

**Paleontological Heritage Assessment for Kadouw Leisure Estate,
Sundays River Valley.**

Prepared for: CEN IEM Unit

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Stratigraphy and Palaeontology of Strata

Stratigraphy is the sequence of rock layers, from the lowest (oldest) to the highest (youngest). Conformably deposited rocks are ones which are continually deposited, layer upon layer, with only limited periods of disruption or erosion between them. Where there is a considerable cessation of deposition, or where some strata are eroded off before deposition of new strata, the latter are said to unconformably overlie the former.

Most of the southern and central portion of the study area represents a Quaternary near-coastal plain surface. Examination of the former calcrete quarry in the south/eastern quadrant reveals the current surface to be underlain by in excess of 2 metres of calcrete in which are occasional quartzitic pebbles reworked from the underlying conglomerates (fig 1.).

A number of small tributaries of the Sunday's River are incised through the calcretes, revealing the underlying Quaternary conglomerates of the Kudus Kloof Formation. These were terrestrially deposited coevally with the latter stages of the Alexandria Formation marine deposits.

The Kudus Kloof Formation is in turn, unconformably, underlain by sediments of the much older Cretaceous Sundays River Formation. These are exposed both in the valleys which incise the plateau, and, more extensively, along the escarpment of the Sundays River. They are comprised of easily weathered clay-rich sediments with occasional, more resilient, thin interbedded sandstones.

The Sundays River Formation, and the coeval Kirkwood and Enon Formations together comprise the Uitenhage Group. The Uitenhage Group sediments were laid down in one of a number of small coastal basins created by stretching and tearing of the crust during the final breakup of the supercontinent Gondwana during the early Cretaceous, 140 to 120 million years ago.

The Enon Formation consists of pebbly conglomerates, deposited where rivers ran down into this steep sided rift basin. More distally, sand and muddy material formed a narrow coastal plane deposited by braided rivers, which would ultimately become the Kirkwood Formation

strata. Silt and mud washed out onto the marine coastal shelf formed the clays of the Sundays River Formation. The deposits of the Sundays River Formation contain a wealth of marine invertebrate fossils, including a range of ammonite species, nautiloids, belemnites, bivalves, gastropods and crustacea. In addition, the skull and partial skeleton of a 3metre long Plesiosaur (marine reptile) has been described from Sundays River Formation rocks in the Zwartkops River valley and an undescribed dinosaur pelvis has been reported further north along the Sundays River escarpment (pers. comm. B. de Klerk) This is consistent with the fact that the Kirkwood Formation is South Africa's primary source of Cretaceous Dinosaur fossils. Recent research has also revealed the remains of a primitive lizard, a type of crocodile and a primitive early mammal from the Kirkwood Formation.

Dairy fields on the level ground between the escarpment and the Sunday's river are comprised of recent alluvium with no paleontological interest. Important archaeological material (including shell middens and pottery) has, however, been studied on the adjacent farm by Dr Johann Binneman of the Albany Museum.

Site Visit

The area was extensively surveyed with a vehicle and on foot between the 18th and 21st of July. The tributary valleys and escarpment edge, providing the only outcrops of paleontological promise, were systematically surveyed in a roughly east to west direction. A number of areas of fossiliferous interest were located (fig. 2)

Site 1

Outcrops were examined in the most proximal east-trending sub-tributary of the most westerly valley (see (1) on fig 2). At the head of this sub-tributary an interesting trace fossil occurrence was located at the interface between the underlying clay-rich sediments of the Sundays River Formation and the overlying conglomerate layer of the Kudus Kloof Formation. Here a brief sedimentary episode is reflected during which soft clay material was deposited as a matrix between the clasts of the first pulse of pebbles. This approximately 20cm thick lens (extending over 3m) was colonised by burrowing organisms creating a convoluted network of burrows. Courser sand associated with the far more massive compact overlying conglomerate layer penetrated this burrow system. Recent weathering of the outcrop has differentially removed the muddier clay material revealing a “sandstone” cast of the burrow system in relief. (see fig. 3)

Site 2

Within the Sundays River Formation, underlying the conglomerate at Site 1, resilient layers of greenish sandy material are revealed. The stratigraphically lower of these two contain (particularly towards its upper surface) storm-lag deposits of bivalves generally arranged in an umbo down position. These are almost exclusively examples of “*Trigonia*” *stowi* and “*Trigonia*” *conocardioformes* although some small ostrea shells were also observed.

Site 3

On the east side of the small valley in the western corner of the study area marine fossils are associated with the highest of three resilient sandstones (fig. 4). These include a number of bivalve species, most prominently *Steinmanella (Trigonia) hertzogi*, “*Trigonia*” *stowi*, and

“*Trigonia*” *conocardioformes*. A piece of driftwood exhibiting shipworm was also noted (fig. 5). The same strata are visible in the opposite side of the valley, with the same type of fossils.

Site 4

The outcrops at this and the next site form part of an extended outcrop cutting through a series of sandy layers bedded within the softer weathering clay. The lowest of these layers, at site 4 contained the same 3 “*Trigonia*” species as seen at site 3 but at this site *T. conocardioformes* is clearly dominant (fig 6).

Site 5

At site 5, the highest stratigraphic layer examined in this area, the bivalve fauna is dominated by *T. hertzogii* (fig. 7) though *T. stowi* and *T. conocardioformes* are also present. The remains of several examples of a thin-shelled bivalve (fig 8) were seen here, as well as smaller bivalve species.

Site 6

At site 6 a little further to the east, a fossiliferous exposure was located, representing a lower horizon than that at site 3. Pearl- oyster-like bivalves were observed (fig 9) as well as fragments of *Aetostreon* (*Gryphea*).

Site 7

A short way up this valley, on the right hand side, the road has cut through a tempestite layer of broken thin shelled oyster shells, of the kind seen at site six (fig. 10). Occasional other thin shelled bivalves also occur in this layer.

Site 8

Here clay and interbedded sandstones are exposed on the eastern side of a small valley. *Steinmanella* (*Trigonia*) *hertzogi*, “*Trigonia conocardioformes*, *Herzogina* (“*Astarte*”) (fig.11) and *Natica uitenhagensis* (fig.12), were all seen. A small ammonite was seen

weathering from the clay high up on this slope (fig. 13). Horizontal trace fossil are also preserved in an interbedded greenish sandstone (fig 14). At the top of this slope the calcrete lies directly on top of the Sundays River Formation clay without the intervening conglomerate. Loose blocks of rock with networks of smaller burrow systems, the same as those seen at the base of the Kudus Kloof Formation at site 1 were also noted on this slope.

Site 11

The top of a little kop sticking out from escarpment produced evidence of "*Trigonia*" *cardioformes* and *Steinmanella hertzogi* as well as oyster fragments.

Site 12

Situated a little up the biggest valley in the study area this outcrop, exposed by a small side tributary, revealed *Steinmanella hertzogi* and small rounded bivalves.

Site 13

Another small washout on the east side of the main valley exhibited more evidence of *Steinmanella hertzogi*.

Site 9

This large washout washout on east side of the most easterly large valley is capped by conglomerate and calcrete. These are underlain by the characteristic, generally weathered, Sundays River Formation clays and thin interbedded sandstones sometimes associated with thin cochleonites. Fossils occur in both the clays and sandstones Fairly abundant *Ostrea* shells and fragments of other oyster shells were seen, particularly lower down. Large bivalves, as in most of the study area, are dominated by *Steinmanella hertzogi* though "*Trigonia*" *conocardioformes* and another similar unidentified species with more "knuckley" ribs were seen, as well as "*Trigonia*" *stowi*. A number of other smaller bivalve species were observed, including *Herzogina*. Fragments were also observed of *Gervillea*. A number of

small gastropods were seen, whereas the cephalopoda are represented by *Bochianites* (fig. 15) and *Belemnites africanus*. Wood fragments occur towards the top of the sequence.

Nearby, an assemblage of small vertebrate remains was discovered on the last afternoon of the survey (fig.15). These could prove to be extremely important. Visible material was excavated and taken to the Albany Museum

Site 10 (at road confluence at top)

The only discernable outcrop of the Sundays River Formation, found on the plateau, (fig 17) is a shallow weathered area exposed through the combined influences of a riverbed, a junction of farm roads, and localised overgrazing by goats due to the proximity of old barns and kraals. Small oyster shells and trace fossils in fragments of sandstone were observed emerging from beneath a calcrete capping.

Interview information

Discussions were held with Charles Marais, the neighbouring farmer. He reported that many people had collected fossils in the study area over a large number of years. Apparently, in years gone by, large ammonites were collected in the valleys intercepting the plateau by the sons of the then landowner. In addition they reportedly found pieces of (presumably reworked Cretaceous) fossil wood within the Quaternary conglomerates.

He himself had collected many fine fossils, particularly in the vicinity of sites 3-6. These had been given to someone from the then University of Port Elizabeth. Most importantly they included very fine examples of fully articulated fossil “crayfish” in which even the minute segments of the antennae were preserved.

Dr Billy de Klerk of the Albany Museum visited the site recently, whilst surveying for vertebrate remains. He collected a few pieces of “crayfish” which are deposited in the Albany

Museum in Grahamstown. None of these, however, exhibits the perfection reported by Mr Marais to have characterised the specimens donated to UPE.

Comments and Recommendations

It is clearly apparent that the area approaching the Sundays River and along its escarpment is **extremely rich in palaeontological material**, particularly of Cretaceous age. This includes **some of the only vertebrate material ever found** in the Sundays River Formation.

It is therefore recommended that:

1. As part of the next phase a palaeontologist should be contracted to carry out a two day investigation of, and excavation of the important new vertebrate fossil site.
2. All new roads in the valleys approaching the river and in the vicinity of the escarpment should be planned in conjunction with the paleontological consultant and disturbed ground should be inspected for important material immediately following grading.
3. An information display is commissioned from a palaeontologist, for the club house, with examples from the site and information regarding the conservation of paleontological material and the National Heritage Act.
4. The Residents Association code should include information discouraging unlicensed disturbance of paleontological material.
5. Provision should be made for future access to the area by licence palaeontologists.