MARINE MANAGEMENT SUPPORT:
NINGALOO

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

TEMPERATURE MONITORING IN NINGALOO MARINE PARK (July 2000 – January 2001)

Field Programme Report: MMS/NIN/NIN – 32/2001

A collaborative project between CALM Marine Conservation Branch,
and CALM Exmouth District Office

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ACKNOWLEDGEMENTS

Direction

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

CALM Collaboration

- Doug Myers – Manager, Exmouth District.
- Caroline Williams – Marine Conservation Officer, Exmouth District.
- Judy Davidson – Marine Conservation Officer, MCB.

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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 (28 July 2000, 28 December 2000 and 3 January 2001) comprising the deployment, maintenance and retrieval of water temperature loggers in Ningaloo Marine Park.

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 Exmouth District office.

The objective of this project is to collect water temperature data over long time scales, as relevant to management of the Ningaloo 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 field activities relating to the establishment of water temperature monitoring sites in Ningaloo Marine Park on 28 July 2000, 28 December 2000 and 3 January 2001. The fieldwork comprised the preparation, deployment and retrieval of temperature-monitoring equipment in Ningaloo Marine Park, as part of the year 2000/01 MCB project titled: *Establishment of an oceanographic monitoring network in marine reserves: Stage 1*.

This project was initiated to establish a statewide monitoring network for physical oceanographic management-related data in marine conservation reserves, as required by CALM for the characterisation and modelling of key ecological processes, and for the ongoing management needs of marine protected areas. The Ningaloo Marine Park deployment forms a component of Stage 1 of this project.

1.2 STUDY AREA

The study area for this fieldwork is Ningaloo Marine Park, with sites established near Tantabiddi and Coral Bay (Figure 1).

1.3 OBJECTIVES

1.3.1 Field trip of 28 July 2000

The objective of the first field trip was:

- To establish a new temperature monitoring site at Tantabiddi, Ningaloo Marine Park, for the long-term collection of water temperature data.

1.3.2 Field trip of 28 December 2000

The objective of the second field trip was:

- To retrieve the temperature loggers deployed at Tantabiddi during the field trip of 28 July 2000 and replace these with two newly initialized loggers.

1.3.3 Field trip of 3 January 2001

The objective of the third field trip was:

- To establish a new temperature monitoring site in southern Bills Bay (adjacent to the shoreline of the Coral Bay township), Ningaloo Marine Park, for the long-term collection of water temperature data.

2 METHODS

2.1 SITE SELECTION

One site was established at Tantabiddi (Table 1 and Figure 2) and one in Bills Bay (Table 1 and Figure 3). These sites were selected to provide data that characterise the annual temperature extremes of the lagoonal areas north and south of Point Cloates. It is expected that the largest temperature variations in Ningaloo Marine Park will occur within the lagoons. Recent studies suggest that the physical

presence of Point Cloates provides a latitudinal transition in the general features of the oceanic hydrodynamics off Ningaloo Reef (D'Adamo and Simpson, 2001) and this further motivated the positioning of the loggers to the north and south of Point Cloates.

The location details of the temperature loggers are presented in Table 1.

Table 1: Reference details for temperature logger deployment and retrieval in Ningaloo Marine Park.

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
NO1 (Tantabiddi, CALM mooring)	Deployment of two loggers, side by side, at the same position along the mooring.	28/07/00, 1000 hrs.	299272/2199 298878/2199	21.91181	113.97354	Approx. 3m	Approx. 0.3m from bottom
NO1 (Tantabiddi, CALM mooring)	Retrieval of the two loggers from the site.	28/12/00, 1255 hrs.	299272/2199 298878/2199	21.91181	113.97354	Approx. 3m	Approx. 0.3m from bottom
NO1 (Tantabiddi, CALM mooring)	Redeployment of two loggers, side by side, at the same position along the mooring.	28/07/00, 1255 hrs.	30427/2199 299266/2199	21.91181	113.97354	Approx. 3m	Approx. 0.3m from bottom
N48** (Southern Bills Bay)	Deployment of one logger, secured to a star picket by tie-wire, near the bottom, amongst corals.	03/01/01, time not recorded.	304285/2199	23.14127	113.76938	Approx. 3m	Approx. 1m from bottom, logger among corals

* Latitude and Longitude are presented in decimal degrees. They were recorded using a Garmin 12 GPS and the datum was WGS 84. The accuracy of these readings is ± 10m.
** Existing CALM habitat monitoring site (see Cary *et al*., 2000).

2.2 SAMPLING METHODS

StowAway Tidbit temperature loggers (Onset Computer Corporation; www.onset.com) were deployed at sites NO1 (Tantabiddi) and N48 (Bills Bay). These loggers record water temperature 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 Exmouth District office.

At Site NO1, the two loggers were secured to the base of the existing CALM mooring, using plastic electrical ties. This method was used for both the first (28 July 2000) and second (28 December 2000) deployments. At Site N48, a logger was secured using metal wire to a steel star picket encased by PVC piping, which had been previously driven into the ground amongst corals (Cary and Daly, 1999; Cary *et al*., 2000). The logger was positioned near the bottom of the water column. An opportunistic inspection of both sites NO1 and N48 by one of the authors (Judy Davidson) on 20 February 2001 found the loggers and mooring to be fixed securely.

Note that advice from the manufacturer indicates that *StowAway Tidbit* 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 likelihood of temperatures in excess of 30 °C for six weeks or more is however small at these two sites of NMP (D'Adamo and Simpson, 2001). 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, with the time of each recording also noted;
iv. The loggers were taken out of the water and dried;
v. The air temperature was recorded every 1 minute for approximately 5 minutes, with the time of each recording also noted;
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 the data report.

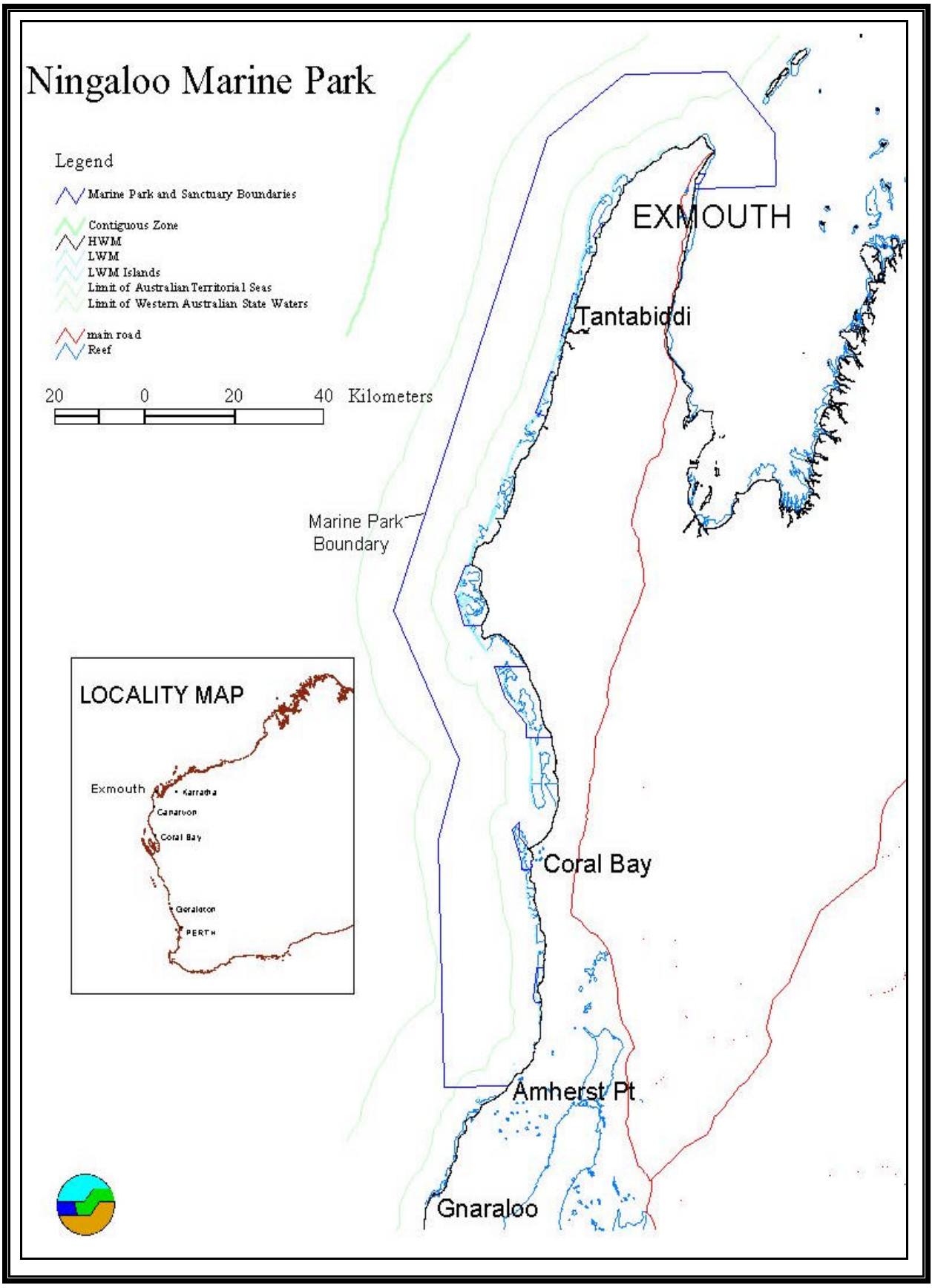

Figure 1: The study area, Ningaloo Marine Park.

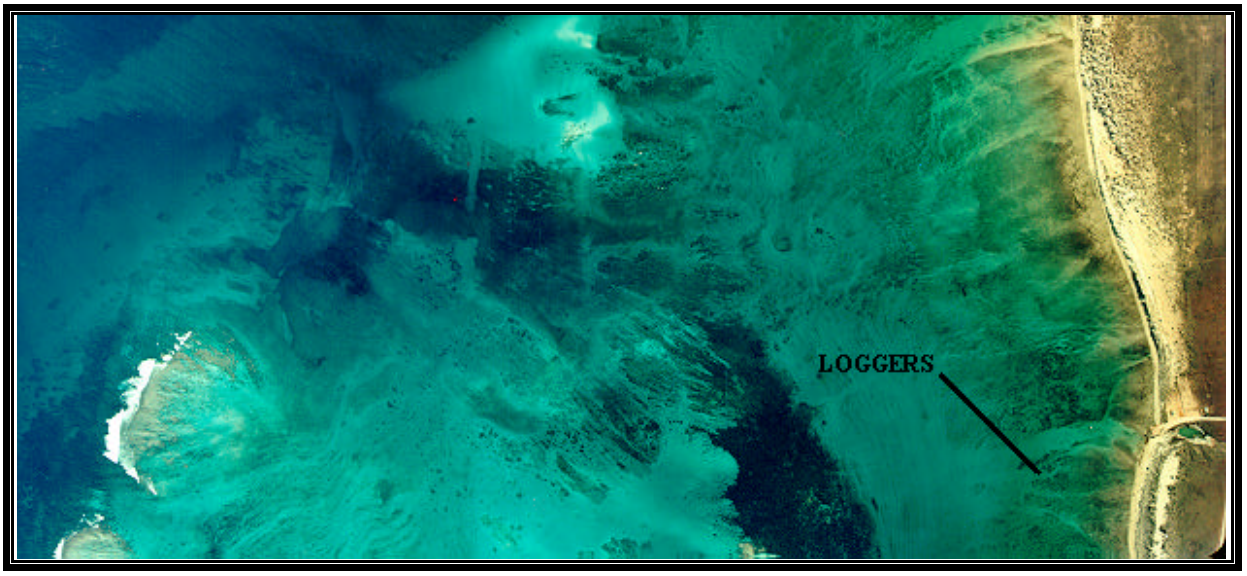

Figure 2: Water temperature monitoring site (NO1) at Tantabiddi, Ningaloo Marine Park.

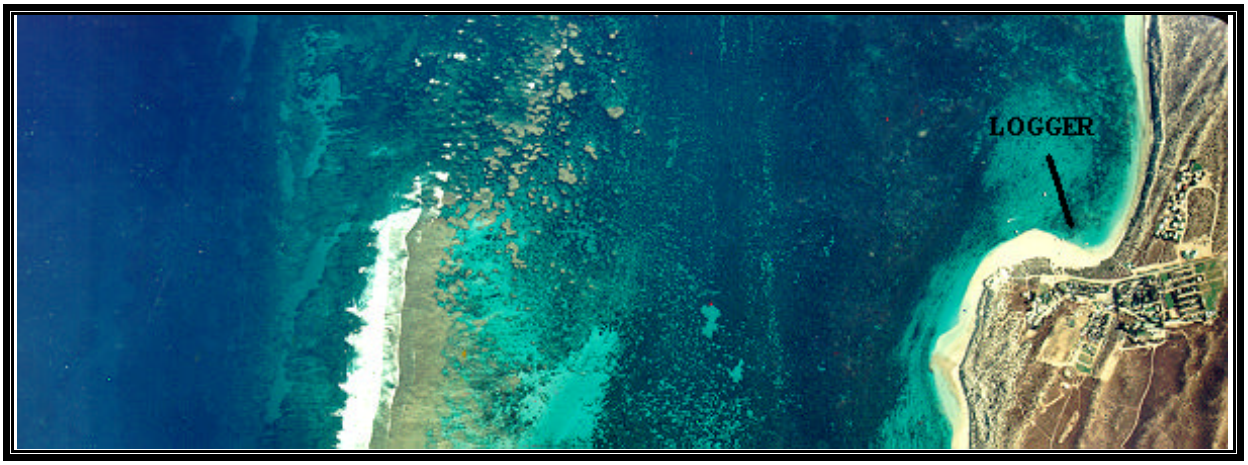

Figure 3: Water temperature monitoring site (N48) at Bills Bay, Ningaloo Marine Park.

3 PROJECT MANAGEMENT

3.1 SURVEY VESSEL

Responsibility of the Exmouth District office.

3.2 SURVEY TEAM

Responsibility of the Exmouth District office.

3.3 FIELD ITINERARY

Responsibility of the Exmouth District office.

3.4 SAFETY

Since all field operations for these surveys were conducted by Exmouth District office staff, all safety aspects for field operations were 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 Exmouth District office.

The MCB budget breakdown for the MCB's expenditure for the project is described in Table 2. Budget details for CALM Exmouth District can be obtained from that office.

Table 2: Budget breakdown for MCB expenses

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	1500
	Sub-total	1500	1500
Consumables			
Postage		100	100
Printing, disks etc		100	100
	Sub-total	200	200
Contingency			
General		650	650
	Sub-total	400	400
	TOTAL	**4000**	**4000**

4 DATA MANAGEMENT

4.1 FIELD PROGRAMME REPORT

Hard copies of this 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_3201]

2. MCB Server full backup DAT tape [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_3201]

3. CD-ROM [MMS_3201]

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 Programme Report. A database of the oceanographic data will be stored digitally at three locations:

1. The 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.
- Doug Myers, Manager, CALM Exmouth District.
- Other relevant marine research organisations.

6 REFERENCES

Cary, J.L. and Daly, T. W. (1999). Marine Management Support Program (Pilbara). Establishment of long-term monitoring sites in Ningaloo marine Park: August 1999. Field Program Report MMSP/PI/NMP-17/1999. (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished Report.

Cary, J. L., Grubba, T. L., Mahendran, M. and Radford, B. J. (2000). Ningaloo Marine Park Monitoring Program: Benthic monitoring sites established in 1999. Data Report: MMS/PI/NMP-21/2000 (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished Report.

D'Adamo, N. and Simpson, C. J. (2001). Review of the oceanography of Ningaloo Reef and adjacent waters. Technical Report: MMS/NIN/NIN_38/2001. (Marine Conservation Branch, Department of

Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished Report.

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4. Has the report been reviewed and signed off by the Branch Manager? ❑
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