

# BATHYMETRY AND SURVEY

---

15

## Great Barrier Reef Aerial Photography

**PERIOD:** 1977  
**ORGANIZATIONS:** GBRMPA  
James Cook University, Geography Department  
Australian Institute of Marine Science

**PROJECT OFFICER:** Mr G. Hawley  
**FINANCIAL SUPPORT:** GBRMPA - \$350. Matching funds by AIMS and ARGC

### OBJECTIVES

To complete the aerial photographic coverage of the reef in the Townsville to Mackay region.

### IMPLICATIONS/MANAGEMENT NEEDS

This survey will enable a useful photographic coverage to be obtained, for a relatively small cost. This photographic coverage can be used to update maps of the area.

### STATUS

The project has been completed.

Eight hours aerial photography of reef using water penetrating film was undertaken. Colour photographic coverage of reefs between Townsville and Mackay was completed.

**LOCALITY:** Great Barrier Reef between Townsville and Mackay

---

**Map of Cairns Reefs. Reef and Island Classification Map at a Scale of 1:300,000. Latitudes 14°S to 17°S as per Admiralty Chart 2344.**

**PERIOD:** Jan 1978 - May 1978

**ORGANIZATION:** James Cook University, Geography Department

**PROJECT LEADER:** Mr N. Harvey

**PROJECT OFFICER:** Mr G. Hawley

**SUPERVISOR:** Mr R. Kenchington

**FINANCIAL SUPPORT:** GBRMPA - \$1,500

**OBJECTIVES**

To classify reefs and islands in the specified area and compile the map using the detail obtained from aerial photography. To present a map with increased resolution of reef shapes (i.e. greater resolution than Admiralty or Reconnaissance maps) including an original geomorphological classification of reefs and islands; and a comprehensive reef and island nomenclature.

**IMPLICATIONS/MANAGEMENT NEEDS**

This project was designed to develop working maps relating to the Cairns area to be researched in preparation for declaration and zoning. It also enabled the Authority to provide geomorphological maps to research institutions and to the general public.

**METHODOLOGY**

Using Admiralty Chart 2744 as a basis and available reference data (the most recent rectified satellite imagery, aerial photography, the Reconnaissance map series and field data) a reef and island map of the area 14°S to 17°S was produced. In addition, all reefs and islands etc. were "classified" geomorphologically and the classification listed and discussed as a separate report.

**STATUS**

The project has been completed.

The map of Cairns reefs and a report were prepared for and accepted by GBRMPA.

**LOCALITY:** Cairns Section

## Assessment of Aerial Photographs and LANDSAT Imagery for Coral Reef Data Collection

**PERIOD:** 1979 - Dec 1983

**ORGANIZATION:** James Cook University, Geography Department

**PROJECT LEADER:** Ms D. Kuchler

**CONSULTATION AND LIAISON:** Dr D. Jupp, CSIRO, Division of Land and Water Resources  
Dr A. Hobbs, Jet Propulsion Lab, Pasadena, California  
Dr R. Bina, Natural Resources Management Centre, Philippines

**PROJECT OFFICER:** Mr J. O'Dwyer, Mr D. van Claasen

**SUPERVISORS:** Assoc Prof. D. Hopley and Dr D. Jupp

**FINANCIAL SUPPORT:** GBRMPA - \$21,590; Augmentative Research Grants: \$1,184

### OBJECTIVES

To test the accuracy of LANDSAT imagery and colour aerial photographs for recording inventory and monitoring data on coral reefs.

### IMPLICATIONS/MANAGEMENT NEEDS

The Authority needs an efficient and economically viable means of acquiring up-to-date information on conditions of the Great Barrier Reef at any point in time. Collection of data by remote sensing on periodic overflights has been proposed as an alternative to ground data collection. This project is designed to provide basic facts about remotely sensed data (quality, quantity, cost) and to answer the following questions: What are the costs of using the competing data collection systems? Will all of GBRMPA's information needs be met by aerial photographs and LANDSAT imagery? If not, what part will be met and is it worth the effort?

### METHODOLOGY

Use of the various inventory and resource-matrix analysis options in the Barrier Reef Image ANalysis (BRIAN) Software Package (see Project 18) resulted in a cross-tabulation relationship between interpreted aerial photographs and interpreted LANDSAT imagery and ground data.

Use of multiple acquisitions of LANDSAT imagery and aerial photographs together with the Layered or Multiple Image and Digital Change Detection (e.g. ratio and difference images) Techniques available in the BRIAN Software Package will result in an assessment of the capability of these remote sensing techniques for identifying and locating changes in the coral reef environment. A distinction will be made between the ability of LANDSAT and aerial photographs as monitoring techniques to realize that a change in the recorded data has taken place and the interpreter's ability to decide from the imagery what the change means in terms of reef cover.

### STATUS

Ground data collection from Green Island, Heron Island, Williamson and Ribbon No.5 reefs has been completed. The accuracy of LANDSAT imagery and color aerial photographs for recording inventory data on coral reefs has been completed. A study testing the monitoring ability of these remote sensing techniques commenced in October 1982.

The following reports have been published:

Kuchler, D.A. Submitted. Geomorphological nomenclature: reef cover and zonation, Great Barrier Reef, Australia. GBRMPA - Technical Memorandum.

Kuchler, D.A. Submitted. Classification system: reef cover and zonation, for use with remotely sensed data, Great Barrier Reef, Australia. GBRMPA - Technical Memorandum.

Jupp, D.L., Mayo, K.K., Kuchler, D., Heggen, S.J., and Kendall, S.W. In press. Remote Sensing by Landsat as Support for Management of the Great Barrier Reef. LANDSAT 81. Proceedings of the Second Australasian Remote Sensing Conference, Canberra, September 1981.

Jupp, D.L., Mayo, K.K., Kuchler, D., Heggen, S.J., and Kendall, S.W. In press. The BRIAN Method for Large Area Inventory and Monitoring. LANDSAT 81. Proceedings of the Second Australasian Remote Sensing Conference, Canberra, September 1981.

---

Jupp, D.L., Mayo, K.K., Kuchler, D.A., Heggen, S.J., and Kendall, S.W. In prep.  
Landsat Based Multidate Information System for the Cairns Section of the Great Barrier Reef Marine Park. Report 1:  
Image Base and Index System. CSIRO, Technical Report, Canberra, Australia.

Jupp, D.L., Mayo, K.K., Kuchler, D.A., Heggen, S.J., and Kendall, S.W. In prep.  
An Interpretation and Mapping of Landsat Satellite Data: Southern Part of the Cairns Section of the Great Barrier  
Reef Marine Park, Australia. CSIRO, Technical Report, Canberra, Australia.

Jupp, D.L., Mayo, K.K., Kuchler, D.A., Heggen, S.J., and Kendall, S.W. In prep.  
An Interpretation and Mapping of Landsat Satellite Data: Central Part, Cairns Section, Great Barrier Reef Marine  
Park, Australia. CSIRO, Technical Report, Canberra, Australia.

LOCALITY: Capricornia Section - Heron Island;  
Cairns Section - Green Island, Williamson and Ribbon No. 5 reefs.

---

**BRIAN (Barrier Reef Image Analysis) and Experienced Reef Interpreters****PERIOD:** June 1981 - October 1982**ORGANIZATION:** CSIRO, Division of Land Use Research**PROJECT LEADER:** Dr D. Jupp**CONSULTATION & LIAISON:** GBRMPAAustralian Institute of Marine Science  
James Cook University**PROJECT OFFICER:** Mr J. O'Dwyer; Mr. D. van Claasen**SUPERVISOR:** Mr R. Kenchington**FINANCIAL SUPPORT:** GBRMPA - \$1,900**OBJECTIVES**

To refine a computer program to analyse LANDSAT imagery of reefs (BRIAN).

**IMPLICATIONS/MANAGEMENT NEEDS**

This project will ensure that training sets are generated by interaction of experts with knowledge of reef areas of primary interest to the Authority. It will also ensure that classificatory phenomena generated via BRIAN are subjected to discussion within the Authority prior to succeeding training visits.

**METHODOLOGY**

Reef experts will apply their detailed knowledge of specific reef areas to assist in interpretation of the satellite imagery.

During 1981 three skilled observers worked on three occasions with Dr Jupp and team on LANDSAT imagery in an iterative process of refining training sets.

**STATUS**

The current stage of the methodology has been realised as the BRIAN-I package. This set of programs is being fixed and documented as a stable package. The advanced options under development, and future research findings, are to be written into a separate BRIAN-II system. Part-I of the "BRIAN Handbook" (introduction, description and methodology) has been completed, and Part II (step by step guide to using the program) is being written.

The BRIAN system has been described in the paper:

Jupp, D.L., Mayo, K.K., Kuchler, D., Heggen, S.J., and Kendall, S.W. 1981. The BRIAN Method for Large Area Inventory and Monitoring. LANDSAT 81. Proceedings of the Second Australian Remote Sensing Conference, Canberra, September 1981.

A second paper was presented at the Conference:

Jupp, D.L., Mayo, K.K., Kuchler, D., Heggen, S.J., and Kendall, S.W. 1981. Remote Sensing by Landsat as Support for Management of the Great Barrier Reef. LANDSAT 81. Proceedings of the Second Australian Remote Sensing Conference, Canberra, September 1981.

Final report to GBRMPA is being prepared.

---

**BRIAN Extension Exercise on the Great Barrier Reef****PERIOD:** July 1981 - October 1982**ORGANIZATION:** CSIRO, Division of Land Use Research**PROJECT LEADER:** Dr D. Jupp**PROJECT OFFICER:** Mr J. O'Dwyer; Mr. D. van Claasen**SUPERVISOR:** Mr R. Kenchington**FINANCIAL SUPPORT:** GBRMPA - \$12,000**OBJECTIVES**

To apply the computer program, BRIAN, to: (1) the northern reefs between Lizard Island and Cairns; and (2) the Capricorn-Bunker Group, to produce colour-write products for both areas showing LANDSAT classes mapped over raw data.

**IMPLICATIONS/MANAGEMENT NEEDS**

This project will provide an inventory of LANDSAT classes for the Cairns Section which may be used in the preparation of a zoning plan. It will also provide pre-survey stratification and design constraints for interpretive activities concerned with the marine park.

**METHODOLOGY**

The training sets developed in the previous BRIAN project (18) will be applied to the reefs of the Cairns-Lizard Island area and the Capricorn-Bunker Group. The knowledge of reef experts will again be used to analyse the results obtained from the application of the training sets.

**STATUS**

The inventory of the two Sections of the Park has been completed.

Final report to GBRMPA is being prepared.

LOCALITY: Cairns Section, Capricornia Section

---

## Reef and Island Classification Map and Gazetteer

**PERIOD:** March 1982 - Dec.1982

**ORGANIZATION:** James Cook University, Geography Department

**PROJECT LEADER:** Professor J. Oliver

**PROJECT OFFICER:** Dr J. Dunn

**SUPERVISOR:** Mr R. Kenchington

**FINANCIAL SUPPORT:** GBRMPA - \$9,765 (Stage I)

### OBJECTIVES

To provide a series of maps at a uniform scale of 1:250,000 showing location, the shape and morphology and other specified characteristics of reefs and islands within the Great Barrier Reef Region, and a gazetteer of reefs. (Stage 1: three maps; Stage 2: two maps and gazetteer)

### IMPLICATIONS/MANAGEMENT NEEDS

These maps would show greater resolution of reef shapes, location and orientation, and an up-to-date classification of reefs and islands that is not available on any existing series of maps or charts, and provide an aid for declaration, zoning, management, and information/education.

### METHODOLOGY

Dyeline transparencies of reef and island classification maps will be prepared using as reference data the most recent rectified satellite imagery, photographs, Commonwealth reconnaissance maps, Queensland cadastral maps (for fringing reefs), photography by the Beach Protection Authority, charts and field data.

### STATUS

Maps of the Cairns Section, Pompeys to Lady Elliott Island and Dunk Island to Whitsundays have been produced with complete cartographic presentation of reefs, showing morphological zones, islands, reef names etc. Two additional maps (Whitsundays to Swain Reefs) and (Cape York to Cape Melville) and gazetteer remain to be produced (Stage II).

Maps received and under consideration.

---

## **Inkjet Maps for the Cairns and Cormorant Pass Sections of the Great Barrier Reef Marine Park**

**PERIOD:** Dec 1981 - Feb 1982

**ORGANIZATION:** CSIRO, Division of Land Use Research

**PROJECT LEADER:** Dr D. Jupp

**PROJECT OFFICER:** Mr J. O'Dwyer

**SUPERVISOR:** Mr R. Kenchington

**FINANCIAL SUPPORT:** GBRMPA - \$2,000

### **OBJECTIVES**

To provide ink-jet maps of the Cairns and Cormorant Pass Sections.

### **IMPLICATIONS/MANAGEMENT NEEDS**

This project is designed to provide a cheap and readily available data base for future broad scale monitoring of reef changes in the Sections. It will update the Authority's knowledge on the reefs in the Cairns Section. It will provide a visual map for public displays. It could also be the basis for extension to whole Reef Region thus providing a Region-wide monitoring base.

### **METHODOLOGY**

Classification results from the Landsat projects are produced in good hard-copy cheaply using the Applicon ink-jet plotter. A set of routines produces Landsat images, with or without classes and themes painted over them, at scales of 1:93,000 and 1:46,500. This process also produces a library of rectified tapes which would be useful for future reference.

### **STATUS**

The project has been completed.

Maps have been supplied to GBRMPA. They are at an approximate scale of 1:160,000 which makes them roughly comparable to the AUS Hydrographic Charts series. They are not directly comparable as the charts are on a graticule base, whereas the inkjet plots are a planimetric projection. The maps are rectified to enable locations to be identified.

The data tapes are currently being held by CSIRO in their tape library.

**LOCALITY:** Cairns Section, Cormorant Pass Section



---

## Remote Sensing Workshop

**PERIOD:** May 1982

**ORGANIZATION:** GBRMPA

**PROJECT LEADER:** Mr R. Kenchington

**SUPERVISOR:** Mr R. Kenchington

**FINANCIAL SUPPORT:** GBRMPA:\$3,500

### OBJECTIVES

To assess the current state of the art of remote sensing for management of the Great Barrier Reef Marine Park and to indicate future directions for research.

### IMPLICATIONS/MANAGEMENT NEEDS

Research on the application of Landsat images is intended to benefit users of the Reef by making available more accurate information which will improve safety, increase understanding of the resource potential of the Reef, assist in reef monitoring, and assist in the Authority's long term function of conserving the Great Barrier Reef as a living resource.

### METHODOLOGY

A Workshop was held at James Cook University from 5 to 7 May, 1982. More than 50 experts from overseas and interstate in the field of remote sensing via satellite attended.

A number of "state of the art" papers were presented, followed by workshop discussion sessions to consider future research needs.

### STATUS

The papers presented to the workshop have been accepted by the Authority and will be published in the GBRMPA Workshop Series.

Remote sensing by satellite and aerial techniques offers a means of resource assessment and study of the Great Barrier Reef Region on a range of scales which cannot be otherwise achieved without unacceptable levels of expenditure and manpower. Therefore, the establishment and maintenance of the ability to make use of the benefits of remote sensing techniques should be a matter of priority for the Great Barrier Reef Marine Park Authority. To this end, ten specific recommendations have been made.

Great Barrier Reef Marine Park Authority. In prep. Report of Remote Sensing Workshop, Townsville, May 5-7, 1982.

