

# Introduction

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### Introduction

From the viewpoint of paleontology, both in its own right and for its application to regional stratigraphy, Soldado Rock, a mere speck in the middle of the sea between Trinidad and Venezuela, is one of the most important localities in the Caribbean Region. This little erratic chunk of rock furnished the type material for quite a number of molluscan, echinoid, brachiopod and foraminiferal species and varieties, most of them (at least of the foraminifera) useful markers for correlation over vast distances. Maury's mollusk fauna from the Southern top of the two-pronged islet earned it the title of type locality of the Paleocene in this region (Soldado Formation), whereas the higher Northern top turned out to be the only known remnant of a formation from the boundary between Lower and Middle Eocene (Boca de Serpiente Formation), which has been destroyed by erosion and has never been found in situ.

The first determinations of Larger Foraminifera from Soldado were made by Mr. T. W. GRIMSDALE when working with Shell's subsidiary in Trinidad (1935, 1940). Afterwards, Shell and the Trinidad Leaseholds Ltd. oil company, in a joint venture called Trinidad Northern Areas, entrusted their Larger Foram material, on a much larger scale, to Drs. T. W. Vaughan and W. S. Cole in Washington, D. C. The results of this study are included in their "Preliminary Report on the Cretaceous and Tertiary Larger Foraminifera" of 1941. The only thing published by GRIMSDALE is his type description of *Helicostegina soldadensis* as an appendix to that report.

In 1940, the detailed study of a duplicate collection retained by Leaseholds in their laboratory at Pointe-à-Pierre, Trinidad, was assigned to the present author. The following pages are, therefore, to be considered as a continuation of VAUGHAN & COLE's work, in some respects going into more detail, in others more directed towards a general synthesis. The exceptionally heavy reworking which has affected the Trinidad area during Late Eocene times has been taken into account for the first time and has called for an adjustment of the stratigraphical value of a number of VAUGHAN & COLE's species.

Apart from two or three checks carried out at the U.S. National Museum in Washington, I had no access to the material studied by VAUGHAN & COLE. At my disposal was the old duplicate collection, gradually supplemented by a large number of new samples that were purposely collected over the intervening years. All the thin sections of individual specimens were made by the author personally so as to lose a minimum of detailed information.

Originally, it had been the intention to include in one comprehensive paper all the Trinidad material, from the main island as well as from the Soldado Rock. However, it was decided later that a monograph on Soldado Rock, combining both its paleontological and stratigraphical aspects, would be preferable and that publication of the Trinidad data should be deferred. The ensuing split-up at this stage of the work did not proceed without a few difficulties, especially with regard to the illustrations, since access to the original routine collection had by that time become nearly impossible. In certain cases, specimens from Trinidad had been selected for photography and substitution by Soldado material of equal quality proved out of the question. For that reason, some of the species descriptions are here illustrated by their counterparts from Trinidad.

Nearly all of the types and illustrated specimens, most of the routine material (especially the newer samples), the complete faunal list and the photographic negatives are deposited in the Museum of Natural History in Basel, Switzerland (the type and figured specimens under C ... catalogue numbers). Some of the figured Trinidad material was borrowed from the U.S. National Museum in Washington and a few other specimens belong to Shell's collection and are stored in Holland.

### Stratigraphical annotations

Soldado Rock is a steep two-topped islet with a surface of about sixty by one hundred meters. Both tops, the higher of which is 36 meters above sea level, consist of limestones and in between lies a saddle of softer silts and marls.

In Part I of the present work (KUGLER & CAUDRI 1975), the stratigraphy of the Rock is discussed in detail, and for the exposed section and our latest analysis of it the reader is referred to the North-South profile and to the Distribution Chart of the Larger Foraminifera given at the end of that paper.

Recapitulating our conclusions, we now distinguish thirteen beds, one more than established by KUGLER in 1938 (Bed 9a, the „*Asterocyclina* marl"). Beds 1 and 2 belong to the Paleocene Soldado Formation and Beds 3 to 10 to the Upper Eocene (equivalent to the San Fernando Formation of Trinidad). Bed 11 is recognized as a slumpmass of Early to Middle Eocene age (Boca de Serpiente Formation) which has slipped into the basal part of the Upper Eocene deposits. Erosion, redeposition and reworking of isolated fossils have played an important part in the history of the Eocene section. In order to unravel the badly mixed faunas we had to make use not only of the samples collected from the beds "in situ", but also of the contents of the innumerable erratic blocks which are scattered all over the islet. Bed 12, a low ridge of barren sandstone off the North shore, does not fit in with the more or less coherent section and is left out of the discussion.

In our chapter on the Geological History of Soldado Rock (Part I, p.427), reasons are given as to why the stratigraphical sequence of the beds, from old to young, has now been construed as follows:

Beds 1 and 2, Soldado Formation, Paleocene

Bed 11, Boca de Serpiente Formation, Lower to early Middle Eocene

Beds 3, 4 and 10	}	San Fernando Formation, Upper Eocene
Beds 5 to 9a		

In this section, Beds 3 and 4 represent the transgression of the Upper Eocene over the Paleocene. Bed 10 is the equivalent of this same basal member of the Upper Eocene, but developed under more open sea, off-shore, conditions.

The fauna in these beds shows everywhere an enormous vertical and lateral variation in its composition, which is typical of shallow water deposits. Some of the limestones contain large amounts of algae and are of a true reefal nature. Others represent reefal debris, both from the exposed talus and the lagoonal back waters. Remnants of a typical reef limestone are, for instance, the blocks of the Paleocene "Atheocyclina limestone", where flat Larger Foraminifera, algae, mollusks, echinoids and Globigerinas (s.l.) are concentrated in great abundance in separate pockets.