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### SPOT IMAGES FOR CORAL REEF MAPPING IN NEW CALEDONIA. A FRUITFUL APPROACH FOR CLASSIC AND NEW TOPICS.

W. BOUR

Institute Français de la Recherche Scientifique  
pour le Développement en Coopération.  
Centre ORSTOM de Noumea.  
B.P. A 5 NOUMEA New Caledonia.

#### ABSTRACT

High-resolution images produced by the French SPOT satellite can, after processing of the remote-sensed data, provide a most useful tool for assessing and managing the living coral reef resources. This was already demonstrated in New Caledonia through simulated SPOT data.

The following step described in this paper is the processing of real SPOT images for the same scope but extended to great areas of New Caledonian lagoon. LATICAL, a multi-purpose remote sensing laboratory, was set up in March 1988 at ORSTOM Centre of Noumea. The image processing package TEIS was used to classify the pixels of the barrier reef in front of the Baie de St. Vincent. In particular, the Tetembia reef, exploited for trochus and living corals, was processed to cartography the different biotope of these resources and the surface areas.

Although SPOT spectral bands are designed for terrestrial observations, they can be processed for water depth mapping. In order to find the depth penetration range of SC 1 channel, a topographic map of the lagoon grounds nearby Tetembia reef was performed. Some features, located in the 25-30 m range, could be detected with clear water condition.

Remote sensing cannot completely replace field sampling, but helps minimise the need for costly reef survey stations. SPOT thus offers a new approach to the interpretation of bionomic and topographic features of reef environments.

#### INTRODUCTION

The coral reefs of the South-West Pacific, including the Australian Great Barrier Reef and the ring of reefs surrounding New Caledonia, have

environment likely to contain an economically valuable gastropod, trochus (*Trochus niloticus*). This study used data from a SPOT simulation campaign conducted in New Caledonia in 1983. The simulated SPOT data were acquired by radiometric methods using an airborne "Daedalus" radiometer. Resolution was equivalent to that of SPOT, but the ground area analysed was much smaller.

SPOT was launched in 1986, and it thus became possible to acquire the scene comprising the area surveyed by simulation. Then, in 1988, a remote sensing laboratory (LATICAL) was set up at the ORSTOM Centre in Noumea. By bringing the image processing facility much closer to the study area it has enabled mapping to be completed for the whole of Tetembia reef, only a small part of which had been mapped at the time of the simulation.

Tetembia reef is a section of the barrier reef which surrounds the main island of New Caledonia (Figure 1). It lies opposite St. Vincent's Bay, not far from Noumea. It is 20 km long and forms a bionomic entity between two lagoon passes. This reef was chosen for study because it is the only one where extraction of faviid corals is authorised for the handicraft and tourist trade. Faviidae corals are very slow-growing (Joannot and Bour, 1988) and it is therefore most important, for proper management, to know the biomasse of the exploitable fraction of the stock.

Like many new Caledonian reefs, Tetembia has an outer reef flat that is very suitable for trochus, a gastropod (*Trochus niloticus*) which is exploited for its nacreous shell. Hundreds of tonnes of trochus shells are exported from New Caledonia each year, to Europe and Asia. Here again, thematic mapping enabled the trochus habitat to be identified and its surface area to be estimated. Trochus density was then found by ground sampling at representative stations and multiplication of total habitat area by average density gave a good

The thematic map of Tetembia reef consists of supervised classification on the XS1 and XS2 SPOT channels. A bi-dimensional histogram of all the pixels of the reef displays a "boomerang" structure, which was already observed in the study using the simulated data (Bour et al., 1986). This structure results from decorrelation of XS1 and XS2 caused by differential penetration through the water layers covering the reef; absorption of the red channel XS2 increases (in other words, reflectance decreases) very rapidly with depth. This fact has another, less useful, consequence in that it hinders classification of these two depths.

The ball-shaped corals of the faviidae family are exploited by local companies for manufacture of decorative objects that are brought by tourists. A recent study (Joannot and Bour, 1988) found faviid corals to be very slow-growing: their diameter increases by only about 2 cm a year. For proper management of faviid stocks, it is therefore essential to know the biomass available.

The themes identifying environments suitable of Faviidae are:

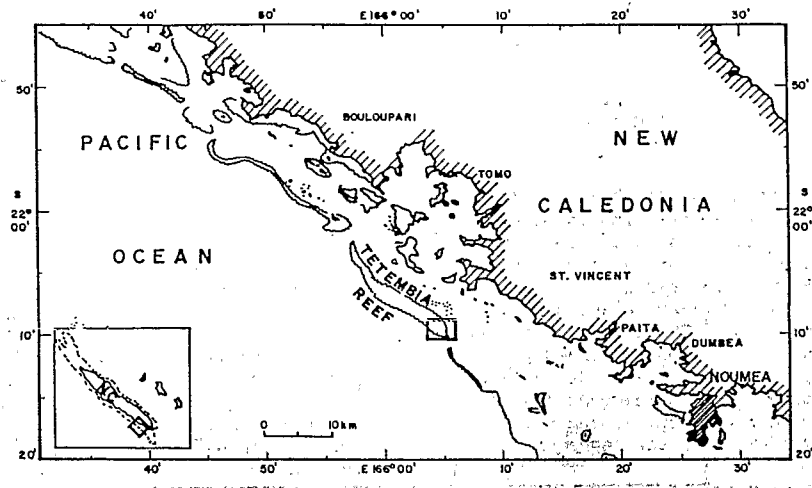


Figure 1: Carte de situation  
Location map

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THEME 1

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THEME 2

