Monitoring of Moreton Bay mangrove communities using Mangrove Watch methods 2010 - 2011

Report No. 2

(permit: QS2009/MAN21)

Report prepared for Port of Brisbane

by

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Outline:

1. Introduction

Mangrove Watch is a program of the Wildlife Preservation Society of Queensland's Bayside Branch with financial support from the Port of Brisbane Corporation and Queensland Parks and Wildlife Service.

The majority of funding for the program is provided by the Port of Brisbane Corporation.

The program is into its second year and in that time has been trialling a hands-on methodology that relies on trained volunteers to regularly collect data from a range of sites in Moreton Bay.

This report provides a summary of Mangrove Watch activities throughout the second year. The period covers three monitoring periods (Jun-Jul 2010, Oct-Nov 2010 and Mar-Apr 2011).

Mangrove Watch currently has 46 volunteers who have registered an interest in the program of these, 28 have attended field training.

Eight sites have now been established in Moreton Bay: these include Coochiemudlo Island, Cleveland, Ormiston, Lota, Fisherman Islands (x2), Nudgee Beach and Hays Inlet. Field training has been conducted at each of these sites in the first year. At this stage of collecting data, there is insufficient repetition of data collection to conduct meaningful analysis. Some work to detect preliminary trends has been attempted. By the end of 2011, analysis of regularly monitored sites will be possible.

2. Launch of the program

The Mangrove Watch program was launched on the 15th March 2009 with a cruise on southern Moreton Bay organised by the Bayside Branch of the Wildlife Preservation Society of Queensland. Since then further public events have been held with the most notable a presentation by Norm Duke who, on the 27th May 2011, outlined a new methodology using video cameras. Wildlife Queensland Bayside Branch is currently in the process of raising funds to incorporate this methodology into the current Mangrove Watch monitoring program. The use of transect based monitoring and monitoring via video footage are considered valuable in helping us understand the health of our mangroves.

3. Volunteers

Mangrove Watch currently has 46 volunteers registered for Mangrove Watch; 28 of whom have had field training. Our volunteers come from a wide cross-section of the community and include office workers, students, as well as interested environmental professionals. Many volunteers work full time either inside or outside the home, some are part time and some are retired. Some volunteers on the database are unable to make the commitment to be part of a regular monitoring group but are still interested in the program and have opted to receive the newsletter only.

As of the end of May 2011, volunteers have collectively contributed a total of 281 hours to the program including both training and monitoring. A total of 117 volunteer hours have been contributed just for the training. The monetary value of volunteer in-kind contributions to the program has been $4215 (calculated at $15/hour).

4. Field training and information

The emphasis this year has been to continue to monitor sites, train and refine the monitoring methodology.

Throughout the year, Mangrove Watch has conducted several community events. On 25th July 2010 Wildlife Queensland Bayside Branch undertook a public event, which involved a walk along the foreshore of Thorneside looking at mangroves. Another such walk was undertaken on Sunday 26th June 2011 at Ormiston. A canoe trip on the 17th of April, 2011 was also undertaken to view the mangroves around Coochiemudlo Island.

Mangrove Watch newsletters continue to be distributed to volunteers and to the general public via our website resources. The newsletter is a short (3 page) reminder of the approaching monitoring period and provides an update on what is happening with the program and includes a one page educational page on some aspect of mangrove ecology or the program. The newsletter is now available from the Wildlife Queensland website (http://www.wildlife.org.au/projects/mangrove/) and our development website (http://www.sbaltais.com/mangrovewatch/). Our sponsors are duly cited.

Mangrove Watch is promoted through the Wildlife Preservation Society of Queensland's website, its regular ebulletin and occasional WPSQ newsletters. Wildlife Queensland Bayside Branch has also attended to many inquiries from the public and media about matters relating to mangroves.

A Mangrove Watch website has been developed where information and data will be presented. The Port of Brisbane Corporation will be recognised on this site.

5. Approvals and Permits

In June 2009, in accordance with changes to the zoning of Moreton Bay, the Mangrove Watch program was informed that it was required to apply for a permit to continue activities.

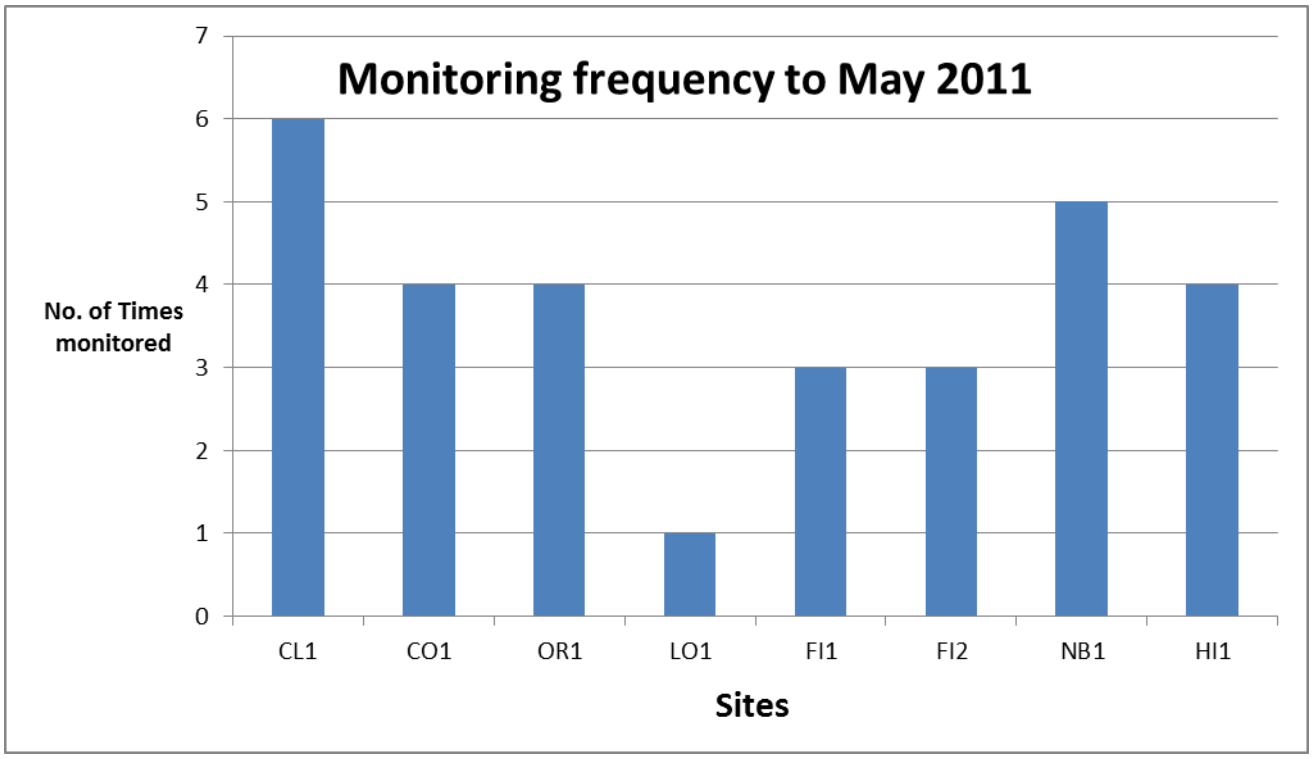
Department of Environment and Resource Management Permit No. QS2009/MAN21 was issued on 16 September 2009 to Simon Baltais program manager for Mangrove Watch and remains valid until 13 September 2014.

6. Monitoring

The number of sites monitored has been affected by flooding and heavy rainfall events since 2010 to May 2011. Work Place Health and Safety concerns restricted monitoring activity. Specifically the presence of bacterial contamination on a number of foreshore areas around Moreton Bay (BCC 2011).

Monitoring Period	Sites monitored
Feb / Mar 2009	Launch of program Ormiston
Jun/Jul 2009	Cleveland Nudgee Beach
Oct/Nov 2009	Ormiston Cleveland Nudgee Beach Lota Coochiemudlo Fisherman Islands 1 Fisherman Islands 2
Feb/Mar 2010	Coochiemudlo Cleveland Nudgee Beach Fisherman Islands 1 Fisherman Islands 2 Hays Inlet
Jun-Jul 2010	Cleveland Hays Inlet Fisherman Islands 1 Fisherman Islands 2 Nudgee Beach
Oct-Nov 2010	Cleveland Coochiemudlo Hays Inlet Nudgee Beach
Feb-Mar 2011	Cleveland (SEQ floods)
Special - Monitoring undertaken after flood	Coochiemudlo Hays Inlet
Jun-Jul 2011 (Winter)	(monitoring commenced)

Figure 1. MangroveWatch sites monitored during year to March 2010



Graph 1. Monitoring Frequency of sites to May 2011.

Key: CL1- Clevelend, CO – Coochiemudlo, OR – Ormiston, LO – Lota, FI – Fisherman Islands, NB – Nudgee Beach, HI – Hays Inlet

7. Data Accuracy and Consistency

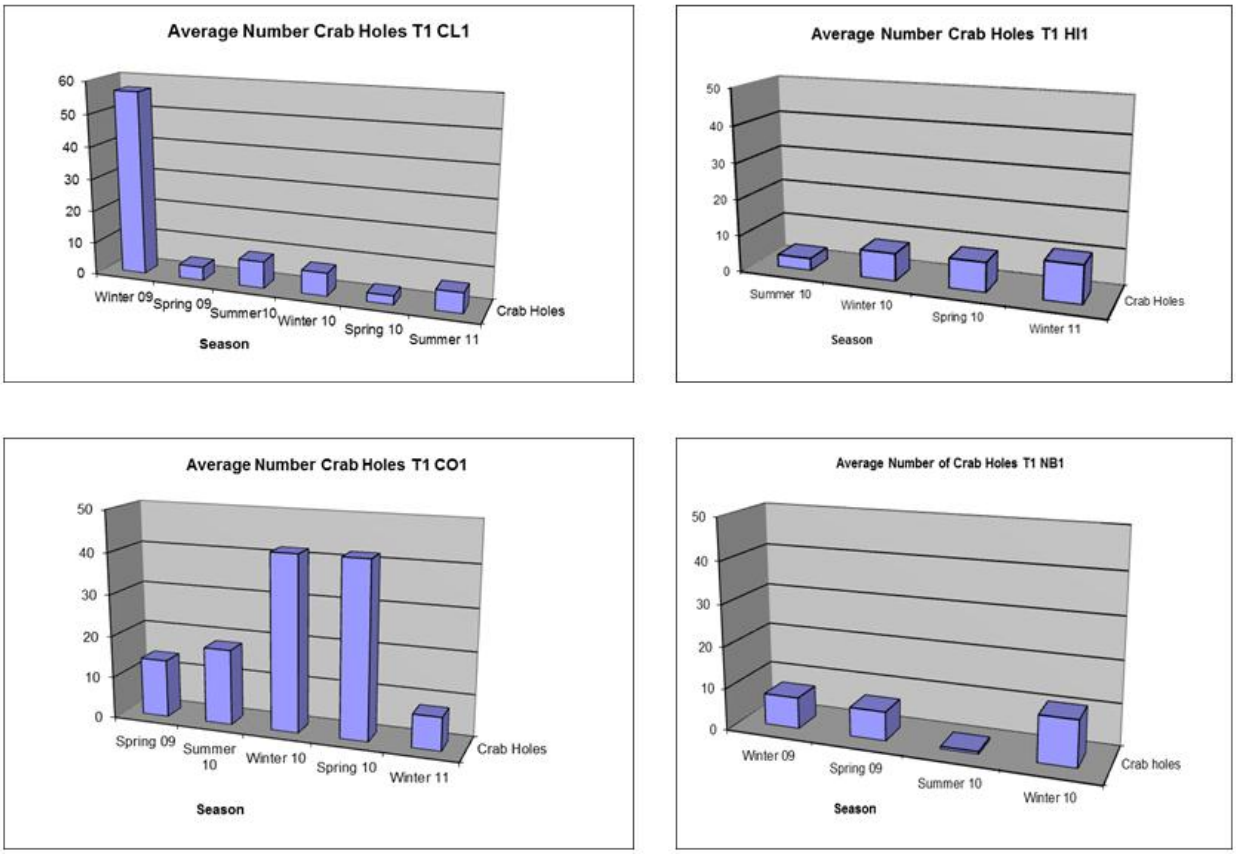
The validity of data being collected by volunteers relies on basic skills such as counting and measuring. After initial training in the monitoring procedures, volunteers are easily able to perform these tasks with reliable accuracy.

Estimates of epiphytic cover on pneumatophores rely on a matrix based assessment, the same used for the Seagrass Watch program. To assist in validating volunteer assessments, photographs of selected quadrats are made and matching assessments are made by the Mangrove Watch Coordinator.

The estimates of canopy height are thought to have been improved through the year with the introduction of a standard height gauge (2.5m pole). This is intended to assist volunteers in estimating height.

8. Results

While data has only been collected for two years, some information gleaned from the data shows some features that may be very important for improving the program and knowledge.

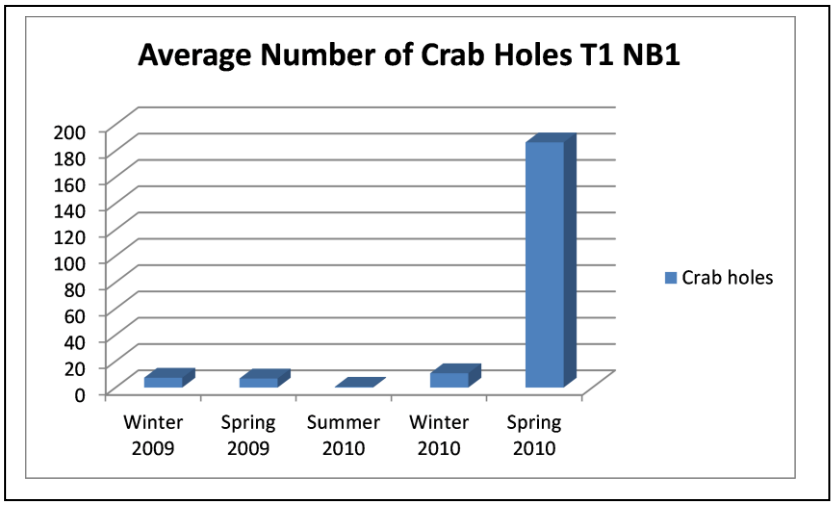


Graph 2. Average number of crab holes at selected sites.

Key: CL1- Clevelend, CO – Coochiemudlo, OR – Ormiston, LO – Lota, FI – Fisherman Islands, NB – Nudgee Beach, HI – Hays Inlet

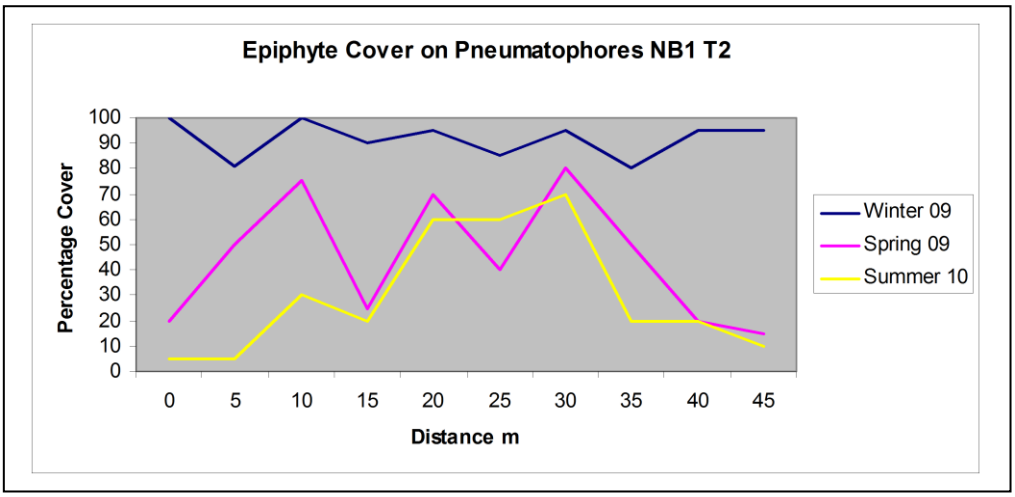
Duke (2009) suggested there could be a close relationship between mangrove trees and mangrove crabs plus other burrowing fauna where their presence is positively correlated with soil aeration and this in turn might influence forest resilience. As such, in locations where crabs and burrowing animals are removed or killed by some pollutant then the forest when stressed by drought, for instance, might succumb more readily and die (Duke, 2009). Consequently, it's considered important to monitor burrowing species in mangrove forests.

Both Nudgee Beach and Hayes Inlet have shown an increase in potential crab numbers. Crab Hole data from the Spring monitoring period for Nudgee Beach is shown in graph 2A. This shows a substantial increase, a similar observation was made at Cleveland during the Winter 2009 monitoring period. Teams have yet to be consulted about these figures but they may highlight successful recruitment, though this is a speculative guess at this stage. It will be important to review the winter 2011 data from Nudgee Beach when it becomes available to see if this trend has continued. Cleveland is relatively static while Coochiemudlo Island saw crab numbers drop substantially after the summer 2011 monitoring period. This decline may be associated with the flood events of 2011 but this hypothesis needs to be tested. Positive and negative events will be compared against aerial photography covering the same area to determine if there are any corresponding changes to mangrove coverage and or dieback. Using aerial photographs it is possible to determine changes to the distribution and height of mangroves (Fensham and Fairfax 2002; Lucas 2002). At this time imagery over study sites is available from before the period covered by this report. As more up to date imagery becomes available, this project may be able to identify changes over time to mangroves in areas surrounding the study sites. It may be possible to connect changes in imagery to changes in field data opening the possibility of developing further value from the field data provided by Mangrove-Watch.



Graph 2A: Nudgee Beach T1 – Spring 2010 data included.

Epiphyte cover on pneumatophores is one feature that had been showing a potential seasonal trend. While percentage cover for different sites varies, epiphyte cover in winter is beginning to show higher percentages across transects and sites. This is consistent with the findings made by Saifullah and Ahmed (2007) who found epiphytic algal on grey mangrove, *Avicennia marina* were more common in shaded areas and also during colder months. Graph 3 shows the seasonal variation that has been recorded for transect 2 at the Nudgee Beach site.



Graph 3. Epiphyte cover on pneumatophores at Transect 2 Nudgee Beach.

Graph 3:Nudgee Beach 1, T2. Epiphyte cover on Pneumatophores

Epiphytic algae grows abundantly on the pneumatophores of *Avicennia marina* in shaded areas of mangrove stands near the low water mark, which indicates that they avoid both exposure and desiccation (Saifullah and Ahmed, 2007). Twilley *et al* (1985) also showed nutrients influenced Epiphytic algae growth and Naidoom *et al* (2008) work shows Epiphytic algae may themselves influence growth. It is thought Epiphytic algae share a mutualistic relationship with mangroves (Naidoom *et al*, 2008). Research showing that epiphytic red algae may be responsible for high rates of photosynthesis and it is postulated that some photosynthates may reach the mangrove tissues via the holdfasts (Naidoom *et al*, 2008). It's not surprising then that epiphytic algae are considered an important source of energy in the mangrove ecosystem (Saifullah and Ahmed, 2007). These factors add

weight to the reasoning to place great importance in monitoring Epiphytic algae. Future monitoring will be more cognisant of topography and those variables that may influence Epiphytic algae abundance and thus help explain their variable growth patterns. Their presence and absence may also explain variations in mangrove health, a view shared by Melville and Pulkownik (2006). The distribution of the Rhodophyta species, *Catenella nipae Zanardini* significantly decreased as metal concentrations increased among the estuaries during seasonal surveys; it is a species that shows strong potential for use as a bio-indicator of estuarine contamination Melville and Pulkownik (2006). Many Mangrove Watch sites are adjacent to urban areas or have creek systems and or stormwater outlets draining into them. It's important to note that with urbanisation will come impermeable surfaces and therefore increased pollutants entering waterways (Nilon, 2009; Eason *et al*, 2009). Sartor *et al* (1974) highlights this point by showing runoff from street surfaces is generally highly contaminated and in general, street runoff is a greater pollutant than sanitary wastewater, at least during storms. It is likely during cyclical weather events, as shown, and with increased nutrient loads coming from the urban environment, may have resulted in favourable conditions for Epiphytic algae. To understand these influences Mangrove Watch will direct effort to mapping stormwater outlets and creek systems in and around Mangrove Watch sites.

Interestingly the winter trend was found to have reversed during the summer 2010 monitoring period as shown by graph 4. The change is likely related to anomalous weather events just prior to the summer monitoring period.

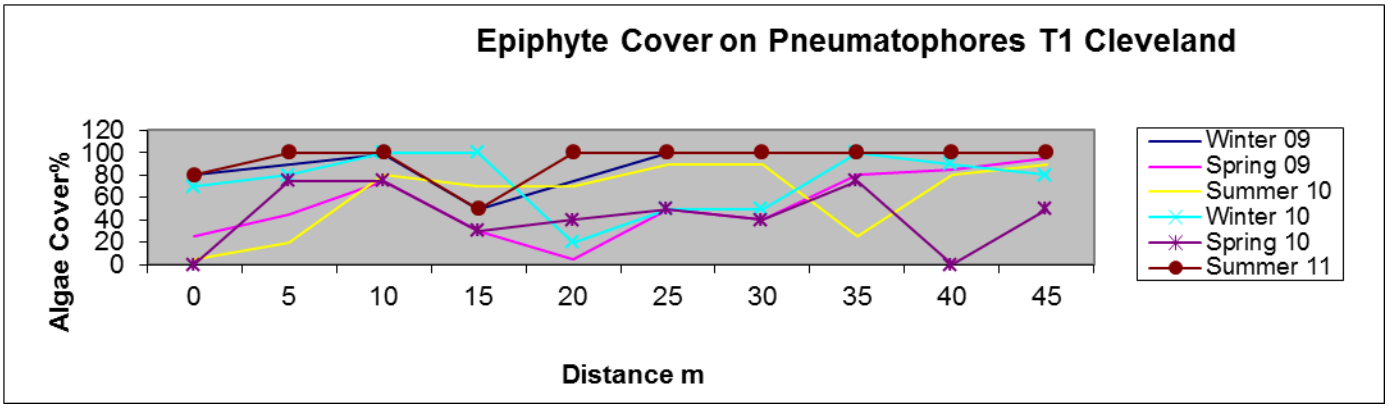
An iButton, which is an electronically configurable temperature monitoring device, was deployed on the 24th October 2010 16:52hrs and it recorded data every 240 minutes until the 25th April, 2011 00:52hrs. Data from the iButton is displayed in graph 5. It shows temperatures during October did not reach the mean maximum of 25.3ºC for that month (BOM, 2011).

BOM data likewise reveals the mean temperature for the Spring 2010 monitoring period (Oct – Nov) was below the mean maximum temperature (see graph 6) but above the mean minimum temperature (see graph 7). However, the most notable variations are found in the rainfall, cloudy days and humidity. Rainfall in October 2010 was significantly above the mean for that month (see graph 8); cloudy days in July and September 2010 were above average cloudy days for the same respective months (see graph 9); and the humidity for

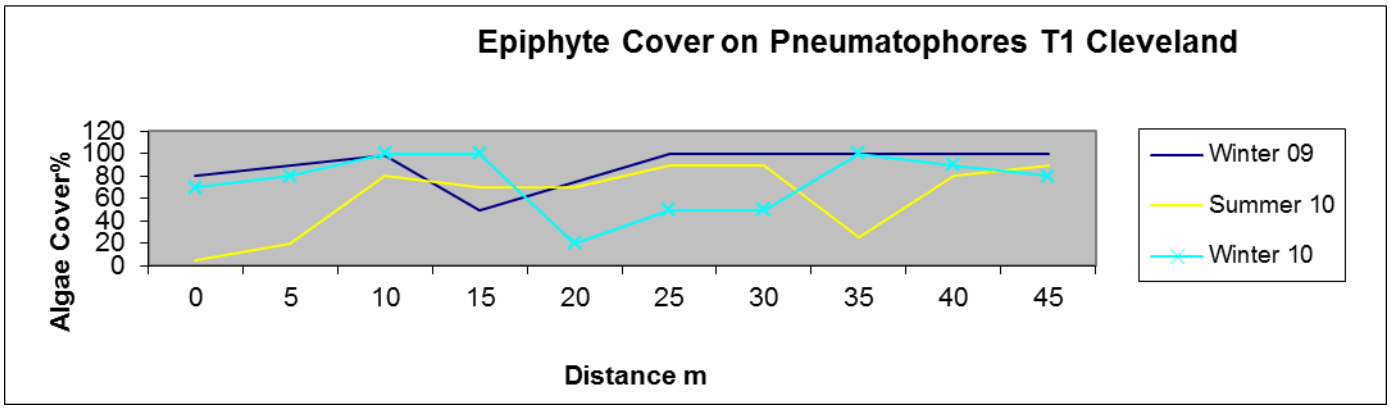
2010 was generally above mean humidity monthly statistics (see graph 10. These variables may have influenced algal growth.

High rainfall and humidity and reduced incident solar radiation may have protected Epiphytic algae from the usual summer die-back caused by desiccation. Also, increased nutrient loads arising from high rainfall events might facilitate their un-seasonal high summer growth.

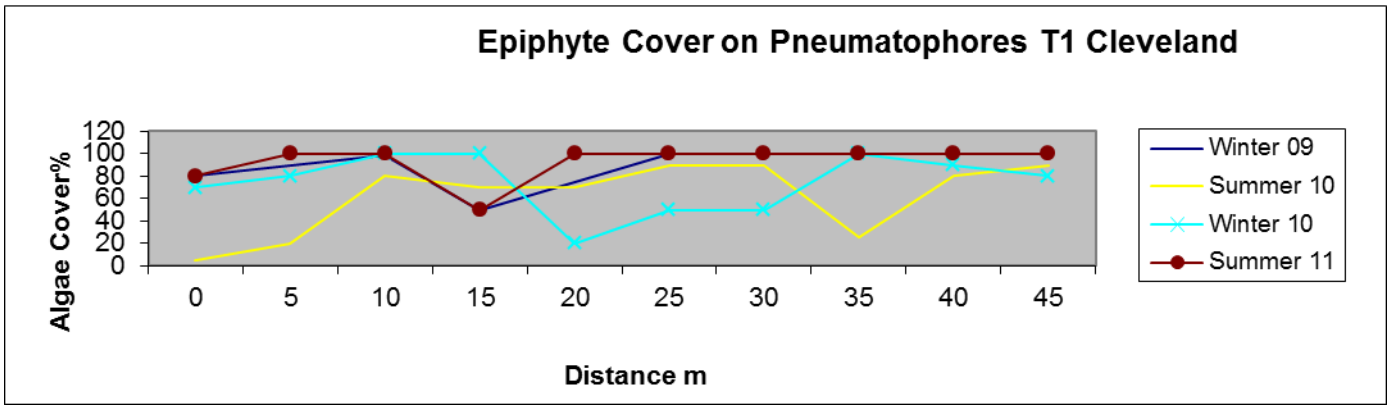
Predation upon Epiphytic algae also needs to be considered and may show seasonal trends. At this point in time we have insufficient data to provide an opinion. However, interestingly there is a positive correlation between total crab holes (surrogate for crab numbers) and pneumatophores at Cleveland (0.836) and Nudgee Beach (0.782), which is consistent with Prosser (2004) research. Prosser (2004) also highlighted how some studies found a negative correlation as we did with Hayes Islet (-0.987), Prosser (2004) suggests that multiple monitoring techniques are required to establish the true extent of crab numbers, a matter Mangrove Watch will need to consider.



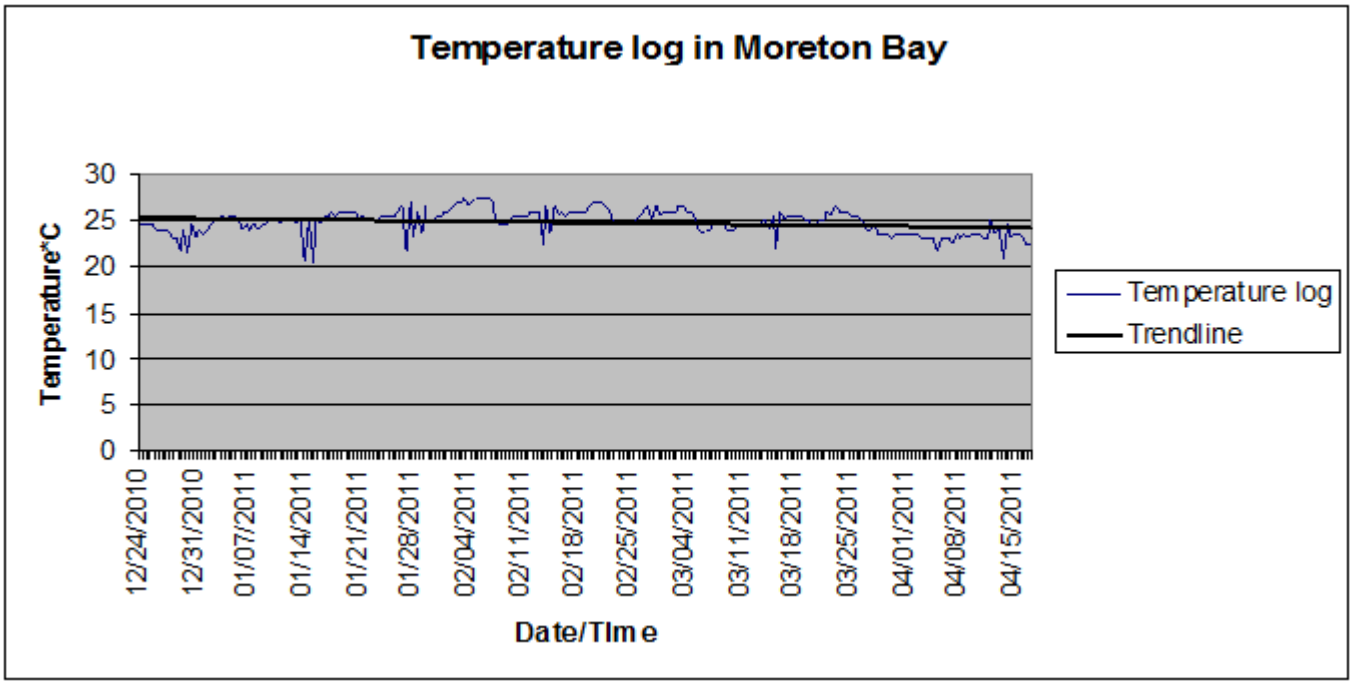
Graph 4. Epiphyte cover on pneumatophores at Transect 1 Cleveland.



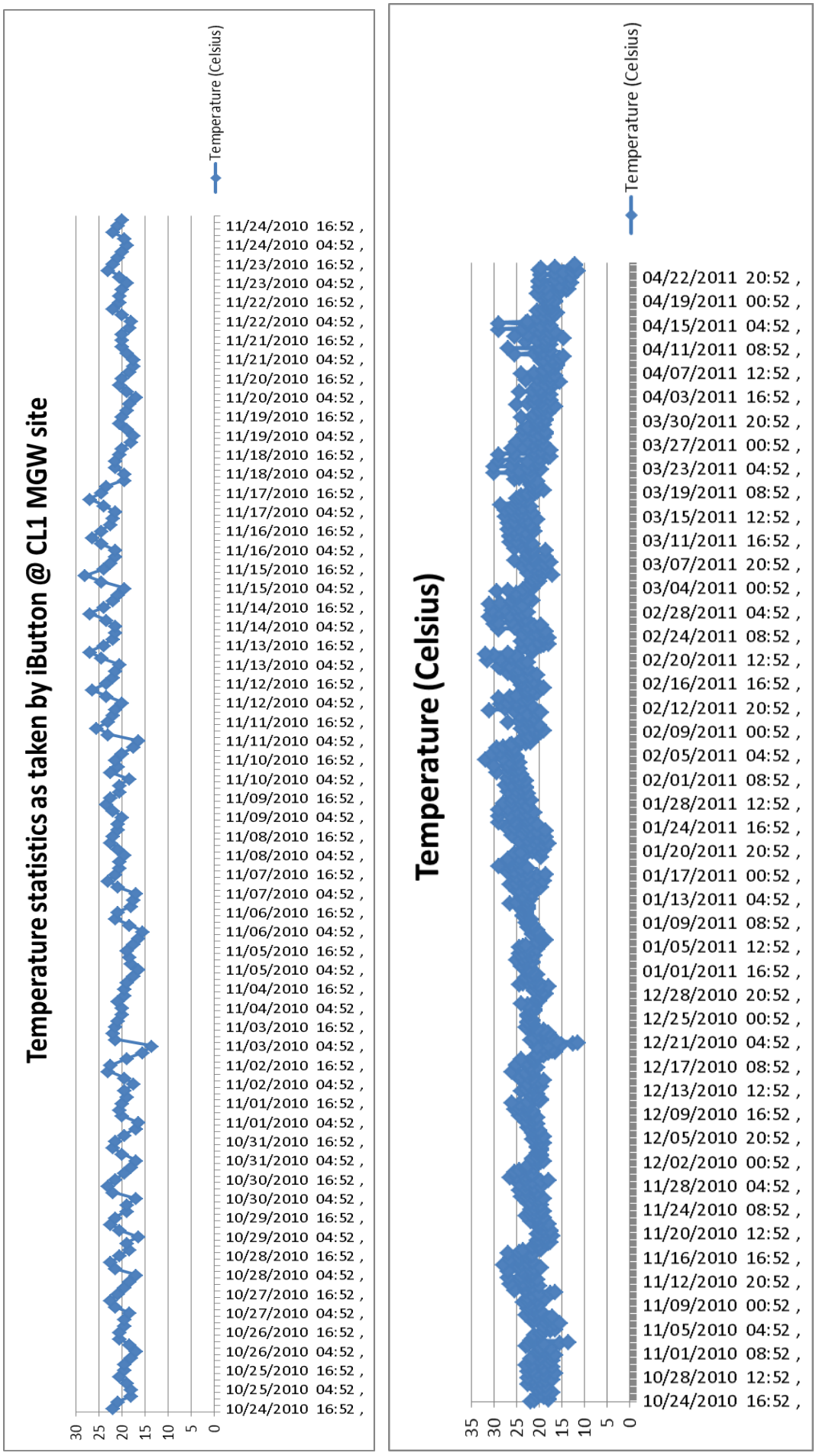
Graph 4: Spring and summer 2011 data removed.



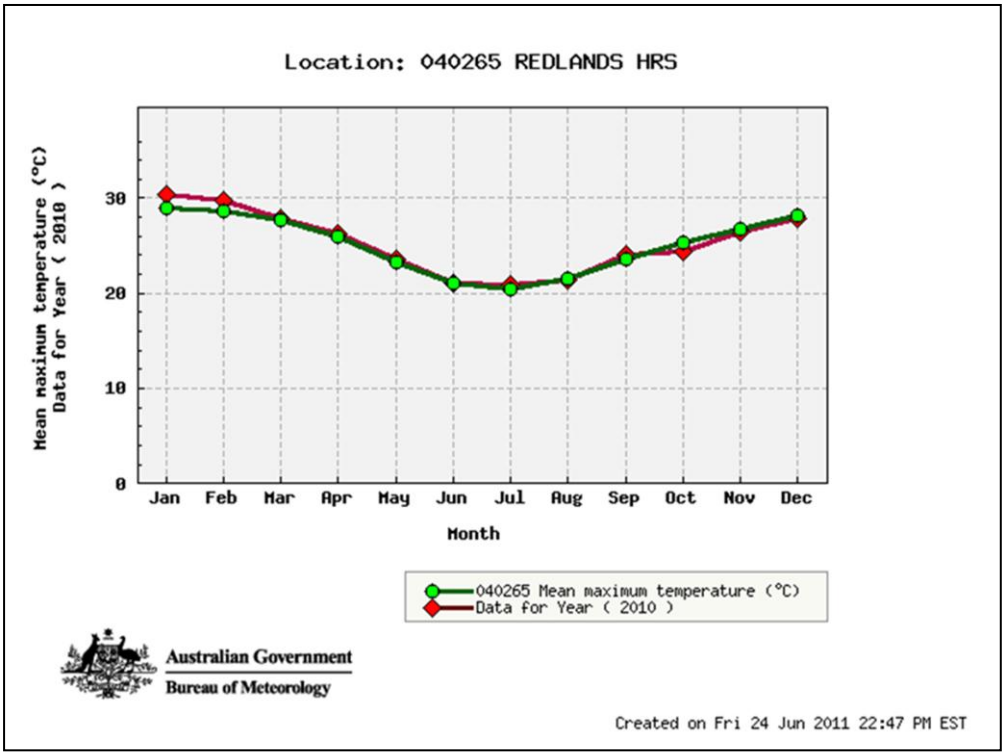
Graph 4. Winter and summer data only.



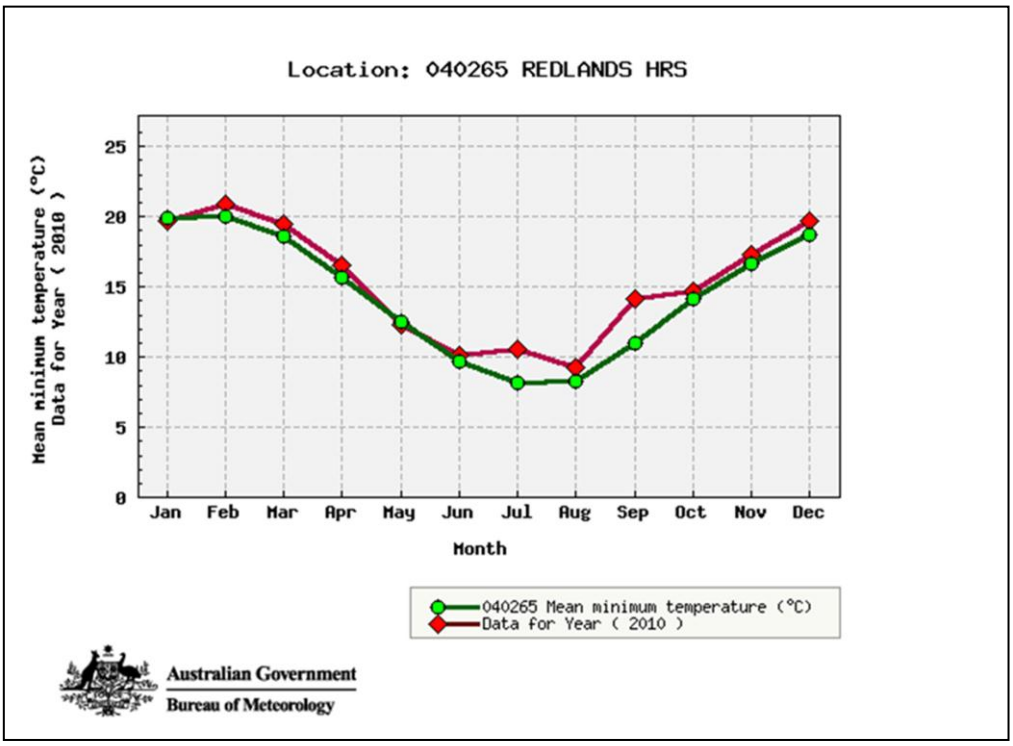
Graph 5: Temperature log in Moreton Bay.



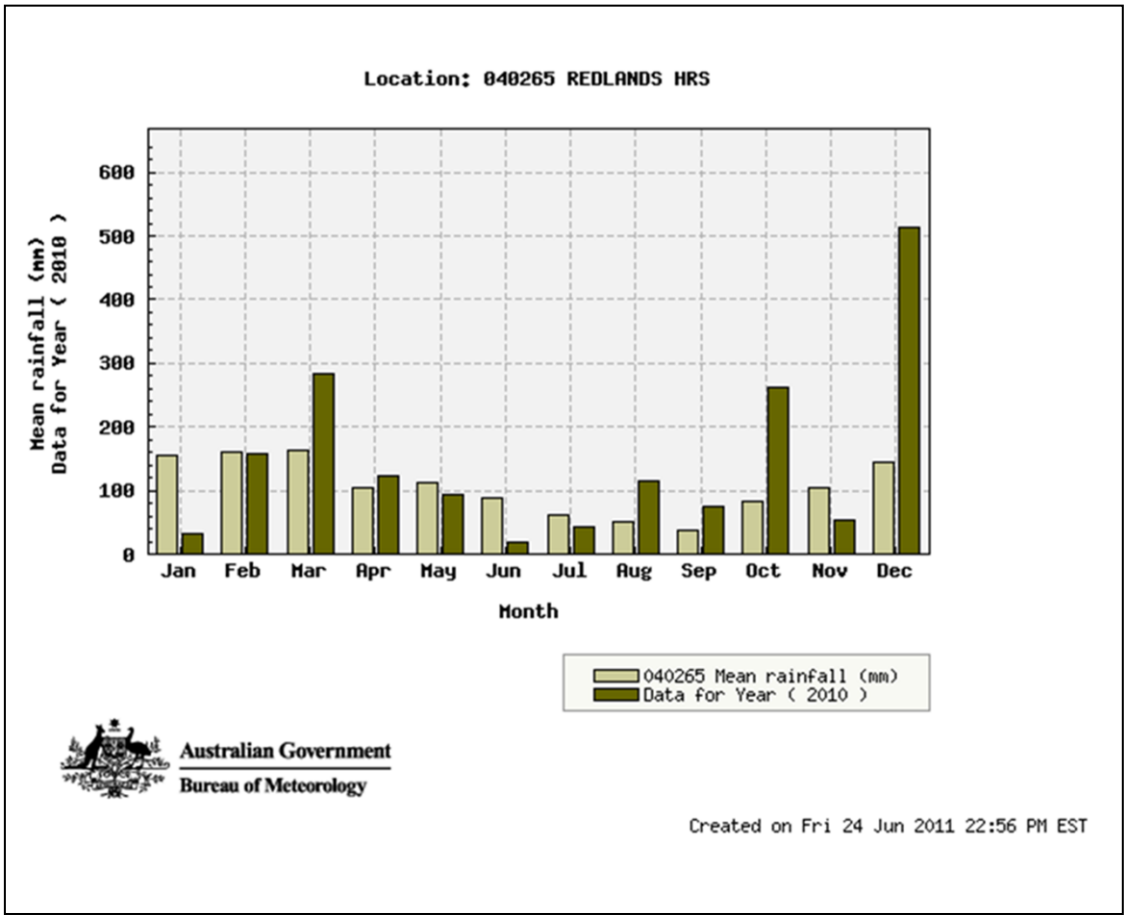
Graph 5: iButton data for Oct – Nov 2010 & Oct 2010 – April 2011



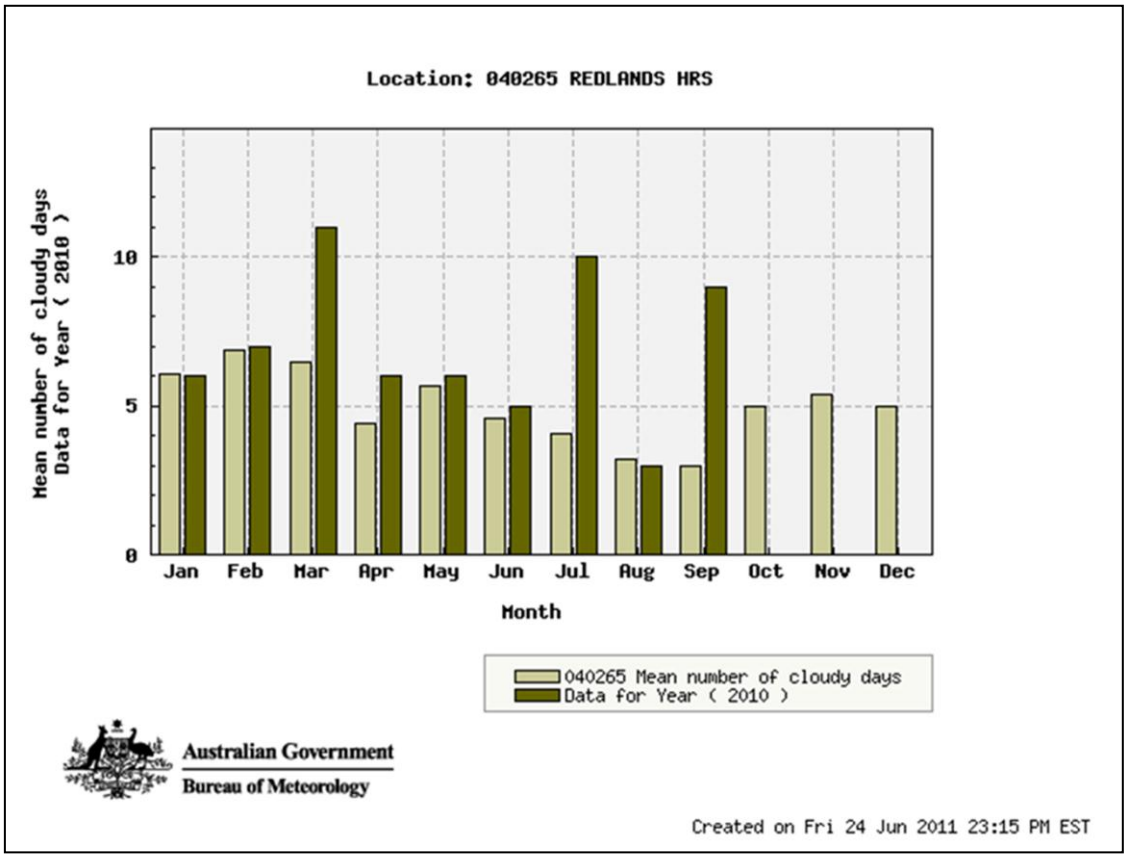
Graph 6: Mean maximum temperature by month.



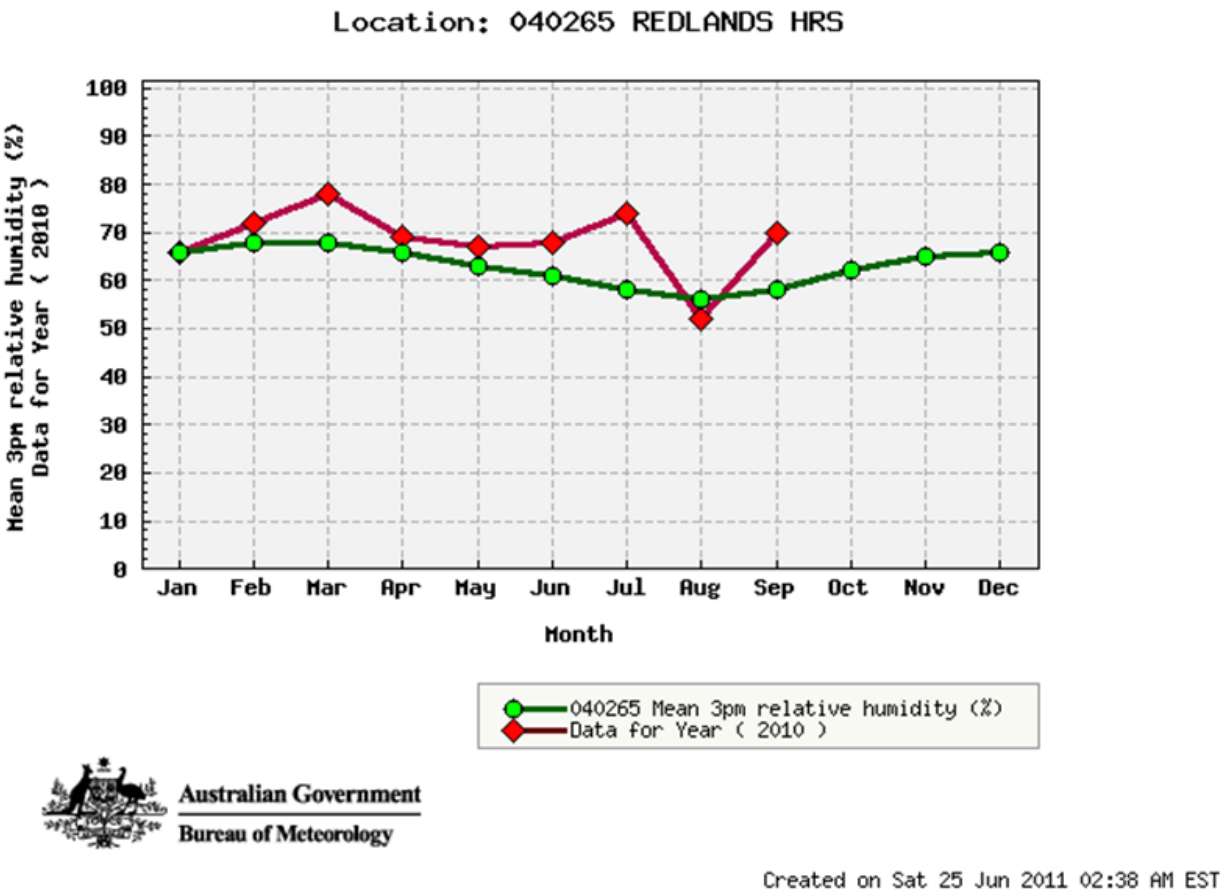
Graph 7: Mean minimum temperature by month.



Graph 8: Mean rainfall by month.



Graph 9: Mean cloudy days by month.



Graph 10: Mean relative humidity by month.

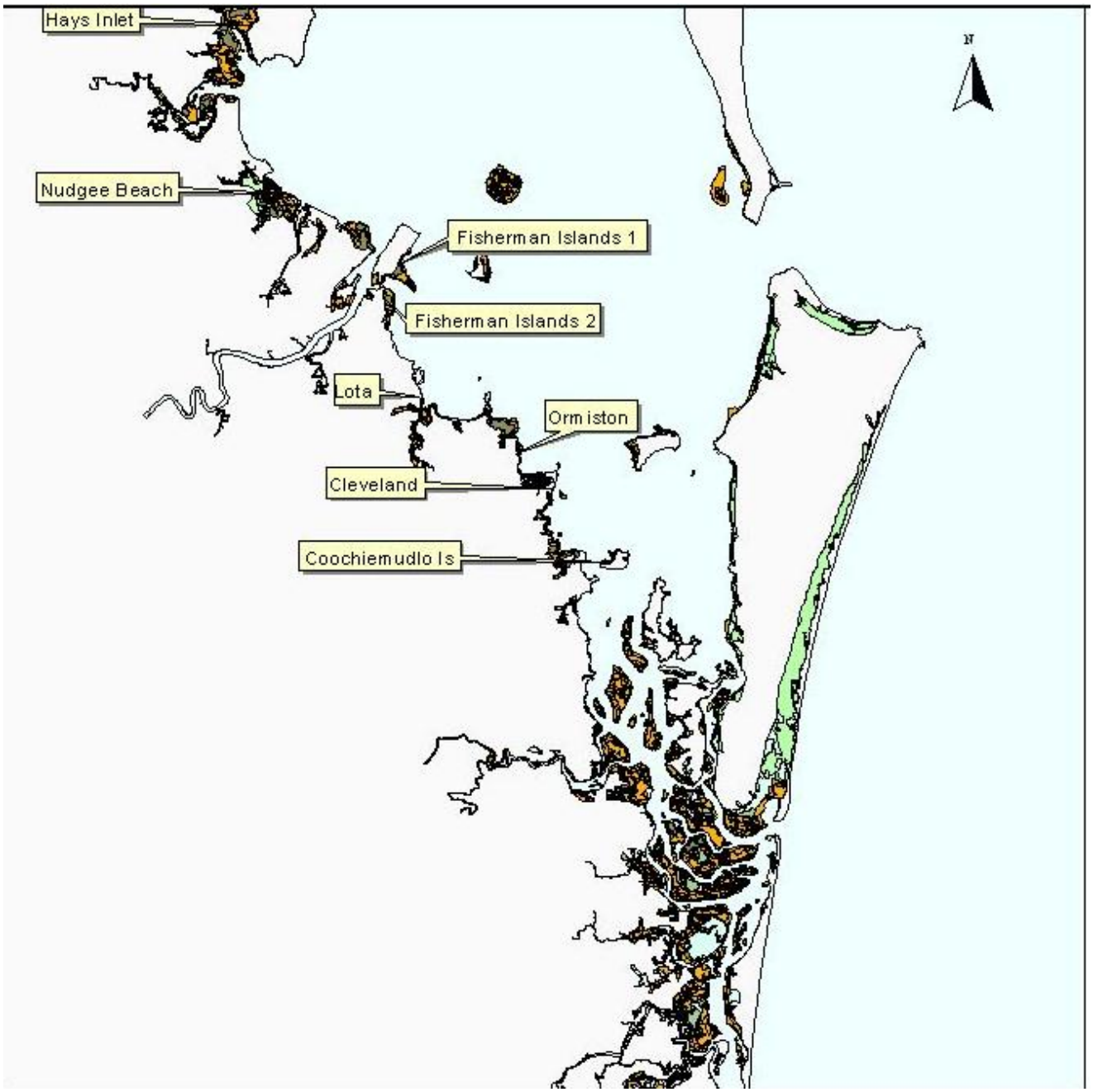
9. Acknowledgements

Mangrove Watch could not exist without the support of the many individuals and organisations that support it. We thank the Port of Brisbane Corporation for the bulk of our financial assistance and for their enthusiasm and ongoing support for the project. We would also like to thank the Bayside Branch of the Wildlife Preservation Society of Queensland for pioneering this project and the head office of the Wildlife Preservation Society of Queensland for administrative and project support. We would also like to thank the Department of Environment and Resource Management QPWS for their substantial in-kind support for the project and for providing a base for activities.

In this second year of the project we would especially like to thank the Seagrass Watch Moreton Bay program, Norm Duke and others for their input into the development of the methodology for the Mangrove Watch program.

Last but not least, we would like to thank the many volunteers who have expressed an interest in the program and have participated in the training. Many are now part of regular monitoring teams and we look forward to maintaining our volunteer networks within the Mangrove Watch program.

10. Mangrove Watch sites



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