Appendix 1

Palau Oceanographic Array Data Report:
January 2003 – January 2004

Craig R. Steinberg, Scott F. Heron, William J. Skirving, Cary McLean, and Severine M. Choukroun

Abstract

Palau is an archipelago of hundreds of islands, the majority of which are surrounded by an extensive barrier reef. The major island group is located near 7° 20’ N, 134° 30’ E, in the Western Pacific Ocean, and is part of the Caroline Islands of Micronesia.

Coral bleaching is a global problem for coral reefs and affected large areas during 1997 and 1998. Most of Micronesia escaped damage; however, there was an unprecedented loss of coral around Palau itself. Field surveys found that on average, nearly half of 946 scleratinian taxa were totally bleached and another 15% were partially bleached. The bleaching event was relatively severe and widespread across depths, sites, habitats and coral taxa.

At the time of the bleaching event, there was no major in situ monitoring of water temperature around Palau. A long-term temperature monitoring program has since been instigated by Pat Colin from the Coral Reef Research Foundation (CRRF). The short-term study reported here complements the CRRF array by expanding the number of observing locations to over 60.

An extensive study of oceanographic parameters in Palauan waters was undertaken during the period August 2003 to January 2004. The period of deployment was selected to coincide with the timing of observed bleaching events. Sixty-two instruments were deployed in and near the Palau lagoon to record currents, temperatures, sea-levels, salinities and weather conditions. This number of instruments is unusually high for a region of this size, and was fueled by a desire to maximize coverage and the fortuitous availability of instruments. The deployment is the most-extensive in situ ocean study ever performed in Palau.

This report presents a comprehensive overview of the data collected and allows a brief view of some of the time series collected. These time series are of sufficient length to undertake a tidal current analysis for hind-casting or prediction. Raw data may be requested by contacting coralreefwatch@noaa.gov.

Citation:
Palau Oceanographic Array
Data Report

August 2003 – January 2004

Craig Steinberg, Scott Heron, William Skirving, Cary McLean & Severine Choukroun

Australian Institute of Marine Science
National Oceanic and Atmospheric Administration
The Nature Conservancy
Disclaimer

This report has been produced for the sole use of the party who requested it. The application or use of this report and of any data or information (including results of experiments, conclusions, and recommendations) contained within it shall be at the sole risk and responsibility of that party. AIMS and NOAA do not provide any warranty or assurance as to the accuracy or suitability of the whole or any part of the report, for any particular purpose or application. Subject only to any contrary non-excludable statutory obligations neither AIMS, NOAA nor its personnel will be responsible to the party requesting the report, or any other person claiming through that party, for any consequences of its use or application (whether in whole or part).
Table of Contents

Disclaimer .......................................................................................................................... ii
List of Figures .................................................................................................................... iv
List of Tables ...................................................................................................................... iv
Acknowledgements ......................................................................................................... v
The Proposed Work ........................................................................................................... 1
Introduction ....................................................................................................................... 2
Deployment Methodology .................................................................................................. 4
Instrument Array Summary ............................................................................................... 9
Temperature Transect and Mooring Summary ................................................................. 15
Instruments and Processing ............................................................................................... 22
  Calibrations ..................................................................................................................... 22
  Data Processing ............................................................................................................. 23
  Current Meters ............................................................................................................. 24
    RD Instruments ADCP ................................................................................................. 24
    Nortek Aquapro current profiler .............................................................................. 25
    Nortek Aquadopp current meter .............................................................................. 26
    Nobska MAVS-3 ......................................................................................................... 27
  Interocean S4 .............................................................................................................. 28
  Tide Gauge .................................................................................................................. 29
    Brancker XR-420 TD ................................................................................................. 29
  Conductivity Logger ....................................................................................................... 30
    SBE16 ....................................................................................................................... 30
  Temperature Loggers ..................................................................................................... 31
    SBE39 ....................................................................................................................... 31
  CTD Profiler .................................................................................................................. 32
    SBE19 ....................................................................................................................... 32
  Weather Station ............................................................................................................ 33
    Campbell Scientific .................................................................................................... 33
  NOAA National Weather Service, Palau ..................................................................... 34
Notable events .................................................................................................................... 35
Acronyms and Instrument Notations ................................................................................. 35
References ......................................................................................................................... 36
Appendix A – Daily Schedule .......................................................................................... 37
Appendix B – Tide gauge deployment information ........................................................... 41
Appendix C – Current meter deployment information ....................................................... 45
Appendix D – Temperature deployment information ......................................................... 52
Appendix E – Salinity deployment information ................................................................. 68
Appendix F – Weather station deployment information ...................................................... 69
Appendix G – Mooring and Transect Summary Plots ......................................................... 70
Appendix H – Time Series Plots of Current Meter Data .................................................... 79
Appendix I – Time Series Plots of Tide Gauge Data ........................................................... 117
Appendix J – Time Series Plots of Salinity Data ................................................................. 125
Appendix K – CTD Profiles ............................................................................................... 131
Appendix L – Time Series Plots of Weather Data .............................................................. 234

iii
List of Figures
Figure 1 Location map of Palau.................................................................3
Figure 2 Temperature Mooring ready for deployment..............................5
Figure 3 Portable Weather station being set up by Cary McLean................5
Figure 4 Schematic showing an in-line mooring and transect of temperature loggers.................................................6
Figure 5 Cary McLean secures an SBE39 temperature logger to a coral outcrop using stainless steel wire.................................................6
Figure 6 Felipe Arzayus Recovering an ADCP..........................................7
Figure 7 Cary McLean securing an SBE16 Conductivity and Temperature logger.........................................................8
Figure 8 IKONOS satellite image of Palau. The Lagoon box covers the area shown. Deployed instruments are indicated by their codes. Orientation of zoomed areas in Figure 9 and Figure 10 may be performed using these codes.................................................................................13
Figure 9 Zoomed image of the Malakal Harbour box from Figure 8........13
Figure 10 Zoomed image of the Rock Islands box from Figure 9..............14
Figure 11 Typical configuration of a reef temperature transect....................15
Figure 12 T5 Mooring design.......................................................................19
Figure 13 T8 mooring design......................................................................21
Figure 14 Screen capture of the WinADCP data viewer............................240
Figure 15 Screen capture of the WinADCP export options.......................241
Figure 16 Archival DVD-ROM directory structure......................................246

List of Tables
Table 1 Station Codes and number of instruments........................................9
Table 2 Instrument codes for each of the three specified regions. Co-located instruments are grouped together.........................................................9
Table 3 Instrument codes listed by primary instrument type..........................10
Table 4 Locations of instruments and other points of interest........................11
Table 5 List of CTD profiles taken during September 2003...........................131
Table 6 List of CTD profiles taken during November 2003...........................132
Table 7 Filename tags..................................................................................238
Table 8 ASCII output from Pal02000.txt, illustrating format........................242
Table 9 Example output for header from the current profiler, A5..................243
Table 10 Example listing of attributes and units from the current profiler, A5........245
Acknowledgements

Steven Victor from the Palau International Coral Reef Center ensured a successful campaign and provided an excellent working base. Thanks to Pat Colin from the Coral Reef Research Foundation for guiding us, providing instrumentation and essential backup in the field. Andrew Bauman from the Office of Environmental Response and Coordination greatly supported the project and assisted with the field work. Andrew Smith and the team at The Nature Conservancy also provided excellent support and the use of their vessel. Bob Richmond from the University of Guam provided additional instrumentation. This research was funded by the Australian Institute of Marine Science, National Oceanic and Atmospheric Administration and The Nature Conservancy. Support from the Koror State Government and the Office of the President is gratefully acknowledged.

Partners

AIMS          Australian Institute of Marine Science
CRRF          Coral Reef Research Foundation
               Koror State Conservation and Law Enforcement
NOAA          National Oceanic and Atmospheric Administration
OERC          Office of the Environmental Response and Coordination & the Office of the President
PICRC         Palau International Coral Reef Center
TNC           The Nature Conservancy
UoG           University of Guam
The Proposed Work

Coral bleaching in Palau: Prediction and mapping with the use of hydrodynamic models and satellite data

Dr William Skirving*, Craig Steinberg+
Dr Rod Salm#, Dr Eric Bayler* and Dr Alan E. Strong*

* NOAA/NESDIS/ORA
+ Australian Institute of Marine Science
# The Nature Conservancy

The Palau International Coral Reef Center (PICRC), the Koror State Department of Conservation and Law Enforcement and the Coral Reef Research Foundation have teamed with the US National Oceanic and Atmospheric Administration (NOAA), the Australian Institute of Marine Science (AIMS), The Nature Conservancy (TNC) and the University of Guam (UoG) to conduct the most intensive study of oceanography in Palau’s history.

The project will be conducted over the next two years and will aim at developing a good understanding of the effects of water currents on coral bleaching. The aim is to model the water currents in and around Palau so that these models can be used to predict which regions are more likely and less likely to experience coral bleaching in the future.

The project has been split into five distinct sections:

a) A study will be conducted with the use of historic environmental data (i.e. water temperatures, weather records and satellite data) to try to develop an understanding of the origin of the hot water that caused the severe bleaching during 1998.

b) Instruments will be deployed between September 2003 and January 2004. Oceanic variables, including tidal heights, currents, water temperature and salinity; and weather variables, such as wind, air temperature and incoming solar radiation; will be recorded.

c) IKONOS satellite imagery, in conjunction with specific hydrographic transects, will be used to derive a complete bathymetric chart of the Palau region at 4 meter resolution.

d) A series of 1, 2 and 3 dimensional hydrodynamic models (computer simulations) will be built with the help of the bathymetric map and the field data.

e) All of the above information will be combined to derive a map, which will describe the patterns of hot and cool water in and around Palau during a future coral bleaching event. This will be used by TNC to derive an understanding of the spatial variability of coral bleaching during a future bleaching event.
PICRC, NOAA and AIMS, with input from Koror State Dept of Conservation and Law Enforcement and TNC, have designed a plan for the deployment of instruments to measure tides, currents, water temperature and salinity. These instruments are being deployed now and will be used to calibrate and validate the computer models of water motion in and around Palau.

The modelling effort will take place at NOAA and AIMS with input from PICRC scientists. It is expected that there will be a number of spin-off projects that will build on this project and will involve PICRC, NOAA and AIMS.

This project has a number of direct benefits for Palau. For example, the bleaching information will be used to help the Federal and State Governments of Palau to design and manage their Marine Protected Areas so as to enable the sustainable use of the valuable coral reef resources in Palauan waters. The output from the models can also be used for other studies such as those concerned with sediment from rivers, fish spawning, coral spawning and gaining a general understanding of the links between one part of the reef and another.

Introduction

Palau is an archipelago of hundreds of islands, the majority of which are surrounded by an extensive barrier reef. The major island group is located near 7° 20’ N, 134° 30’ E, in the Western Pacific Ocean, and is part of the Caroline Islands of Micronesia.

Coral bleaching is a global problem for coral reefs and affected large areas during 1997/1998. Most of Micronesia escaped damage; however, there was an unprecedented loss of coral around Palau itself (Wilkinson, 2002). Bruno et al. (2001) documents the 1998 bleaching event in Palau from field surveys and found, on average, nearly half of 946 scleratinian taxa were totally bleached and another 15% were partially bleached. The bleaching event was relatively severe and widespread across depths, sites, habitats and coral taxa.

There was no major in situ monitoring of water temperature around Palau during the bleaching event. A long-term temperature monitoring programme has since been instigated by Pat Colin from the Coral Reef Research Foundation (Colin, 2000). The short-term study reported here complements the CRRF array by expanding the number of observing locations to over 60.

This study will attempt to explain how the corals will fare during a bleaching event by understanding the key physical processes that determine the thermal environment in which the corals live. As Palau is located near 7°N, it experiences the sun passing meridionally overhead twice a year and therefore has two peaks of solar insolation, offset from the maximum solar zenith, in March and October/November (Penland et al., 2004). We were able to deploy instruments in August 2003 and recover them in January 2004 so that at least one of the hottest periods of the year was observed.
This report describes data collected from a physical oceanographic array deployed in Palau from August 2003 to January 2004. The aim was to observe bleaching-like conditions; this four-month period allowed a reasonable amount of time to experience a variety of weather events. This report presents a comprehensive overview of the data collected and allows a first look at the time series collected. Further analysis and data quality assessments will be done as the study progresses.

The data will also be useful for longer-term studies as the time series are long enough for a good tidal current analysis for hindcasting or prediction.

The Temperature Transect and Mooring Summary section displays what instruments were deployed at each site and their position in the water column or reef slope. The filenames of the raw data downloaded directly from the loggers is given together with their processed filename. The naming conventions are summarized in Appendix M.

Deployment details of each instrument can be found in Appendices B, C, D, E and F. Plots of the observed data can be found in Appendices G, H, I, J, K and L. The plots in these appendices are presented specifically to illustrate what data were collected; they are not intended for analysis or scientific investigation. A companion DVD-ROM to this data report is available for these purposes, the data format and layout of which are described in Appendices M & N.

Figure 1 Location map of Palau.
Deployment Methodology

As coral bleaching has a high spatial variability, the best scenario would have been to position instruments to maximise the geographic coverage of Palau. However, due to time constraints and a limited number of instruments this was not possible. A region that is influenced by a wide range of oceanic conditions was selected for instrumentation, to be representative of the situation in Palau. As discussed, a planned endeavour is to use numerical models to infer oceanic information in the Palau region. Instruments were positioned so as to provide boundary conditions for such models. To this end, most major entrances or channels were assigned a current meter or tide gauge to measure flows or sealevels in order to determine the fluxes into, or out of the system. Other instrumentation was then deployed within these regions to allow model validation and observe the thermal stratification at reasonably high temporal and spatial resolution.

A small vessel from The Nature Conservancy was used and a team of SCUBA divers secured the instruments to the reef slopes or sea floor. This meant that it was more practical to instrument the region adjacent to our base at PICRC in Koror. The nearby region also had the desired large range of topographic features; for example, a reef flat, lagoons, channels, rock islands, lakes and the open ocean.

Instruments were sourced principally from AIMS and were supplemented by others from UoG and CRRF. The instruments were deployed to, in effect, bound specific regions of interest. These boxes were named Lagoon (Figure 8), Malakal Harbour (Figure 9) and the Rock Islands near Koror (Figure 10). The lagoon box extended from the Philippine Sea in the West to a deep-water mooring off Uchelbeluu in the East. Ulong Island defined the southern boundary and the Paleo channel near the western entrance, mid-way up Babeldaob, was the northernmost limit. The Malakal box is contained within the Lagoon box and adjacent to the Rock Islands box. The next section describes the locations and instrumentation deployed at each location.

A deep-water mooring was deployed seaward of the outer reef at Uchelbeluu to gain an understanding of the oceanic conditions. The mooring was designed for a water depth of 120m, however due to the rapid descent of the seafloor, the mooring was positioned at 250m, 130m deeper than anticipated. This meant that the data were collected below the main thermocline.
Weather:
Meteorological observations for the period from January 1994 to April 2004 were acquired from the NOAA National Weather Service station in Palau. Due to nearby obstacles, the location of the NOAA weather station led to a lack of confidence in the wind measurements. A portable weather station was installed as a part of this study to compare with the existing long-term dataset. The weather station monitored standard meteorological parameters and also included solar radiation and Photosynthetically Active Radiation (PAR) sensors to monitor the solar insolation. This station was positioned high on a promontory in the northeast of Koror to ensure the best fetch in all directions.
Temperature measurements:
Temperature loggers were positioned either individually or as vertical profiles. Profiles were realised by placing instruments on moorings or down reef slopes. The locations of the loggers were selected to monitor regions where vertical stratification of water may occur, or conversely where turbulent mixing may occur, and also to examine possible areas of upwelling.

![Figure 4 Schematic showing an in-line mooring and transect of temperature loggers.](image)

Current measurements:
An array of bottom mounted Acoustic Doppler Current Profilers (ADCP), as well as a number of point instruments, were deployed in reef channels, lagoons and flats to ensure a wide variety of current regimes. Current profilers monitor water movement through the entire depth of the water column using acoustic techniques and, thus, were deployed in deep channels at region boundaries. Point meters were located in shallow waters, at region boundaries and within the specified boxes.
Tide gauges:
While several of the temperature and current meters also contained pressure sensors, additional tide gauges were deployed to ascertain the sealevel response to weather, tides and larger scale circulation features in greater detail. Tide gauges were deployed on reef flats at region boundaries to monitor over-reef water fluxes. Tide gauges were located across the specified regions to determine the relative phase of tidal inundation across Palau. One tide gauge was positioned adjacent to the existing Malakal Harbour Tide Gauge, for a short period, to compare with the long-term dataset.

Salinity measurements:
Salinity can be determined by measuring the conductivity and temperature of water. An east-west transect of conductivity and temperature loggers was constructed to measure salinity and monitor the development of salinity fronts and hyper-saline conditions. The transect was positioned from the Philippine Sea, across the Palau lagoon, through Malakal Harbour and out to the eastern reef extreme.
Vertical profiles of Conductivity and Temperature with Depth (CTD):
A number of CTD profiles were measured to determine the vertical variation of water properties across the Palau region. These were performed using an instrument which measures conductivity, temperature, and pressure with a frequency of 4 Hz. The instrument was attached to a rope and lowered by hand through the water column. The speed of descent was controlled at approximately 1 m/s; the ascent of the CTD was performed at the same rate. This permitted a near-repeat measurement of the water properties.

Bathymetry measurements:
An essential input for numerical modelling is accurate bathymetry. Production of a satellite-derived bathymetry of Palau is underway at the NOAA National Ocean Service. The techniques being applied require calibration by \textit{in situ} data. An echo-sounder was used to collect \textit{in situ} depth measurements in a variety of regions across Palau. These data are not presented here but will be in the final bathymetry report.
**Instrument Array Summary**

A total of thirteen current meters, six tide gauges, five conductivity loggers, one weather station and thirty-seven individual temperature loggers were deployed in this experiment. Some instruments were positioned in two or more locations during the study; e.g., the thirteen current meters were deployed in fourteen locations.

Table 1, Table 2, Table 3 and Table 4 list the instruments, their deployment codes and geographic locations. Figure 8, Figure 9 and Figure 10 show the array locations overlaid on satellite imagery. Station coding was used to help distinguish the type of parameters measured, as shown in Table 1. Many instruments have sensing capabilities beyond their primary function listed below and thus measure additional properties (e.g., temperature is measured by the current profilers, tide gauges and conductivity probes).

Table 1 Station Codes and number of instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Instrument</th>
<th>Number of Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Current meter</td>
<td>13 total (9 Profiling - 2 Point S4s, 2 Point Nobskas)</td>
</tr>
<tr>
<td>B</td>
<td>Tide gauge</td>
<td>4 Brancker XR420 TD, 2 SBE39PT</td>
</tr>
<tr>
<td>C</td>
<td>Conductivity logger</td>
<td>5 SBE16CT</td>
</tr>
<tr>
<td>T</td>
<td>Temperature</td>
<td>37 SBE39, 4 SBE16CT, 1 Brancker XR420 TD, 1 RDI ADCP, 1 Nobska</td>
</tr>
<tr>
<td>WX</td>
<td>Weather station</td>
<td>1 Campbell Scientific</td>
</tr>
</tbody>
</table>

Table 2 lists the deployment summary ordered by the three specified regions or boxes: Lagoon, Malakal Harbour and the Rock Islands. The Malakal Harbour box completes the western boundary of the Lagoon box. Co-located instruments are grouped together in Table 2. Table 3 lists the instrument sites by the primary parameter measured; i.e., currents, sealevel, temperature and salinity.

Table 2 Instrument codes for each of the three specified regions. Co-located instruments are grouped together.

(a) Lagoon box

<table>
<thead>
<tr>
<th>Code</th>
<th>Instrument</th>
<th>Serial no.</th>
<th>Depth</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>S4 SBE39T</td>
<td>564</td>
<td>33m</td>
<td>Paleo Channel - Toachel Mlengui</td>
</tr>
<tr>
<td>T6</td>
<td>SBE39T</td>
<td>7560</td>
<td>20m</td>
<td>Philippine Sea - West reef flat</td>
</tr>
<tr>
<td>B5</td>
<td>SBE16CT</td>
<td>2123</td>
<td>14.5m</td>
<td>Falcon Reef - lagoon central</td>
</tr>
<tr>
<td>A7</td>
<td>Nobska SBE39T</td>
<td>10046</td>
<td>10m</td>
<td>Ulong West</td>
</tr>
<tr>
<td>T1</td>
<td>SBE39T</td>
<td>7560</td>
<td>20m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>C2</td>
<td>SBE16CT</td>
<td>2127</td>
<td>10m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>A4</td>
<td>ADCP 300kHz SBE39T</td>
<td>584 BT</td>
<td>&gt;30m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>T8</td>
<td>Brancker XR420</td>
<td>5 loggers</td>
<td>to 40m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>B4</td>
<td>SBE39T</td>
<td>10091</td>
<td>1m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>T7</td>
<td>Brancker XR420</td>
<td>5 loggers</td>
<td>to 18m</td>
<td>Central Rock Islands, Urukthapel</td>
</tr>
<tr>
<td>B3</td>
<td></td>
<td>10093</td>
<td>6m</td>
<td></td>
</tr>
<tr>
<td>A13</td>
<td>Nortek Aquapro</td>
<td>0866 CRRF</td>
<td>&gt;30m</td>
<td>Toachel mid</td>
</tr>
<tr>
<td>Code</td>
<td>Instrument</td>
<td>Serial no.</td>
<td>Depth</td>
<td>Location Description</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>------------</td>
<td>-------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>A2</td>
<td>S4</td>
<td>615</td>
<td>4m</td>
<td>Ngetalau passage (channel) outside Rock Is.</td>
</tr>
<tr>
<td>A5</td>
<td>ADCP 300kHz SBE39T SBE16CT</td>
<td>412 BTP 2125</td>
<td>215m</td>
<td>Uchelbeluu</td>
</tr>
<tr>
<td>A10</td>
<td>ADCP 1200kHz</td>
<td>1292 UoG 22m</td>
<td>Toachel Ra Ngel</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>SBE39PT</td>
<td>0759</td>
<td>1.9m</td>
<td>Ngedarrak Reef flat</td>
</tr>
<tr>
<td>A8</td>
<td>ADCP 600kHz</td>
<td>3228 BTPW 30m</td>
<td>Lighthouse Toachel Ra Kesebekuu</td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>Nortek Aquapro</td>
<td>0794 27.7m</td>
<td>Malakal Harbor Pincers</td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>Brancker XR420</td>
<td>10093 2m</td>
<td>Malakal Harbour Tide Gauge (moved from B3)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3 Instrument codes listed by primary instrument type

#### (a) Current Profilers and Point Meters

<table>
<thead>
<tr>
<th>Code</th>
<th>Instrument</th>
<th>Serial no.</th>
<th>Depth</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>ADCP 1200kHz</td>
<td>974 25m</td>
<td>RI mid channel</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>S4</td>
<td>615</td>
<td>4m</td>
<td>Ngetalau passage outside rock is.</td>
</tr>
<tr>
<td>A3</td>
<td>Nobska</td>
<td>10045</td>
<td>16m</td>
<td>Ulong West</td>
</tr>
<tr>
<td>A4</td>
<td>RDI ADCP 300kHz</td>
<td>584 BT 30m+</td>
<td>Ulong East</td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>RDI ADCP 300kHz</td>
<td>412 BTP 126m</td>
<td>Uchelbeluu</td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>S4</td>
<td>564</td>
<td>30m</td>
<td>Paleo Channel - Toachel Mlengui</td>
</tr>
<tr>
<td>A7</td>
<td>Nobska</td>
<td>10046</td>
<td>25m</td>
<td>Falcon Reef - lagoon central</td>
</tr>
<tr>
<td>A8</td>
<td>RDI ADCP 600kHz</td>
<td>3228 BTPW 30m</td>
<td>Lighthouse Toachel Ra Kesebekuu</td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>Nortek Aquapro</td>
<td>1015 30m</td>
<td>Malakal Harbor Pincers</td>
<td></td>
</tr>
<tr>
<td>A10</td>
<td>ADCP 1200kHz</td>
<td>1292 17m</td>
<td>Toachel Ra Ngel</td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>RDI ADCP 600kHz</td>
<td>1673 25m</td>
<td>RI northern channel entrance</td>
<td></td>
</tr>
<tr>
<td>A11b</td>
<td>ADCP 1200kHz</td>
<td>1292 22.6m</td>
<td>RI northern channel entrance</td>
<td></td>
</tr>
</tbody>
</table>
### Table 4 Locations of instruments and other points of interest

#### (a) Instrument locations

<table>
<thead>
<tr>
<th>Code</th>
<th>Latitude, Longitude</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>7,19.786,134,29.637</td>
<td>RI mid channel</td>
</tr>
<tr>
<td>A2</td>
<td>7,19.315,134,29.400</td>
<td>Ngetalau passage</td>
</tr>
<tr>
<td>A3</td>
<td>7,18.293,134,16.726</td>
<td>Ulong West</td>
</tr>
<tr>
<td>A4B4</td>
<td>7,16.617,134,18.716</td>
<td>Ulong East</td>
</tr>
<tr>
<td>A4</td>
<td>7,16.621,134,18.681</td>
<td>Subsurface buoy</td>
</tr>
<tr>
<td>A5T5C5</td>
<td>7,15.918,134,33.398</td>
<td>Uchelbeluu</td>
</tr>
<tr>
<td>A6</td>
<td>7,28.927,134,27.776</td>
<td>Paleo Channel – Toachel Mengu</td>
</tr>
<tr>
<td>A7T1C2</td>
<td>7,22.424,134,23.231</td>
<td>Falcon Reef</td>
</tr>
<tr>
<td>A8T2C4</td>
<td>7,16.991,134,27.928</td>
<td>Lighthouse Toachel Ra Kesebeaku</td>
</tr>
<tr>
<td>A9C3</td>
<td>7,20.163,134,25.483</td>
<td>Malakal Harbour Pincers</td>
</tr>
<tr>
<td>A10</td>
<td>7,17.786,134,28.958</td>
<td>Toachel Ra Ngel</td>
</tr>
</tbody>
</table>

#### (b) Temperature Profiles

<table>
<thead>
<tr>
<th>Code</th>
<th>Instruments</th>
<th>Other</th>
<th>Depth</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>4 SBE39s</td>
<td>C2</td>
<td>20m</td>
<td>Falcon Reef - lagoon central</td>
</tr>
<tr>
<td>T2</td>
<td>4 SBE39s</td>
<td>C4</td>
<td>20m</td>
<td>Lighthouse Toachel Ra Kesebeaku</td>
</tr>
<tr>
<td>T3</td>
<td>5 SBE39s</td>
<td></td>
<td>20m</td>
<td>RI inside channel</td>
</tr>
<tr>
<td>T4</td>
<td>5 SBE39s</td>
<td>C5</td>
<td>18m</td>
<td>RI Nikko Bay</td>
</tr>
<tr>
<td>T5</td>
<td>5 SBE39s</td>
<td></td>
<td>250m</td>
<td>Deep water mooring Uchelbeluu</td>
</tr>
<tr>
<td>T6</td>
<td>4 SBE39s</td>
<td>C1 B5</td>
<td>30m</td>
<td>Philippine Sea – West reef flat</td>
</tr>
<tr>
<td>T7</td>
<td>5 SBE39s</td>
<td>B3</td>
<td>18m</td>
<td>Central Rock Islands, Urukthapel</td>
</tr>
<tr>
<td>T8</td>
<td>4 SBE39s</td>
<td>B7</td>
<td>45m</td>
<td>Ulong East Channel</td>
</tr>
</tbody>
</table>

#### (c) Tide Gauges

<table>
<thead>
<tr>
<th>Code</th>
<th>Instrument</th>
<th>Serial no.</th>
<th>Depth</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Brancker XR420</td>
<td>10079</td>
<td>4m</td>
<td>RI Toirius</td>
</tr>
<tr>
<td>B2</td>
<td>SBE39PT</td>
<td>759</td>
<td>4m</td>
<td>Reef flat Ngedarrak Reef</td>
</tr>
<tr>
<td>B3</td>
<td>Brancker XR420</td>
<td>10093</td>
<td>18m</td>
<td>Central Rock Islands, Urukthapel</td>
</tr>
<tr>
<td>B3B</td>
<td>Brancker XR420</td>
<td>10093</td>
<td>4.5m</td>
<td>East of Blue Corner</td>
</tr>
<tr>
<td>B3C</td>
<td>Brancker XR420</td>
<td>10093</td>
<td>2.5m</td>
<td>North Babeldaup</td>
</tr>
<tr>
<td>B4</td>
<td>Brancker XR420</td>
<td>10091</td>
<td>30m</td>
<td>Ulong East</td>
</tr>
<tr>
<td>B5</td>
<td>SBE39PT</td>
<td>760</td>
<td>20m</td>
<td>Philippine Sea – lagoon side reef flat</td>
</tr>
<tr>
<td>B6</td>
<td>Brancker XR420</td>
<td>10093</td>
<td>2m</td>
<td>Malakal Harbour Tide Gauge</td>
</tr>
</tbody>
</table>

#### (d) Conductivity loggers

<table>
<thead>
<tr>
<th>Code</th>
<th>Instrument</th>
<th>Serial no.</th>
<th>Depth</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>SBE16CT</td>
<td>2123</td>
<td>5.5m</td>
<td>Philippine Sea</td>
</tr>
<tr>
<td>C2</td>
<td>SBE16CT</td>
<td>2127</td>
<td>5.0m</td>
<td>Falcon Reef</td>
</tr>
<tr>
<td>C3</td>
<td>SBE16CT</td>
<td>2126</td>
<td>2.6m</td>
<td>Malakal Harbour Pincers</td>
</tr>
<tr>
<td>C4</td>
<td>SBE16CT</td>
<td>2124</td>
<td>1.5m</td>
<td>Lighthouse Toachel Ra Kesebeaku</td>
</tr>
<tr>
<td>C5</td>
<td>SBE16CT</td>
<td>2125</td>
<td>160m</td>
<td>Uchelbeluu</td>
</tr>
<tr>
<td>Code</td>
<td>Latitude, Longitude</td>
<td>Location Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>7,19.400,134,28.949</td>
<td>RI northern channel entrance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A12</td>
<td>7,19.223,134,29.795</td>
<td>RI southern reef opening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A13</td>
<td>7,19.023,134,31.490</td>
<td>Toachel mid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A14</td>
<td>7,17.786,134,28.958</td>
<td>Japanese Channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>7,19.570,134,29.417</td>
<td>RI Inside channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>7,19.772,134,30.034</td>
<td>RI Nikko Bay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6C1</td>
<td>7,24.713,134,20.258</td>
<td>Philippine Sea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T7B3</td>
<td>7,16.376,134,24.667</td>
<td>Urukthapel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T8</td>
<td>7,16.621,134,18.802</td>
<td>Ulong East Channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>7,19.821,134,28.878</td>
<td>RI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>7,17.472,134,28.282</td>
<td>Ngedarrak Reef flat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>7,16.376,134,24.667</td>
<td>Central Rock Islands, Urukthapel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3B</td>
<td>7,4912,134,17.825</td>
<td>East of Blue Corner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3C</td>
<td>7,46.608,134,35.1582</td>
<td>North Babeldaup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>07,16.621,134,18.680</td>
<td>Ulong East</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>7,24.380,134,21.065</td>
<td>Philippine Sea – Lagoon reef</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>7,20.011,134,27.430</td>
<td>Malakal Harbour Tide Gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>7,24.713,134,20.258</td>
<td>Philippine Sea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>7,22.424,134,23.231</td>
<td>Falcon Reef</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>7,20.163,134,25.483</td>
<td>Malakal Harbour Pincers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>7,16.991,134,27.928</td>
<td>Lighthouse Toachel Ra Kesebekuu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>7,15.918,134,33.398</td>
<td>Uchelbeluu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WXSTA</td>
<td>7,20.969,134,30.018</td>
<td>Weather Station</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional locations**

<table>
<thead>
<tr>
<th>Code</th>
<th>Latitude, Longitude</th>
<th>Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L10CRRF</td>
<td>7,19.786,134,29.637</td>
<td>Lighthouse 10m CRRF</td>
</tr>
<tr>
<td>L2 CRRF</td>
<td>7,16.613,134,27.067</td>
<td>Lighthouse 2m CRRF</td>
</tr>
<tr>
<td>Falcon Reef</td>
<td>7,22.400,134,23.240</td>
<td>Falcon Reef CRRF</td>
</tr>
<tr>
<td>Malakal Hbr</td>
<td>7,19.008,134,27.627</td>
<td>Malakal Hbr CRRF</td>
</tr>
<tr>
<td>Ngaregabel Rf</td>
<td>7,24.725,134,27.006</td>
<td>Ngaregabel Reef CRRF</td>
</tr>
<tr>
<td>Ngerkul Gap</td>
<td>7,19.170,134,29.779</td>
<td>Ngerkul Gap CRRF</td>
</tr>
<tr>
<td>Nikko Bay</td>
<td>7,20.049,134,30.301</td>
<td>Nikko Bay CRRF</td>
</tr>
<tr>
<td>Ongael Basin</td>
<td>7,15.053,134,22.479</td>
<td>Ongael Basin CRRF</td>
</tr>
<tr>
<td>Ongael out</td>
<td>7,14.964,134,22.471</td>
<td>Ongael Outside CRRF</td>
</tr>
<tr>
<td>ShortDropOff</td>
<td>7,16.418,134,31.440</td>
<td>Short Drop Off CRRF</td>
</tr>
<tr>
<td>Ulong 10</td>
<td>7,17.425,134,14.463</td>
<td>Ulong Rock 10m CRRF N</td>
</tr>
<tr>
<td>Ulong 55</td>
<td>7,17.453,134,14.442</td>
<td>Ulong Rock 55m CRRF N</td>
</tr>
<tr>
<td>West Channel</td>
<td>7,32.560,134,28.059</td>
<td>West Channel CRRF</td>
</tr>
<tr>
<td>LIGHTTH</td>
<td>7,16.927,134,27.881</td>
<td>Lighthouse</td>
</tr>
</tbody>
</table>
Figure 8 IKONOS satellite image of Palau. The Lagoon box covers the area shown. Deployed instruments are indicated by their codes. Orientation of zoomed areas in Figure 9 and Figure 10 may be performed using these codes.

Figure 9 Zoomed image of the Malakal Harbour box from Figure 8.
Figure 10 Zoomed image of the Rock Islands box from Figure 9.
Temperature Transect and Mooring Summary

The following tables summarise all of the instrumentation on each of the transects or in-line moorings. Further, instrument-specific information can be found in Appendices B, C, D and E. Instruments are numbered from the bottom up - T1i1 indicates transect one, instrument 1 (the deepest instrument). T1i6 is the shallowest instrument in the same transect. Figure 11 depicts a typical reef transect; Figure 12 and Figure 13 illustrate the moorings deployed at locations T5 and T8, respectively.

After the tables are calculations to estimate each instrument depth relative to Lowest Astronomical Tide (LAT). The Malakal Harbour sealevel was used to estimate the tide height when observations of water depth were taken by diver pressure gauges. There were usually 2 estimates taken: one upon deployment and one at recovery. There may be missing data; however, the best estimate was included in the table proper. Deployment times are all UTC+9 hours; i.e., the local Palau time.

![Figure 11 Typical configuration of a reef temperature transect.](image-url)
### T1 + A7 + C2  
**Falcon Reef**

7° 22.424’ N  134° 23.232’ E  45m Total Depth

- First Good: 8 Sep 2003, 14:00:00
- Last Good: 3 Jan 2004, 14:30:00

<table>
<thead>
<tr>
<th>Depth (LAT)</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1i6</td>
<td>1.9m SBE39T</td>
<td>0935</td>
<td>09350401.asc</td>
</tr>
<tr>
<td>T1i5</td>
<td>2.9m SBE39T</td>
<td>0929</td>
<td>09290401.asc</td>
</tr>
<tr>
<td>T1i4 C2</td>
<td>5.1m SBE16CT</td>
<td>2127</td>
<td>21270401.hex</td>
</tr>
<tr>
<td>T1i3</td>
<td>8.2m SBE39T</td>
<td>0920</td>
<td>09200401.asc</td>
</tr>
<tr>
<td>T1i2 A7</td>
<td>11.3m Nobska</td>
<td>10046</td>
<td>10046.bin</td>
</tr>
<tr>
<td>T1i1</td>
<td>19.4m SBE39T</td>
<td>0934</td>
<td>09340401.asc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deployment depth(m)</th>
<th>2.5</th>
<th>3.5</th>
<th>6</th>
<th>9</th>
<th>14.5</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malakal slv</td>
<td>1.13</td>
<td>1.06</td>
<td>1.00</td>
<td>0.74</td>
<td>1.82</td>
<td>0.72</td>
</tr>
<tr>
<td>Recovery depth(m)</td>
<td>3.7</td>
<td>4.7</td>
<td>6.9</td>
<td>10</td>
<td>13.1</td>
<td>21.4</td>
</tr>
<tr>
<td>Malakal slv</td>
<td>1.82</td>
<td>1.83</td>
<td>1.83</td>
<td>1.83</td>
<td>1.85</td>
<td>1.85</td>
</tr>
<tr>
<td>LAT = depth-slv</td>
<td>1.9</td>
<td>2.9</td>
<td>5.1</td>
<td>8.2</td>
<td>11.3</td>
<td>19.4</td>
</tr>
</tbody>
</table>

### T2 + A8 + C4  
**Lighthouse Toachel Ra Kesebekuu**

07°16.955’N, 134°27.932’E  30m Total Depth

- First Good: 31 Aug 2003, 16:00:00
- Last Good: 31 Dec 2003, 08:00:00

<table>
<thead>
<tr>
<th>Depth (LAT)</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2i6</td>
<td>1.3m SBE39T</td>
<td>925</td>
<td>09250801.asc</td>
</tr>
<tr>
<td>T2i5 C4</td>
<td>1.5m SBE16CT</td>
<td>2124</td>
<td>21240301.asc</td>
</tr>
<tr>
<td>T2i4</td>
<td>5.1m SBE39T</td>
<td>933</td>
<td>09330801.asc</td>
</tr>
<tr>
<td>T2i3</td>
<td>9.2m SBE39T</td>
<td>1054</td>
<td>10540801.asc</td>
</tr>
<tr>
<td>T2i2</td>
<td>21.6m SBE39T</td>
<td>1052</td>
<td>10520801.asc</td>
</tr>
<tr>
<td>T2i1 A8</td>
<td>27.7m RDI</td>
<td>3228</td>
<td>pal02000.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deployment depth(m)</th>
<th>1</th>
<th>2.5</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malakal slv</td>
<td>1</td>
<td>0.97</td>
<td>0.95</td>
<td>0.93</td>
<td>0.92</td>
<td>2.29</td>
</tr>
<tr>
<td>Recovery depth(m)</td>
<td>3.1</td>
<td>2.7</td>
<td>6.9</td>
<td>11</td>
<td>23.4</td>
<td>-</td>
</tr>
<tr>
<td>Malakal slv</td>
<td>1.81</td>
<td>1.86</td>
<td>1.83</td>
<td>1.83</td>
<td>1.82</td>
<td>1.85</td>
</tr>
<tr>
<td>LAT = depth-slv</td>
<td>1.3</td>
<td>1.5</td>
<td>5.1</td>
<td>9.2</td>
<td>21.6</td>
<td>27.7</td>
</tr>
</tbody>
</table>
T3  Rock Islands, inside channel
7° 19.570’ N  134° 29.418 E  19m Total Depth

First Good: 29 Aug 2003, 15:30:00  
Last Good: 30 Dec 2003, 15:00:00

<table>
<thead>
<tr>
<th>Depth (LAT)</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3i5 1.0m</td>
<td>SBE39T</td>
<td>1055</td>
<td>10550301.asc</td>
</tr>
<tr>
<td>T3i4 1.9m</td>
<td>SBE39T</td>
<td>1058</td>
<td>10583112.asc</td>
</tr>
<tr>
<td>T3i3 4.3m</td>
<td>SBE39T</td>
<td>0676</td>
<td>06763112.asc</td>
</tr>
<tr>
<td>T3i2 8.9m</td>
<td>SBE39T</td>
<td>0675</td>
<td>06753112.asc</td>
</tr>
<tr>
<td>T3i1 18.9m</td>
<td>SBE39T</td>
<td>1057</td>
<td>10573112.asc</td>
</tr>
</tbody>
</table>

Recovery depth(m): T35 2.6, T34 3.5, T33 5.9, T32 10.5, T31 20.5
Malakal slv: T35 1.65, T34 1.65, T33 1.65, T32 1.64, T31 1.63
LAT = depth-slv: T35 1.0, T34 1.9, T33 4.3, T32 8.9, T31 18.9

T4  Rock Islands, Nikko Lake
7° 22’.424 N  134° 23’.232 E  19.7m Total Depth

First Good: 30 Aug 2003, 18:00:00  
Last Good: 30 Dec 2003, 15:30:00

<table>
<thead>
<tr>
<th>Depth</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4i5 0.9m</td>
<td>SBE39T</td>
<td>1059</td>
<td>10593112.asc</td>
</tr>
<tr>
<td>T4i4 1.1m</td>
<td>SBE39T</td>
<td>1051</td>
<td>10513112.asc</td>
</tr>
<tr>
<td>T4i3 3.9m</td>
<td>SBE39T</td>
<td>1061</td>
<td>10613112.asc</td>
</tr>
<tr>
<td>T4i2 9.3m</td>
<td>SBE39T</td>
<td>1060</td>
<td>10603112.asc</td>
</tr>
<tr>
<td>T4i1 16.2m</td>
<td>SBE39T</td>
<td>1053</td>
<td>10533112.asc</td>
</tr>
</tbody>
</table>

Deployment depth(m): T45 1, T44 2.5, T43 5, T42 10.6, T41 17.6
Malakal slv: T45 1.48, T44 1.45, T43 1.38, T42 1.34, T41 1.26
Recovery depth(m): T45 2.4, T44 2.6, T43 5.4, T42 10.8, T41 17.6
Malakal slv: T45 1.52, T44 1.51, T43 1.50, T42 1.50, T41 1.49
LAT = depth-slv: T45 0.9, T44 1.1, T43 3.9, T42 9.3, T41 16.1
**T5 + A5 + C5 Uchbeluu (deepwater mooring)**

07°15.545’N  134° 33.167 E  124m Total Depth

First Good:  17 Sep 2003, 12:00:00
Last Good:  13 Jan 2004, 14:00:00

<table>
<thead>
<tr>
<th>Depth (LAT)</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5i6 C5  150m</td>
<td>SBE16</td>
<td>2125</td>
<td>21251401.hex</td>
</tr>
<tr>
<td>T5i5  160m</td>
<td>SBE39PT</td>
<td>1062</td>
<td>10621401.asc</td>
</tr>
<tr>
<td>T5i4  170m</td>
<td>SBE39T</td>
<td>931</td>
<td>09311401.asc</td>
</tr>
<tr>
<td>T5i3  190m</td>
<td>SBE39T</td>
<td>923</td>
<td>09231401.asc</td>
</tr>
<tr>
<td>T5i2 A5  215m</td>
<td>RDI</td>
<td>412</td>
<td>Pal09000.000</td>
</tr>
<tr>
<td>T5i1  225m</td>
<td>SBE39T</td>
<td>927</td>
<td>09271401.asc</td>
</tr>
</tbody>
</table>

**Deployment**  depth(m)  126m 1100 17/9/03  159.5 215

Malakal slv  1.9m  1.9  1.9

LAT = depth-slv  124  157.6  213
Figure 12 T5 Mooring design.
### T6 + C1 Central Philippine Sea – West Reef flat

**Location:** 7° 16.955’ N 134° 27.932’ E 16 m Total Depth

**First Good:** 12 Sep 2003, 11:00:00

**Last Good:** 14 Jan 2004, 11:00:00

<table>
<thead>
<tr>
<th>Depth</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6i5</td>
<td>1m</td>
<td>SBE39T</td>
<td>1137 Not recovered</td>
</tr>
<tr>
<td>T6i4</td>
<td>3m</td>
<td>SBE39T</td>
<td>928 09281401.asc</td>
</tr>
<tr>
<td>T6i3</td>
<td>5.5m</td>
<td>SBE16</td>
<td>2123 21231401.hex</td>
</tr>
<tr>
<td>T6i2</td>
<td>10.5m</td>
<td>SBE39T</td>
<td>917 09171401.asc</td>
</tr>
<tr>
<td>T6i1</td>
<td>22.5m</td>
<td>SBE39T</td>
<td>924 09241401.asc</td>
</tr>
</tbody>
</table>

**Deployment depth(m) T65 T64 T63 T62 T61**

- 3
- 4.5
- 7
- 12
- 24

**Malakal slv**

- 2.00
- 1.82
- 1.96
- 1.91
- 1.89

**Recovery depth(m)**

- 2.0
- 5.3
- 7.5
- 12.5
- 24.5

**Malakal slv**

- 1.96
- 1.96
- 1.96
- 1.96

**LAT = depth-slv**

- 1
- 3
- 5.5
- 10.5
- 22.5

### T7 + B3 Southern Rock Islands

**Location:** 7° 16.955’ N 134° 27.932’ E 16 m Total Depth

**First Good:** 2 Sep 2003, 10:00:00

**Last Good:** 2 Jan 2004, 15:30:00

<table>
<thead>
<tr>
<th>Depth</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T7i5</td>
<td>0.2m</td>
<td>SBE39T</td>
<td>1056 10560301.asc</td>
</tr>
<tr>
<td>T7i4</td>
<td>1.5m</td>
<td>SBE39T</td>
<td>0926 9260301.asc</td>
</tr>
<tr>
<td>T7i3</td>
<td>3.7m</td>
<td>SBE39T</td>
<td>0919 09190903.asc</td>
</tr>
<tr>
<td>T7i3b</td>
<td>3.7m</td>
<td>XR420</td>
<td>10093 100931103.dat</td>
</tr>
<tr>
<td>T7i3c</td>
<td>3.7m</td>
<td>SBE39T</td>
<td>0732 From T7i1</td>
</tr>
<tr>
<td>T7i2</td>
<td>11.3m</td>
<td>SBE39T</td>
<td>0930 09300301.asc</td>
</tr>
<tr>
<td>T7i1</td>
<td>16.0m</td>
<td>SBE39T</td>
<td>0732 07320401.asc</td>
</tr>
</tbody>
</table>

n.b., 23 Sep, 2003 SBE39 #0919 replaced with Brancker XR420 #10093

n.b., 5 Nov, 2003 Brancker XR420 #10093 replaced with SBE39 #0732 from 19m into the 3.8m position.

**Deployment depth(m)**

- T75 T74 T73 T73b T73c T72 T71
- 1.5
- 3.0
- 6.0
- 5.0
- -
- 12.0
- 18.0

**Malakal slv**

- T75 T74 T73 T73b T73c T72 T71
- 2.0
- 2.05
- 2.03
- 1.26
- -
- 2.00
- 1.96

**Recovery depth(m)**

- T75 T74 T73 T73b T73c T72 T71
- 2.0
- 3.3
- 5.0
- -
- 5.5
- 13.2
- -

**Malakal slv**

- T75 T74 T73 T73b T73c T72 T71
- 1.83
- 1.83
- 1.28
- -
- 1.84
- 1.86
- -

**LAT = depth-slv**

- T75 T74 T73 T73b T73c T72 T71
- 0.2
- 1.5
- 3.7
- 3.7
- 3.7
- 11.3
- 16.0

20
**T8**  
Ulong East Channel  
7° 16’.621 N  134° 18’.802 E  42m Total Depth

First Good:  23 Sep 2003, 09:00:00  
Last Good:  13 Jan 2004, 12:30:00

<table>
<thead>
<tr>
<th>Depth</th>
<th>Instrument</th>
<th>Serial</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>T8i6</td>
<td>4m</td>
<td>SBE39T</td>
<td>918 09181401.asc</td>
</tr>
<tr>
<td>T8i5</td>
<td>4.2m</td>
<td>XR420</td>
<td>10092 0100921401.dat</td>
</tr>
<tr>
<td>T8i4</td>
<td>8m</td>
<td>SBE39T</td>
<td>932 09321401.asc</td>
</tr>
<tr>
<td>T8i3</td>
<td>13m</td>
<td>SBE39T</td>
<td>922 09221401.asc</td>
</tr>
<tr>
<td>T8i2</td>
<td>23m</td>
<td>SBE39T</td>
<td>921 09211401.asc</td>
</tr>
<tr>
<td>T8i1</td>
<td>43m</td>
<td>SBE39T</td>
<td>916 09161401.asc</td>
</tr>
</tbody>
</table>

n.b., top logger was 6m at high water from diver obs.  0818 23/9/03

Use tide gauge for final datum adjustment

T8  
Deployment depth(m)  43m 1135 22/9/03  
Malakal slv  0.93  
LAT = depth-slv  42m

![Ulong East Channel T8 Diagram](image)

Figure 13 T8 mooring design.
Instruments and Processing

This section provides internet links to descriptions of each of the instruments by the manufacturer. Specifications and capabilities are outlined. The sheets can be obtained from the manufacturers’ websites directly through the links and are also included on the companion archive DVD-ROM of this report. See Appendix N for a description of where they are located.

Calibrations

The calibration information for each instrument is contained within the headers of the binary and ASCII files directly downloaded from the instrument.

The current meters are acoustic and are difficult to calibrate in the field. The point current meters can, in general, be placed in a flow tank for calibration; however, such a facility was not available. As the Nobska point current meters had not been previously deployed, they were placed in a water bath for calibration to a zero flow reading. They were subsequently placed off the wharf at PICRC on short deployments (one tidal cycle) to gain confidence in the readings.

The tide gauges and most of the SBE39 temperature loggers were less than 12 months old and so the calibrations supplied by the manufacturer were assumed to still be valid. The Brancker tide gauges initially had unacceptably large clock drift, due to a poor batch of electronic chips. These instruments were replaced in time for the field programme.

Temperature inter-calibrations were undertaken after deployment to check the consistency of the instruments with each other. After recovery, the instruments collected that day were placed together in the ocean water outside of PICRC, usually overnight. They were then brought inside an air-conditioned room and placed in a water bath for a number of hours in order for the temperature to equilibrate. This ensured a reasonable temperature range for any linear adjustment, if found to be necessary.

Plots of all the temperatures collected from all the loggers have been made and are shown in Appendix G. By grouping them from the same mooring or transect, an effective inter-calibration can be made during well-mixed periods. The best period for this was late November as the water cooled by at least one degree Celsius from near bleaching conditions. The temperatures converge and track down together until more benign weather conditions prevailed, allowing stratification to re-establish.

Of all the instruments, only two look anomalous; both were on the T2 transect. The deepest instrument, at 30.6m (red line), was the ADCP A8 and its temperature record indicates slightly higher readings than instruments above it. A linear correction in this case should be adequate. The second anomalous instrument was SBE39, serial number 1054. It was located at a depth of 9m and shows significantly higher readings than instruments above and below it. It appears a linear correction will also suffice in this case.
The SBE16CT logger called C5 and T5i6 only worked intermittently, so care should be taken when using this record. For this reason, it was not included in the consolidated mooring plot of temperatures. The data plot for this instrument is shown with the conductivity loggers in Appendix J.

Data Processing
Data processing algorithms are described here using flow charts (pp. 24-34).
Current Meters
RD Instruments ADCP  http://www.rdinstruments.com/sen.html

**Instrument Output**
ADCP Binary File *.000  
(e.g., SCTS1000.000)

**Program rdi2struct.m**  
Converts binary *.000  
to *.mat structure

MATLAB file *.mat  
(e.g., adcpscts1.mat)

**Program rdi2standard.m**  
Converts to structure into  
standardized variables

MATLAB file *.mat  
(e.g., S1i1.mat)

**Program adcp_crop.m**  
Crops to appropriate top bin

MATLAB file *.mat  
(e.g., S1i1uvm.mat)

**Program tsl_consol.m**  
Temperature, salinity,  
sealevel consolidation

**Program adcp_plot.m**  
Plots Time-Series Data

Calls on programs  
rdradcp.m

Calls on program  
get_location.m

Calls on programs  
uvwplots.m  
rcmplotsADCP.m

All Bins  
Image Graph  
[*_.emf & *_.fig & *_.jpg]  
(e.g., Sladep.fig)

Top Bin  
Time-Series Graph  
[*_.emf & *_.fig & *_.jpg]  
(e.g., S1top.fig)

Bottom Bin  
Time-Series Graph  
[*_.emf & *_.fig & *_.jpg]  
(e.g., S1bottom.fig)
Nortek Aquapro current profiler  

**Instrument output**
ADCP Data File *.prf  
(e.g., 79430301.prf)

**Instrument output**
ADCP Deployment File *.dep  
(e.g., 79430301.dep)

**Program Aquapro**
Converts binary *.prf to physical units

- ASCII header *.hdr  
  (e.g., 79430301.hdr)
- Beam 1 Velocity *.v1  
  (e.g., 79430301.v1)
- Beam 1 Velocity *.v2  
  (e.g., 79430301.v2)
- Beam 1 Velocity *.v3  
  (e.g., 79430301.v3)
- Beam 1 Amplitude *.a1  
  (e.g., 79430301.a1)
- Beam 1 Amplitude *.a2  
  (e.g., 79430301.a2)
- Beam 1 Amplitude *.a3  
  (e.g., 79430301.a3)

**Program aqdpprof2mat.m**
Converts to structure into standardized variables

- Calls on program
  get_location.m

- MATLAB file *.mat  
  (e.g., EH1.mat)

**Program adcp_crop.m**
Crops to appropriate top bin

- MATLAB file *.mat  
  (e.g., EH1uvm.mat)

**Program adcp_plot.m**
Plots Time-Series Data

- Calls on programs
  uvwplots.m  
  rcmplotsADCP.m

- **Program tsl_consol.m**
  Temperature, salinity, sealevel consolidation

- **All Bins**
  Image Graph  
  [*emf & *.fig & *.jpg*]  
  (e.g., EH1adcp.fig)

- **Top Bin**
  Time-Series Graph  
  [*emf & *.fig & *.jpg*]  
  (e.g., EH1top.fig)

- **Bottom Bin**
  Time-Series Graph  
  [*emf & *.fig & *.jpg*]  
  (e.g., EH1bottom.emf)
Nortek Aquadopp current meter  

http://www.nortekusa.com/acm.html

**Instrument output**  
AquaDopp Data File *.aqd  
(e.g., S5Scot01.aqd)

---

**Program ExploreAQD**  
Converts binary *.aqd to physical units

---

**Program aqdp2mat.m**  
Converts *.dat to *.mat  
Trims to in-water time

---

**Program current_plot.m**  
Plots temperature  
& depth (if present)

---

**Program tsl_consol.m**  
Temperature, salinity,  
sealevel consolidation

---

**Calls on program**  
get_location.m

---

**Calls on program**  
rcmplots2003.m

---

MATLAB file *.mat  
(e.g., SCE1uv.mat)

---

Time Series Plots  
[*emf & *.fig & *.jpg]  
(e.g., SCE1uv.fig)
Program Simple Term (STGold.exe)
Download data from Nobska MAVS-3

Instrument Output
ASCII header and data *.bin
(e.g., 10046.bin)

Calls on program get_location.m

Program Nobska2mat.m
Converts *.bin to *.mat
Trims to in-water time

MATLAB file *.mat
(e.g., A7i1uvwt.mat)

Program tsl_consol.m
Temperature, salinity, sealevel consolidation

Calls on program nobplots2003.m

Program nobska_plot.m
Plots temperature & depth (if present)

Time Series Plots
[*.emf & *.fig & *.jpg]
(e.g., a7tsdc.fig)

Time Series Plots
[*.emf & *.fig & *.jpg]
(e.g., a7tuvw.jpg)

Nobska MAVS-3 http://www.nobska.net/
Interocean S4 http://www.interoceansystems.com/s4main.htm

Instrument Output
S4 Binary File *.s4b
(e.g., 6320603.s4b)

Program cmapp.bat
InterOcean Systems S4
Current Meter Application
Software Version 2.72

ASCII header and data *.s4a
(e.g., 6320603.s4a)

Program s4mat2.m
Converts *.s4a to *.mat
Trims to in-water time

MATLAB file *.mat
(e.g., S10i3uv.mat)

Program tsl_consol.m
Temperature, salinity,
sealevel consolidation

Program current_plot.m
Plots temperature
& depth (if present)

Time Series Plots
[*.emf & *.fig & *.jpg]
(e.g., S10uv.fig)

Calls on program
current_plot.m

Calls on program
get_location.m

Calls on program
cmapp.bat

Program cmapp.bat

Calls on program
get_location.m

Calls on program
get_location.m

Program cmapp.bat
**Program Rbr4w20.exe**
Download and conversion to physical

**Instrument Output**
ASCII header and data *.dat (e.g., 0100920401.dat)

**Program Brancker2mat.m**
Converts *.asc file to set of MATLAB variables

**Program get_location.m**

**Calibration File**
(e.g., call0092.mat)

**MATLAB file *.mat**
(b2tl.mat)

**Program tsl_consol.m**
Temperature, salinity, sealevel consolidation

**Program temp_plot.m**
Plots temperature & depth

**Time Series Plots**
[*emf & *.fig & *.jpg]*
(e.g., b2tl.fig)
Conductivity Logger
SBE16 http://www.seabird.com/products/spec_sheets/16plusdata.htm

**Instrument Output**
SBE 16 Binary File *.hex
(e.g., 21260603.hex)

**Program Seaterm**
binary *.hex
to ASCII *.cnv file

ASCII header and data *.cnv
(e.g., 21260603.cnv)

**Program sb16mat.m**
Converts *.cnv file to set of MATLAB variables

**Program ct_plot.m**
Plots temperature and salinity

**Program tsl_consol.m**
Temperature, salinity, sealevel consolidation

**Calls on programs**
get_location.m
sw_dens.m

densder.m

**Calls on program**

Time Series Plots
[*.emf & *.fig & *.jpg]
(e.g., S10ct.fig)
Temperature Loggers

**SBE39**  

---

**Instrument output**
Raw Data from SBE 39 logger  
(e.g., 10520603.raw)

---

**Program Seaterm**
Binary to ascii  
conversion to physical

---

ASCII header and data *.asc  
(e.g., 10520603.asc)

---

**Program sb39mat.m**
Converts*.asc file to set of  
MATLAB variables

---

Calls on program  
get_location.m

---

Calibration File  
(e.g., cal1052.mat)  

MATLAB file *.mat  
(e.g., S10i4t.mat)

---

**Program tsl_consol.m**
Temperature, salinity,  
sealevel consolidation

---

**Program temp_plot.m**
Plots temperature  
& depth (if present)

---

Time Series Plots  
[*emf & *.fig & *.jpg]  
(e.g., S10tsl.fig)

---

Time Series Plots  
[*emf & *.fig & *.jpg]  
(e.g., S10i4t.fig)
CTD Profiler
SBE19  http://www.seabird.com/products/spec_sheets/19plusdata.htm

Instrument output
CTD Binary File *.hex
(e.g. 1909000.hex)

Catalogue File
castdata.dat

Program SBEDataProcessing-Win32
Converts binary *.hex to *.cnv ASCII

ASCII file *.cnv
(e.g. 19090001.cnv)

Program scott2003ctdplot.m
Converts to structure into standardized variables

MATLAB file *.mat
(e.g. 1909000.mat)

CTD Plot *.fig
(e.g. 1909000.fig)

CTD Plot *.emf
(e.g. 1909000.emf)

Calls on program
cnv2mat2.m
pressure.m
sw_dens.m
densder.m
tsdiagram.m
floatAxisXX.m
Weather Station
Campbell Scientific  
http://www.campbellsci.com/

This measures wind speed, direction, air temperature, photosynthetically active radiation (PAR), short wave radiation.

Relative humidity:  
http://www.campbellsci.com/temp_rh.html
Solar radiation sensors:  
http://www.campbellsci.com/solarrad.html#li190sb  
http://env.licor.com/Products/Sensors/rad.htm

---

**Instrument Output**
Campbell Scientific  
Portable weather station

**Program PC200W**
Download data & conversion to physical

**Program Aimswxp2mat.m**
Converts *.dat file to set of MATLAB variables

**Program aimswx_plot.m**
Plots the weather data

**Calls on program**
get_location.m

**Time Series Plots**
[*.emf & *.fig & *.jpg]
(e.g., awx1uv.fig)

**Time Series Plots**
[*.emf & *.fig & *.jpg]
(e.g., awx2uv.fig)
Acquired Data
NOAA Palau
HAS000102121d3appp_op.txt

Program **ReadNWS.m**
Reformats to MATLAB format

ASCII header and data *.dat
(e.g., NWS94.dat)

**Calls on program get_location.m**

Program **nws2mat.m**
Converts *.dat file to set of MATLAB variables

MATLAB file *.mat
(e.g., Noaa94.mat)

Program **aimswx_plot.m**
Plots the weather data

Time Series Plots
[*.emf & *.fig & *.jpg]
(e.g., awx1.fig)

Time Series Plots*.jpg
(e.g., awx1.jpg)
Notable events

The principle goal was to observe bleaching-like conditions whilst laying the foundation for establishing a quality observational dataset to aid in setting up numerical models. Bleaching-like conditions developed over the period between late October and late November 2003. A general warming and stratification of the waters is evident in the mooring and transect summary plots in Appendix G. The plots are similar in the heating, stratification and subsequent cooling through this period. Winds were low during this warming trend, assisting the intensification of the surface warming. The winds then increased and were, in part, responsible for the subsequent cooling in late October and November.

Acronyms and Instrument Notations

A Current meter
AIMS Australian Institute of Marine Science
ADCP Acoustic Doppler Current Profiler
B Tide gauge
BT Bottom Tracking
C Conductivity meter
CT Conductivity and Temperature
CTD Conductivity, Temperature and Depth
CRRF Coral Reef Research Foundation
LAT Lowest Astronomical Tide
NOAA National Oceanic and Atmospheric Administration
P Pressure sensor
PICRC Palau International Coral Reef Research Center
RI Rock Islands
RDI RD Instruments – manufacturer of ADCPs
S4 Intercean S4 current meter
S16 SBE 16 CT logger
S39 SBE 39 logger
SBE Sea Bird Electronics
T Temperature logger or transect
TNC The Nature Conservancy
UoG University of Guam
WX Weather Station
References


Appendix A – Daily Schedule

Deployment, AIMS Trip#3553 24 Aug - 18 Sep 2003

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Severine Choukroun, Cary McLean, Craig Steinberg (AIMS)</th>
<th>Scott Heron, William Skirving (NOAA)</th>
</tr>
</thead>
</table>

**Wed 20 Aug**  
Freight sent from AIMS

**Sun 24 Aug**  
AIMS personnel travel Townsville – Cairns  
NOAA personnel travel Washington DC – Guam

**Mon 25 Aug**  
AIMS personnel travel Cairns – Guam – Palau  
NOAA personnel travel Guam – Palau

**Tue 26 Aug**  
Pick up freight, meet and greet, find accommodation

**Wed 27 Aug**  
Setup lab

**Thu 28 Aug**  
Pat Colin, CRRF shows us around rock islands and lighthouse, check out TNC boat

**Fri 29 Aug**  
T3  5 SBE39  20m  RI inside channel

**Sat 30 Aug**  
B1a  Brancker XR420  10083  4m  RI northern reef opening in 2.5m hole  
A11  ADCP 600kHz  1673  25m  RI northern channel entrance  
T4  5 SBE39  18m  RI Nikko Lake

**Sun 31 Aug**  
A8  ADCP 600kHz BTPW  3228  30m  Lighthouse Toachel Ra Kesebekuu  
T2  4 SBE39  30m  Lighthouse Toachel Ra Kesebekuu  
C4  SBE16CT  2124  2.5m  Lighthouse Toachel Ra Kesebekuu

**Mon 1 Sep**  
Complete A8  
A2  S4  615  4m  Ngetalau Passage, outside Rock Islands  
Recover B1a  
B1  Brancker XR420  10079  4m  RI northern reef opening in 2.5m hole  
Setup instruments

**Tue 2 Sep**  
T7  5 SBE39  18m  Central Rock Islands, Urukthapel  
A4  RDIADCP 300kHz BT  584  30+m  Ulong east

**Wed 3 Sep**  
A12  Nortek Aquadopp CRRF  0970  12m  RI southern reef opening  
Setup instruments

**Thu 4 Sep**  
Severine departs 0145 Palau – Guam.  
Setup instruments and bathymetry sounder  
1400 Presentation to Palau Govt & groups

**Fri 5 Sep**  
A10  ADCP 1200kHz UoG  1292  17m  Toachel Ra Ngel  
B2  SBE39PT  4m  Reef flat Ngedarrak Reef  
A13  Nortek Aquapro CRRF  0866  30m  NE channel Toachel mid

**Sat 6 Sep**  
Too windy for deployment of Philippine Sea transect

**Sun 7 Sep**  
Craig departs 0030 Palau - Guam

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Instrument(s)</td>
<td>Location/Reef</td>
<td>Notes</td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
<td>----------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Mon 8 Sep</td>
<td>T1: 4 SBE39</td>
<td>20m Falcon Reef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C2: SBE16CT</td>
<td>6m Falcon Reef</td>
<td></td>
</tr>
<tr>
<td>Tue 9 Sep</td>
<td>A9: Nortek Aquapro</td>
<td>27m Malakal Harbour pincers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C3: SBE16CT</td>
<td>3m Malakal Harbour pincers</td>
<td></td>
</tr>
<tr>
<td>Wed 10 Sep</td>
<td>Setup instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thu 11 Sep</td>
<td>William departs</td>
<td></td>
<td>Perform CT calibration</td>
</tr>
<tr>
<td>Fri 12 Sep</td>
<td>Setup Nobskas and deploy for testing at PICRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T6: 4 SBE39</td>
<td>20m Philippine Sea – West Reef flat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C1: SBE16</td>
<td>7m Philippine Sea – West Reef flat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B5: SBE39PT</td>
<td>5m Central Philippine Sea – East Reef</td>
<td></td>
</tr>
<tr>
<td>Sat 13 Sep</td>
<td>Recover Nobskas and compare data</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A3: Nobskas</td>
<td>16m Ulong west</td>
<td></td>
</tr>
<tr>
<td>Sun 14 Sep</td>
<td>Setup instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mon 15 Sep</td>
<td>A7: Nobskas</td>
<td>25m Falcon Reef - lagoon central</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A6: S4</td>
<td>30m Paleo Channel - Toachel Mlengui</td>
<td></td>
</tr>
<tr>
<td>Tue 16 Sep</td>
<td>A1: ADCP 1200kHz</td>
<td>25m RI mid channel - Subject to Ada</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bathymetry logging set up</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prepare Deep water mooring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed 17 Sep</td>
<td>A5: RDIADCP 300kHz BTP412</td>
<td>126m Uchelbelu – Deep water mooring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T5: 4 SBE39</td>
<td>126m Uchelbelu – Deep water mooring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C5: SBE16CT</td>
<td>126m Uchelbelu – Deep water mooring</td>
<td></td>
</tr>
<tr>
<td>Thu 18 Sep</td>
<td>Boat maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fri 19 Sep</td>
<td>CTD transect Blue Corner – PICRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sat 20 Sep</td>
<td>Clean up Koror day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun 21 Sep</td>
<td>Scott departs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CTD transect A2 through SE entrance to shelf edge &amp; north to Toachel mid channel &amp; KB Bridge.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CTD transect from A9 Pincers to central harbour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mon 22 Sep</td>
<td>T8: SBE39 + 1 XR420</td>
<td>43m Ulong East Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pack up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tue 23 Sep</td>
<td>Recover T73</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B4: Brancker XR420</td>
<td>4.5m Ulong East</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B3/T73b: Brancker XR420</td>
<td>5m Central Rock Islands, Urukthapel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WX: Campbell Scientific</td>
<td>WX1 Shalom Etison’s residence</td>
<td></td>
</tr>
<tr>
<td>Wed 24 Sep</td>
<td>Cary departs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mid-deployment, AIMS Trip# 3585 2 – 9 Nov 2003

Personnel  Cary McLean (AIMS)
William Skirving, Alan Strong (NOAA)

2-12 Nov  Bathymetry validation, instrument check and CTD transects

Wed 5 Nov  Recover B3/T73b
Move T71 to T73c
B3b Brancker XR420 10093 Blue Corner, 1015-1519
Recover B3b

Fri 7 Nov  B3c Brancker XR420 10093 north of Babeldaob, 0730-1437
Recover B3c
(bathymetry transect 2a)

Wed 12 Nov  B6 Brancker XR420 10093 2m Malakal Harbour Tide Gauge
Check WX

Recovery, AIMS Trip # 3587 27 Dec 2003 – 18 Jan 2004

Personnel  Cary McLean, Craig Steinberg (AIMS)
Felipe Arzayus, William Skirving, Alan Strong (NOAA)

Mon 22 Dec  Freight sent from AIMS

Sat 27 Dec  Townsville 1315–1410 Cairns QF2308

Sun 28 Dec  Cairns 0135-0610 Guam CO903, Guam 1940-2050 Koror CO953

Mon 29 Dec  Pick up freight & preparation

Tue 30 Dec  Prepare boat and gear, Recover T3, T4, A1, A2 & B1

Wed 31 Dec  Recover A9, C3, B2, C2, C4 & B6

Thu 01 Jan  New Year’s Day

Fri 02 Jan  Recover A3 & T7

Sat 03 Jan  Recover A11, A7, T1 & C2

Sun 04 Jan  Recover A12

Mon 05 Jan  Freight urgent gear to Townsville, Felipe Arzayus arrives & has check out dive

Tue 06 Jan  Blue Corner, Lighthouse channel attempt – storm.

Wed 07 Jan  Deep water mooring (A5+T5+C5) recovery attempt – too rough
Recover A8+T2
Recover A10 and redeploy as A11b
A11b ADCP 1200kHz UoG 1292 23m RI Northern channel entrance

Thu 08 Jan  Deep water mooring (A5+T5+C5) recovery attempt – too rough
A13 recovery attempt – found subsurface buoy. Waypoint not very good today.
Fri 09 Jan  Recover A13, A4, B4 & WX  
Presentations to World Bank  
“Development of CRW Products: Prediction and mapping with the use of hydrodynamic models and satellite data”  William Skirving, Craig Steinberg, Scott Heron, Alan Strong, Cary McLean  
“NOAA’s Coral Reef Watch – An Update”  Alan Strong

Sat 10 Jan  Winds 20-25kts from NE.  Lab day

Sun 11 Jan  Winds still 20-25kts from NE.  Lab day.  Pat Colin arrives  
Recover A11b  
A11c  Nortek Aquapro CRRF  0866  23m  RI Northern channel entrance  
A14  ADCP 1200kHz UoG  1292  4m  Japanese Channel

Mon 12 Jan  Recover A6 with Alma Ridep-Morris team

Tue 13 Jan  Recover B5, T8, A14 & A5+T5+C5

Wed 14 Jan  Recover T6 & C1  
Pack up

Thu 15 Jan  Felipe leaves 0230

Fri 16 Jan  Freight gear

Sat 17 Jan  Pack up accommodation

Sun 18 Jan  Remaining personnel travel Koror 0115-0530 Guam, Guam 1955-1235 Cairns

Mon 19 Jan  Cairns 1005-1100 Townsville

Thu 5 Feb  Recover A11c (Pat Colin)
Appendix B – Tide gauge deployment information

B1a  RI northern reef opening in 2.5m hole, off Toirius Island

Instrument: Brancker XR-420-TG, 10083
(serial no.)
Capability: Maximum depth 90m pressure sensor, temperature sensor
Location: 07°19.821’N 134°28.878’E
Sampling : 5 minute sampling interval, 60 second averaging interval
Filename : 010083test.dat
All times listed as local time UTC+9.
Switch on: 102930 30/08/03
Time check: 0839 30/08/03
In water: 1050 30/08/03
in posn : 1057 30/08/03
First good: -
Last in posn : -
Out of water : 1102 01/09/03
Switch off
Comments : Time drift of logger, gained 59 sec in 53 hours ! Withdrawn

B1  RI northern reef opening in 2.5m hole, off Toirius Island

Instrument: Brancker XR-420-TG, 10079
(serial no.)
Capability: Maximum depth 90m pressure sensor, temperature sensor
Location: 07°19.821’N 134°28.878’E
Sampling : 5 minute sampling interval, 60 second averaging interval
Filename : 0100790301.dat
All times listed as local time UTC+9.
Switch on: 102930 31/08/03
Time check: 072421 01/09/03
In water: 1050 01/09/03
in posn : 1100 01/09/03 4.1m
First good: 1100 01/09/03 01-Sep-2003 11:00:00
Last good : 03-Nov-2003 00:05:00
Last in posn :
Out of water : 1432 30/12/03
Switch off
Comments : Flat battery 3.0V, clock lost time so no time off available
5.6% memory used 18K readings, 2 months

B2  Reef flat, Ngederrak Reef

Instrument: SBE39PT Pressure & Temperature logger, #0759
(serial no.)
**B3 Central Rock Islands, Urukthapel (T73b)**

**Instrument:** Brancker XR-420-TG, 10093  
**Capability:** Maximum depth 90m pressure sensor, temperature sensor  
**Location:** 07°16.376’N 134°24.667’E  
**Sampling:** 5 minute sampling interval, 60 second averaging interval  
**Filename:** 100931103.dat  
**Switch on:** 00:14:30 3/9/03  
**In water:** 0849 23/9/03  
**First good:** 0900 23/9/03  
**Last in posn:** 0900 05/11/03  
**Filename:** B3B  
**Location:** 7 08.4912°,134 17.8275’  
**First good:** 1015 5/11/03  
**Last good:** 1515 5/11/03  
**Filename:** B3C  
**Location:** 7 46.60848, 134 35.1582  
**First good:** 0730 7/11/03  
**Last good:** 1435 7/11/03  
**Out of water:** 1437 7/11/03  
**Switch Off:** 1122 8/11/2003
**Comments:** Flat battery, clock lost time so no time off available, Clock +15 seconds, 4.1% memory

**B3B**
Moved to Blue corner 5/11/03 1015-1519 wpt TIDE Region 13 transect C 7 08.4912',134 17.8275'

**B3C**
Moved to north of Babeldaup 7/11/03 0730-1437 Region 2 transect A 7 46.60848, 134 35.1582; then B6 Malakal Harbour on Nov 5 2003 Last 2 records look bad

---

**B4 Ulong East**

**Instrument:** Brancker XR-420-TG, 10091  
(serial no.)

**Capability:** Maximum depth 90m pressure sensor, temperature sensor

**Location:** 07°16.621’N 134°18.680’E 4.5m LAT

**Sampling:** 5 minute sampling interval, 60 second averaging interval

**Filename:** 0100911001.dat  
All times listed as local time UTC+9.

**Switch on:** 214430 22/09/03

**In water:**

<table>
<thead>
<tr>
<th>in posn</th>
<th>Date</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0805</td>
<td>23/09/03</td>
<td>5.5m</td>
</tr>
<tr>
<td>First good:</td>
<td>0805 23/09/03</td>
<td>23-Sep-2003 08:15:00</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1017 09/01/04</td>
<td>6.1m</td>
</tr>
</tbody>
</table>

**Out of water:** 19-Dec-2003 20:00:00

**Last record:** 19-Dec-2003 23:05:00

**Switch off:** Flat battery

**Comments:** Flat battery, clock lost time so no time off available  
Second deployment for intercalibration with SBE39PT#732  
On @1513 10/1/04 Off @1605 11/1/04 10091calib.dat

---

**B5 Central Philippine Sea – East Reef (Lagoon side)**

**Instrument:** SBE39PT Pressure & Temperature logger, #0760  
(serial no.)

**Capability:** Pressure and Temperature, 230K samples

**Location:** 07°24.380’N, 134°21.065’E, 5m

**Sampling:** Sampling Interval 5 min

**Filename:** 07601401.asc  
All times listed as local time UTC+9.

**Time** | **Depth**
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1120 12/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1125 12/09/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1135 12/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1030 13/01/04</td>
</tr>
<tr>
<td>Out of water:</td>
<td>14-Jan-2004 18:44:59</td>
</tr>
<tr>
<td>Last record:</td>
<td>14-Jan-2004 18:44:59</td>
</tr>
</tbody>
</table>

**Switch off:** 1853 14/01/04 38351 samples

43
Logger 2 secs slow

Comments :
Lionfish under rock.

B6 Malakal Harbour Tide Gauge

Instrument : Brancker XR-420-TG, 10093
(serial no.)
Capability : Maximum depth 90m pressure sensor, temperature sensor. 60 sec ave
Location : 07°20.016’N 134°27.429’E
Sampling : 5 minute sampling interval, 60 second averaging interval

Filename : 0100930301.dat
All times listed as local time UTC+9.
Switch on: 1230 08/11/03 From file header
Time check:
In water: 0859 12/11/03
in posn :
First good: 0915 12/11/03 12-Nov-2003 10:00:00
Last good : 20-Dec-2003 04:00:00
Out of water : 0853 31/12/03 ~2m
Last record : 20-Dec-2003 04:45:30
Switch off

Comments :
Flat battery, clock lost time so no time off available
3.7% memory used 12K readings, 1.5 months
Moved from B3 in November
Appendix C – Current meter deployment information

A1  Rock Islands, mid channel

Instrument : ADCP 1200kHz, #0974
Capability : 40M card
Location : 07°19.786’N, 134°29.637’E, 24.2m
Sampling : 15min ensembles, continuous; 144 pings/ensemble, 24*1m bins, SD=0.26cm/s

Filename : pal08000.000
Switch on: 095230 16/09/03
In water: 1140 16/09/03
in posn: 1155 16/09/03 24.2m
First good: 1230 16/09/03 16-Sep-2003 12:30:00
Last in posn: 1614 30/12/03 30-Dec-2003 16:00:00, 23.8m
Out of water:
Switch off: 10178 ensembles
Logger 1:04 fast

Comments :

A2 Ngetalau Passage, outside Rock Islands

Instrument : Interocean S4 current meter, #615
Capability : 20 Mb RAM, high resolution pressure sensor draws 49mA no Temp
Location : 07°19.315’N, 134°29.400’E, 4m
Sampling : 1 min average every 30 minutes

Filename : 6150903.s4a 6150903.su
Switch on: 1500 01/09/03
In water: 1600 01/09/03
in posn: 1610 01/09/3 4m
First good: 1630 01/09/03 01-Sep-2003 16:30:00
Last in posn: 1642 30/12/03 30-Dec-2003 16:30:00 3.7m
Out of water:
Switch off: 1015 31/12/03
No clock drift

Comments :

A3 Ulong West

Instrument : Nobska , #10045 – UoG (Bob Richmond)
Capability : UVW velocity component output, temperature, conductivity
Location : 07°18.293’N, 134°16.726’E, 20m
Sampling : 120 measurements at 2Hz averaged (1min sampling) every 15min

Comments :
Filename : 10045.txt
All times listed as local time UTC+9.
Switch on: 1030 13/09/03
In water: 1250 13/09/03
in posn : 1310 13/09/03 20m
First good: 1/2
Out of water:
Last in posn : 1432 02/01/04 20.7m
Comments : Subsurface buoy 5m

A4  Ulong East

Instrument : RDI ADCP 300kHz, #584 BT
(serial no.)
Capability : 48M card Bottom tracking, No Pressure and temperature
Location : 07°16.617’N, 134°18.716’E, 30m
Sampling : 15min ensembles, continuous; 18*2m bins, SD=0.61cm/s, 6M mem – 140 days
Filename : pal03000.000
All times listed as local time UTC+9.
Switch on: 185230 01/09/03 01-Sep-2003 19:00:00
In water: 1100 02/09/03
in posn : 1115 02/09/03 30+m
First good: 1130 02/09/03 02-Sep-2003 11:30:00
Last in posn : 1025 09/01/04 09-Jan-2004 10:00:00 33.1m
Out of water:
Last Read: 1141 10/01/04 12546 ensembles, 12530 works
10-Jan-2004 07:15:00
Logger 59 seconds fast
Comments : Subsurface buoy at 7°16.62’N, 134°18.68’E

A5  Uchelbeluu (deepwater mooring)

Instrument : RDI ADCP 300kHz, #412BTP
(serial no.)
Capability : Bottom Tracking, Temperature and Pressure
Location : 07°15.545’N, 134°33.167’E, "215m" on 126m mooring
Sampling : 15min ensembles, continuous; 23*5m bins, SD=0.33cm/s, 10M mem in 170 days
Filename : pal09000.000
All times listed as local time UTC+9.
Switch on: 082230 17/09/03 01-Sep-2003 19:00:00
In water: 1045 17/09/03
in posn : 1100 17/09/03
First good: 1115 17/09/03 17-Sep-2003 11:30:00
Last in posn : 1445 13/01/04 13-Jan-2004 14:45:00
Popped: 1450 13/01/04
Out of water : 1505 13/01/04
Last Read: 2210 14/01/04 11479 ensembles
Comments : with T5,C5, Acoustic Release #445 (13.5 B/D)

A6 Paleo Channel – Toachel Mlengui (West Passage)

Instrument : S4, #564
(serial no.)
Capability : Temperature and pressure.
Location : 07°28.927’N, 134°27.776’E, 33m
Sampling : 1min sampling every 30 minutes
Filename : 5640104.s4a 5640903.su
Switch on: 1330 04/09/03
In water: 0930 15/09/03 30.0m
in posn : 0938 15/09/03 15-Sep-2003 10:00:00
First good: 1000 15/09/03 12-Jan-2004 10:00:00 32.5m
Last in posn : 1028 12/01/04
Out of water : 0830 05/02/04
Last Read:
Comments : Comms box didn’t work – downloaded later in Darwin!

A7 Falcon Reef

Instrument : Nobska, #10046 – UoG (Bob Richmond)
(serial no.)
Capability : UVW velocity component output, temperature
Location : 07°22.445’N, 134°23.177’E, 14.5m
Sampling : 120 measurements at 2Hz averaged (1min sampling) every 15min
Filename : 10046.txt
Switch on: 1030 13/09/03
In water: 1129 15/09/03
in posn : 1145 15/09/03
First good: 1507 03/01/04
Out of water : 13.1m
Last Read: Flat battery
Comments : with transect T1

A8 Lighthouse Channel

Instrument : RDI ADCP 600kHz, #3228
(serial no.)
Capability : Bottom tracking, pressure and temperature
A9 Malakal Harbour pincers

Instrument: Nortek Aquapro, #0794
(Canada)
Capability: 50cm blanking distance, 2.1M mem
Location: 07°16.955‘N, 134°27.932‘E, 30m
Sampling: 15min ensembles, continuous; 150 pings/ensemble, 35*1m bins, 10M card
Filename: Pal02000.000 setup pal02.whp
All times listed as local time UTC+9.
Switch on: 120730 31/08/03
In water: 1600 31/08/03
in posn : 0940 01/09/03
First good: 1000 01/09/03 01-Sep-2003 10:00:00
Last in posn : 0825 07/01/04 07-Jan-2004 08:00:00
Out of water : 1411 08/01/04 10Mb data 12488
Switch off: 1528 08/01/04
Logger 2 mins 13 sec fast
Comments : with T2; strong tidal currents – didn’t complete deploy until next day.
Internal clock is Australian Eastern Standard Time (UTC+10hr), so 1 hour fast

A10 Toachel ra Ngel (Ngel Channel)

Instrument: ADCP 1200kHz, #1292 – UoG (Bob Richmond)
(Canada)
Capability: Temperature and Pressure
Location: 07°17.786‘N, 134°28.958‘E, 22 m
Sampling: 15min ensembles, continuous; 180 pings/ensemble, 22*1m bins,
SD=0.2cm/s
Filename: Pal05000.000
All times listed as local time UTC+9.
Switch on: 085230 05/09/03 05-Sep-2003 09:00:00
In water: 1100 05/09/03
in posn : 1113 05/09/03 19.3m
First good: 1130 05/09/03 05-Sep-2003 11:30:00
Last in posn : 1310 07/01/04 07-Jan-2004 13:00:00
Out of water :

Last Read:

Comments : This instrument was moved to A11b and afterwards to A14

**A11  Rock Islands northern channel entrance**

**Instrument :** RDI ADCP 600kHz, #1673  
(serial no.)
**Capability :**
**Location :** 07°19.400’N, 134°28.949’E, 22m
**Sampling :** 15min ensembles, continuous; 150 pings/ensemble, 30*1m bins, SD=0.57cm/s, 424 Wh, 9.7m, 140 days
**Filename :** No Data setup pal01.whp

Switch on: 100730 30/08/03
In water: 1600 30/08/03
in posn : 1616 30/08/03
First good:
Last in posn : 1613 03/01/04 23.6m
Out of water :
Last Read: 1013 07/01/04 No data

Comments : No data – battery failed, put UoG ADCP#1292 in 7/1/04

**A11b  Rock Islands northern channel entrance**

**Instrument :** ADCP 1200kHz, #1292 – UoG (Bob Richmond)  
(serial no.)
**Capability :** Temperature and Pressure
**Location :** 07° 17.786’N, 134° 28.958’E, 22 m
**Sampling :** 15min ensembles, continuous; 180 pings/ensemble, 22*1m bins, SD=0.2cm/s
**Filename :** pal05000.000

In water:
in posn : 1402 07/01/04 22.6m deep
First good: 1415 07/01/04
Last in posn : 1430 11/01/04
Popped: 1438 11/01/04
Out of water :
Last Read:

Comments : The above instrument was moved from A10 and afterwards to A14
A11c  Rock Islands northern channel entrance

**Instrument:** Nortek Aquapro, #0866/784 – CRRF (Pat Colin)

(serial no.)

**Capability:** 50cm blanking distance

**Location:** 07°19.023’N, 134°31.490’E, 30+m

**Sampling:** 1min sampling interval every 15min, 30*1m bins

**Filename:** Pal1001.prf  setup Pal10

All times listed as local time UTC+9.

**Switch on:** 125930 11/01/04

**In water:**

in posn : 1438 11/01/04 22.6 m

First good: 1500 11/01/04 11-Jan-2004 15:30:00

Last in posn : 1430 05/02/04 05-Feb-2004 14:30:00

Out of water :

Last Read: 125930 10/02/04 2004-02-10 13:00:00

**Comments:** Replaced failed current meter #1673 A11 and short A11b deployments.

21 good bins

This instrument was moved from A13

A12  Rock Islands southern reef opening

**Instrument:** Nortek Aquadopp, #0970/0855 – CRRF (Pat Colin)

(serial no.)

**Capability:** 50cm blanking distance, 5M mem

**Location:** 07°19.223’N, 134°29.795’E, 11.4m

**Sampling:** 5min sampling interval every 15min, SD=0.4cm/s, 0.3M mem, 107%

battery in 75 days

**Filename:** Pal0401.AQD,*_.HDR & *.DAT  setup pal04

All times listed as local time UTC+9.

**Switch on:** 151230 03/09/03

**In water:**

in posn : 1715 03/09/03 11.4m

First good: 1730 03/09/03 03-Sep-2003 17:30:00

Last good : 204230 03/10/01 01-Oct-2003 20:45:00

Last in posn : 1056 04/01/04 11.2m

Out of water :

Last Read:

Switch off : 1100 07/01/04

1 sec/ 6mths specification

**Comments:** Battery flat as expected although should have lasted 70 days

1230 in cold box for intercalibration

A13  Toachel mid

**Instrument:** Nortek Aquapro, #0866/784 – CRRF (Pat Colin)

(serial no.)

**Capability:** 50cm blanking distance
Location : 07°19.023’N, 134°31.490’E, 30+m  
Sampling : 1min sampling interval every 15min, 30*1m bins

Filename : pal0601.prf  
All times listed as local time UTC+9.

Switch on: 135930 05/09/03  
In water: 1510 05/09/03  
in posn : 1530 05/09/03  
First good: 05-Sep-2003 15:30:00  
Last good : 0230 30/11/03 30-Nov-2003 02:30:00  
Last in posn : 0830 09/01/04  
Popped : 0840 09/01/04  
Out of water :  
Last Read: 1153 10/01/04  
Logger 23 seconds fast  
Comments : 26 good bins, shorter than deployed record – 75 days  
This instrument was moved to A11c

A14 Japanese Channel

Instrument : ADCP 1200kHz, #1292 – UoG (Bob Richmond)  
(serial no.)  
Capability : Temperature and Pressure  
Location : 07° 17.786’N, 134° 28.958’E, 22 m  
Sampling : 15min ensembles, continuous; 180 pings/ensemble, 22*1m bins,  
SD=0.2cm/s

Filename : pal05000.000  
All times listed as local time UTC+9.  

In water:  
in posn : 1520 11/01/04 4m deep  
First good: 1530 11/01/04  
Last in posn :  
Popped :  
Out of water :  
Switch off : 2135 14/01/04 12626 ensembles  
Logger 16 seconds fast  
Comments : This instrument was moved from A10 and A11b
## Appendix D – Temperature deployment information

### T1 Falcon Reef

**T16**

**Instrument**: SBE39T Temperature logger, #0935  
* (serial no.)

**Capability**:  

**Location**: 07°22.424’N, 134°23.232’E, 2.5m

**Sampling**: Sampling Interval 5 min

**Filename**: 09350401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1330 08/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1408 08/09/03</td>
</tr>
<tr>
<td>2.5m</td>
<td></td>
</tr>
<tr>
<td>First good:</td>
<td>1410 08/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1443 03/01/04</td>
</tr>
<tr>
<td>3.7m</td>
<td></td>
</tr>
<tr>
<td>Out of water:</td>
<td>1525 03/01/04</td>
</tr>
<tr>
<td>Switch off</td>
<td>1601 04/01/04</td>
</tr>
</tbody>
</table>

**Comments**: Long transect, 4 SBE39T & 1 SBE16CT

### T15

**Instrument**: SBE39T Temperature logger, #0929  
* (serial no.)

**Capability**:  

**Location**: 07°22.424’N, 134°23.232’E, 3.5m

**Sampling**: Sampling Interval 5 min

**Filename**: 09290401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1330 08/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1355 08/09/03</td>
</tr>
<tr>
<td>3.5m</td>
<td></td>
</tr>
<tr>
<td>First good:</td>
<td>1400 08/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1448 03/01/04</td>
</tr>
<tr>
<td>4.7m</td>
<td></td>
</tr>
<tr>
<td>Out of water:</td>
<td>1525 03/01/04</td>
</tr>
<tr>
<td>Switch off</td>
<td>1606 04/01/04</td>
</tr>
</tbody>
</table>

**Comments**: Logger 1 second fast

### T14 C2

**Instrument**: SBE16CT Conductivity & Temperature logger, #2127  
* (serial no.)

**Capability**:  

**Location**: 07°22.424’N, 134°23.232’E, 6m

**Sampling**: Sampling Interval 5 min

**Filename**: 21270401.hex  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1330 08/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1500 08/09/03</td>
</tr>
<tr>
<td>3.5m</td>
<td></td>
</tr>
<tr>
<td>First good:</td>
<td>1400 08/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1448 03/01/04</td>
</tr>
<tr>
<td>4.7m</td>
<td></td>
</tr>
<tr>
<td>Out of water:</td>
<td>1525 03/01/04</td>
</tr>
<tr>
<td>Switch off</td>
<td>1606 04/01/04</td>
</tr>
</tbody>
</table>

**Comments**: Logger 1 second fast

---

52
Switch on: 1500 04/09/03
In water:
in posn : 1345 08/09/03 6m
First good: 1345 08/09/03 8 Sep 2003, 14:00:00
Last in posn : 1450 03/01/04 3 Jan 2004, 14:30:00 6.9m
Out of water : 1525 03/01/04
Switch off 1808 04/01/04 35170 samples

Comments :
Logger 2 seconds fast

T13
Instrument : SBE39T Temperature logger, #0920
(serial no.)
Capability :
Location : 07° 22.445’N, 134° 23.177’E, 9m
Sampling : Sampling Interval 5 min
Filename : 09200401.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1118 08/09/03</td>
</tr>
<tr>
<td>in posn :</td>
<td>1132 08/09/03 9m</td>
</tr>
<tr>
<td>First good:</td>
<td>1135 08/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1454 03/01/04 10.0m</td>
</tr>
<tr>
<td>Out of water :</td>
<td>1525 03/01/04</td>
</tr>
<tr>
<td>Switch off</td>
<td>1557 04/01/04 35436 samples</td>
</tr>
</tbody>
</table>

Comments :
Next to CRRF logger

T12 – current meter A7

T11
Instrument : SBE39T Temperature logger, #0934
(serial no.)
Capability :
Location : 07°22.445’N, 134°23.177’E, 20m
Sampling : Sampling Interval 5 min
Filename : 09340401.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1118 08/09/03</td>
</tr>
<tr>
<td>in posn :</td>
<td>1142 08/09/03 20m</td>
</tr>
<tr>
<td>First good:</td>
<td>1145 08/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1509 03/01/04 21.4m</td>
</tr>
<tr>
<td>Out of water :</td>
<td>1525 03/01/04</td>
</tr>
<tr>
<td>Switch off</td>
<td>1551 04/01/04 35435 samples</td>
</tr>
</tbody>
</table>

Comments :
No clock drift
### T2 Lighthouse, Toachel ra Kesebekuu

#### T26

**Instrument**: SBE39T Temperature logger, #0925  
**Capability**  
**Location**: 07°16.955’N, 134°27.932’E, 1m  
**Sampling**: Sampling Interval 5 min

**Filename**: 09250801.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 30/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>1444 31/08/03 1m</td>
</tr>
<tr>
<td>First good:</td>
<td>1445 31/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>0846 07/01/04 3.1m</td>
</tr>
<tr>
<td>Out of water:</td>
<td>Switch off 1607 08/01/04 37742 samples</td>
</tr>
<tr>
<td>Comments :</td>
<td>Transect: 4 SBE39T, 1 SBE16CT; with A8</td>
</tr>
</tbody>
</table>

#### T25 C4

**Instrument**: SBE16CT Conductivity & Temperature logger, #2124  
**Capability**  
**Location**: 07°16.955’N, 134°27.932’E, 3 m  
**Sampling**: Sampling Interval 5 min

**Filename**: 21240301.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1230 31/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>1452 31/08/03 2.5m</td>
</tr>
<tr>
<td>First good:</td>
<td>1455 31/08/03 31-Aug-2003 16:00:00</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>0815 31/12/03 31-Dec-2003 08:00:00 2.7m</td>
</tr>
<tr>
<td>Out of water:</td>
<td>Switch off 1208 03/01/04 35996 samples</td>
</tr>
<tr>
<td>Comments :</td>
<td>Logger 6 seconds fast</td>
</tr>
</tbody>
</table>

#### T24

**Instrument**: SBE39T Temperature logger, #0933  
**Capability**  
**Location**: 07°16.955’N, 134°27.932’E, 5m  
**Sampling**: Sampling Interval 5 min

**Filename**: 09330801.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 30/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
</tbody>
</table>
in posn : 1500 31/08/03 5m
First good: 1500 31/08/03
Last in posn : 0837 07/01/04 7.2m
Out of water : Switch off 1558 08/01/04

Switch on:
In water:
in posn : 1500 31/08/03 5m
First good: 1500 31/08/03
Last in posn : 0837 07/01/04 7.2m
Out of water : Switch off 1558 08/01/04 37740 samples

Logger 10 seconds fast

Comments :
T23
Instrument : SBE39T Temperature logger, #1054
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 10m
Sampling : Sampling Interval 5 min

Filename : 10540801.asc
List all times as local time. UTC+9.

Time Depth
Switch on: 1500 30/08/03
In water:
in posn : 1509 31/08/03 10m
First good: 1510 31/08/03
Last in posn : 0834 07/01/04 11.0m
Out of water : Switch off 1541 08/01/04 37737 samples
Logger 2 seconds slow

Comments :
T22
Instrument : SBE39T Temperature logger, #1052
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 20m
Sampling : Sampling Interval 5 min

Filename : 10520801.asc
All times listed as local time UTC+9.

Time Depth
Switch on: 1500 30/08/03
In water:
in posn : 1516 31/08/03 20m
First good: 1520 31/08/03
Last in posn : 0840 07/01/04 23.4m
Out of water : Switch off 1530 08/01/04 37737 samples
Logger 1 second slow

Comments :
T21 – current meter A8

T3 Rock Islands, inside channel
T35
Instrument : SBE39T Temperature logger, #1055

Capability:
Location : 07°19.570’N, 134°29.418’E, 1m

Sampling : Sampling Interval 5 min

Filename : 10550301.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1030 29/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>1517 29/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1520 29/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1459 30/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
</tr>
<tr>
<td>Switch off:</td>
<td>1801 03/01/04</td>
</tr>
</tbody>
</table>

Comments : Transect of 5 loggers, put in at low water on cloudy day.

T34

Instrument : SBE39T Temperature logger, #1058

Capability:
Location : 07°19.570’N, 134°29.418’E, 2.5m

Sampling : Sampling Interval 5 min

Filename : 10583112.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1030 29/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>1510 29/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1510 29/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1500 30/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
</tr>
<tr>
<td>Switch off:</td>
<td>1204 31/12/03</td>
</tr>
</tbody>
</table>

Comments : Logger 2 seconds slow

T33

Instrument : SBE39T Temperature logger, #0676

Capability:
Location : 07°19.570’N, 134°29.418’E, 5m

Sampling : Sampling Interval 5 min

Filename : 06763112.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1030 29/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>1500 29/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1500 29/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1502 30/12/03</td>
</tr>
</tbody>
</table>

Out of water: |
Switch off:  1135 31/12/03  35725 samples
Comments:
Logger 1 second slow

T32
Instrument:  SBE39T Temperature logger, #0675
(serial no.)
Capability:
Location:  07°19.570’N, 134°29.418’E, 10m
Sampling:  Sampling Interval 5 min
Filename:  06753112.asc  All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1030 29/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1444 29/08/03  10.0m</td>
</tr>
<tr>
<td>in posn:</td>
<td>1445 29/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1504 30/12/03  10.4m</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1332 31/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td>Switch off</td>
</tr>
<tr>
<td>Switch off:</td>
<td>1332 31/12/03  35749 samples</td>
</tr>
<tr>
<td>Logger 8 seconds fast</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

T31
Instrument:  SBE39T Temperature logger, #1057
(serial no.)
Capability:
Location:  07°19.570’N, 134°29.418’E, 20m
Sampling:  Sampling Interval 5 min
Filename:  10573112.asc  All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1030 29/08/03</td>
</tr>
<tr>
<td>In water:</td>
<td>1432 29/08/03  20m</td>
</tr>
<tr>
<td>in posn:</td>
<td>1435 29/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1506 30/12/03  20.5m</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>124710 31/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td>Switch off</td>
</tr>
<tr>
<td>Switch off:</td>
<td>124710 31/12/03  347410 samples</td>
</tr>
<tr>
<td>Logger 9 seconds fast</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

T4  Rock Islands, Nikko Bay
T45
Instrument:  SBE39T Temperature logger, #1059
(serial no.)
Capability:
Location:  07°19.772’N, 134°30.034’E, 1m
Sampling:  Sampling Interval 5 min
Filename:  10593112.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>0930 30/08/03</td>
<td></td>
</tr>
<tr>
<td>in posn:</td>
<td>1735 30/08/03</td>
<td>1m</td>
</tr>
<tr>
<td>First good:</td>
<td>1735 30/08/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1537 30/12/03</td>
<td>2.4m</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch off:</td>
<td>1153 31/12/03</td>
<td>35453 samples</td>
</tr>
</tbody>
</table>

Comments:

T44
Instrument: SBE39T Temperature logger, #1051 (serial no.)
Capability: Sampling Interval 5 min
Location: 07°19.772’N, 134°30.034’E, 2.5m
Sampling: 35453 samples
Filename: 10513112.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>0930 30/08/03</td>
<td></td>
</tr>
<tr>
<td>in posn:</td>
<td>1730 30/08/03</td>
<td>2.5m</td>
</tr>
<tr>
<td>First good:</td>
<td>1730 30/08/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1540 30/12/03</td>
<td>2.6m</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch off:</td>
<td>1300 31/12/03</td>
<td>35466 samples</td>
</tr>
</tbody>
</table>

Comments:

T43
Instrument: SBE39T Temperature logger, #1061 (serial no.)
Capability: Sampling Interval 5 min
Location: 07°19.772’N, 134°30.034’E, 5m
Sampling: 35466 samples
Filename: 1061311203.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>0930 30/08/03</td>
<td></td>
</tr>
<tr>
<td>in posn:</td>
<td>1720 30/08/03</td>
<td>5m</td>
</tr>
<tr>
<td>First good:</td>
<td>1720 30/08/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1541 30/12/03</td>
<td>5.4m</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch off:</td>
<td>1214 31/12/03</td>
<td>35457 samples</td>
</tr>
</tbody>
</table>

Comments:

T42
Instrument: SBE39T Temperature logger, #1060 (serial no.)
Capability: Sampling Interval 5 min
Location: 07°19.772’N, 134°30.034’E, 10m
Sampling: Sampling Interval 5 min

Filename: 10603112.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td></td>
</tr>
<tr>
<td>in posn:</td>
<td>0930 30/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1715 30/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1544 30/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
</tr>
<tr>
<td>Switch off</td>
<td>1225 31/12/03</td>
</tr>
</tbody>
</table>

Comments:
Logger 5 seconds slow

T41
Instrument: SBE39T Temperature logger, #1053
(seral no.)
Capability: 
Location: 07°19.772’N, 134°30.034’E, 17.6m
Sampling: Sampling Interval 5 min

Filename: 10533112.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td></td>
</tr>
<tr>
<td>in posn:</td>
<td>0930 30/08/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1705 30/08/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1546 30/12/03</td>
</tr>
<tr>
<td>Out of water:</td>
<td></td>
</tr>
<tr>
<td>Switch off</td>
<td>1236 31/12/03</td>
</tr>
</tbody>
</table>

Comments:
Logger 2 seconds slow

T5 Uchelbeluu (deepwater mooring)
T56 C5
Instrument: SBE16CT Conductivity & Temperature logger, #2125
(seral no.)
Capability: 
Location: 07°15.545’N, 134°33.167’E, "150m below" on 126m mooring
Sampling: Sampling Interval 10 min, 600secs

Filename: 21251401.hex
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
</tr>
<tr>
<td>In water:</td>
</tr>
<tr>
<td>in posn:</td>
</tr>
<tr>
<td>First good:</td>
</tr>
<tr>
<td>Last in posn:</td>
</tr>
<tr>
<td>Out of water:</td>
</tr>
<tr>
<td>Switch off</td>
</tr>
</tbody>
</table>

Comments:
with A5,C5, Acoustic Release #445 (13.5 B/D)
Poor data set, 50% OK
T55
Instrument: SBE39PT Pressure & Temperature logger, #1062
(serial no.)
Capability:
Location: 07°15.545'N, 134°33.167'E, "160m below" on 126m mooring
Sampling: Sampling Interval 5 min
Filename: 10621401.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1030</td>
<td></td>
</tr>
<tr>
<td>1045</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>1440</td>
<td></td>
</tr>
<tr>
<td>1501</td>
<td></td>
</tr>
<tr>
<td>2233</td>
<td>35279</td>
</tr>
</tbody>
</table>

Switch on: 1030 14/09/03
In water: 1045 17/09/03
in posn: 1100 17/09/03
First good: 1100 17/09/03
Last in posn: 1440 13/01/04
Out of water: 1501 13/01/04
Switch off: 2233 14/01/04

Comments: with A5,C5, Acoustic Release #445 (13.5 B/D)

T54
Instrument: SBE39T Temperature logger, #0931
(serial no.)
Capability:
Location: 07°15.545'N, 134°33.167'E, "170m below" on 126m mooring
Sampling: Sampling Interval 5 min
Filename: 09311401.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>1045</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>1440</td>
<td></td>
</tr>
<tr>
<td>1501</td>
<td></td>
</tr>
<tr>
<td>221212</td>
<td>28391</td>
</tr>
</tbody>
</table>

Switch on: 1500 03/09/03
In water: 1045 17/09/03
in posn: 1100 17/09/03
First good: 1100 17/09/03
Last in posn: 1440 13/01/04
Out of water: 1501 13/01/04
Switch off: 221212 14/01/01

Comments: with A5,C5, Acoustic Release #445 (13.5 B/D)
File date is worn shows wnd date 15th!

T53
Instrument: SBE39T Temperature logger, #0923
(serial no.)
Capability:
Location: 07°15.545'N, 134°33.167'E, "190m below" on 126m mooring
Sampling: Sampling Interval 5 min
Filename: 09231401.asc
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>1045</td>
<td></td>
</tr>
</tbody>
</table>

Switch on: 1500 03/09/03
In water: 1045 17/09/03
In posn: 1100 17/09/03
First good: 1100 17/09/03
Last in posn: 1440 13/01/04
Out of water: 1501 13/01/04
Switch off 210955 14/01/04 38378 samples

Logger 19 seconds slow

Comments: with A5,C5, Acoustic Release #445 (13.5 B/D)

T52 – current meter A5

T51
Instrument: SBE39T Temperature logger, #0927
(Capability: SBE39T Temperature logger, #0927
Location: 07°15.545’N, 134°33.167’E, "225m below" on 126m mooring
Sampling: Sampling Interval 5 min
Filename: 09271401.asc

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on: 1500 03/09/03</td>
<td></td>
</tr>
<tr>
<td>In water: 1045 17/09/03</td>
<td></td>
</tr>
<tr>
<td>in posn: 1100 17/09/03</td>
<td></td>
</tr>
<tr>
<td>First good: 1100 17/09/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn: 1440 13/01/04</td>
<td></td>
</tr>
<tr>
<td>Out of water: 1501 13/01/04</td>
<td></td>
</tr>
<tr>
<td>Switch off 2233 14/01/04 38395 samples</td>
<td></td>
</tr>
</tbody>
</table>

Logger 7 seconds slow

Comments: with A5,C5, Acoustic Release #445 (13.5 B/D)

T6 Central Philippine Sea – West Reef flat

T65
Instrument: SBE39T Temperature logger, #1137
(Capability: SBE39T Temperature logger, #1137
Location: 07°24.713’N, 134°20.258’E, 3m (high water)
Sampling: Sampling Interval 5 min
Filename: No Data

All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on: 1500 03/09/03</td>
<td></td>
</tr>
<tr>
<td>In water: 0955 12/09/03</td>
<td></td>
</tr>
<tr>
<td>in posn: 1040 12/09/03</td>
<td></td>
</tr>
<tr>
<td>First good: 1040 12/09/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn:</td>
<td></td>
</tr>
<tr>
<td>Out of water:</td>
<td>NOT RECOVERED</td>
</tr>
<tr>
<td>Switch off</td>
<td></td>
</tr>
</tbody>
</table>

Comments: Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT
Wire securing logger recovered but had been cut through and had weed growth on the cut
**T64**

**Instrument:** SBE39T Temperature logger, #0928  
(serial no.)

**Capability:**

**Location:** 07°24.713’N, 134°20.258’E, 4.5m (high water)

**Sampling:** Sampling Interval 5 min

**Filename:** 09281401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>0955 12/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1028 12/09/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1030 12/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1110 14/01/04</td>
</tr>
<tr>
<td>Out of water:</td>
<td>1150 14/01/04</td>
</tr>
<tr>
<td>Switch off:</td>
<td>2324 14/01/04</td>
</tr>
</tbody>
</table>

**Comments:** Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

---

**T63 C1**

**Instrument:** SBE16CT Conductivity & Temperature logger, #2123  
(serial no.)

**Capability:**

**Location:** 07°24.713’N, 134°20.258’E, 7m (high water)

**Sampling:** Sampling Interval 5 min

**Filename:** 21231401.hex  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>0750 10/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>0955 12/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1003 12/09/03</td>
</tr>
<tr>
<td>First good:</td>
<td>1005 12/09/03</td>
</tr>
<tr>
<td>Last in posn:</td>
<td>1115 14/01/04</td>
</tr>
<tr>
<td>Out of water:</td>
<td>1150 14/01/04</td>
</tr>
<tr>
<td>Switch off:</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

---

**T62**

**Instrument:** SBE39T Temperature logger, #0917  
(serial no.)

**Capability:**

**Location:** 07°24.713’N, 134°20.258’E, 12m (high water)

**Sampling:** Sampling Interval 5 min

**Filename:** 09171401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td>1500 03/09/03</td>
</tr>
<tr>
<td>In water:</td>
<td>0955 12/09/03</td>
</tr>
<tr>
<td>in posn:</td>
<td>1010 12/09/03</td>
</tr>
</tbody>
</table>

---

62
First good: 1010 12/09/03 12m
Last in posn : 1135 14/1/04 12.5m
Out of water : 1150 14/1/04
Switch off 2317 14/01/04 38404 samples
4 seconds fast
Comments : Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

T61
Instrument : SBE39T Temperature logger, #0924
(serial no.)
Capability :
Location : 07°24.713’N, 134°20.258’E, 24m (high water)
Sampling : Sampling Interval 5 min
Filename : 09241401.asc
All times listed as local time UTC+9.

Time Depth
Switch on: 1500 03/09/03
In water: 0955 12/09/03
in posn : 1015 12/09/03
First good: 1015 12/09/03 24
Last in posn : 1140 14/01/04 24.5
Out of water : 1150 14/01/04
Switch off 2329 14/01/04 38406 samples
Logger is 6 seconds fast
Comments : Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

T7 Southern Rock Islands
T75
Instrument : SBE39T Temperature logger, #1056
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 1.5m
Sampling : Sampling Interval 5 min
Filename : 10560301.asc
All times listed as local time UTC+9.

Time Depth
Switch on: 1500 30/08/03
In water: 0957 02/09/03 1.5m
in posn : 1000 02/09/03
First good: 1000 02/09/03 2.0m
Last in posn : 1604 02/01/04 2.0m
Out of water : 1822 03/01/04 36329 samples
6 seconds slow
Comments :

T74
Instrument : SBE39T Temperature logger, #0926
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 3m
Sampling : Sampling Interval 5 min

Filename : 9260301.asc

All times listed as local time UTC+9.

Time                  Depth
Switch on: 1415 01/09/03
In water:
in posn : 0945 02/09/03 3m
First good: 0945 02/09/03
Last in posn : 1603 02/01/04 3.3m
Out of water:
Switch off 175640 03/01/04 35756 samples

Comments : Logger 4 seconds fast

T73
Instrument : SBE39T Temperature logger, #0919
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 6m
Sampling : Sampling Interval 5 min

Filename : 09190903.asc

All times listed as local time UTC+9.

Time                  Depth
Switch on: 1415 01/09/03
In water:
in posn : 0940 02/09/03 5m
First good: 0940 02/09/03 02 Sep 2003, 10:00:00
Last in posn : 0845 23/09/03 23 Sep 2003, 08:45:00 5m
Out of water:
Switch off 1134 23/09/03 6304 samples

Comments : Tide gauge B3 replaced this in late Sep and bottom logger (T71) brought up in Nov

T73b – tide gauge B3

T73c
Instrument : SBE39PT Pressure & Temperature logger, #0732
(serial no.)
Capability :
Location : 07°16.955’N, 134°27.932’E, 5m
Sampling : Sampling Interval 5 min

Filename : 07321401.asc

First good : 0915 05/11/03 05 Nov 2003, 09:15:00
Last in posn : 1601 02/01/04 02 Jan 2004, 15:30:00 5.5m
Out of water:
Switch off 2320 14/01/04 38990 samples

Comments : Logger moved from T71
T72
Instrument: SBE39T Temperature logger, #0930
Capability: Temperature 300K samples
Location: 07°16.955’N, 134°27.932’E, 12m
Sampling: Sampling Interval 5 min
Filename: 09300301.asc
Switch on: 1415 01/09/03
In water: 0930 02/09/03
First good: 0930 02/09/03
Last in posn: 1539 02/01/04
Out of water:
Switch off: 1815 03/01/04
Comments: No clock drift
All times listed as local time UTC+9.

T71
Instrument: SBE39PT Pressure & Temperature logger, #0732
Capability: Temperature 300K samples
Location: 07°16.376’N, 134°24.667’E, 9m 07°16.955’N, 134°27.932’E, 18m
Sampling: Sampling Interval 5 min
Filename: 07321401.asc
Switch on: 1415 01/09/03
In water: 0918 02/09/03
First good: 0920 02/09/03
Last in posn: 0900 05/11/03
Out of water:
Switch off: 05 Nov 2003, 09:00:00
Comments: Moved from bottom in November to 5m T73c at the same transect
Temperature sub-standard for post deployment inter-calibration
All times listed as local time UTC+9.

T8 Ulong East Channel
T86
Instrument: SBE39T Temperature logger, #918
Capability: Temperature 300K samples
Location: 07°16.621’N, 134°18.802’E, 1m in 42m of water
Sampling: Sampling Interval 5 min
Filename: 09181401.asc
Switch on: 1500 03/09/03
In water: 1135 22/09/03
First good: 1140 22/09/03
Comments: 22-Sep-2003 12:00:00
All times listed as local time UTC+9.
Last in posn : 1230 13/01/04 13-Jan-2004 12:30:00
Out of water : 
Switch off 164034 14/1/04 38349 samples
Comments : Logger 2 seconds fast

T85
Instrument : Brancker XR-420-TG tide gauge, #10092
(serial no.)
Capability : Temperature and pressure gauge, 60 sec ave, max depth 90m
Location : 07° 16.621’N, 134° 18.802’E, 1m in 42m of water
Sampling : Sampling Interval 5 min, 60 sec ave
Filename : 0100921401.dat
All times listed as local time UTC+9.

Switch on: 214930 22/09/03 2150 22/9/03
In water: 0818 23/09/03
First good: 0830 23/09/03 23-Sep-2003 08:30:00
Last good :
Last record : 1040 19/12/03 19-Dec-2003 06:00:00
Last in posn : 1230 13/01/04
Out of water :
Switch off No power 25212 samples
Comments : Battery flat on recovery
Temp calibration
on 1555 14/1/04, 5’si 60 sec ave with 732 @1550 14/1/04 in ocean
in bath 2100 14/1/04 off @2400 14/1/04 10092calib.dat

T84
Instrument : SBE39T Temperature logger, #932
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621’N, 134° 18.802’E, 5m in 42m of water
Sampling : Sampling Interval 5 min
Filename : 09321401.asc
All times listed as local time UTC+9.

Switch on: 1500 03/09/03
In water: 1135 22/09/03
First good: 1140 22/09/03
Last in posn : 1230 13/01/04
Out of water :
Switch off 214202 14/1/04 38385 samples
Logger 1 second fast
Comments :

T83
Instrument : SBE39T Temperature logger, #922
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621’N, 134° 18.802’E, 10m in 42m of water
Sampling : Sampling Interval 5 min

Filename : 09221401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on: 1500 03/09/03</td>
<td></td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn : 1135 22/09/03</td>
<td></td>
</tr>
<tr>
<td>First good: 1140 22/09/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn : 1230 13/01/04</td>
<td></td>
</tr>
<tr>
<td>Out of water : Switch off 1741 14/01/04 38337 samples</td>
<td></td>
</tr>
</tbody>
</table>

Comments :
Logger 1 second fast

Instrument : SBE39T Temperature logger, #921
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621’N, 134° 18.802’E, 20m in 42m of water
Sampling : Sampling Interval 5 min

Time
Switch on: 1500 03/09/03
In water:
in posn : 1135 22/09/03
First good: 1140 22/09/03
Last in posn : 1230 13/01/04
Out of water : Switch off 1749 14/01/04 38338 samples

Comments :
Logger 3 seconds slow

T81
Instrument : SBE39T Temperature logger, #916
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621’N, 134° 18.802’E, 40m in 42m of water
Sampling : Sampling Interval 5 min

Filename : 09161401.asc  
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on: 1500 03/09/03</td>
<td></td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>in posn : 1135 22/09/03</td>
<td></td>
</tr>
<tr>
<td>First good: 1140 22/09/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn : 1230 13/01/04</td>
<td></td>
</tr>
<tr>
<td>Out of water : Switch off 1727 14/01/04 38334 samples</td>
<td></td>
</tr>
</tbody>
</table>

Comments :
Logger 4 seconds slow

67
Appendix E – Salinity deployment information

C1 Philippine Sea – West reef flat

See T63

C2 Falcon Reef – lagoon central

See T14

C3 Malakal Harbour Pincers

Instrument : SBE16CT Conductivity & Temperature logger, #2126 (serial no.)
Capability : Conductivity and Temperature
Location : 07°20.163’N, 134°25.483’E, 3 m
Sampling : Sampling Interval 5 min
Filename : 21260301.hex
All times listed as local time UTC+9.

<table>
<thead>
<tr>
<th>Time</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on:</td>
<td></td>
</tr>
<tr>
<td>1500 04/09/03</td>
<td></td>
</tr>
<tr>
<td>In water:</td>
<td></td>
</tr>
<tr>
<td>1615 09/09/03</td>
<td></td>
</tr>
<tr>
<td>in posn :</td>
<td>2.6m</td>
</tr>
<tr>
<td>1627 09/09/03</td>
<td></td>
</tr>
<tr>
<td>First good:</td>
<td>09-Sep-2003 16:30:00</td>
</tr>
<tr>
<td>1630 09/09/03</td>
<td></td>
</tr>
<tr>
<td>Last in posn :</td>
<td>31-Dec-2003 07:30:00</td>
</tr>
<tr>
<td>0732 31/12/03</td>
<td>2.1m</td>
</tr>
<tr>
<td>Out of water :</td>
<td></td>
</tr>
<tr>
<td>Switch off</td>
<td>34803 Samples</td>
</tr>
<tr>
<td>1112 03/01/04</td>
<td></td>
</tr>
<tr>
<td>Comments :</td>
<td>with A9</td>
</tr>
<tr>
<td>Logger 5 seconds fast</td>
<td></td>
</tr>
</tbody>
</table>

C4 Lighthouse Toachel Ra Kesebekuu

See T25

C5 Uchelbeluu

See T56
### Appendix F – Weather station deployment information

**WX**

**Instrument:** Campbell Scientific WX1  
**Capability:** Wind Speed and direction RM Young  
Air temperature  
Pyranometer Kipp & Zonen CM3 #026233 22.24e-6 V/Wm⁻²  
PAR Licor Quantum Q31622

**Location:** 07°20.969’N 134°30.018’E, 210m Shalom Etpisons residence

**Sampling:** 5 minute sampling interval, 60 second averaging interval

**Filename:** 0100930301.dat  
All times listed as local time UTC+9.

**Switch on:**  
in posn:  
First good: 1350 23/09/03  
Last in posn: 1430 09/01/04

**Switch off**

**Comments:** Flat battery – gap
Appendix G – Mooring and Transect Summary Plots

Summary plots from the moorings and transects of temperature loggers are presented for observation of temperature variations with depth. Where available, depth and salinity data are also shown for each location.
Appendix H – Time Series Plots of Current Meter Data

The following data plots vary according to the type of instrument used to record the currents.

**ADCP data** (A1, A4, A5, A8, A9, A10, A11b, A11c, A13, A14) are presented using three figures. The first of these provides plots of current magnitude, direction and components (east, north and vertical) for all depth bins and throughout the deployment. The second and third figures show time series from the top and bottom bins of the vertical profile (i.e., nearest to the ocean surface and nearest to the instrument, respectively). These figures provide plots of temperature, depth (where available), current speed, current direction and a quiver plot of the currents. The quiver plot representation draws a line segment, originating at the axis, whose length is proportional to the current speed and whose direction represents that of the current (north and east directions are along the ordinate and abscissae, respectively). The scale on the ordinate axis reflects the current speed, as represented by the length of the line segment.

**S4 current meter data** (A2, A6) are presented in a single figure with time series plots of temperature (where available), depth, current magnitude, current direction and the quiver plot of currents, as described previously.

**Nobska current meter data** (A3, A7) are presented in two figures. The first of these shows time series of temperature, pressure in depth units (where available), current speed, current direction and the quiver plot of currents, as described previously. The second figure repeats the temperature plot accompanied by plots of conductivity (where available) and current components (east – u; north – v; and vertical – w).

No data were recorded for deployments A11 and A12.
A4 Palau
RDI ADCP 584

Velocity Magnitude Avg = 12 cm/s

Velocity Direction

East Velocity Avg = 1 cm/s

North Velocity Avg = -6 cm/s

Vertical Velocity Avg = 0 cm/s

Date (2003 WST)

86
Appendix I – Time Series Plots of Tide Gauge Data

Tide gauge data are presented as plots of depth and temperature for each deployment. Note that deployments B3b and B3c are presented as a single graph. The two deployments can be clearly seen from the depth graph by observing the surface-interval between them.
Appendix J – Time Series Plots of Salinity Data

Salinity values were determined from measurements of conductivity and temperature. The density anomaly (sigma-t), the increase in the density of the sea-water sample from that of fresh-water (1000 kg.m⁻³), can be derived from the temperature and salinity. Three time-series plots (temperature, salinity and density anomaly) are presented for each instrument.
Appendix K – CTD Profiles

Conductivity Temperature and Depth (CTD) Cast Summary

CTD casts are named using the following naming convention: ddmmnnn, with dd being the day, mm the month and nnn being the cast number starting from zero. Data were processed from raw *.hex files to *.cnv using the manufacturer software. They were then edited to in-water values.

The tables below summarise the cast locations from each survey in September and November 2003. The Site column identifies the CTD location. If the profile was recorded near deployed instruments, the site is referenced by the instrument code; e.g., cast 2109000 was taken near temperature profile T4. The information is contained in the ASCII file castdata.dat.

MATLAB uses this information to process the data into *.mat files and produce figures (*.emf). The data from each cast are presented here in two plots. The time, locations and depths, obtained from the original file header information, are included in the title. The first plot illustrates the variation with depth of the temperature, salinity and density anomaly. The second plot combines these three variables (contours of density anomaly are shown on the axes) on a two-dimensional graph. In this representation, a grouping of data indicates a specific type of water.

As an example, the second plot from cast 1909001 (page 136) is analysed. Two distinct water types are observed; to the right of the diagram, water with near-constant salinity (33.7 PSU) and density anomaly (21.12) shows a temperature range of 28.88 – 28.91°C; on the left of the diagram, water with near-constant temperature (28.89°C) has variable salinity (33.5 – 33.6 PSU) and density anomaly (20.99 – 21.07).

Table 5 List of CTD profiles taken during September 2003

<table>
<thead>
<tr>
<th>Cast</th>
<th>Site</th>
<th>Lat [°]</th>
<th>Lat [min]</th>
<th>Lon [°]</th>
<th>Lon [min]</th>
<th>Cast Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909000</td>
<td>018</td>
<td>7</td>
<td>6.857</td>
<td>134</td>
<td>15.937</td>
<td>24.5</td>
</tr>
<tr>
<td>1909001</td>
<td>019</td>
<td>7</td>
<td>8.073</td>
<td>134</td>
<td>17.910</td>
<td>15.8</td>
</tr>
<tr>
<td>1909002</td>
<td>020</td>
<td>7</td>
<td>9.686</td>
<td>134</td>
<td>19.861</td>
<td>25</td>
</tr>
<tr>
<td>1909003</td>
<td>021</td>
<td>7</td>
<td>10.880</td>
<td>134</td>
<td>21.754</td>
<td>26</td>
</tr>
<tr>
<td>1909004</td>
<td>022</td>
<td>7</td>
<td>12.783</td>
<td>134</td>
<td>23.249</td>
<td>18.5</td>
</tr>
<tr>
<td>1909005</td>
<td>023</td>
<td>7</td>
<td>13.054</td>
<td>134</td>
<td>26.643</td>
<td>27</td>
</tr>
<tr>
<td>1909006</td>
<td>026</td>
<td>7</td>
<td>15.351</td>
<td>134</td>
<td>27.651</td>
<td>28</td>
</tr>
<tr>
<td>1909007</td>
<td>025</td>
<td>7</td>
<td>16.966</td>
<td>134</td>
<td>27.922</td>
<td>22</td>
</tr>
<tr>
<td>1909008</td>
<td>026</td>
<td>7</td>
<td>17.672</td>
<td>134</td>
<td>27.459</td>
<td>13.8</td>
</tr>
<tr>
<td>1909009</td>
<td>027</td>
<td>7</td>
<td>18.653</td>
<td>134</td>
<td>27.605</td>
<td>14.7</td>
</tr>
<tr>
<td>1909010</td>
<td>028</td>
<td>7</td>
<td>19.858</td>
<td>134</td>
<td>27.887</td>
<td>29.5</td>
</tr>
</tbody>
</table>
Table 6 List of CTD profiles taken during November 2003

<table>
<thead>
<tr>
<th>Cast</th>
<th>Site</th>
<th>Lat [°]</th>
<th>Lat [min]</th>
<th>Lon [°]</th>
<th>Lon [min]</th>
<th>Cast Depth</th>
<th>Sounder Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0311000</td>
<td>11b</td>
<td>7</td>
<td>18.8864</td>
<td>134</td>
<td>27.3167</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>0411000</td>
<td>CTD0</td>
<td>7</td>
<td>14.0504</td>
<td>134</td>
<td>27.0888</td>
<td>15</td>
<td>14.6</td>
</tr>
<tr>
<td>0411001</td>
<td>CTD1</td>
<td>7</td>
<td>14.0386</td>
<td>134</td>
<td>27.0801</td>
<td>20</td>
<td>14.8</td>
</tr>
<tr>
<td>0411002</td>
<td>CTD2</td>
<td>7</td>
<td>14.0366</td>
<td>134</td>
<td>27.0790</td>
<td>24</td>
<td>14.2</td>
</tr>
<tr>
<td>0411003</td>
<td>CTD3</td>
<td>7</td>
<td>12.6739</td>
<td>134</td>
<td>26.8814</td>
<td>27</td>
<td>134.5</td>
</tr>
<tr>
<td>0411004</td>
<td>CTD4</td>
<td>7</td>
<td>12.6008</td>
<td>134</td>
<td>25.3299</td>
<td>25</td>
<td>17.9</td>
</tr>
<tr>
<td>0411005</td>
<td>CTD5</td>
<td>7</td>
<td>12.5031</td>
<td>134</td>
<td>23.9171</td>
<td>3.2</td>
<td>0</td>
</tr>
<tr>
<td>0411006</td>
<td>CTD6</td>
<td>7</td>
<td>09.3991</td>
<td>134</td>
<td>25.0446</td>
<td>13.8</td>
<td>12.3</td>
</tr>
<tr>
<td>Code</td>
<td>Type</td>
<td>Value</td>
<td>Code</td>
<td>Type</td>
<td>Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>--------</td>
<td>---------</td>
<td>-------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0411007</td>
<td>CTD7</td>
<td>12.7256</td>
<td>0411008</td>
<td>CTD8</td>
<td>15.6579</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0411009</td>
<td>CTD9</td>
<td>16.1055</td>
<td>0411010</td>
<td>CTD10</td>
<td>12.6050</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0411011</td>
<td>CTD11</td>
<td>09.4580</td>
<td>0411012</td>
<td>CTD12</td>
<td>16.4348</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0411013</td>
<td>CTD13</td>
<td>17.3838</td>
<td>0411014</td>
<td>CTD14</td>
<td>18.1537</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511000</td>
<td>Tide</td>
<td>08.4912</td>
<td>0511001</td>
<td>C2</td>
<td>08.4912</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511002</td>
<td>CTD2</td>
<td>08.5862</td>
<td>0511003</td>
<td>C1</td>
<td>08.6464</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511004</td>
<td>CTD4</td>
<td>07.6638</td>
<td>0511005</td>
<td>CTD5</td>
<td>08.9591</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511006</td>
<td>CTD6</td>
<td>09.5599</td>
<td>0511007</td>
<td>CTD7</td>
<td>09.8933</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511008</td>
<td>CTD8</td>
<td>08.8731</td>
<td>0511009</td>
<td>CTD9</td>
<td>08.0643</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511010</td>
<td>CTD10</td>
<td>19.2354</td>
<td>0511011</td>
<td>CTD11</td>
<td>21.5479</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511012</td>
<td>CTD12</td>
<td>23.2839</td>
<td>0511013</td>
<td>CTD13</td>
<td>26.8286</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0511014</td>
<td>CTD14</td>
<td>22.5419</td>
<td>0511015</td>
<td>CTD14</td>
<td>21.7790</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0611000</td>
<td>CTD0</td>
<td>28.6144</td>
<td>0611001</td>
<td>CTD1</td>
<td>29.5474</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0611002</td>
<td>CTD2</td>
<td>30.6139</td>
<td>0611003</td>
<td>CTD3</td>
<td>31.0064</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0611004</td>
<td>CTD4</td>
<td>29.5404</td>
<td>0611005</td>
<td>CTD5</td>
<td>29.5404</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711000</td>
<td>CTD0</td>
<td>46.3574</td>
<td>0711001</td>
<td>CTD1</td>
<td>50.7233</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711002</td>
<td>CTD2</td>
<td>54.8317</td>
<td>0711003</td>
<td>CTD3</td>
<td>56.3801</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711004</td>
<td>CTD4</td>
<td>58.5619</td>
<td>0711005</td>
<td>CTD5</td>
<td>59.5498</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711006</td>
<td>CTD6</td>
<td>52.7399</td>
<td>0711007</td>
<td>CTD7</td>
<td>50.9388</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711008</td>
<td>CTD8</td>
<td>49.0609</td>
<td>0711009</td>
<td>CTD9</td>
<td>46.3673</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0711010</td>
<td>CTD10</td>
<td>44.6621</td>
<td>0711011</td>
<td>CTD11</td>
<td>43.5478</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0911000</td>
<td>11C1</td>
<td>16.9557</td>
<td>0911001</td>
<td>11C2</td>
<td>15.8782</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0911002</td>
<td>11C3</td>
<td>14.8337</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>---</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>0911003</td>
<td>10A1</td>
<td>7</td>
<td>20.6072</td>
<td>134</td>
<td>34.3320</td>
<td>27</td>
<td>37.3</td>
</tr>
<tr>
<td>0911004</td>
<td>CTD4</td>
<td>7</td>
<td>22.0578</td>
<td>134</td>
<td>35.9943</td>
<td>27</td>
<td>1.5</td>
</tr>
<tr>
<td>1111000</td>
<td>6A</td>
<td>7</td>
<td>36.5044</td>
<td>134</td>
<td>31.3058</td>
<td>29</td>
<td>35.2</td>
</tr>
<tr>
<td>1111001</td>
<td>6Af</td>
<td>7</td>
<td>37.6915</td>
<td>134</td>
<td>33.0635</td>
<td>28</td>
<td>36.6</td>
</tr>
<tr>
<td>1111002</td>
<td>5As</td>
<td>7</td>
<td>39.6513</td>
<td>134</td>
<td>37.4472</td>
<td>6.9</td>
<td>1.1</td>
</tr>
<tr>
<td>1111003</td>
<td>5Af</td>
<td>7</td>
<td>38.1567</td>
<td>134</td>
<td>35.4293</td>
<td>24.5</td>
<td>33.5</td>
</tr>
<tr>
<td>1111004</td>
<td>5bs</td>
<td>7</td>
<td>37.7145</td>
<td>134</td>
<td>36.1149</td>
<td>19.5</td>
<td>19.5</td>
</tr>
<tr>
<td>1111005</td>
<td>5bf</td>
<td>7</td>
<td>40.6068</td>
<td>134</td>
<td>36.9029</td>
<td>26</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Temperature (deg C) (dotted)

Salinity (psu) (solid)

Density (sigma-t) (dashed)

Temperature (deg C) (dotted)

Salinity (psu) (solid)

Density (sigma-t) (dashed)

Temperature (°C)

Salinity (psu)
Depth (m)
File: 0411014  04-Nov-2003 17:34:03 S7.3026 E134.4722 Site: CTD14

- Temperature (°C)
  - 29.55, 29.56, 29.57, 29.58, 29.59, 29.6, 29.61, 29.62

- Salinity (psu)
  - 20.6, 20.65, 20.7, 20.75, 20.8, 20.85, 20.9, 20.95

- Density (σ-t)
  - 29.565, 29.57, 29.575, 29.58, 29.585, 29.59, 29.595

- Depth (m)
  - -2, 0, 2, 4, 6, 8, 10, 12, 14, 16, 18

- Temperature (deg C) (dotted)
- Salinity (psu) (solid)
- Density (sigma-t) (dashed)
File: 0711001  07-Nov-2003 08:31:36 S7.8454 E134.5425  Site: CTD1
Depth (m)

Temperature (°C) (dotted)

Salinity (psu) (solid)

Density (sigma-t) (dashed)
Appendix L – Time Series Plots of Weather Data

Two figures are presented for the portable weather station (WXSTA) data; the first shows the entire deployment and the second is zoomed to the Sep-Oct period. On each of these figures, two air temperatures (direct sunlight – blue; shaded – green) are presented together on the first plot, with axis label “Temp”. The data from two radiation measurements (Short-Wave Radiation – red; Photosynthetically Active Radiation (PAR) – blue) are shown on the second plot; the axis label, QSO, stands for Quantum Sensor Output. The two radiation measurements, although plotted together, differ in their units. The PAR has units of $\mu\text{mol.m}^{-2}\text{s}^{-1}$, whereas short wave radiation is in units of $\text{Wm}^{-2}$. Wind speed and direction are shown on the third and fourth plots. The fifth plot represents the wind data as a quiver plot, as described in Appendix H for ocean currents.

The NOAA data are presented in a single figure with plots of temperature, atmospheric pressure, wind speed, wind direction and the quiver plot of winds.

Unit Conversions for PAR: $1 \, \mu\text{Einstein} = 6.02 \times 10^{17} \, \text{photons s}^{-1} \, \text{m}^{-2} = 1 \, \mu\text{mol s}^{-1} \, \text{m}^{-2}$
Appendix M – Data Format & File naming conventions

Each instrument’s output data has its own, often manufacturer-specific, format when downloaded. From these, a standard file format is produced utilising MATLAB, a widely-used analysis package. The MATLAB data are binary; however, they can easily be reformatted to alternative formats, such as ASCII, from within the MATLAB environment.

File naming convention

File names are attributed according to the naming conventions associated with each particular project. The file prefix is made up of a 2 or 3 character instrument type and site number, and a 2 character position code, with further characters appended to help understand what type/s of data the file contains and what processing has been performed. The MATLAB files have a default filename extension ‘.mat’.

Example names are A10i1uvm.mat and T4i3t.mat

<table>
<thead>
<tr>
<th>Instrument Type Processing</th>
<th>Site Number</th>
<th>Position</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – current meters</td>
<td>1-14</td>
<td>i1-7</td>
<td>uv, uvw, uvm</td>
</tr>
<tr>
<td>B – tide gauges</td>
<td>1-6</td>
<td>i1</td>
<td>tl</td>
</tr>
<tr>
<td>C – salinity</td>
<td>1-5</td>
<td>i1</td>
<td>tc</td>
</tr>
<tr>
<td>T – Temperature transect</td>
<td>1-8</td>
<td>i1-7</td>
<td>t,tl</td>
</tr>
</tbody>
</table>

Instrument Type and Site Number codes can be found in the Instrument Array Summary section in the main part of this document. The tables in that section cross reference to actual location names, and a later table lists their geographic position coordinates.

Position codes indicate an instrument’s vertical position, as listed in The Temperature Transect and Mooring Summary section. The letter “i” precedes a number where 1 is the deepest instrument at the site and each higher instrument is given a consecutively higher number. If two loggers are located at the same depth, they are given the same number. Therefore the deepest instrument position on mooring A10 would be A10i1 or for transect T4 – T4i1.

Parameter codes, the final tag/s, indicate what variables are being measured by the instrument. Multiple tags are used to classify loggers with more than one sensor. Thus the instrument at mooring A10, which measured current profiles, has the codename A10i1uvm. The “m” indicates a matrix of data instead of a vector from single point measurements. The temperature (t) and water level (l) are sometimes suppressed for the current meters.
**Processing** codes are used to indicate level of data processing, specifically:

- **p** – prediction, **r** – residual, **o** – observed, **l** – low passed, **h** – high passed

CTD casts are named using the following naming convention: ddmmnnn, with **dd** being the day, **mm** the month and **nnn** being the cast number starting from zero. Data were processed from raw *.hex files to *.cnv using the manufacturer software. They were then edited to in-water values.

**ASCII Data Format**

Most data were downloaded from the instruments in a binary or hexadecimal format. Manufacturer’s software was then used to convert to American Standard Code for Information Interchange (ASCII) prior to ingestion into MATLAB for visualisation and analysis. ASCII is potentially the most easily-read format for this data where MATLAB is not available. These files can simply be inspected in any common text file viewer and most are self-explanatory.

ASCII files for individual instruments are listed in the instrument deployment tables in Appendices B, C, D, E and F. For instruments deployed in transects or on moorings, the file names are summarised in the **Temperature Transect and Mooring Summary** section. The original instrument output files were archived by instrument type in the “Raw Data” folder (Appendix N). A description of the ASCII-output format from the RDI ADCP instruments is provided here due to the complexity of the data file.

RDI ADCP data were converted to ASCII using the manufacturer software package, WinADCP. Due to their size, these files were compressed (*.zip) for inclusion in the DVD archive. While the ASCII files are provided with this report, it is recommended that the manufacturer’s software be obtained by individual users as it provides a method to view and export the data. The software is available at the RDInstruments website ([http://www.rdinstruments.com/](http://www.rdinstruments.com/)); while the package is free-of-charge, registration is required for download. To register, select “Customer Support” from the option column at the left of the screen and then follow the “Request Registration” link in the text. Fill in the required fields; for the type of ADCP, enter “300-kHz Workhorse Sentinel”. After submitting the form, RDI will provide access information via email. Upon receipt of this information, the downloading process requires, as input, parameters from one instrument. The necessary parameters from the instrument deployed at location A5 are:

- ADCP Serial number – WH 412
- Frequency – 300 kHz
- Type – Real time fixed

An example of the use of the WinADCP software is provided here. RDI ADCP binary data files for this study have a filename of the form “PAL02000.000”. To open a binary file from WinADCP go to the “File” menu and select “Open”. In the pop-up window select the data file to be opened and click “Open”. Binary data files output by BroadBand and WorkHorse ADCP instruments may be accessed by this process. Figure 14 is a screen-capture of the WinADCP workspace displaying data from the file PAL02000.000. A summary of the setup of the instrument and logging parameters is
shown in the upper-left sub-window, labelled “WinADCP Information”; the full dataset is displayed in the upper-right sub-window, labelled “Whole Set”; and a zoomed image of data from the first 64-hours of the deployment is shown in the bottom sub-window, labelled “Sub Set”.

Figure 14 Screen-capture of the WinADCP data viewer

To export data from WinADCP click on the “Export” menu; this opens the Export Options control box (Figure 15). In the “Series/Ancillary” tab, select the output file type (text or MATLAB); the required bins; the time-series data desired; the ancillary data desired; and which ensembles (i.e., timesteps of data) are required for downloading.

Selecting the items as shown Figure 15 will replicate the ASCII data supplied on the accompanying DVD. The format for the text output is shown in Table 8. General header information is listed, followed by the matrix of data. The number of columns in the matrix depends on the export options chosen; each column header containing short-forms of the variable name and units. Each row in the matrix represents one ensemble average; i.e., one time period of measurement. For the deployment shown, a total of 12488
ensemble averages were made. The first column lists the ensemble number and the subsequent eight columns show the ancillary data (as selected from Figure 15). The remaining columns contain time series data for each selected variable, grouped by the number of bins in the vertical profile (thirty-five in this case). The first thirty-five of these columns contain data of the first variable; the second set of thirty-five columns contains data of the second variable; etc. For compactness, only the values from the first bin (nearest the instrument) are presented here. The variables shown in Table 8 reflect those selected in the export options window; i.e., the average of the 4-beam echo amplitudes (EAA); the correlations for each bin (C1); the east component of velocity; the north component of velocity; the vertical component of velocity; the error in the magnitude of velocity; the velocity magnitude; and the velocity direction.

![Figure 15 Screen-capture of the WinADCP export options](image)

Figure 15 Screen-capture of the WinADCP export options
Sample ADCP ASCII txt file
"Series Data"
"C:\data\palauadcp\Pal02000.000"
"Broadband 614.4 kHz"
"Pings/Ens= 150"
"Time/Ping = 00:06.00"
"First Ensemble Date = 03/08/31"
"First Ensemble Time = 12:07:30.00"
"Ensemble Interval (s) = 897.33"
"1st Bin Range (m) = 2.01"
"Bin Size (m) = 1.00"

<table>
<thead>
<tr>
<th>Pit (deg)</th>
<th>Roll (deg)</th>
<th>Heading (deg)</th>
<th>Temp (deg)</th>
<th>Depth (m)</th>
<th>Origin (cnt)</th>
<th>BIT (cnt)</th>
<th>EAA (cnt)</th>
<th>Eas (cnt)</th>
<th>Ver (cnt)</th>
<th>_err (cnt)</th>
<th>Mag (mm/s)</th>
<th>Dir (deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.76</td>
<td>-1.88</td>
<td>226.49</td>
<td>27.49</td>
<td>0.00</td>
<td>1</td>
<td>0</td>
<td>160</td>
<td>45</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.37</td>
<td>-3.94</td>
<td>303.30</td>
<td>27.46</td>
<td>0.00</td>
<td>1</td>
<td>0</td>
<td>160</td>
<td>46</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.36</td>
<td>-3.88</td>
<td>303.35</td>
<td>27.42</td>
<td>0.00</td>
<td>1</td>
<td>0</td>
<td>160</td>
<td>46</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5014</td>
<td>-4.66</td>
<td>188.07</td>
<td>29.42</td>
<td>30.20</td>
<td>1</td>
<td>0</td>
<td>140</td>
<td>130</td>
<td>124</td>
<td>228</td>
<td>-380</td>
<td>-20</td>
</tr>
<tr>
<td>5015</td>
<td>-4.66</td>
<td>188.05</td>
<td>29.49</td>
<td>30.20</td>
<td>1</td>
<td>0</td>
<td>140</td>
<td>133</td>
<td>124</td>
<td>222</td>
<td>-310</td>
<td>-1</td>
</tr>
<tr>
<td>5016</td>
<td>-4.66</td>
<td>188.06</td>
<td>29.50</td>
<td>30.20</td>
<td>1</td>
<td>0</td>
<td>140</td>
<td>136</td>
<td>124</td>
<td>265</td>
<td>-351</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12488</td>
<td>23.20</td>
<td>-25.79</td>
<td>214.26</td>
<td>23.97</td>
<td>0.20</td>
<td>1</td>
<td>0</td>
<td>133</td>
<td>192</td>
<td>75</td>
<td>-11</td>
<td>51</td>
</tr>
</tbody>
</table>
**MATLAB Data Format**

MATLAB is a commonly-used scientific programming language with high-level visualisation capabilities. For this reason, the data collected in this study have been archived using the MATLAB format. Metadata are contained within the MATLAB data files. After loading a data file, the program “hdrmat.m” displays a summary of the information. An example for the current profiler A5 is shown in Table 9.

**Table 9 Example output for header from the current profiler, A5**

```matlab
>> load a5iluvmt
>> hdrmat

Palau A5 RDI ADCP 412
Instrument Depth 215 m

start    finish    si    tz
17-Sep-2003 11:30:00 13-Jan-2004 14:45:00 15    -9

Time series statistics
Variable Min     Max     Mean     Units
Temp    9.30000  13.27000  10.82724  deg C
Depth  210.00000 215.20000 210.58688  m
Dirn    0.00000 359.61467 140.72883  degrees
Speed   0.00000 293.48284  9.29600  cm/s
U       -98.20000 291.70000 3.24227  cm/s
V       -138.80000 193.30000 1.63225  cm/s
```

```matlab
>> whos

Name       Size     Bytes      Class
attributes 1x1      2028    struct array
depth      1x11342  90736    double array
dirn       23x11342 2086928  double array
speed      23x11342 2086928  double array
temp       1x11342  90736    double array
time       1x11342  90736    double array
u          23x11342 2086928  double array
units      1x1      1714    struct array
v          23x11342 2086928  double array
w          23x11342 2086928  double array
z          23x1
```

**Variables**

The MATLAB file associated with each instrument contains the variable names listed in the adjacent table, as appropriate to the sensors. Each data point is placed into a vector based on its data type and sample number. In addition, the time when each data point is sampled is written to the time vector element with the corresponding sample number. Time, temperature (temp), instrument depth (depth), salinity (sal), and density (sigma_t) are always vectors.
Currents, however, can be measured at either a particular location (point current meter) or at several locations throughout the water column (current profiler). If the logger measures at only one location, as is the case with an S4 current meter, the velocity data are stored in four, one-dimensional vectors: eastward velocity (u), northward velocity (v), magnitude (speed), and direction (dirn). If several currents are measured at different depths, the data are stored in several matrices (or arrays). The currents are placed into bins (in accordance with the instrument setup) based on their depth. The data from each bin occupy a row of the matrix. Additionally, the column vector, z, identifies the height of the bins. Thus the depth of the fourth bin from the bottom is tabulated as the fourth element of column vector, z. The northward currents measured at this depth are recorded in the fourth row of the matrix, v. Current profiler instrument files have a vertical velocity (w) matrix in addition to the eastward velocity (u), northward velocity (v), magnitude (speed), and direction (dirn) matrices. For Nortek Aquadopp Current Profilers, the count of measured particles at each bin for each sampling interval is also recorded. These values are arranged in the matrices au, av, and aw and correspond to the matrices u, v, and w respectively.

The final two parameters are attributes and units. Unlike the other variables which are all vector based, these are structure arrays. They contain pertinent information regarding the instrument and the units for each of the variables. Thus, every data file will contain both the attributes and units variables. Table 10 lists the attributes and units fields and values for the Uchelbeluu deepwater current profiler (A5).

Attributes
Information, such as the instrument make and serial number, are stored as fields in the attributes structure array. All instrument files have the same core of attributes listed in Table 10. A standard core of attributes allows MATLAB scripts to easily retrieve information among different instruments. Profiler data contain additional attribute fields which describe how the bins are set up.

Units
Like attributes, units are also structure arrays. The units field names are the same as variable and attribute names, such as temp and instrument_depth. However, the values are all strings describing the units of the named parameter. The number of fields in a units structure array vary from instrument to instrument and depend on which variables are measured.
Table 10 Example listing of attributes and units from the current profiler, A5

attributes =

    tz: 9
    si: 900
ensemble_period: 900
project: 'Palau'
    lat: 7.2653
    lon: 134.5566
    site: 'A5'
    serial: '412'
    make: 'RDI ADCP'
instrument_depth: 215
cell_size: 5
blanking_distance: 1.7600
bin_depth: [1x23 double]
top_bin: 23

units =

    time: 'serial date'
    si: 'seconds'
    u: 'cm/s'
    v: 'cm/s'
    w: 'cm/s'
    temp: 'deg C'
    depth: 'm'
instrument_depth: 'm'
cell_size: 'm'
blanking_distance: 'm'
speed: 'cm/s'
dirn: 'degrees'
z: 'm'

Other computing languages
MATLAB binary files can be read directly into other programming languages (Fortran, C). Programs to access data are provided in each of these languages at the Mathworks web site:
Appendix N – Data Archive

Data are stored on a companion DVD-ROM and is structured as shown in Figure 16. This document, “Palau Oceanographic Array Data Report.doc”, is contained in the Documents subdirectory.

The Raw Data have been organised by instrument type; whereas, the processed data are organised by variable type – Currents, CTD, Salinity, Sealevels, Temperatures and Weather. Temperature mooring and transect data were consolidated and placed in the Tempprofiles subdirectory. The summary data plots can also be found under each of variable type as shown below for currents.

Figure 16 Archival DVD-ROM directory structure