MARINE MANAGEMENT SUPPORT:
OCEANIC SHOALS

ESTABLISHMENT OF AN OCEANOGRAPHIC MONITORING NETWORK IN MARINE RESERVES: STAGE 1.

TEMPERATURE MONITORING IN ROWLEY SHOALS MARINE PARK (December 2000)

Field Programme Report: MMS/OSS/RSMP – 34/2001

A collaborative project between CALM Marine Conservation Branch,
and CALM West Kimberley District Office.

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Direction

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- Dr Chris Simpson - Manager, Marine Conservation Branch (MCB), Nature Conservation Division.

CALM Collaboration

- Chris Done – Manager, Kimberley Region.
- Allen Grosse – Manager, West Kimberley District.
- Mike Lapwood – Marine Operations Officer, West Kimberley District.

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Copies of this report may be obtained from:

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SUMMARY

This report presents the details of fieldwork recently undertaken (2nd and 4th December 2000) comprising the deployment of water temperature loggers in Rowley Shoals Marine Park and Mermaid Reef Marine National Nature Reserve.

This project is being coordinated by the Marine Conservation Branch (MCB) of the Department of Conservation and Land Management (CALM) and conducted in collaboration with CALM's West Kimberley District office, Broome.

The objective of this project is to collect water temperature data over long time scales, as relevant to management of the Rowley Shoals Marine Park. This comprises part of the development of a statewide ocean temperature monitoring capacity in Western Australia's marine conservation reserves, required by CALM for the characterisation and modelling of key ecological processes and for the on-going management of these areas.

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1 INTRODUCTION

1.1 GENERAL BACKGROUND

This field program report presents the details of fieldwork that was carried out in Rowley Shoals Marine Park and Mermaid Reef Marine National Nature Reserve on 2nd and 4th December 2000. The fieldwork comprised the preparation and deployment of temperature-monitoring equipment in these marine parks, as part of the MCB project titled: *Establishment of an oceanographic monitoring network in marine reserves: Stage 1*.

Deployments were conducted from the commercial charter vessel Kingfisher III. As part of CALM license conditions, this charter operation provides CALM staff with regular places onboard the vessel during charter tours to the Rowley Shoals. This provides CALM with opportunities to conduct marine activities related to management of the marine park, such as education, public participation, surveillance, enforcement, research and monitoring. One such opportunity arose during 2nd to 4th December 2000 as part of the final tour of the summer 2000/2001 charter season. During this time temperature loggers were deployed in the lagoonal area of Clerke Reef (Rowley Shoals Marine Park) and, opportunistically, in the lagoon of the Commonwealth's Mermaid Reef Marine National Nature Reserve.

This project was implemented as a contribution to the establishment of a statewide monitoring network for physical oceanographic management-related data in marine conservation reserves, required by CALM for the charecterisation and modelling of key ecological processes, as a contribution to the ongoing management needs of marine protected areas.

1.2 STUDY AREA

The study area for this fieldwork comprised the lagoonal areas of Clerke Reef, Rowley Shoals Marine Park, and Mermaid Reef, Mermaid Reef Marine National Nature Reserve (Figure 1).

1.3 OBJECTIVES

The objective of the fieldwork was:

- To establish new monitoring sites at Rowley Shoals Marine Park for the long-term collection of water temperature data.

2 METHODS

2.1 SITE SELECTION

One site at Mermaid Reef (Figure 2 and 3) and one site at Clerke Reef (Figure 4 and 5) were selected as the monitoring sites for the placement of temperature loggers. Location details of the temperature loggers are presented in Table 1.

The sites were established in the lagoons to ensure that: (i) extremes in water temperature could be monitored, and; (ii) the temperature characteristics of data from within the lagoons could later be compared and correlated with sea-surface temperature (SST) data collected by satellite-based SST sensors. The charter vessel used during the field survey only visited Clerke and Mermaid Reefs, hence only two sites were established within the lagoons of these two reefs.

Table 1: Reference details for temperature loggers deployed in Rowley Shoals Marine Park and Mermaid Reef Marine National Nature Reserve.

Site name (description of site)	Activity*	Date and time	Serial number(s)	Latitude**	Longitude**	Water depth (m) at time of deploy-ment	Position of logger in water column*
Clerke Lagoon	Deployment of one logger onto the Kingfisher mooring.	02/12/00, 1610 hrs.	299261/2199	17.27916	119.36395	11m	1m from seabed.
Clerke Lagoon	Deployment of one logger onto the Kingfisher mooring.	02/12/00, 1615 hrs.	304273/2199	17.27916	119.36395	11m	1m beneath surface float.
Mermaid Lagoon	Deployment of one logger onto a newly constructed mooring.	04/12/00, 1610 hrs.	298514/2199	17.06562	119.6239	12m	1m from seabed.
Mermaid Lagoon	Deployment of one logger onto a newly constructed mooring.	04/12/00, 1615 hrs.	304286/2199	14.06562	119.6239	12m	1m beneath sub-surface float.

* For more details on how the loggers were deployed and the position of the loggers in the water column see section 2.2.
** Latitude and Longitude are presented in decimal degrees. The datum was WGS 84 and the accuracy of the readings is ± 10m.

2.2 SAMPLING METHODS

StowAway Tidbit temperature loggers (Onset Computer Corporation; www.onset.com) were deployed at Clerke Reef and Mermaid Reef. These loggers collect time-series data of water temperature variation at pre-specified time intervals. For these initial deployments, the Marine Conservation Branch (MCB) assumed responsibility for pre-deployment activities, which included logger calibration (Section 2.3) and initialisation. The MCB will also coordinate initial downloading and data processing of retrieved data. The loggers were set to record instantaneous temperature data at 30 minute intervals. Operational aspects in relation to deployment and retrieval were coordinated and implemented by CALM's West Kimberley District office, Broome.

At Clerke Reef the loggers were attached to the 'Kingfisher III' mooring line. One logger was attached 1m from the seabed and the other was attached 1m beneath the surface float. The effect of tidal change is such that the position (in the water column) of the bottom logger may vary with the tide, whereas the position of the top logger will remain constant (1m under the surface). The loggers were attached using stainless steel wire and a plastic electrical tie, which was completely wrapped (entire logger and rope 100mm either side of the logger) with 'gaffa' electrical tape.

At Mermaid Reef a mooring was constructed using approximately 10m of 7mm thick rope, which was buoyed by a 4in sub-surface float and anchored by a danforth anchor and chain. The loggers were attached in the same way as at Clerke Reef i.e. using stainless steel wire, plastic electrical ties and 'gaffa' electrical tape. One logger was attached 1m from the seabed and the other was attached 1m beneath the sub-surface float. The effect of tidal change is such that the position (in the water column) of the bottom logger will remain constant (1m from seabed), whereas the position of the top logger may vary with the tide.

Note that advice from the manufacturer indicates that loggers immersed in water for a continuous period of 6 weeks or more at temperatures above 30°C have a susceptibility to temperature drift. The only way to avoid this would be to waterproof the loggers by, for example, deploying them within waterproof containers. However, the absence of suitable containers (in respect of thermal lag response times between the outside water and inner air of the container) resulted in deployment without the protection of waterproof containers in this instance. The data will be appropriately scrutinised for the possibility of excessive temperature effects during data evaluation and processing.

2.3 CALIBRATION

StowAway Tidbit temperature loggers have an accuracy of ± 0.2°C and must be calibrated against a thermometer, or any other temperature recorder with an accuracy much better than ± 0.2°C, prior to all field deployments. For this deployment, calibration was performed using a scientific mercury thermometer (accuracy of ± 0.05°C). The procedure for calibration was as follows:

i. Temperature loggers were initialised to record instantaneous temperature data at 30 second intervals;
ii. The air temperature was recorded using a mercury thermometer, and the time of each recording was taken down;
iii. The loggers were placed in a bucket of water for approximately 5 minutes and the water temperature was recorded with the mercury thermometer every 1 minute, time of each recording was also taken down;
iv. The loggers were taken out of the water and dried;
v. The air temperature was recorded every 1 minute for approximately 5 minutes, the time of each reading was also recorded;
vi. The information was downloaded from the loggers to ensure that the difference between the logger and thermometer readings was not greater than ± 0.2°C.

This calibration information has been recorded in the appropriate Marine Conservation Branch file and will be included in a data report.

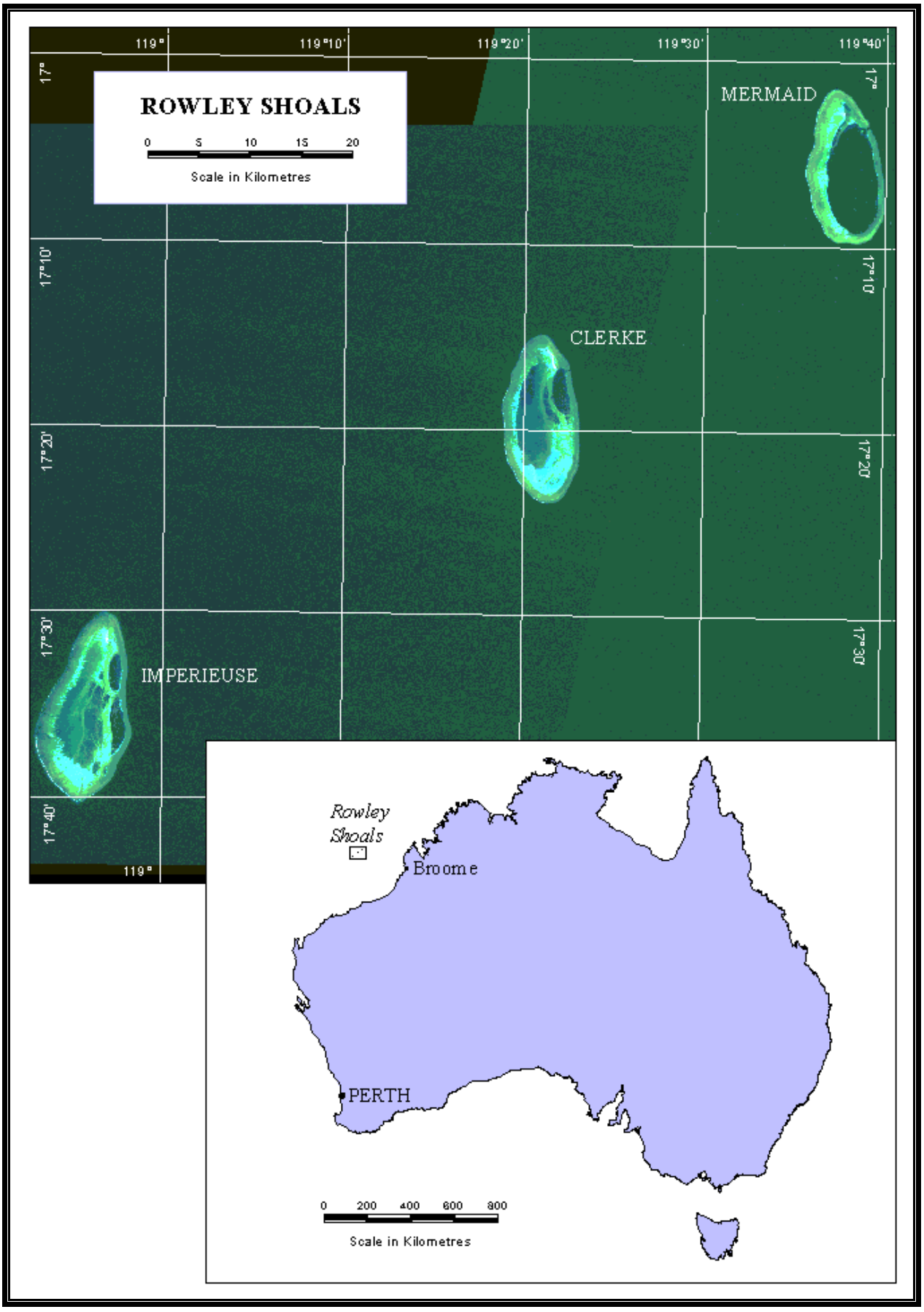

Figure 1: The study area, Rowley Shoals.

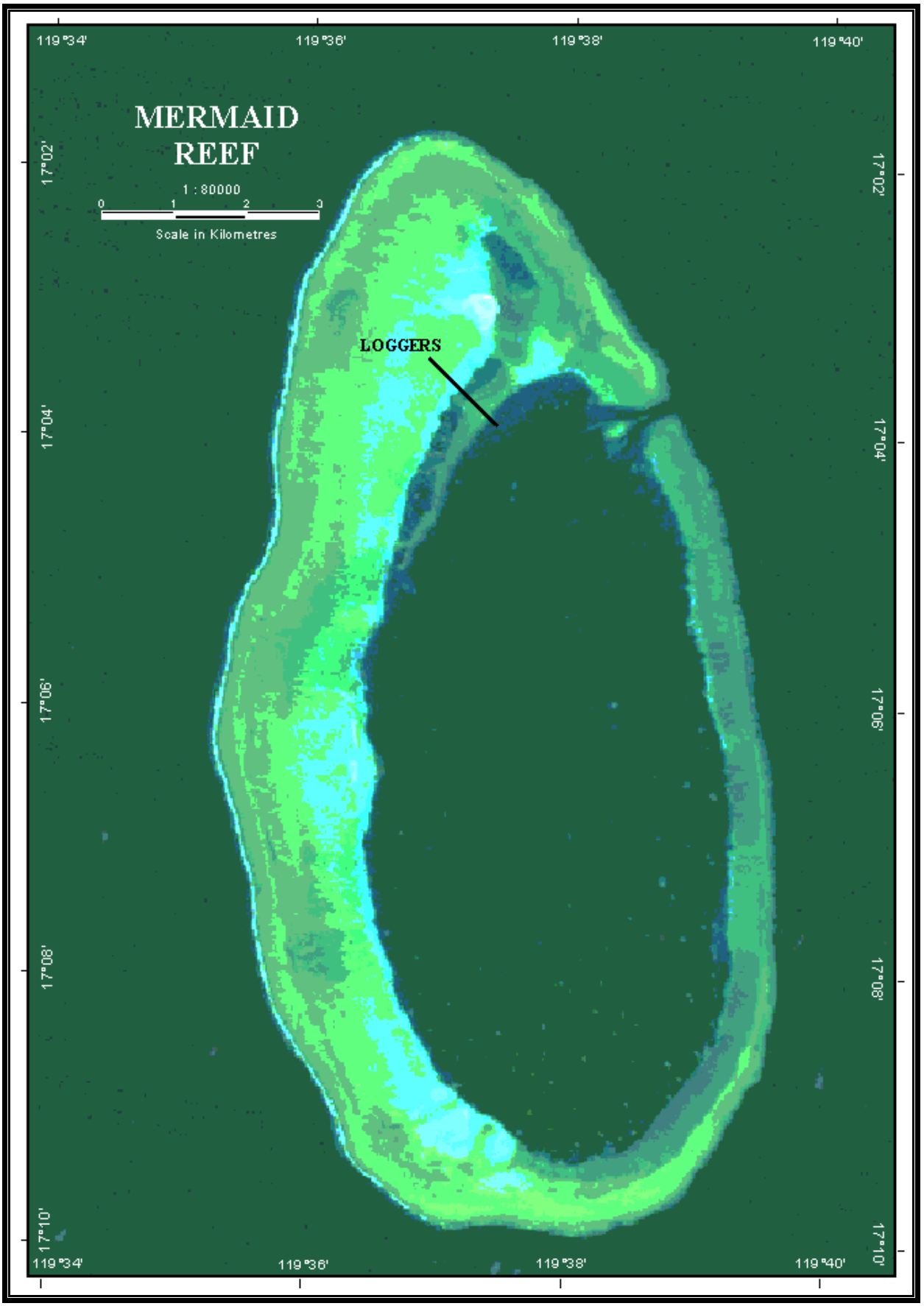

Figure 2: Water temperature monitoring site at Mermaid Reef, Mermaid Reef Marine National Nature Reserve.

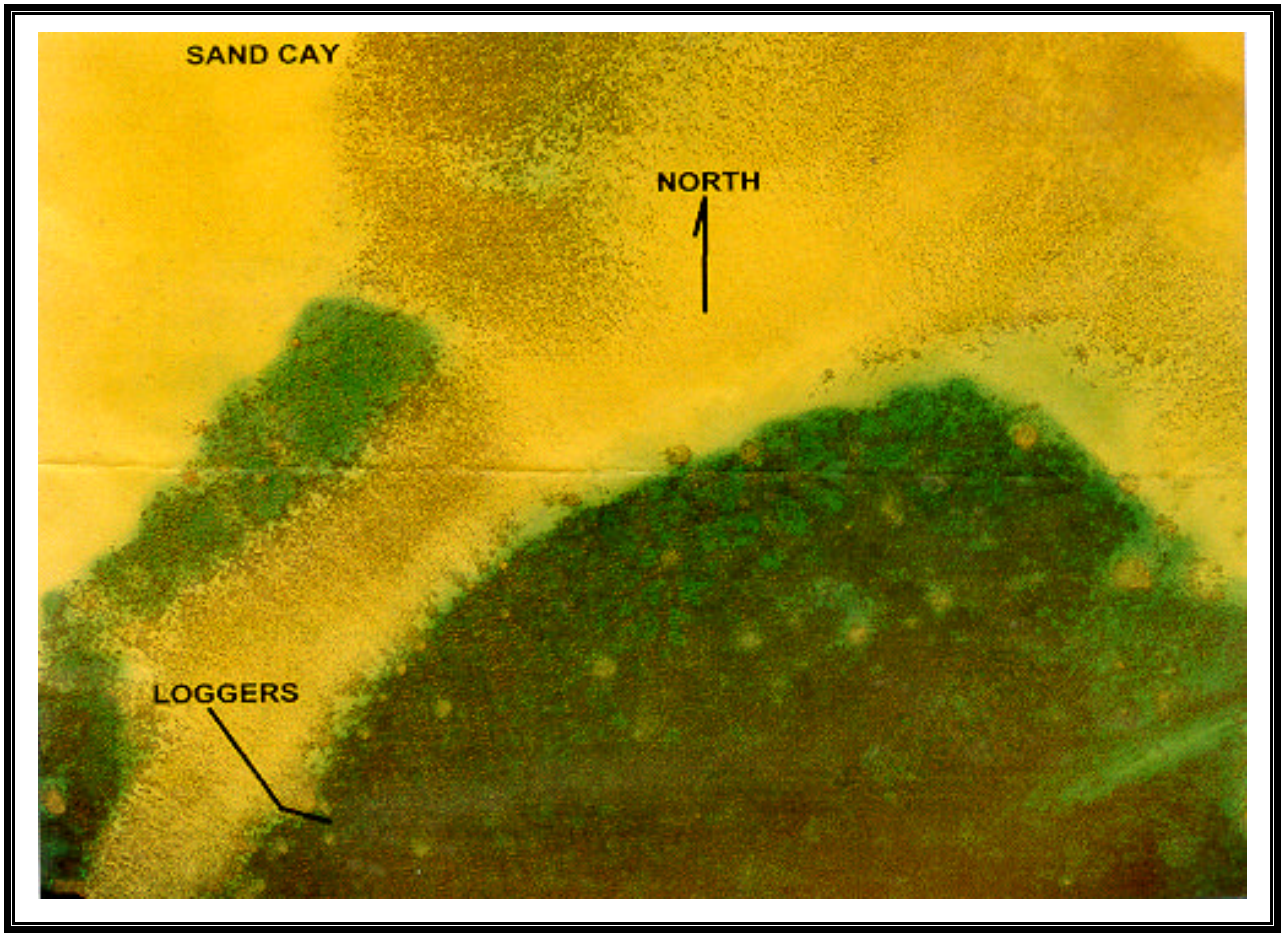

Figure 3: Location of the temperature loggers at Mermaid Reef, Mermaid Reef Marine National Nature Reserve.

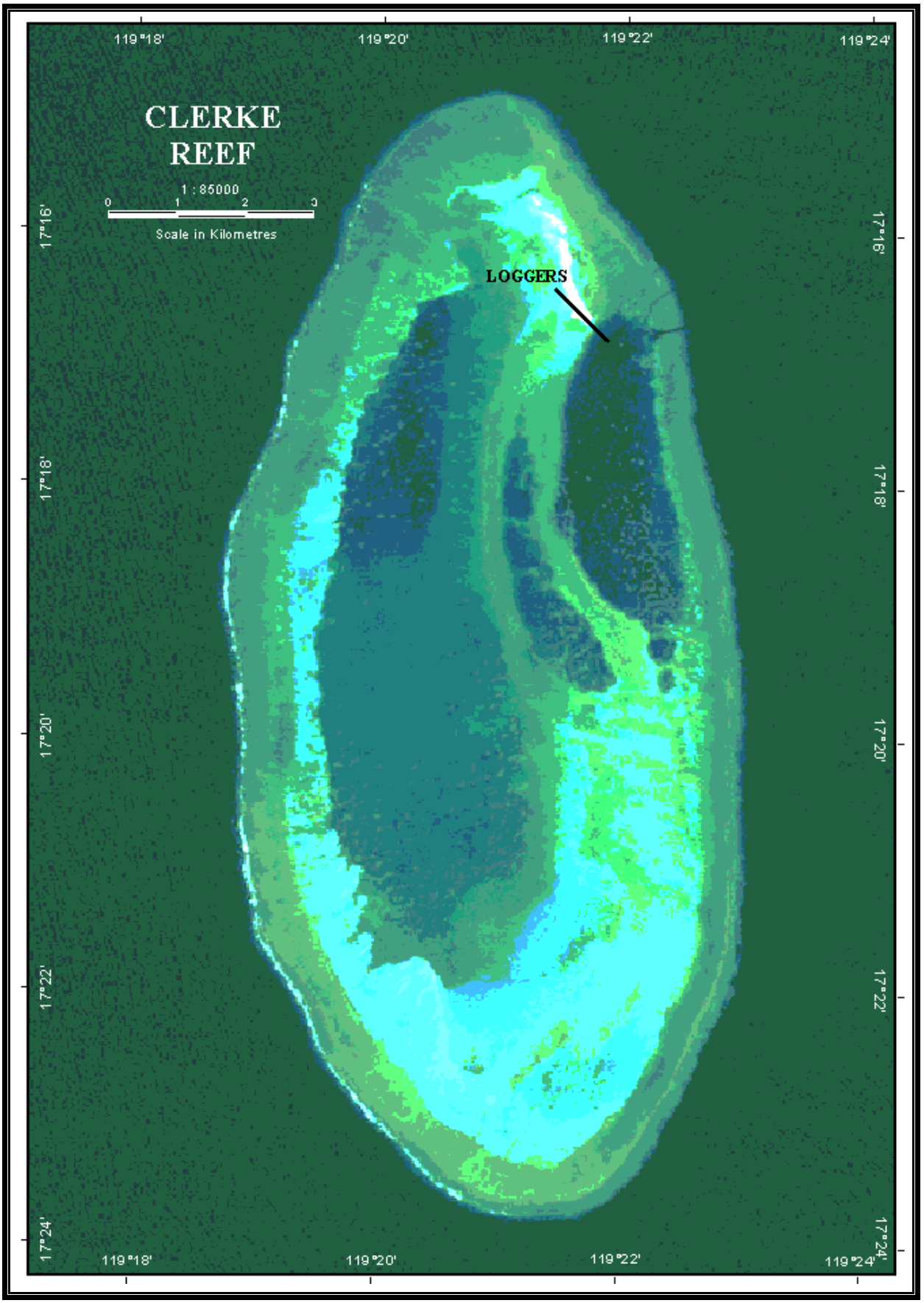

Figure 4: Water temperature monitoring site at Clerke Reef, Rowley Shoals Marine Park.

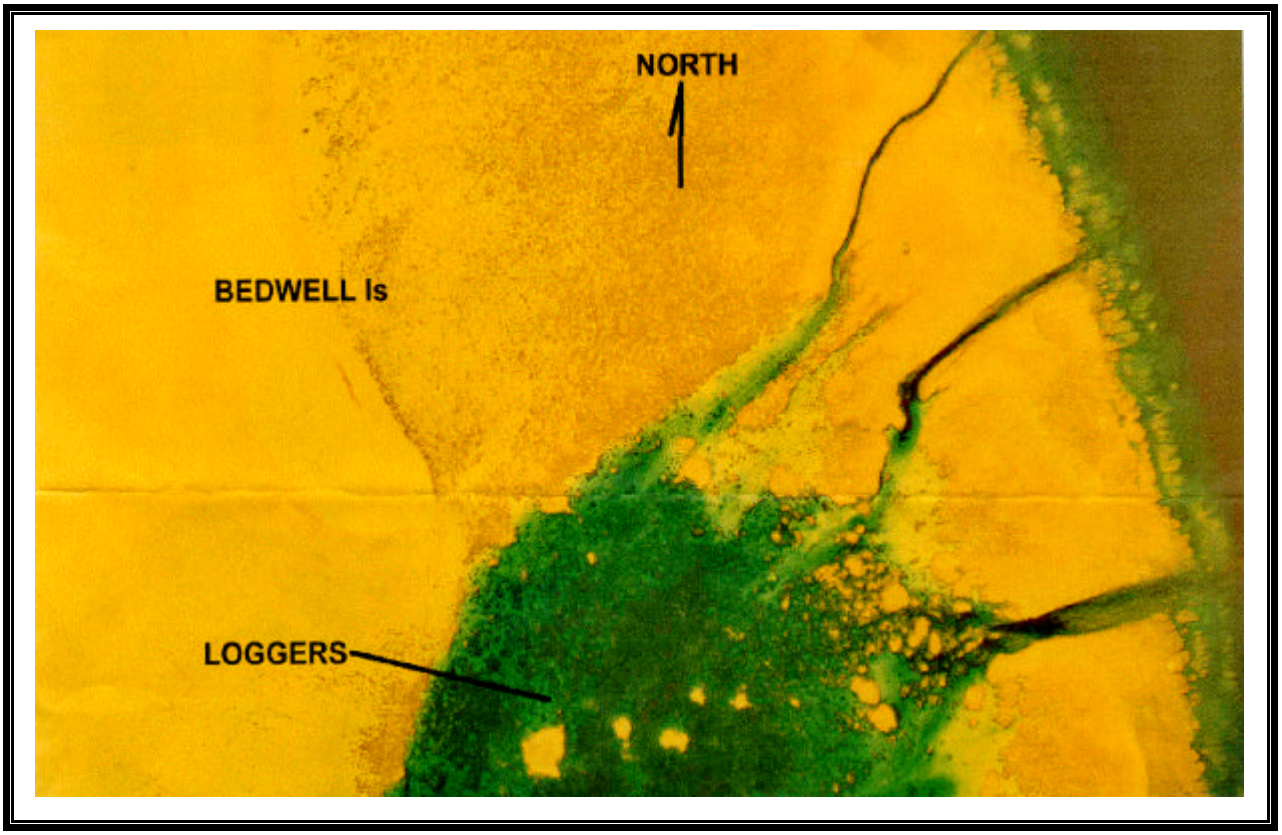

Figure 5: Location of the temperature loggers at Clerke Reef, Rowley Shoals Marine Park.

3 PROJECT MANAGEMENT

3.1 SURVEY VESSEL

Responsibility of the West Kimberley District office.

3.2 SURVEY TEAM

Responsibility of the West Kimberley District office.

3.3 FIELD ITINERARY

Responsibility of the West Kimberley District office.

3.4 SAFETY

Since all field operations for these surveys have and will be conducted by West Kimberley District office staff, all safety aspects will be coordinated by that office under the supervision of the District Manager.

3.5 BUDGET

This project was jointly resourced through core budgets of MCB and West Kimberley District office.

The MCB budget breakdown for the MCB's expenditure for this project is described in Table 2.

Table 2: Budget breakdown for the Rowley Shoals Marine Park temperature monitoring survey.

Budget Item	Description	CALM ($)	Total costs ($)
Travel	N/a		
Vehicles	N/a		
Airfares	N/a		
Accommodation	N/a		
	Sub-total		0
Staff			
Judy Davidson	Preparation for deployments: 4 days	650	650
Nick D'Adamo	Supervision, project management, preparation for deployments: 3 days	1000	1000
	Sub-total	1650	1650
Vessel & other equipment			
Purchase Tidbit loggers and associated equipment	5 loggers @ $200 each plus data retrieval shuttle and associated software ($500)	1500	
	Sub-total	1500	1500
Consumables			
Postage		100	100
Printing, disks etc		100	100
	Sub-total	200	200
Contingency			
General		650	650
	Sub-total	650	650
	TOTAL	**4000**	**4000**

4 DATA MANAGEMENT

4.1 FIELD PROGRAMME REPORT

Hard copies of the Field Programme Report will be held at three locations:

1. Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle Western Australia, 6160.

2. Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026.

3. Archives, Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026.

The Marine Conservation Branch will hold digital copies of this Field Programme Report at three locations:

1. The Marine Conservation Branch Server:
   Shareddat on 'Calm-frem-1'
   [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_3401]

2. MCB Server full backup DAT tape
   [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_3401]

3. CD-ROM [MMS_3401]

4.2 DATA REPORT

Collected raw data will be presented in a data report(s) (to be prepared by the MCB) and held at the same locations as for the Field Program Report. A database of the oceanographic data will be stored digitally at three locations:

1. On MCB server:
   144-mcb gis data on 'Calm-frem-1'
   [L:\MIS\Data\Development\Oceanography\Temperature\Calm]

2. MCB Server full backup DAT tape:
   [L:\MIS\Data\Development\Oceanography\Temperature\Calm]

3. On 3.5" floppy disk stored in the back of the relevant data report.

5 REPORT DISTRIBUTION LIST

Copies of this report will be distributed to:

- Chris Simpson Manger, CALM Marine Conservation Branch.
- Allen Grosse, Manager, CALM West Kimberley District.
- Other relevant marine research organisations.