of an export from here". In the event, his letter did not reach Silsoe until 9 May, but his initiative was much appreciated at the Institute.

The flax duly arrived at Cardiff on 3 April. One of the research staff declared they were "over the moon" to be supplied so promptly. But will it open up a market for the Island's flax? The answer must surely be 'No'. The present research is designed, not to import raw material, but to find ways of utilising U.K. farmers' surplus crops, like linseed straw. It seeks to promote the use of "home-grown fibre plants and all the downstream products they can generate, from textiles to horse-bedding, from Bibles to particle board." St Helena should, in fact, benefit far more from this. Machinery capable of transforming **Phormium tenax** into marketable modern textile would, if wisely managed on the Island, offer exciting possibilities for the profitable use of its hitherto unwanted legacy. It would certainly be more productive than shipping bundles of leaves overseas – or even bales of fibre to make string for the British Post Office! We shall watch developments at Silsoe and Leeds with interest.

THE REAL SHAPE OF ST HELENA

by **David Holt**

'Mountains are the beginning and end of all natural scenery'

JOHN RUSKIN (1819-1900)

A MATTER OF PERSPECTIVE

Most of us think of St Helena as an island, which of course it is. Quite understandably therefore most of what has been written about St Helena concerns that which lies contained within the present coastline and events that have occurred on the Island and around its shores.

St Helena is however much more than just an island, it is also a mountain of vast size rising from the ocean depths.

Although navigators and local fishermen will, since the Island's discovery in 1502, have acquired an ever increasing working knowledge of what lies on the coastal flanks of this great mountain down to a dozen or so fathoms below the waves, the shape and size of the part of the mountain that lies below those depths has until now had to be largely a matter of speculation because of the lack of detailed reliable information on the subject.

This situation has however recently been changed by the publication of a new bathymetric chart showing records of many more depth soundings around the island that had been published hitherto. The time has come therefore to look at these new records of the hidden depths around the Island to try to deduce the true shape of St Helena that would be revealed were the ocean waters to be drained away, and also to consider the possible implications of what is thus revealed.

MOUNT ST HELENA

In his excellent account of the geology of St Helena written in 1991 Barry Weaver tells us that St Helena Island represents only the top five per cent of a large shield volcano the cone of which has a height of over 5,000m (16,400ft) and an average base diameter of 130Km (81 miles). He also tells us that the dimensions of this huge volcanic seamount far exceed that of any continental volcano and adds that 'nothing is known about the structure . . . . . of the volcanic cone'.

AN IMPORTANT NEW SOURCE OF INFORMATION

At Taunton, England, on the 24th March 1994, under the superintendence of the Hydrographer to the Royal Navy a new Hydographic Chart was published in the International Chart Series. This Chart includes coverage of approximately 5645 Sq Km (2180 Sq miles) of the waters around St Helena at a scale of 1:125,000 (approximately 2 inches to a mile).

A total of 444 depth soundings are shown on the Chart around St Helena, and one of the most significant facts about these is that they go down to more than 4000 metres (13,123 ft), the maximum depth recorded being 4583m (15,036 ft, 2506 fathoms) at the south-east edge of the Chart.

Inshore the distance between soundings shown averages about 80m (262 ft) but further offshore this increases about five times to about 400m (1310 ft). Also the coverage is rather scattered with an east/west imbalance in favour of the west side where 306 soundings are recorded whereas only 138 are shown on the east side.

INTERPRETING THE SOUNDING RECORDS

The limitations of the data presented mean that a certain amount of guesswork is called for in the sketching in of submarine contours which is necessary preliminary to obtaining an overall view of the shape and size of the submerged part of the Island. It follows therefore any plans and sections constructed from the bathymetric data presented on the Chart may fail to show some quite major features. The Chart does nevertheless represent a very big advance in providing important and interesting new data which makes it possible to take a new look at the St Helena seamount and make some new interpretations of past events in its history which could not have previously been contemplated.

ST HELENA'S VITAL STATISTICS – *What the Chart Shows* *(Figure 1)*

In his account of the geology of St Helena, Barry Weaver has stated that the St Helena volcanic cone rises from the depths of the surrounding ocean at 4,400m below sea level. Although this indeed may be the case as far as the very broad regional pattern is

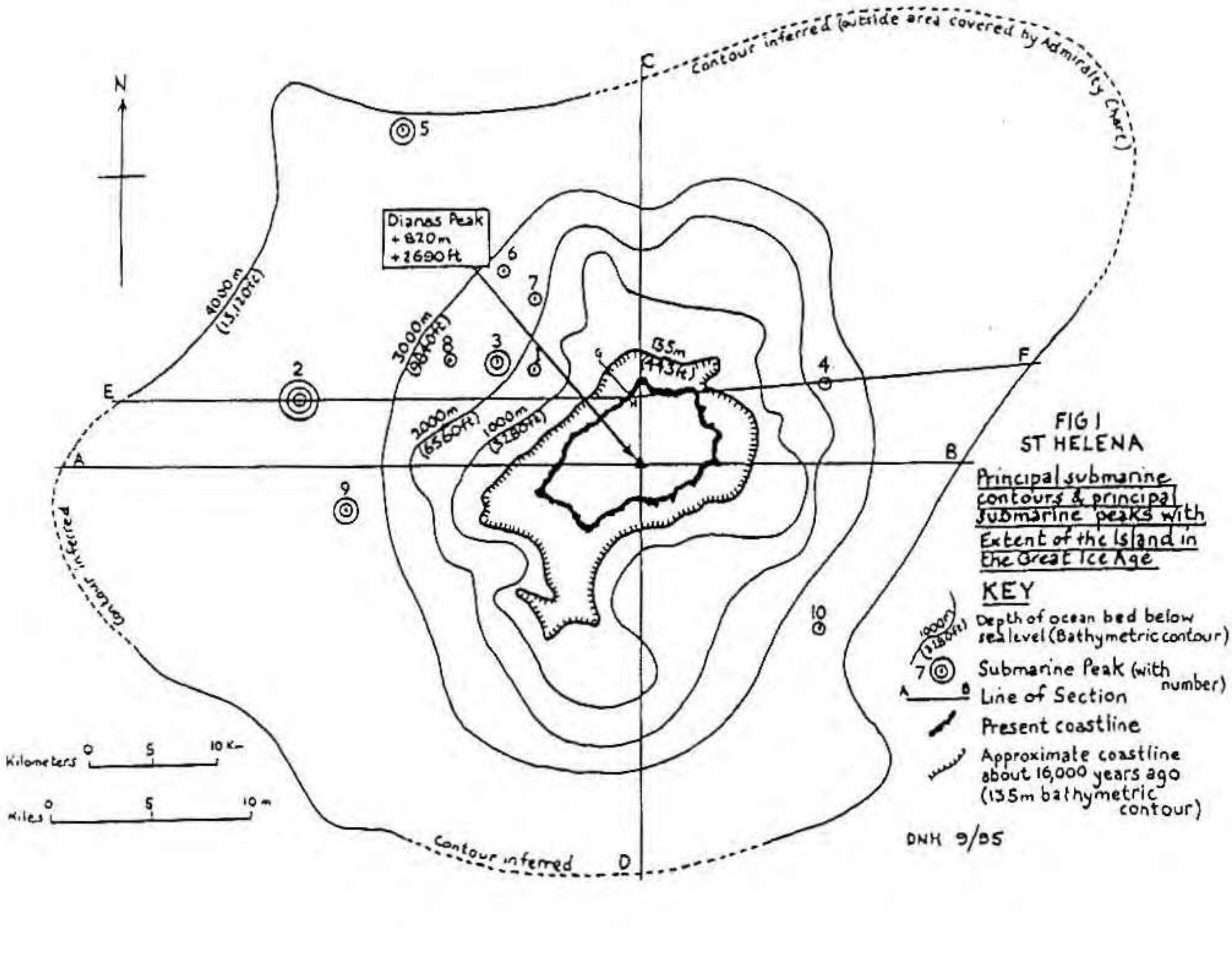


Figure 1 - St Helena : Principal submarine Contours and Principal submarine Peaks

concerned, it is important to realise in this context that the general form of shield volcanoes is such that the gradient of the outermost and lowest slopes falls off gradually and almost imperceptibly to the horizontal (i.e. they are asymptotic in form). This in turn means that the base level of very large shield volcanoes such as St Helena may not be exactly definable to within a few hundred metres either way. In the case of the Admiralty Chart only 2 of the 444 soundings go down as far as 4,400m, but all the deeper soundings do confirm the asymptotic form of the lower slopes. It is therefore reasonable to accept the limitations of the Chart and take 4,000m depth as the base of the volcanic shield of the St Helena seamount rather than 4,400m. Unfortunately even at this depth we are working at the limits of the data recorded, and when the depth contours are sketched in it is found that the 4000m depth contour runs off the edge of the Chart in the west and north-east. For these segments therefore the 4,000m contour remains conjectural and so is shown on Fig 1 as a dotted line.

As a result the following 'vital statistics' for the St Helena seamount rising from a postulated base of 4,000m below sea level may be approximately inferred from the contoured plan (Fig. 1).

Perimeter of Base	255km	158 miles
Area of Base	5027km^2	1940 miles^2
Maximum Diameter	100km	62 miles
Minimum Diameter	60km	37 miles
Total Height (Base to Dianas Peak)	4820m	15,814 ft

THE REAL SHAPE OF ST HELENA – *Some Geological Consideration*

It is a well-known and generally accepted scientific fact that St Helena's volcanic eruptions initiated from the dark abyss of the sea bed in the Miocene Period about 14 million years ago, i.e. long after the Dinosaurs became extinct but long before man appeared on the face of the earth. Even at this time the volcano did not immediately break the surface, but remained active for a further period of about 7 million years during which time it built itself up by a series of eruptions separated by long periods of quiescence until eventually it appeared above the waves to form an island. Although there were no human beings on the earth at that time to witness the event, it may be concluded that at some time in this period St Helena may have looked a bit like a larger version of how Ascension looks at present day, the latter having been active almost certainly within the last thousand years. As far as both islands are concerned, it is evident however that more than ninety per cent of them has always been submerged and has never seen the light of day.

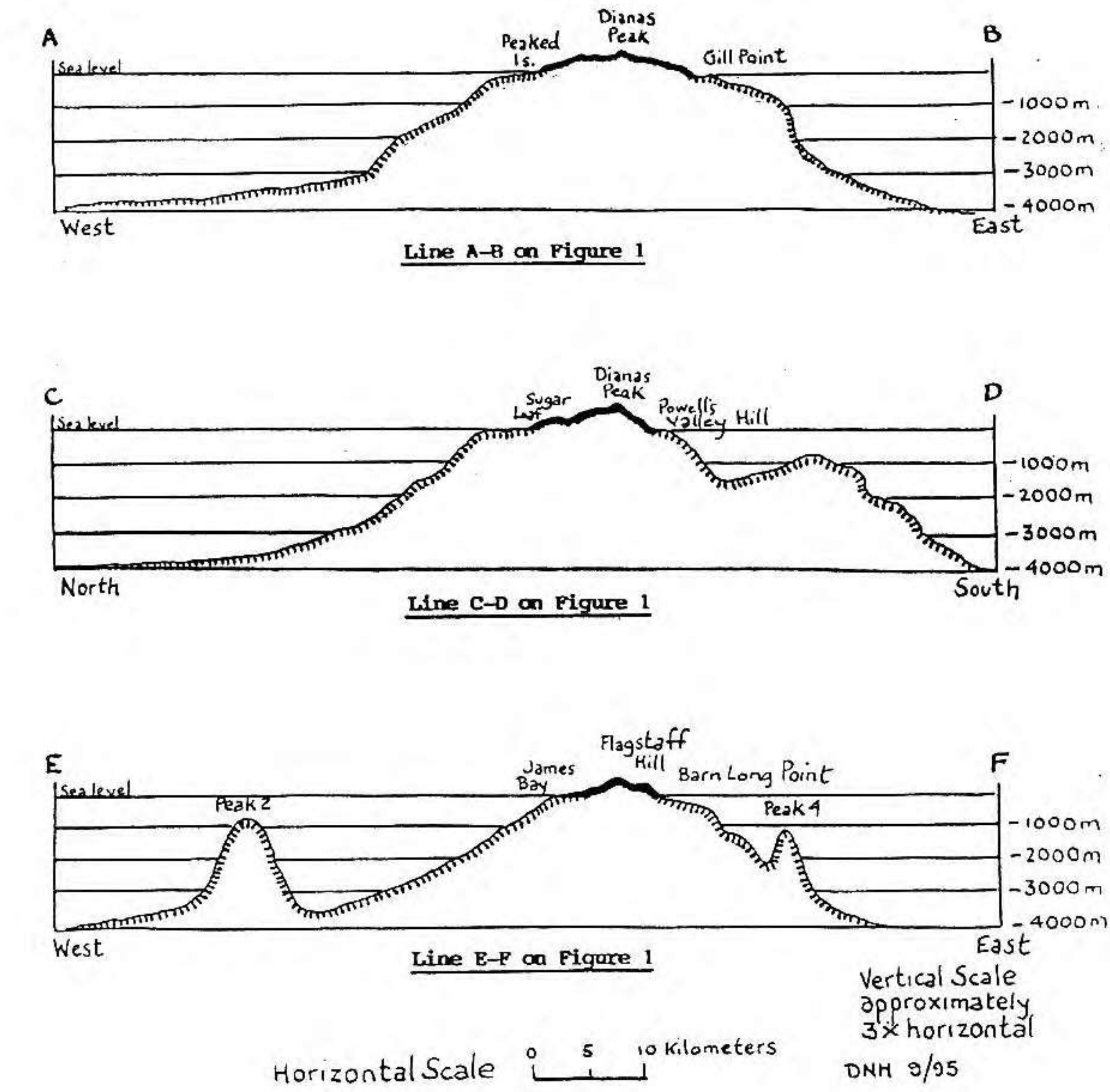


Figure 2 – St Helena : Longitudinal Sections through the Seamount

THE REAL SHAPE OF ST HELENA – *What the Chart can tell us* *(Figures 1 & 2)*

Figure 1 presents a two dimensional picture of the St Helena seamount, and so leaves us guessing about its shape in profile. In order to resolve this it is therefore necessary to construct some cross-sections, and these are shown in Figure 2. To demonstrate topographic forms in the clearest possible manner, it is customary for such cross-sections to be presented with the vertical scale enlarged to three times the horizontal, and this convention is followed for the sections presented in Figure 2. This means that the slopes shown on the sections are steeper than those that actually exist, and that the St Helena seamount is flatter and more shield-like in form than depicted.

The cross-sections clearly show the asymmetry of the St Helena volcanic complex, and the limitations imposed by having to try to interpret the sequence and location of successive eruptions from the small part of the vast volcanic shield that is accessible above sea level. Indeed Barry Weaver, quoting earlier work by Ian Baker lists three main volcanic events for St Helena, but both authors acknowledge that the vast bulk of the volcanic material ejected by the eruptions remains hidden, and the picture as seen by them, and therefore their interpretation, may be very incomplete. In view of this it is therefore reasonable to regard the rise in submarine topography seen off the south coast of the Island on Fig 2 (2) as possibly part of an hitherto unrecorded volcanic eruptive centre of unknown status and age within the postulated volcanic sequence.

SOME UNEXPECTED FEATURES OF THE SUBMARINE TOPOGRAPHY

A curious feature of the Chart is that it shows a scatter of relatively shallow soundings far offshore and immediately surrounded by much deeper water. These evidently indicate the presence and location of a number of hitherto unknown very steep sided and high submarine peaks. They are marked on Figure 1 and numbered in increasing order of their depths below sea level, from which it can be seen that some are very major features. The biggest of these is located 27.5km (17 miles) due west of James Bay. It rises abruptly no less that 2930m (3170 ft) from its base to 669m (2195 ft) below sea level, and Fig 2 (3) has been drawn on an east/west line through James Bay to show this feature in profile as well as a similar but smaller one on the other side of the Island (nos 2 and 4 respectively on Fig 1). The following Table gives the main dimensions of the principal peaks as indicated on the Chart. It should be noted however that the list may be incomplete because the spacing between soundings is such that round the outer periphery of the main seamount such features could have been missed in the sounding survey.

Because each of these peaks is represented on the Chart by a single relatively high level sounding it is impossible to determine the detailed shape of the feature concerned, other than to expect it to be very steep sided, and probably pipe-like in

Submarine Peak No (Fig 1)	Depth to summit	Depth to base	Height above base
1	70m	1500m	1430m
2	670m	3600m	2930m
3	830m	2300m	1470m
4	1000m	2500m	1500m
5	1060m	3900m	2840m
6	1160m	2500m	1340m
7	1210m	2100m	890m
8	1350m	1850m	500m
9	1680m	2800m	1120m
10	2760m	3600m	840m

form. If this were so then the features concerned would be comparable to such onshore prominences such as Lot, Lot's Wife and some offshore features such as Egg Island and Speery Island. If such a comparison holds good then it would be reasonable to suppose that some, if not all, of the features listed in the table above are of the same origin as the similarly shaped onshore and near offshore features. This in turn would mean that they might be intrusions of trachyte or phonolite magma of the Late volcanic intrusive phase emplaced into the basaltic rocks of the solidified earliest lava flows. The analogy is made more convincing by the fact that Barry Weaver describes these late trachytic and phonolitic intrusions as 'essentially cylindrical, pipe-like bodies'. Underwater sampling would help to resolve this question, but unfortunately none has been done so far at the depths needed (670m, 366 fathoms).

THE FORMER SHAPE OF ST HELENA ISLAND – *What the Chart can Tell Us*

The foregoing discussions relate to the vast mass of the St Helena seamount most of which has always been submerged, the Island being just the bit that broke the surface of the sea and remained exposed after the volcanic activity ceased about 7 million years ago.

The sea level has not however always been where it is today in relation to the existing land masses, it is known to have changed many times. A higher level than at present would have meant for St Helena a smaller Island than we see today and the possibility of ancient high level shore lines preserved on land, a subject which was investigated by the University College, London 1981 Expedition to St Helena and subsequently reported on by them, (P.D. Nunn 1983). Conversely a lower sea level than today means the existence of a larger Island and the existence of submerged ancient shores, a topic which was beyond the scope of the London University's investigations but one about which the Chart provides some very interesting evidence.

A GREATER ST HELENA ISLAND – *What the Chart Actually Shows Us*

In the Period of the Great Ice Age, long after all volcanic activity has ceased on St Helena the sea is generally acknowledged to have been at a much lower level than at present, the reason for this being generally assumed to be because of the very large volumes of the ocean waters locked up in the vast polar ice caps that existed at that time. This is thought to have resulted in a maximum drop in the general level of the world's oceans of as much as 135m (443 ft) at about 16,000 years ago. Good evidence of this exists in many parts of the world in the form of a submerged wave cut platform at about this level.

The Chart most strikingly demonstrates the existence of such a platform or rocky ledge completely surrounding the Island (Fig 1) the outer edge of which is almost exactly at 135m depth, thereby providing convincing additional evidence of the former lowering of the sea level to this depth. The existence of this ledge has probably been known to fishermen and navigators for a long time, but the Chart has the advantage of showing its shape in some detail, and therefore the shape of the Island in Ice Age time about 16,000 years ago. St Helena's shoreline at that time would have roughly coincided with the 135m depth contour as shown in Fig 1, making the Island about twice the size it is today.

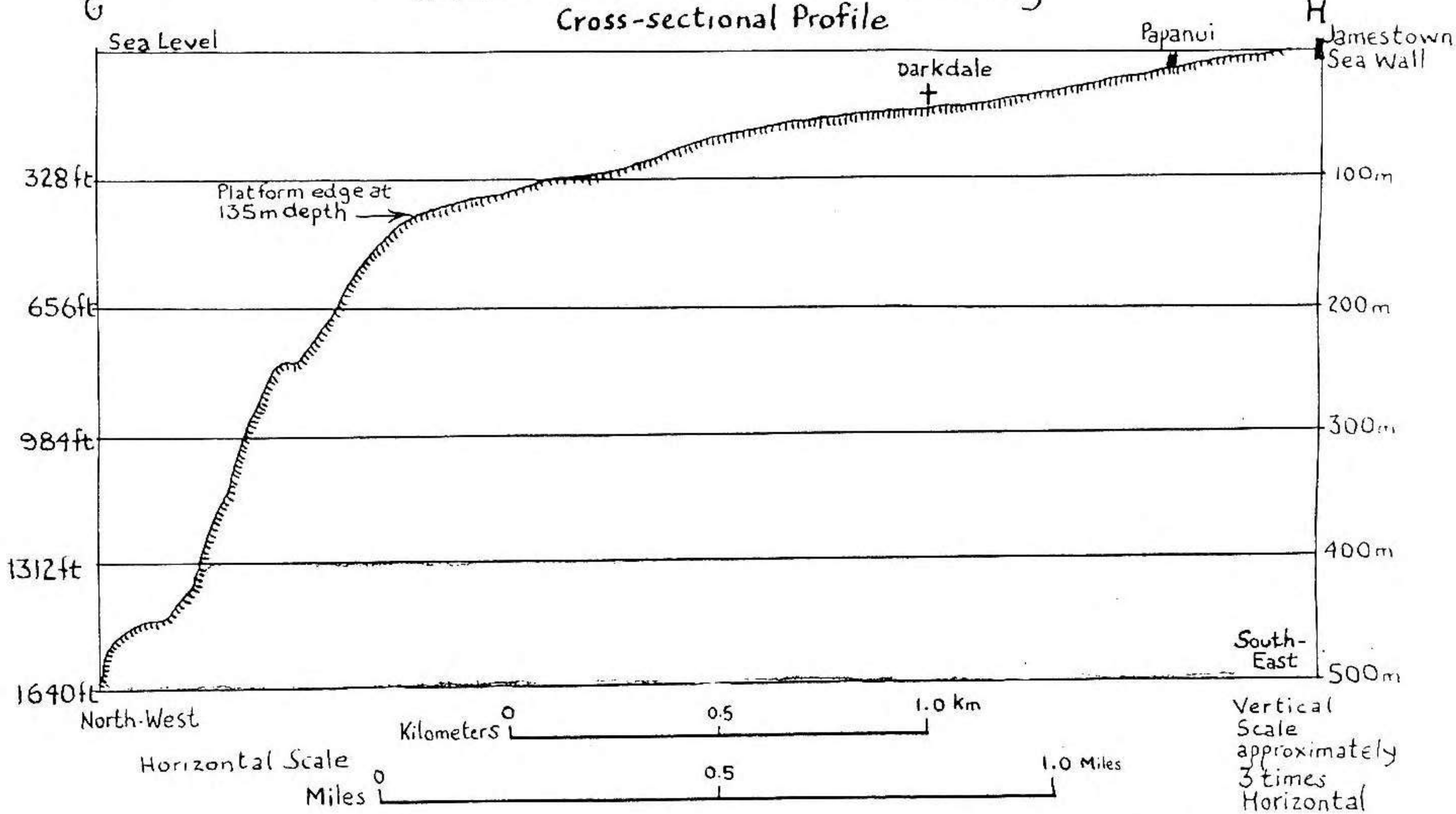
The cross-sections shown in Figure 2 also show the wave cut platforms, but because of the scale of the drawings only as barely discernible nick points. To see the form of such a platform in section at a more appropriate scale it is possible to refer to Sheet 2 of the 1:10,000 Scale map of St Helena published by the Ordnance Survey of the UK Government in 1990. This very conveniently shows submarine contours at 10 metre intervals for a distance of 2.85km (1.8 miles) offshore from James Bay. A cross section of the wave cut platform drawn from this map is given in Figure 3.

The wave cut platform seen was created because the ocean tides rose and fell at about 130m below present datum for a very long time, and certainly long enough to assault and

FIG 3

St Helena Wave Cut Platform — James Bay

Cross-sectional Profile



A typical cross-section of the wave cut platform that completely surrounds the Island of St Helena

DNH 3/95

(Line G–H on Figure 1)

cut into even the most rocky coasts that became exposed to their action. On the melting of the ice the sea level rose again with the result that these ancient shore lines became deeply submerged and no longer subject to wave action, leaving a submerged rocky ledge. It should perhaps be added that not all such wave cut platforms were completely levelled off by the waves, where harder rocks occurred rocky promontories or islands remained, and submerged examples of these occur round St Helena, notably at Speery Ledge off the south coast of the Island. It may also be noted that active soil erosion on the Island which has gone on since 1502 will have deposited large volumes of silty and muddy material on the wave cut platform and beyond thereby modifying its original post-glacier form.

CONCLUSIONS

The new Admiralty Chart enables us to get a new overview of the shape and size of the St Helena seamount and look at some of the features of its topography. Because the data presented on the Chart is in the form of separate soundings at variable distances from one another and not contiguous readings the picture presented lacks detail. It does however represent a huge advance on what was available previously. The Chart not only presents new information but also provides evidence for ideas on the vulcanological history of the Island, and how its shape has changed since the vulcanicity ceased.

Modern methods of bathymetric sounding using acoustic reflection methods and sidescan sonar provide continuous graphical records and therefore a much more complete record of the submarine topography. The time is probably not far off when such records will be available for the waters round St Helena and the present records provide an interesting preview and show what an exciting prospect this is.

Restoration of ST JAMES' TOWER CLOCK

by **Owen George**

St James' Tower Clock was provided by the Governor and Directors of the East India Company in 1786 to enhance Jamestown's newly re-built church. It was made by Aynesworth Thwaites of Clerkenwell and placed in the tower in 1787. For the Governor of St Helena at that time, and indeed its people, this was without doubt a proud historic occasion.