposed on the opposite side of the block, it can be seen that the overlapping processes were not nearly as elaborate as in *Thrinaxodon;* there was apparently no effective overlapping. The lumbar regions of the adult skeleton and of one of the immature

specimens could be exposed satisfactorily along their ventral sides, and from these it is clear that the lumbar ribs were involved in an intricate interlocking system as advanced as in *Thrinaxodon*. Two lumbar vertebrae, with their ribs, belonging to the new specimen, show clearly that the lumbar ribs were firmly fused to the vertebrae.

By comparing these skeletons with some *Thrinaxodon* skeletons at hand, it would appear that on reconstruction a similar posture can be arrived at for both these forms. *N. luckhoffi* is about 20 per cent larger than *Thrinaxodon*. On careful comparison numerous detailed differences can no doubt be demonstrated, but the major differences are the smaller overlapping processes on the thoracic ribs and apparently heavier limbs and larger feet in *N. luckhoffi*.

The accompanying photographs, with the legends, demonstrate the above observations.



Legend to Figure 45

1. Skull of adult, described as *N. trigonocephalus*.
2. Skull of young, described as *N. gracilis*, referred to as Specimen A in this legend.
3. Skull of second young, referred to as Specimen B in this legend.
4. Skull of third young.
5. Lumbar region, ventrally, of adult.
6. Lumbar region, ventrally, of Specimen A.
7. Pelvic girdle of Specimen A.
8. Tail of Specimen A.
9. Thoracic ribs of Specimen A.
10. Pectoral girdle and front limb bones of Specimen A.
11. Hand of Specimen B.
12. Right humerus of adult.
13. Radius and ulna of the right fore-limb of the adult.
14. Right hand of adult.
15. Left arm and hand of adult.
16. Pectoral girdle of adult.
17. Thoracic ribs of adult.
18. Scattered limb bones of Specimen A.

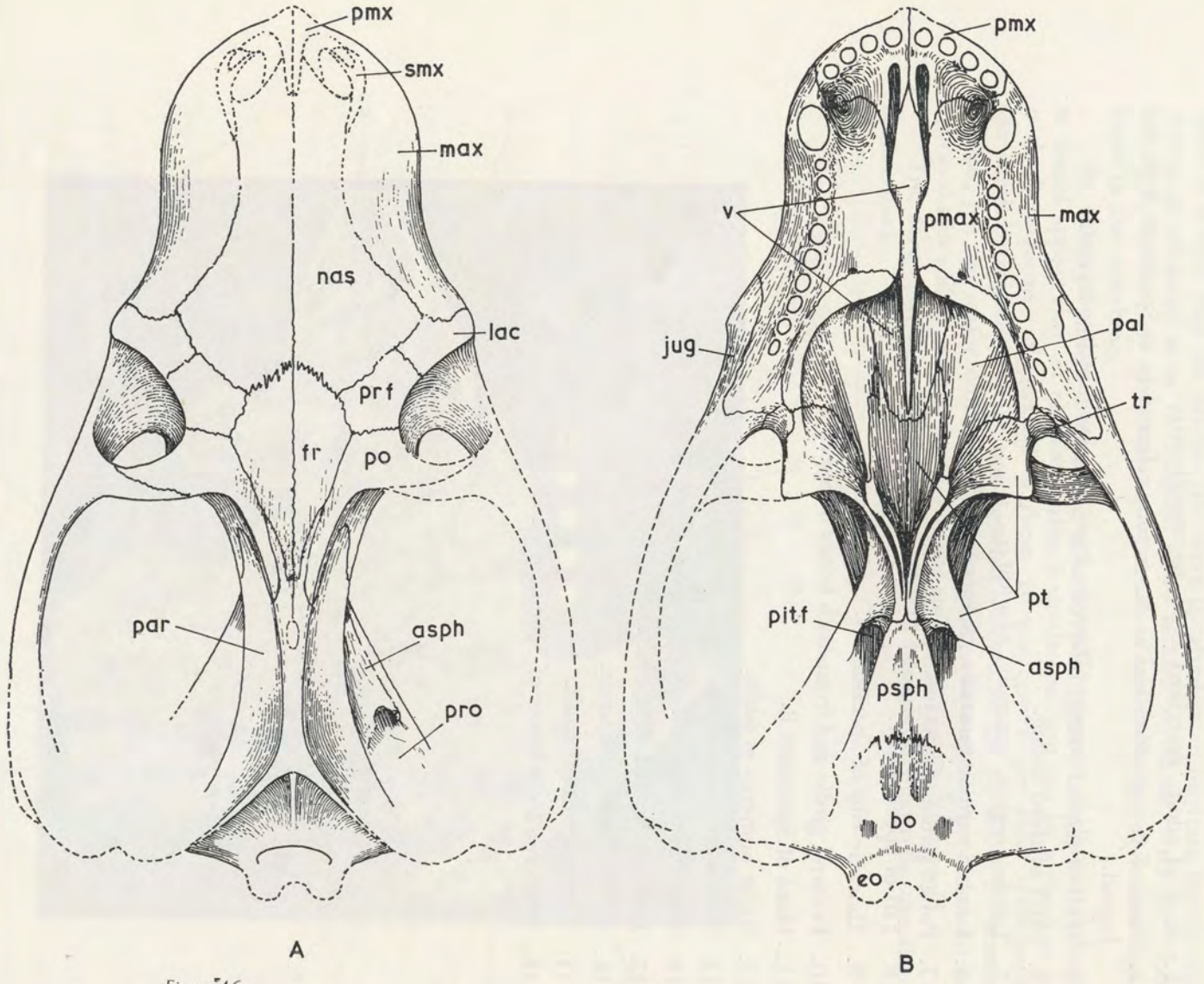


Figure 46
A—Dorsal and B—Ventral view of the skull of *Cynosuchoides whaitsi*, natural size. For abbreviations see figure 26.

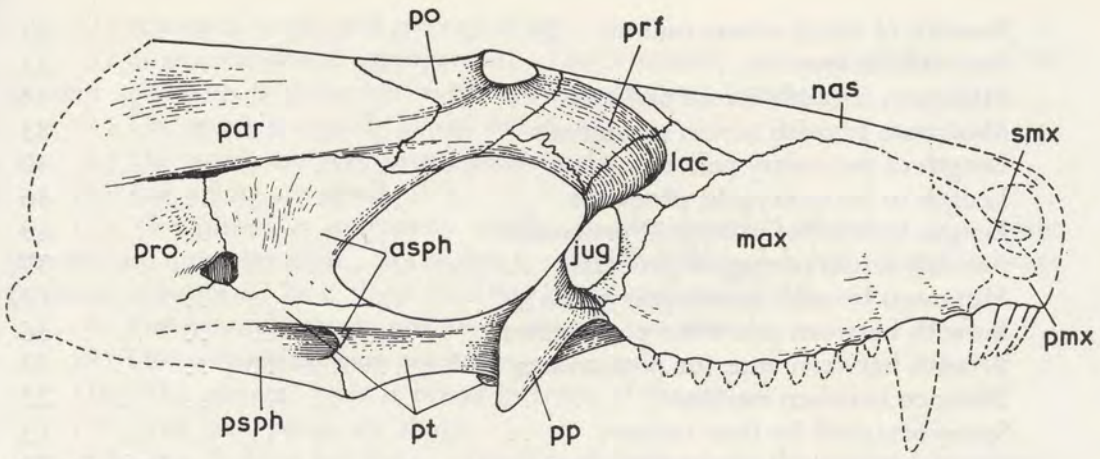


Figure 47
Side view of the skull of *Cynosuchoides whaitsi*, natural size. For abbreviations see figure 26.

Cynosuchoides whaitsi (Haughton)
Figures 46 and 47

1918, Haughton, S. H. (*Cynosuchus whaitsi*), *Ann. S. Afr. Mus.*, xii, p. 197, fig. 53.
1931, Broom, R., *Rec. Albany Mus.*, iv, p. 164.
1932, Broom, R., Mammal-like Reptiles, p. 267, fig. 89A-C.

Type. A fair specimen in the South African Museum, Cat. No. 4333, from *Cistecephalus*-zone beds on the farm Weltevreden, Graaff Reinet.

Present specimen. Variously damaged but nevertheless good skull, without lower jaw, discovered by Mr J. W. Kitching in 1963 in *Lystrosaurus*-zone strata, near the *Cistecephalus*-zone contact, on the farm Tweefontein at the foot of the Lootsberg Pass near Bethesda Road station. It is catalogued in the collection of the Bernard Price Institute under Field No. 3926 and Museum No. 371.

Diagnosis. Large galesaurid with a short and broad snout; secondary palate cleft, ventral margin of the vomer broader than the cleft; parietal region not crested in front of pineal; postorbitals with additional extensions reaching down to the alisphenoids and contacting them firmly; pineal very small and not nearly reached by postorbitals; dental formula i4 : cl : pc 9, with apparently one less incisor in the lower jaw.

Measurements. The following is a list of measurements in millimeters; those marked with a questionmark are arrived at indirectly through the reconstruction figures:

Greatest length of skull	?124
Length to squamosals	?119
Length to interparietal notch	107
Length to level of posterior borders of orbits	65
Length to level of anterior borders of orbits	47

Breadth of snout across canines		37
Interorbital breadth		31
Minimum breadth across parietals		14
Maximum breadth across squamosals		?83
Length of secondary palate		40
Length to basipterygoid processes		86
Length to level of pterygoid processes		69
Breadth across pterygoid processes		37
Minimum breadth across pterygoids		11
Breadth between posterior postcanines		36
Breadth between anterior postcanines		23
Distance between canines		22
Space occupied by four incisors		13
Space occupied by nine postcanines	Left	29
	Right	30

Description

The present specimen is of exactly the same size as the type and comes from approximately the same locality and horizon. Weltevreden, the type locality, is also near Bethesda Road station and very high in the *Cistecephalus*-zone. While the present specimen comes from *Lystrosaurus*-zone beds near the *Cistecephalus*-zone contact, the type comes from *Cistecephalus*-zone beds near the *Lystrosaurus*-zone contact. The two localities are in the same general neighbourhood.

The specimen agrees perfectly well with Broom's (1932) reconstruction, except for the fact that he interpreted a completely closed secondary palate. From Haughton's (1918) original description it can be seen that only the left side of the palate is preserved in the type; there would appear to be no evidence for a closed secondary palate. Haughton reconstructed the snout narrower than it should be, thereby bringing the median margin of the palatal plate on to the midline. Broom (1932) found evidence for reconstructing the snout much broader, but he kept the secondary palate closed. The present specimen clearly demonstrates the true condition.

In numerous respects the present specimen agrees perfectly with the type, but in basic structure it is also so close to the previously described *Notictosaurus* that there can be no dispute over the inclusion of *Cynosuchoides* in the Galesauridae, even should *Cynosaurus suppostus* remain as a single, imperfectly known specimen under the family Cynosauridae. However, the thought is expressed here that *Cynosaurus suppostus*, on careful reinvestigation, may prove to be a galesaurid too, in which case the family Cynosauridae will cease to exist.

The present specimen agrees with the type:

(1) In size and general proportions.

(2) In area of origin and geological age.

(3) In general dental arrangement. Unfortunately not a single tooth in the present specimen is preserved with crown structure intact.

(4) The snout is equally broad and short.

(5) The nasals are very broad posteriorly.

(6) The orbits are small.

(7) The pineal is extremely small. In the present specimen it is compressed and quite invisible; the region is somewhat damaged, but its approximate position is indicated by a slight swelling in the parietal crest.

(8) The postorbitals do not reach near to the pineal.

(9) The postorbital bars are strong.

(10) The parietal crest is broad in front of the pineal.

(11) The lachrymals are short.

(12) The frontals are long, extend well back along the parietal crest but, do not reach to the level of the anterior borders of the orbits.

(13) There is no interpterygoid fossa.

(14) The pterygoids are for a long distance narrow before the quadrate extensions swing outward.

(15) The basipterygoid processes do not contribute to the anterior margins of the pituitary fossae.

The present specimen differs from the type:

(1) In that the palate is cleft, but the type has evidently been wrongly interpreted.

(2) There are two additional postcanine teeth, but this can be due to age.

(3) The transverse bones are smaller.

The present specimen agrees with Notictosaurus, or with the Galesauridae in general:

(1) In the nature of the cleft palate.

(2) In dental formula and arrangement.

(3) In the width of the parietal crest in front of the pineal.

(4) In the extent to which the frontals reach back along the parietal crest.

(5) In the extent to which the parietals reach forward either side of the frontals.

(6) In the shortness of the upper posterior projections of the postorbitals.

(7) In that the postorbitals extend additionally backward and downward to meet the alisphenoids.

(8) In the exactly similar shape and structure of the alisphenoids.

The present specimen differs from Notictosaurus:

(1) In size, general shape and age.

(2) In the more massive postorbitals.

(3) In the smaller pineal.

(4) In the shorter lachrymals.

(5) In the nasals being broader posteriorly.

(6) In the more heavily ridged posterior palate, and the extension of the palatines across these.

(7) In the narrower basipterygoid region.

From these observed characteristics and by further careful comparison of the figures, it is quite clear that there is no reason why *Cynosuchoides whaitsi* should not be incorporated into the family Galesauridae. There is also no definite feature on which the present specimen can be specifically distinguished from the type of *Cynosuchoides whaitsi*.