

Gun Island Geological Thoughts

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The Zeewijk Services Stay On Gun Island - Geologically Speaking

Introduction:

For eight months during 1727-1728, the survivors from the wreck of the Dutch East Indiaman "Zeewijk" lived on Gun Island in the Pelsart Group of Houtman's Abrolhos. Subsequent to the Dutch stay, the Island has undergone several changes, mainly through the activities of guano miners between 1840 and 1904 and oil drillers during 1968.

In 1976, the Maritime Archaeological Department of the Western Australian Museum, commenced the "Zeewijk" project; the investigation of the remains of the wreck and the survivors stay on the Island. A re-construction of the Island as it may have looked in 1727 and an analysis of the effects the various human activities and natural factors have had on the archaeological sites would be desirable assets.

AFFECTS OF MAJOR HUMAN ACTIVITIES.

Guano Mining

Guano was taken from Gun Island mainly during the 1880's and 1890's. The method of mining, as outlined by Green (1972) was to remove the vegetation, shovel, scrape and sweep the material into piles and later to screen out the roots and stones. The guano was then bagged and carried in trolleys along wooden rails to jetties for shipment. The larger boulders uncovered during this operation were set aside in piles or used as foundations for the train lines.

Most of the Island appears to have been covered by some guano and most of this, away from the dunes, has been removed (see later). It follows that any remains from the "Zeewijk" survivors stay on the Island, which were left on the rocky part of the Island, have been disturbed. Fortunately, any artefacts discovered during the guano digging were collected and listed (Broadhurst, F, no date). Some material may have been lost through souveniring (especially coins). Much of the less exciting material, such as pieces of broken glass, were probably overlooked and piled aside perhaps obliterating concentrations which were former camp sites.

OIL DRILLING

Gun Island Number 2 stratigraphic well was drilled on the Island between June and November in 1968. The well reached a total depth of 3,725 metres and was abandoned dry.

A large amount of sand from the dune area in the South-West of the "Zeewijk" expedition camp-site, was removed to build a platform for the drilling rig, near the Eastern centre of the Island. Several Dutch graves were unearthed in the dunes and a guano diggers' camp was demolished on the East side of the Island.

The run-off from the rig may have concealed some Dutch artefact material and other material may have been lost through souvenir-ing.

Affects of Natural Factors.

Most of the artefacts found so far on the Island have occurred in the sand dunes on the West side. These dunes are constantly being worked by birds and animals, particularly the wedge-tailed shearwater or mutton bird. These birds dig burrow-like nests into the sand, a task that would involve the turning over of large quantities of sand. It has previously been noted that the majority of artefacts on the surface in the dune area, are found at the entrance to the burrows (Bevacque, 1974).

The dunes are at present stabilized by low shrub-vegetation and it appears that the nests are not re-dug each year. However, with new adults and the dilapidation of old nests much soil must have been disturbed within the top metre or so. The amount of disturbance is hard to ascertain but because of it, any stratification of artefacts must be interpreted with caution.

GEOLOGY

The geology and geomorphology of the Pelsart Group have been described in detail by Teichert (1947) and Fairbridge (1948). It is intended here to give only an account of the occurrence of the major rock types on the Island. A geological map accompanies the report.

The Island essentially consists of a coral reef limestone platform

which has been raised to about 3 metres above sea level and onto which younger units have been deposited. These consist of a shelly limestone, guano, most of which has been raised, and dune sands.

The central core of the Island is composed of coral reef limestone consisting predominantly of the skeletons of the same species of coral which are still found living in the surrounding waters. The spaces between the colonies, are filled with coral debris, shells and shepp grit, cemented into one solid mass mainly by secondary calcite. The reef limestone is characterized by rock holes of which there are more than twenty large and many more small examples on the Island. It seems that many of these holes may have been particularly or totally infilled with guano and other sediment in the eighteenth century (see later). In places pockets of darker grey, conglomeratic limestone occupy similar, though possible older, rock holes. The reef limestone has been deeply undercut along over half the coast forming overhanging visors which have subsequently collapsed in places.

The shell limestone overlies the reef limestone in a thin (usually less than 10cm thick) discontinuous layer, mainly in the North. The material is cream coloured compared to the light grey reef limestone. It is characterized mainly by shell remains, rounded weathering surfaces and fewer rock holes giving a flatter terrain. The boundaries of this unit shown on the map are approximate as weathering has made outcrop patchy.

Most of the guano on the Island has been removed and now it occurs only in a small patch on the North-Nor-East side and under some of the dunes. The guano is a whitish coloured material with a clayey, mat-like structure. The main deposits probably occurred on the lower parts of the Island.

Dunes are found mainly along the Northwest and West Coasts with a small dune on the Northern part of the East Coast and sand build ups around the rock wall in the North East. Thin patches of sand are common over the reef limestone. The dune sand consists of shell and coral fragments which are mainly fine to

medium grained but range from silt to boulder sized. The colour ranges from light greyish brown to dark greyish brown away from the coast due to an increase in the amount of plant and animal debris. Bird remains, bones and pieces of bird shell are also found.

Extent of Mined Areas.

Leaching and redeposition of salts from the guano has caused skin of dull, orange-brown material to be formed on the rocks immediately below. Attempts were made to remove this along with the guano during mining but this was not entirely successful particularly in the less accessible places. Thus the presence of this material on rock surfaces is good evidence that guano has been taken from an area. On the basis of this and the position of tram line foundations, obtained from pre-oil drilling aerial photographs (see map) it is possible to make some estimation of the areas which have and have not been mined. As the thickest guano deposits probably occurred away from the higher parts of the reef platform, the mining was probably least there.

It seems as though most of the Island was overlain by some guano during the eighteenth century. The thickness of the deposits probably varied greatly. No "phosphate skin" was found South of the quarry, but it appears from relic tram-line foundations, inferred from aerial photographs, that at least some of the area has been mined. Unmined areas is given on the accompanying map.

Most of the guano has now been removed except for a small patch at the North end of the East side of the Island, a thin strip along the landward edge of the dunes between Point Happy and Lunch Point and deposits under much of the dune area. A conservative estimate of the extent of unmined areas is shown on the accompanying map.

Changes Since the 18th. Century.

Natural Changes

Gun Island has probably undergone little change due to natural causes. It is possible that the visors on the East side, which are undercut mainly by chemical and biological activity rather than wave action, have collapsed since then, but no evidence exists to verify this.

Much of the dune area, particularly the landward side, is underlain by guano. This indicates that the dunes have been building up at the seaward edge and slowly moving inland. The rate of movement, going by the existing limits of the guano mining is small and it is likely that the dunes were of about the same extent as today in 1727.

Teichert (1947, p160) noted that although extensive investigations of the Southern end of Pelsart Island were made by the "Zeewijk" survivors, none of their maps show the small island that now lies South of Wreck Point. He concludes that this island may have been tied to the main island by shingle deposits which have now been washed away. Care must be taken not to apply these erosional rates to Gun Island, due to the relatively quite waters around the latter and the relative hardness of the rocks involved (shingle ridges versus hard reef limestone).

Changes Due to Man.

The main changes to Gun Island have been caused by man. The guano diggers not only stripped guano from the Island but also made rock piles with the debris left behind. It is likely that much of the sand that has been deposited around the rock wall built along the North Nor East Coast, has been deposited after it was erected. Just North of the Eastern end of cross-section line 9, the collapse of a visor has exposed a section through a small rock (approx. 1m diameter x 0.6m deep). The hole is filled mainly with guano, shell fragments, coral fragments, roots and soil and its existence suggest that at least some of the other rock holes were similarly infilled before the mining commenced. The changes caused by the oil drillers are mainly due to the building and excavation for the oil rig platform. This has been discussed earlier.

Groundwater.

The twenty rock holes inspected during the 1976 "Zeewijk" expedition were, with one other, again inspected in 1977. The results are outlined in Table 1.

Table 1. Results of rock hole inspections (rock hole numbers are taken from the accompanying map).

Rock Hole No.	Status 1976	Status 1977	Rock Hole No.	Status 1976	Status 1977
1	dry	dry	11	dry	dry
2	"	just moist	12	moist	moist
3	"	dry	13	"	"
4	"	"	14	dry	dry
5	"	just moist	15	moist	moist
6	"	dry	16	water (fresh)	dry
7	water fresh	"	17	dry	"
8	"	"	18	water	"
9	dry	"	19	dry	"
10	"	"	20	water (fresh)	water approx. 4000mg/e*
			21	-	dry

The salinity of water from the well on Middle Island used by the "Zeewijk" survivors was measured at approximately 3,300mg/e*. The maximum salinity of water consumable by humans is about 2000 mg/e. (The salinity of the water in the quarry was greater than 15,000 mg/e*).

Groundwater on a small Island such as Gun Island occurs as a thin fresh water mound resting upon salt water. The mound is maintained by infiltration of precipitation to the water table. The extent of such a mound on an Island the size of Gun Island would be very limited and very sensitive to seasonal rainfall variations. During dry periods or periods of extraction from the freshwater layer, the level of the water in any wells would fall and the salinity of the water would rise after a period of time. This accounts for the periodic "salting up" of the Gun Island well, sometimes less than a month after heavy rain, in 1727 - 28.

*TOTAL SOLUBLE SALTS BY CONDUCTIVITY.

Conclusions.

Gun Island is a flat reef limestone platform over which thin younger deposits, in the form of shell limestone, guano and sands, have been laid. Much of the platform has been undercut forming visors which have subsequently collapsed in places.

The major changes to the Island since the eighteenth century have been caused by man. Guano mining has resulted in a more uneven surface due to the piling up of rock slabs and the cleaning out of rock holes. The oil drillers removed a large amount of sand from the West of the Island to build a pad for their rig. It is possible that erosion of the East Coast has resulted in the collapse of visors since 1727-28, but no evidence can be seen to verify this.

Water was present in only one of the twenty one rock holes inspected during 1977. The salinity of this water was approx. 400mg/e compared with the maximum salt tolerance for humans of about 2000mg/e. This water, and the water from the "Zeewijk" survivors main supply on Middle Island (3,300mg/e) would have been unfit for human consumption in early 1977.

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