TRANSIT SONAR RECONNAISSANCE OF THE SOUTHERN APPROACHES TO GALWAY BAY

M. Geoghegan, A. Slevin and M.D. Max.

GEOLOGICAL SURVEY OF IRELAND

REPORT SERIES

RS 75/4 (MARINE GEOLOGY)

Published by authority of the Minister for Industry and Commerce.
Printed at the Geological Survey Office by John Duffy.

TRANSIT SONAR RECONNAISSANCE OF THE SOUTHERN APPROACHES TO GALWAY BAY

INTRODUCTION

This project was carried out by the Marine Geology Division as part of a general investigation by the Mineral Resources Research Unit of the Geological Survey into the phosphatic beds of the Lower Namurian of Co. Clare. All the known phosphate deposits in Co. Clare occur just above the boundary between Visean Limestones and Namurian Shales, which appears to extend seawards from the Co. Clare coast near Doolin (Figure 1). It was thought that some topographical change would mark the boundary between Visean Limestones and Namurian Shales as it does on land, and it was hoped that this change and distinctive acoustic signatures for the two rock types could be discerned by the use of Transit Sonar. The project was envisaged as the first step of a detailed evaluation of the phosphatic beds offshore.

INSTRUMENTATION AND FIELD PROCEDURE

The Transit Sonar used was a shipmounted Kelvin Hughes type L.S. 47 Mk. 1, with an operating frequency of 48kHz, a pulse length of one millisecond, and fixed recorder range of 300m or 600m, the latter range being used throughout most of the project. A Decca Navigation Plotter was used to chart the boat's course and shipboard recorded echo soundings were made to supplement the transit sonographs. Scanning was carried out to the boat's port side.

A total of nine scan lanes was completed. These are generally in a NE-SW direction. This direction was chosen for two reasons; firstly, from previous experience, it was known that the best record is obtained while the boat is running normal to the wave crest direction,and secondly it was hoped to delineate a postulated E-W feature, coincident with the Visean/Namurian boundary, extending westwards from Doolin Head. For convenience these lanes have been numbered 1 to 9 from E to W (Figure 1).

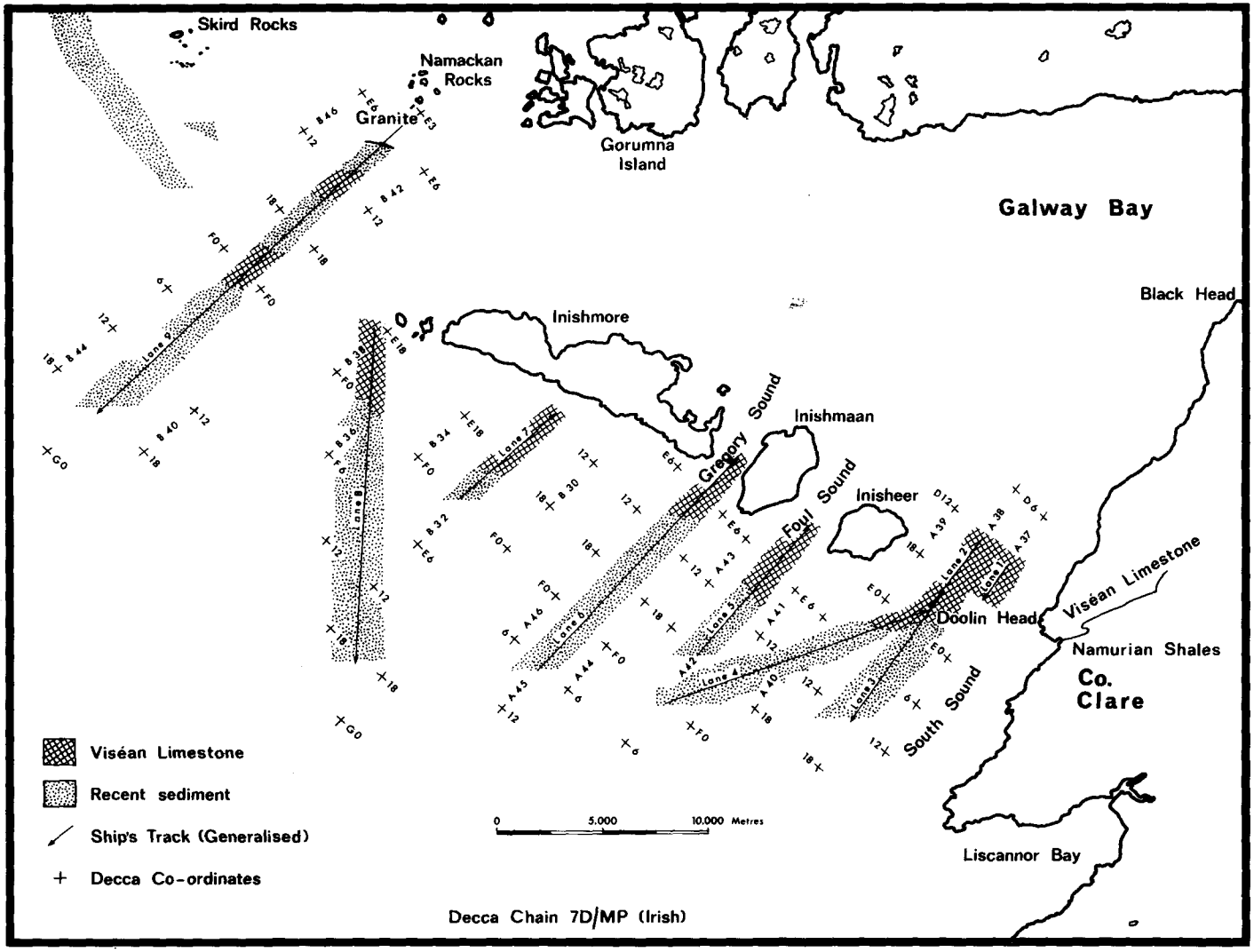

Figure 1: Generalised geological map of the project area showing the simplified ship's track and the pertinent geological relationships.

DISCUSSION OF RESULTS

Sonographs from all the lanes revealed an acoustic picture characteristic of solid outcrops in the north, passing into a region of more homogeneous acoustic signature indicative of mud in the south. This mud slopes gently towards the SW (Figure 1), and is virtually free of all strong reflectors. The change northwards along each lane from mud to rock is usually associated with a sharp rise in topography (Figure 2). The patterns of jointing, striking N-S and E-W, and bedding, dipping gently to the SW, observed in the sonographs strongly suggest that the rocks must be Visean Limestones, since the nearby Visean Limestone on the Aran Islands and north of Doolin in Co. Clare occur along strike and display the same structural features.

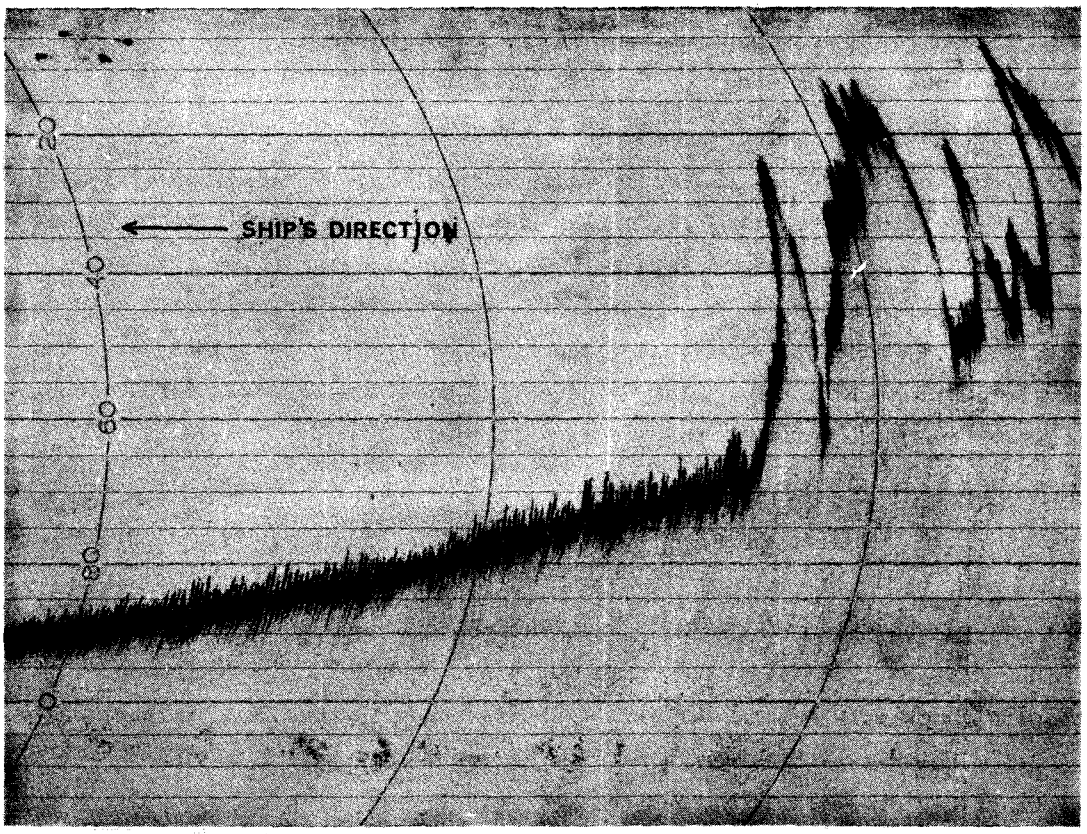

Figure 2: Echo sounder record showing sharp drop-off from the limestone outcrop to relatively flat muds, Lane 9. Vertical grading in metres. Total horizontal distance 5,350 metres.

In Gregory Sound there is no abrupt break in topography and the bottom continues to slope evenly right up to the sound. Here, also, isolated limestone outcrops occur within the mud. The sonographs from north of the mud boundary show that the limestone outcrop at the boundary is not as strong a reflector as other limestone outcrops. This would seem to indicate that there is a thin patchy cover of recent sediment overlying the limestone. This may be the result of sediment being carried by strong outflowing tides extant in Gregory Sound.

The features displayed by the limestone in the sonographs are for the most part related to the jointing and bedding patterns. However, some broad, deep, partly sediment-filled channels occur, e.g. in Lane 7 an E-W channel is found at Decca Location E18, B32 (Figure 3), which may have resulted from the erosion of faults in the limestone.

In the northerly part of Lane 9 mud obscures the granite/limestone contact, but its position may be extrapolated from previous work (Max et al., 1975).

The sharp rise in topography which normally accompanies the change from mud to limestone is worthy of further consideration. With the exception of Lane 9 it occurs in approximately 52 to 55m of water (Lane 9; 62m). Taking conditions during the Pleistocene into consideration, this distinctive, possibly continuous, feature most likely represents a submerged sea cliff and would be indicative of a former sea level at least some 52 to 55m lower than the present sea level.

CONCLUSIONS

Offshore from Co. Clare a southern limit to outcrops of the Visean Limestone has been located. Mud was found south of this limit, and possibly covers Namurian Shales. Further study is required, in particular shallow seismic profiling, before an accurate delineation of this potentially economically important geological boundary can be made.

More detailed interpretation of the Transit Sonar records and day to day operational logs are available in the Geological Survey's files under M.G. 75/2.

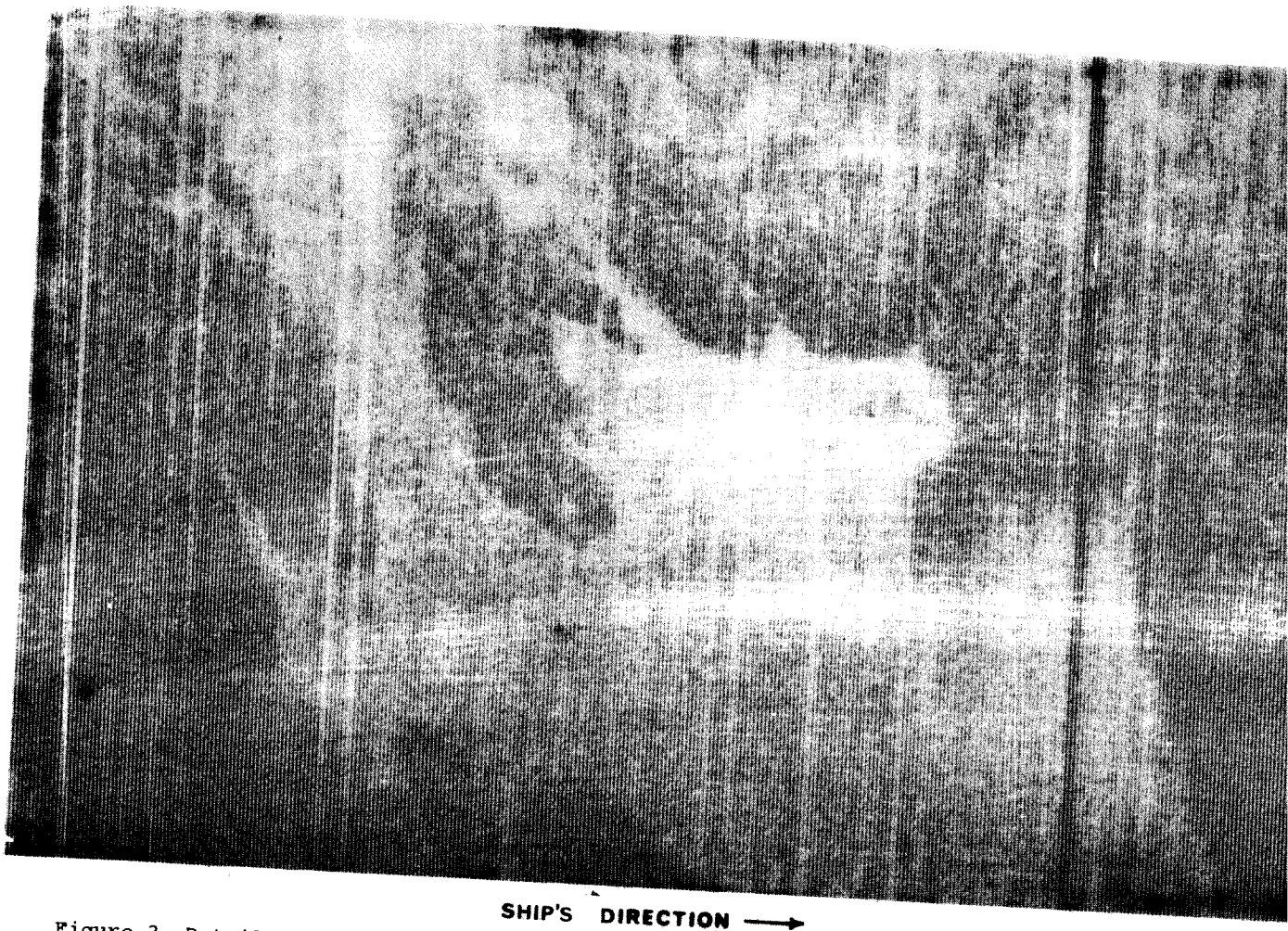

Figure 3. Detail of a channel in Lane 7. Decca location E.J8, B.32. Ship's speed was approximately 3 knots and the range from P (profile) was 600 metres. The darker areas in the sonograph are produced by echoes from the limestone outcrop, the mud filled channel returning a weaker echo is represented by the lighter area towards the centre of the sonograph.

ACKNOWLEDGEMENTS

The authors wish to thank R. Keary of the Geology Department, University College, Galway for encouragement and advice, and also to the technical staff of that Department. A special word of thanks is also due to C. Lydon, skipper of the Research Vessel Corunna, and to B. Keegan of the Zoology Department, U.C.G. for making ship time available to the Geological Survey.

REFERENCE

MAX, M.D., LONG, C.B., KEARY, R., RYAN, P.D. GEOGHEGAN, M., O'GRADY, M., INAMDAR, D., McINTYRE, T., with introduction by C.E. WILLIAMS, 1975. Preliminary report on the geology of the north-western approaches to Galway Bay and part of the landward area. Rept. Ser. geol. Surv. Ireland, RS 75/3.