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**THE CONSTRUCTION OF BERTH 306 AT THE PORT OF
RICHARDS BAY:
REMOVAL OF AMMONITES FROM THE UPPER
MAASTRICHTIAN (CRETACEOUS) LAYER**

Albert van Jaarsveld

Executive summary

Due to an NPA decision to expand the harbour at Richards Bay in order to accommodate future growth, excavations of a dry pit to enable the construction of Caissons, commenced during May 2005

Due to a lack of Palaeontologists in KZN, SAHRA employed local archaeologists to monitor the excavations. Fossils such as ammonites were removed from the Cretaceous layer and soil samples were taken. The method and rate of excavations hampered the collection and preservation of fossils.

It is suggested that much closer co-operation between the Heritage authorities and the NPA is necessary before future expansion of the harbour takes place.

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1) **Background**

Due to an enormous growth in the SA coal export industry (3-million tons per annum in 1976 to 67-million tons presently), the National Ports Authority (NPA) decided to expand the Richards Bay Harbour in order to accommodate future growth. NPA decided to construct an additional coal export berth at position 306. This would result in a quay wall extension constructed by 11 caissons (hollow reinforced concrete structures). The caissons are built in a dry pit that has to be excavated adjacent to the harbour for this purpose.

The depth of the pit is 14 metres with the bottom of the pit well below sea level. The extreme depth is necessary in order to flood the pit once the caissons are completed, allowing the caissons to be floated out of the pit and across the harbour to where they are needed at berth 306.

The caissons will be sunk into place to construct the quay. The earth wall separating the excavations from the harbour will then be dredged.

The excavation of the dry pit necessitated the removal of some 325 000 cubic metres of soil.

Recent (1997) expansions at the harbour, have yielded Upper Maastrichtian (cretaceous), Palaeocene, Miocene and Pleistocene sediments, which contained diverse macrofaunal assemblages. (See Klinger *et al* 2001: 273-291). For this reason, SAHRA (South African Heritage Resource Agency) requested that someone monitor the excavation of the dry-pit as well as the dredging operations afterwards. Due to the lack of palaeontologists in KwaZulu Natal, the Institute of Natural Resources contacted local archaeologists with a view to possibly monitor the operations.

Following permission granted by SAHRA on request of

AMAFA AKWAZULU/NATALI, UMLANDO:

ARCAEOLOGICAL TOURISM AND RESOURCE MANAGEMENT was appointed to monitor the excavation and dredging operations as well as the

removal of whatever ammonites surfaced. Albert van Jaarsveld was sub-contracted by UMLANDO and undertook the principal work.

A site meeting took place on Tuesday 10 May 2005 where it was agreed that the contractors (Basil Read) would contact Gavin Anderson of Umlando as soon as the excavations had reached Cretaceous layer depths. The levels were reached but the archaeologists were only contacted afterwards.

The above happened during the last week of July 2005.

A site orientation meeting with Dave Bennet took place on 28 July 2005.

On 29 July 2005 the site was revisited by the archaeologist as well as Jean Simonis, a geologist from the University of Zululand, who confirmed that the excavations had reached the upper part of the Cretaceous layer (grey-greenish in colour). Several ammonites were removed from a dumping spot during this visit and two soil samples were taken.

2) **Method**

Excavations by Basil Read took place on a 7-days-a-week basis. It was clear from the onset that it would be impossible for an archaeologist to be on site during the entire duration of the excavations. The involvement of the archaeologist would be limited to visiting the site as often as possible, liaise with contractors and labour, photograph material and take soil samples (soil that has not been exposed to our air) from the cretaceous layer and to collect fossils such as ammonites.

During the last week of July 2005, Albert van Jaarsveld met with Dave Bennett as well as the site foreman of Basil Read where the above issues were discussed. It was agreed that labourers of Basil Read would assist in removing ammonites from dumpsites to a central point where the archaeologist would collect them. Labourers were shown ammonites (by the foreman) and they were requested to collect these as they surfaced. From the outset the collection of ammonites proved to be problematic due to the method and speed of excavations, especially after having reached the cretaceous layer.

The cretaceous layer is exceptionally hard and a mechanical excavator was required to remove the soil and pile it up after which a front-end loader would deposit it on a special transport deposit truck (see photographs).

The truck would then deposit the soil at a dumping site nearby, or initially on the 'wall', which had to be created, to separate the excavation pits from the harbour.

Only at this stage of the operation could those ammonites, which surfaced by chance, be removed. Most ammonites were deposited in a damaged or badly damaged condition and relatively few were undamaged.

As the transport trucks load up to 40 tons of material at a time, it is clear that many ammonites simply 'disappeared' into the separating wall and dumpsites. It was simply impossible and impractical to even have attempted to search through these. It is expected that future dredging operations to remove the separating wall between the harbour and excavation pits will produce many more ammonites, as was the case in 1997.

The rate of construction and excavation, hampered the collection and preservation of ammonites. For example: At a site visit on Friday 29 July 2005 when excavations had almost reached the required depth within the cretaceous layer, many ammonites were observed in the floor bed of the pit. The idea was to request the contractors (who had left by midday in order to receive wages) to assist in removing these, as some were extremely heavy and impossible to retrieve by hand. At this stage it was incorrectly assumed that the contractors had closed for the weekend. A subsequent visit to the site on Tuesday 2 August 2005 to effect this operation, proved futile as the floor bed had already been partially covered in crushed stone in order to stabilise it for the construction of the caissons. Only then did it become clear that excavations were carried out seven days a week.

Fortunately two soil samples had already been taken before the crushed stones were deposited. Two more soil samples were taken on Tuesday 9 August.

The appointment of Mark Mattson as NPA environmentalist to the excavation site during September 2005 made a huge difference and proved to be a tremendous help. Mr Mattson took a keen interest in ammonites and being on site virtually all the time, could keep an eye on excavations. Mr Mattson was supplied with literature regarding the Cretaceous layer and its containing faunal assemblages and on his request was issued with a geological pick/hammer to assist him remove visible ammonites from the extremely hard layer. The majority of retrieved ammonites were eventually collected by him on daily visits to the excavation pits and various dumpsites.

Excavations were completed by early December 2005 and construction of the caissons should be completed within the near future (April 2006).

3) **Summary of finds and work**

3.1 Ammonites:

Approximately 100 ammonites were removed during excavation operations. This excludes much smaller faunal remains collected by Mark Mattson and stored separately in a bottle.

The species still need to be confirmed by a palaeontologist. However, the majority of sampled remains are ammonites from the species Pachydiscus Australis which vary in size from 10cm to ± 160 cm. The species Baculites Amabatoryensis was also represented as well as possibly Desmophyllites Diphylloides and Angaudryceras politissimum. (See Klinger et al 2001: 273-291).

Since the author of this report is an archaeologist, no further attempt will be made to identify species. The above identification is based on first sight. The ammonites may be sent to Cape Town for further analysis.

It must be mentioned that the author of this report is of the opinion that the ammonites which were retrieved, cannot be regarded as a representative

sample of ammonites which occur in the cretaceous layer below the Richards Bay harbour for the following reasons:

Firstly, the excavations did not reach deep into the Cretaceous layer – only $\pm 2-3$ m of the top part of this layer was excavated.

Secondly, the method of excavation that was followed (mechanical excavators, front-end loaders, etc) did not enable a representative sample to surface. In the same process the majority of ammonites were damaged or destroyed completely due to their brittle nature. (This is in no way to be viewed as criticism of the contractors, who were left with no other options. The Cretaceous layer is extremely hard while deadlines were attached to the excavations.)

3.2 Soil Samples

Four soil samples were taken: two by auger and two by pick-and-shovel as, due to the very hard nature of the cretaceous layer, it was almost impossible to penetrate the bottom surface by auger. The soil samples were taken in the eastern and western sections of the excavation pit at a depth of ± 10 m below sea level (GPS reading). The centre of the pit was at S 28°47'33,9" and E 32°01'36,3". The soil samples were sealed in plastic.

3.3 Photographs

Many photographs were taken while excavations were in progress. Some of these are attached as an appendix to this report while the remainder will be placed on CD-ROM.

4) General observations

- a) The “wall” separating the harbour from the excavation pits contains thousands of ammonites or pieces of ammonites. It is recommended that dredging operations be monitored in order to retrieve as many of these as possible.

- b) Even more ammonites occur on the dumpsite to the west of the excavation pit. These could be retrieved should a scientist wish to do so. They are not 'lost'. They are, however, now out of context and most probably in some cases mixed with more recent soil materials from the layers above the cretaceous layer.
- c) The fact that so many ammonites were damaged and so many were 'lost' on the dumping sites, is an unfortunate situation which was caused due to a clash of interests between the natural sciences on the one hand and the need to sustain economic growth on the other. The 'dilemma' the contractors find themselves in – namely a limited budget to complete the excavations – needs to be addressed. This necessitates much closer co-operation between the Heritage authorities (in this case, Amafa and SAHRA) and the National Ports Authority (NPA). Negotiations between the latter three institutions could result in a much better outcome than the present situation. Future developments/excavations at the Richards Bay harbour (which are most likely) will in such a case reveal much more of prehistoric ocean life than the most recent attempts.
- d) Public access to the 'dump sites' should be controlled more strictly. It seems as if enthusiastic 'fossil-hunting' members of the public have already raided some of these sites as no individuals have free access to the cretaceous layer – seeing that it is buried by ± 10 metres of soil. (See attached clipping from The Zululand Observer, 2-12-2005). SAHRA should make the public aware that 'fossil-hunting' is against the law – and for very good reasons. The local newspaper should be discouraged from publishing articles where members of the public 'with interesting fossils' are invited to contact the Unizul Science Centre, thereby almost encouraging people to 'fossil hunt' as a result of being infected by 'fossil fever'.

5) **Sources:**

Klinger, H C; Kennedy, W J; Lees, J A and Kitto, Stephen: “Upper Maastrichtian ammonites and nannofossils and a Palaeocene nautilod from Richards Bay, KwaZulu, South Africa”. Acta Geologica Polonica, Vol 51 (2001), No 3, pp 273-291.

Dhondt, A V: “Tenuipteria Geulemensis (Mollusca: Bivalvia), an Inoceramid species from the upper Maastrichtian of the Saint Pietersberg area, the Netherlands.” Annales Soc. & Zoo/Belg, T.108 (1978), fasc 3-4, Bruxelles, 1979

Van der Walt, J C: **The Wonder of Richards Bay**. Richards Bay Municipality, 1985.

6) **Appendix 1:**



“Wall constructed between harbour and dry pit excavations containing many ammonites.



Excavations of dry pit as on 29 July 2005.



Excavations of dry pit as on 29 July 2005.



Excavations of dry pit as on 29 July 2005.



Soil profile: Eastern wall of excavations, 29 July 2005.

The upper part of the Cretaceous layer is exposed.



Eastern wall of excavations, 29 July 2005. Harbour in background.



“Wall” constructed between harbour and dry pit excavations on eastern side of harbour.



Ammonites on exposed floor of cretaceous layer.



Ammonites visible in eastern wall of excavation pit.



Construction of "wall" between harbour and dry pit excavations, 29 July 2005.

Pile in background from the cretaceous layer.



“Wall” between harbour and dry pit excavations.



Ammonites dumped on wall between dry pit excavations and harbour.



Cretaceous layer being covered in crushed stone to stabilize floor for construction of caissons, 2 August 2005.



Ammonites removed by contractors from dumped soil, 16 August 2005.



Excavations in progress, 2 August 2005.



Excavations in progress, 2 August 2005.



Excavations in progress, 2 August 2005.



Mechanical excavator, front-end loader and dump truck
excavation pit, 2 August 2005.



Southern wall of excavation pit, 16 August 2005.



Dumping material from cretaceous layer, 16 September 2005.



Crane erected in dry pit for construction of first caisson, 16 September 2005.



Caissons under construction.



Cretaceous layer dumpsite.



Berm Wall and caissons under construction



Close up picture of caisson.



Dredger.

7) Appendix 2:

Fossil fever

Tanya Waterworth

Evidence of pre-historic sharks has been found on the coast of Zululand.

Visiting US Fulbright scholar, Dr Terry Hutter, said he was overwhelmed by the response from local fossil collectors following an article in the Zululand Observer.

'I have studied photographs sent in and there is no doubt about it - the Megalodon swam in waters off the coast of South Africa,' said Hutter who was preparing to take a field trip with local, Roy Thompson.

Two other submissions to the Unizul Science Centre could also prove to be Megalodon teeth.

The discovery promises to be noteworthy in scientific circles, as there has been no official report of the existence of the pre-historic Megaladons in this part of the world.

Believed to have swum the oceans some 65 000 to eight million years ago, teeth belonging to these ancient creatures have been recorded in America, Australia and Chile.

Among the chosen few
Fulbright scholars are among the chosen elite in American academia and Hutter is an environmental specialist in geology.

Traditionally, Fulbright scholars partner with overseas universities to teach and carry out further research in both the sciences and arts.

One of Hutter's most exciting expeditions was to the Qumran area in Israel where they discovered the 'factory' for an ancient temple over 2000 years old.

'The factory was a storage facility for a family who held the recipe for spices since the time of Moses,' he said.

Working with archeologists on the site, Hutter had to analyse 11 different spices, along with sedom salt and carcenic lye after which a report was submitted to the Head Rabbi of Israel.

Now working with the University of Zululand, Hutter is assisting the science centre in setting up a fossil repository and display which will be used to introduce different sciences to Zululand schools.

'There is even a mini wetlands outside the back of the science centre which will be wonderful to introduce concepts in microbiology and geology, especially in terms of timelines,' said Hutter.

While he left for America on the weekend, Hutter is scheduled to return to Zululand next year when he will start the exciting new project.

'While I am away, anyone with interesting fossils is welcome to contact the science centre,' he said.

The Unizul Science Centre can be contacted on 035 797 3204.



A huge ammonite sent in by a local enthusiastic fossil hunter



Delighted with fossil finds in Zululand - Dr Terry Hutter with his wife Diana

The Zululand Observer, 2 December 2005, p 35.