Wave data recording program

Queensland wave climate annual summary for season 2001–02

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Foreword

This summary of wave climate in Queensland is one of the series of technical wave reports to be prepared annually by the Coastal Services Unit. It represents a change in the way wave data is presented by the EPA. Previously, the wave data recording program technical report series comprised separate reports prepared for each region, covering all data recorded at a site from deployment to date of report.

Annual reports will not replace the more comprehensive regional reports. Instead, they will serve to supplement and enhance the reporting ability of the Coastal Services Unit by providing more timely information on wave climates in Queensland.

Regional wave data reports will continue to provide the more thorough, long-time presentation of regional conditions. Using the information presented annually, it is hoped that in future, regional reports will be updated every five years.

Annual reports cover the year from 1 November through to 31 October of the following calendar year. The start of the year therefore coincides with the commencement of the annual cyclone season which extends from 1 November through to 30 April. This period is also classed as *summer* in both this annual report and the regional technical reports. The remainder of the year (1 May to 31 October) is classed as *winter* in these reports.

Annual reports present wave information in a similar format to the regional reports, however they also include plots of monthly average significant wave heights and directional wave rose (where possible).

Cover photo: Large waves breaking on Gold Coast beaches, emanating from a 1000hPa low centred near New Caledonia combined with a high moving across the Tasman Sea on 26 January, 2002.

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Abstract

This report summarises the primary analyses of wave data recorded using Datawell non-directional and directional Waverider buoys positioned at selected locations along the Queensland coast for the 2001–02 seasonal year.

The data recorded covers the period from 1 November, 2001, to 31 October, 2002, which embraces all of the seasonal variations for one year, and includes the 2001–02 cyclone season.

The data is divided into seasonal groupings for analysis and no estimations of wave directions have been provided, unless calculated by a directional buoy.

This report has been prepared by the EPA's Coastal Services Unit, Environmental Sciences Division. The EPA acknowledges the following team members who contributed their time and effort to the preparation of this report: John Mohoupt; Vince Cunningham; Gary Hart; Jeff Shortell; Daniel Conwell; Colin Newport; Darren Hanis; Martin Hansen and Jim Waldron.

Disclaimer

While reasonable care and attention have been exercised in the collection, processing and compilation of the wave data included in this report, the Coastal Services Unit does not guarantee the accuracy and reliability of this information in any way. Neither the Queensland Government nor the EPA accepts liability for any decisions or actions taken on the basis of this report.

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Contents

1.0	Introduction	1
2.0	Recording equipment configuration	1
3.0	Laboratory calibration checks	2
4.0	Wave recording and analysis	3
5.0	Data losses	3
6.0	Data presentation	4
7.0	References	6
8.0	Other reports in this series	6

Tables

Table 1:	Wave recording stations for season 2001–02	1
Table 2:	Wave recording history	5
Table 3:	Directional wave recording history	5
Table 4:	Wave recording program — summary data capture for season 2001–02	7
Table 5:	Significant meteorological events for season 2001–02	8
Table 6:	Queensland cyclones for season 2001–02	14

Sites and figures

Figure A:	Wave recording sites — locality plan	15
Figure 13:	Cyclone tracks	110
Figure 14:	Zero up-crossing wave	111

Tweed

Details of wave recorder installations 16

Figure 1.1:	Tweed wave recording station — locality plan	17
Figure 1.2:	Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)	18
Figure 1.3:	Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)	19
Figure 1.4:	Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)	20
Figure 1.5:	Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)	21
Figure 1.6:	Daily wave recordings	22
Figure 1.7:	Water temperature and peak direction recordings	23
Figure 1.8:	Directional wave rose	24

Gold Coast

Details of wave recorder installations 25

Figure 2.1:	Gold Coast wave recording station — locality plan	26
Figure 2.2:	Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)	27
Figure 2.3:	Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)	28
Figure 2.4:	Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)	29
Figure 2.5:	Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)	30
Figure 2.6:	Daily wave recordings	31

Brisbane

Details of wave recorder installations 32

Figure 3.1:	Brisbane wave recording station — locality plan	33
Figure 3.2:	Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)	34
Figure 3.3:	Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)	35
Figure 3.4:	Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)	36
Figure 3.5:	Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)	37
Figure 3.6:	Daily wave recordings	38
Figure 3.7:	Water temperature and peak direction recordings	39
Figure 3.8:	Directional wave rose	40

Moreton Bay

Details of wave recorder installations 41

Figure 4.1: Moreton Bay wave recording station — locality plan 42
Figure 4.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 43
Figure 4.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 44
Figure 4.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 45
Figure 4.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 46
Figure 4.6: Daily wave recordings 47

Mooloolaba

Details of wave recorder installations 48

Figure 5.1: Mooloolaba wave recording station — locality plan 49
Figure 5.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 50
Figure 5.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 51
Figure 5.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 52
Figure 5.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 53
Figure 5.6: Daily wave recordings 54

Emu Park

Details of wave recorder installations 55

Figure 6.1: Emu Park wave recording station — locality plan 56
Figure 6.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 57
Figure 6.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 58
Figure 6.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 59
Figure 6.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 60
Figure 6.6: Daily wave recordings 61
Figure 6.7: Water temperature and peak direction recordings 62
Figure 6.8: Directional wave rose 63

Hay Point

Details of wave recorder installations 64

Figure 7.1: Hay Point wave recording station — locality plan 65
Figure 7.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 66
Figure 7.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 67
Figure 7.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 68
Figure 7.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 69
Figure 7.6: Daily wave recordings 70

Mackay

Details of wave recorder installations 71

Figure 8.1: Mackay wave recording station — locality plan 72
Figure 8.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 73
Figure 8.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 74
Figure 8.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 75
Figure 8.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 76
Figure 8.6: Daily wave recordings 77
Figure 8.7: Water temperature and peak direction recordings 78
Figure 8.8: Directional wave rose 79

Townsville

Details of wave recorder installations 80

Figure 9.1: Townsville wave recording station — locality plan 81
Figure 9.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 82
Figure 9.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 83
Figure 9.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 84
Figure 9.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 85
Figure 9.6: Daily wave recordings 86
Figure 9.7: Water temperature and peak direction recordings 87
Figure 9.8: Directional wave rose 88

Dunk Island

Details of wave recorder installations 89

Figure 10.1: Dunk Island wave recording station — locality plan 90
Figure 10.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 91
Figure 10.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 92
Figure 10.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 93
Figure 10.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 94
Figure 10.6: Daily wave recordings 95

Cairns

Details of wave recorder installations 96

Figure 11.1: Cairns wave recording station — locality plan 97
Figure 11.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 98
Figure 11.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 99
Figure 11.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 100
Figure 11.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 101
Figure 11.6: Daily wave recordings 102

Weipa

Details of wave recorder installations 103

Figure 12.1: Weipa wave recording station — locality plan 104
Figure 12.2: Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp) 105
Figure 12.3: Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp) 106
Figure 12.4: Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig) 107
Figure 12.5: Plot of monthly averages for seasonal year and for all data, for wave height (Hsig) 108
Figure 12.6: Daily wave recordings 109

Appendices

Appendix A: Glossary of terms 112

1.0 Introduction

The Environmental Protection Agency (EPA), as part of its long-term data collection program, has maintained a network of wave recording stations along the Queensland coast since 1968.

The network of wave recording stations has been grouped into three categories:

Long-term sites: These sites form part of long-term data collection activities along the Queensland coast that gather wave statistics used for coastal management purposes. The stations are fully funded and operated by the EPA.

EPA project sites: These sites are of limited duration, associated with some specific coastal activity, which are used to assess wave conditions for coastal investigation projects and/or to help monitor works such as beach nourishment. The stations are fully-funded and operated by the EPA, as specific projects.

Joint project sites: The life of these sites will vary in duration, and they are associated with specific projects, to assess wave conditions or to monitor works. These stations are operated by the EPA in conjunction with (and jointly-funded by) other agencies.

The 2001–02 site groups are as follows:

Table 1
Wave recording stations
for season 2001–02

Long term	EPA project	Joint project	Joint project partners
Brisbane	**Moreton Bay**	**Tweed Heads**	**TRESBP** *
Mackay	**Mooloolaba**	**Gold Coast**	**GCCC**+
Townsville	**Dunk Island**	**Hay Point**	**PCQ** #
Cairns		**Weipa**	**PCQ** #
Emu Park			

* Tweed River Entrance Sand Bypassing Project (joint project of Queensland and New South Wales Governments with support from Gold Coast City Council)
\+ Gold Coast City Council
\# Ports Corporation of Queensland

This report is from a series of reports intended to make wave information more readily available by summarising the primary analysis of wave data collected at the buoy locations along the Queensland coastline and presenting wave climate information for the period 1 November, 2001 to 31 October, 2002.

For all stations, the wave data collected for the current year is statistically compared to the long-term average conditions at the site. Brief details of the recording equipment, the methods of handling raw data and the type of analyses employed are provided within this report.

2.0 Recording equipment configuration

For the duration of this summary report the Coastal Services Unit's wave recording program utilised the Waverider system, manufactured by Datawell of the Netherlands to measure the sea-surface fluctuations at an offshore location. Both non-directional and directional Waverider buoys were in operation during the period of this report.

Both the directional and non-directional Waverider buoys measure vertical acceleration by means of an accelerometer that is mounted on a gravity-stabilised platform, suspended in a fluid-filled plastic sphere, located at the bottom of the buoy. The vertical accelerations are then twice integrated to give displacement.

The directional buoy also measures horizontal accelerations using a further two fixed accelerometers and an onboard fluxgate compass to give the directional displacement in two horizontal axes. By use of a transformation matrix, these measured accelerations in the north–south and east–west directions are calculated.

The vertical buoy displacement, representing the instantaneous water level, and directional data (if present), are then transmitted to a receiver station as a frequency modulated high frequency radio signal.

Non-directional Waverider receiver stations comprise of a computer-based system utilising the Datawell DIWAR Waverider receiver/digitiser. The water level data, digitised at 0·39sec intervals (2·56Hz), is recorded in bursts of 4096 points (approximately 26min) and recorded on the computer's hard disk.

Directional Waverider receiver stations also comprise a PC based system utilising the Datawell DIWAR Waverider receiver/digitiser. The water level data, digitised at 0·78sec intervals (1·28Hz), is recorded in bursts of 2048 points (approximately 26min) and recorded on the hard disk of the PC.

The proprietary software running on the PC controls the timing of data recording, and processes the data in *near real time* to provide a set of standard, sea-state parameters and spectra that may be accessed remotely via the public telephone network. Recorded data and analysis results are downloaded daily to a central computer system in Brisbane for checking, further processing and archiving.

Further information on the operation of the Waverider buoy and the recording systems can be obtained from the sources listed in section 7.0 of this report.

3.0 Laboratory calibration checks

Waverider buoys used by the EPA are calibrated before deployment and also after recovery. Normally, a buoy is calibrated once every 12 months. Calibration is performed at the EPA's Deagon site using a buoy calibrator to simulate sinusoidal waves with vertical displacements of either 2m or 2·7m depending on whether a 0·7m or 0·9m diameter buoy is being tested. The calibrator is electrically controlled and the frequency may be adjusted from 0·016–0·25Hz. It is usual to check three frequencies during a calibration. The following characteristics of the buoy are also checked during the calibration procedure:

- compass (directional buoy);
- phase and amplitude response;
- accelerometer platform stability;
- platform tilt;
- battery capacity; and
- power output.

There are no adjustments to the recorded wave data, based on the laboratory calibration results. Monthly averages are calculated based on available data and no wave data records are rejected based on low capture rates. Research [Bacon and Carter (1991), Allan and Komar (2001)] has suggested rejecting entire records where less than a certain threshold has been recorded. All Queensland wave-recording sites generally have high percentage capture rates for the seasonal year (table 4) and thus minimal bias is introduced into calculations.

4.0 Wave recording and analysis procedures

The PC-based wave recording system generally records data at (nominally) hourly intervals. During periods when the recorded significant wave height (Hsig) value reaches the predetermined storm threshold of the site, the recording frequency is increased to (nominally) thirty-minute intervals.

Recorded non-directional wave data is analysed in the time domain by the zero up-crossing method and in the frequency domain by spectral analysis using Fast Fourier Transform (FFT) techniques to give 128 spectral estimates in bands of 0·01Hz.

The directional wave data undergoes initial processing on the buoy, where the datasets are divided into data sub-sets and each sub-set is analysed using FFT techniques. The output from this processing is then transmitted to the shore station, along with the raw data, where it undergoes further analysis using FFT techniques to produce 128 spectral estimates in bands of 0·005Hz.

The zero up-crossing analysis is equivalent in both systems.

Wave parameters resulting from the time and frequency domain analysis included the following:

S(f)	Energy density spectrum.
Hsig	Significant wave height (time domain), the average of the highest third of the waves in the record.
Hmax	Highest individual wave in the record (time domain).
Hrms	Root mean square of the wave heights in the record (time domain).
Tsig	Significant wave period (time domain), the average period of the highest third of waves in the record.
Tz	Average period of all zero up-crossing waves in the record (time domain).
Tp	Wave period corresponding to the peak of the energy density spectrum (frequency domain).
Tc	Average period of all the waves in the record based on successive crests (time domain).

These parameters form the basis for the summary plots and tables included in this report.

5.0 Data losses

Data losses can be divided into two categories: losses due to equipment failure and losses during data processing due to signal corruption. Common causes of data corruption include radio interference and a spurious low-frequency component in the water-level signal caused by a tilting accelerometer platform in the Waverider buoy.

Analysis of recorded data by the PC-based systems includes some data rejection checks which may result in a small number of spurious and rejected data points being replaced using an interpolation procedure, otherwise the entire series is rejected.

As discussed above, the various sources of data losses can cause occasional gaps in the data record. Gaps may be relatively short, caused by rejection of data records or much longer if caused by malfunction of the Waverider buoy or the recording equipment.

In the calculation of wave-climate statistics, each record is assigned a total duration equal to half the recording interval on either side of that record. The durations on the side of those records adjacent to gaps in the data are limited to a maximum value dependent on the nominal-recording interval of those records.

With the nominal recording interval set at one hour, the maximum allowable total duration of a record is equal to three hours. Any duration on either side of a record greater than 90min (half the maximum allowable total duration) is set to the maximum allowable of exactly 90min, and a gap in the data is reported.

6.0 Data presentation

No attempt has been made to interpret the recorded data for design purposes or to apply corrections for refraction, diffraction and shoaling to obtain equivalent deep-water waves. Before any use is made of this data, the exact location of the buoy, and the water depth in which the buoy was moored, should be noted. Details are presented in the location history plans (figures 1.1 to 12.1) for each site shown later in this report. The non-directional Waverider recording system utilised by the EPA is designed to record vertical movements of the water surface only and any wave directions must be assigned to the individual wave records by other means.

Data capture rates for each wave site over the seasonal year are presented in table 4.

A summary of major meteorological events, where the recorded Hsig value reached the storm threshold wave height for a site, for the 2001–02 seasonal year is shown in table 5. Wave parameters Hsig, Hmax, Tp, and other relevant information are listed for each event. Only storm and cyclone events that contributed to the Hsig reaching the storm threshold value at any of the wave sites are listed in the table.

Table 6 lists the details of the only cyclone that occurred along the Queensland coastline during the 2001–02 season (figure 13).

Figure A presents a large-scale view of the locations of wave recording stations in operation around the Queensland coastline for the 2001–02 seasonal year. Detailed station location maps are presented for all sites in figures 1.1 through to 12.1.

Details of wave recorder installations for each site are shown on the first page of each site section, and include information on buoy location, recording station location, recording intervals and data collection.

The wave-climate data presented in this report is based on statistical analyses of the parameters obtained from the recorded-wave data. Programs developed by the EPA provide statistical information on percentage of time occurrence and exceedance for wave heights and periods. The results of these analyses are presented in figures §.2, §.3 and §.4 for each site, where § represents the site number. In each of these three figures for each site, the term. *All data* refers to the entire available dataset collected for that site (table 2). To determine how much emphasis should be placed on this data, recording histories are shown in table 2 below. In addition, similar statistical analysis provides monthly averages of wave heights for the seasonal year and all data.

Table 2
Wave recording history

Site	Start date	End date	Restart	End date	Total years
Cairns	4/05/1975	31/10/2002			27.51
Mackay	19/09/1975	31/10/2002			27.13
Townsville	20/11/1975	31/10/2002			26.96
Brisbane	31/10/1976	31/10/2002			26.02
Weipa	22/12/1978	31/10/2002			23.87
Hay Point	24/03/1977	25/05/1987	3/03/1993	31/10/2002	19.84
Gold Coast	21/02/1987	31/10/2002			15.70
Tweed Heads	13/01/1995	31/10/2002			7.80
Emu Park	24/07/1996	31/10/2002			6.27
Dunk Island	18/12/1998	31/10/2002			3.87
Mooloolaba	20/04/2000	31/10/2002			2.53
Moreton Bay	19/10/2000	31/10/2002			2.03

denotes a directional site for 2001–02

Daily wave recordings for the seasonal year are shown for all sites, however directional sites show average water temperature and peak direction (Dir_p) recordings as well.

Directional wave roses for the 2001–02 seasonal year are presented for the sites shown in table 3 below. Wave roses summarise wave occurrence at a directional site by indicating their size, direction and frequency. Each branch of a wave rose represents waves coming from that direction with branches divided into three Hsig segments of varying range. The length of each branch represents the total percentage of waves from that direction with the length of each segment within a branch representing the percentage of waves, in that size range, arriving from that direction for all wave periods. Calm wave conditions have been defined as below 0.5m and are represented as a percentage inside the centre circle. Periods of deployment as a directional site will vary from site to site as indicated in table 3. Note that a 0.2 percent cut off has been applied to the data as the wave roses are only intended as a visual guide to the wave climate at a site.

Table 3
Directional wave recording history
for current directional sites

Site	Start date	End date	Total years
Tweed Heads	**13/01/1995**	**31/10/2002**	**7.80**
Brisbane	**20/01/1997**	**31/10/2002**	**5.78**
Emu Park	**24/07/1996**	**31/10/2002**	**6.27**
Mackay	**13/02/2002**	**31/10/2002**	**0.67**
Townsville	**12/10/2001**	**31/10/2002**	**1.05**

This report covers the seasonal year from 1 November, 2001 to 31 October, 2002 where, for the purposes of analysis, *summer* has been taken as the period from 1 November to 30 April of the following year and *winter* covers the period 1 May to 31 October in any one year.

7.0 References

Permanent International Association of Navigation Congresses (1986), *List of Sea State Parameters*

Datawell, *Operation and Service Manual for the Non-directional Waverider* (2001)

Datawell, *Manual of the Digital Waverider Receiver Type DIWAR* (1992)

Datawell, *Operations and Service Manual for Directional Waverider* (2002)

Lawson and Treloar Pty Ltd (2002), *Real Time Wave Analysis Package*

Queensland Transport, *The Official Tide Tables & Boating Safety Guide 2002*

Australian Hydrographic Service, *Australian National Tide Tables 2002*

Bureau of Meteorology, Monthly Weather Reviews

8.0 Other wave data reports in this series

Cairns Region	Report No. W01.1	2 May 1975 to 3 Sept 1978
Cairns Region	Report No. W01.2	2 May 1975 to 11 Jun 1985
Cairns Region	Report No. W01.3	2 May 1975 to 30 Apr 1997
Mackay Region	Report No. W02.1	17 Sept 1975 to 5 Nov 1976
Mackay Region	Report No. W02.2	17 Sept 1975 to 23 Aug 1985
Mackay Region	Report No. W02.3	17 Sept 1975 to 30 Oct 1996
Townsville Region	Report No. W03.1	16 July 1975 to 23 Feb 1979
Townsville Region	Report No. W03.2	19 Nov 1975 to 29 Dec 1987
Townsville Region	Report No. W03.3	19 Nov 1975 to 30 Apr 1997
Sunshine Coast Region	Report No.W04.1	5 Apr 1974 to 5 Jul 1977
Burnett Heads Region	Report No. W05.1	5 May 1976 to 5 Mar 1982
Burnett Heads Region	Report No. W05.2	5 May 1976 to 13 Oct 1988
Abbot Point Region	Report No. W06.1	6 May 1977 to 9 Aug 1979
Abbot Point Region	Report No. W06.2	6 May 1977 to 31 Oct 1996
Weipa Region	Report No. W07.1	21 Dec 1978 to 7 Apr 1983
Weipa Region	Report No. W07.2	21 Dec 1978 to 30 Apr 1997
Gladstone Region	Report No. W08.1	19 Dec 1979 to 16 May 1983
Brisbane Region	Report No. W09.1	30 Oct 1976 to 30 Jun 1983
Brisbane Region	Report No. W09.2	30 Oct 1976 to 30 Jun 1994
Brisbane Region	Report No. W09.3	30 Oct 1976 to 28 Feb 1997
Bowen Region	Report No. W10.1	14 Sept 1978 to 15 Nov 1984
Moreton Island Region	Report No.W11.1	15 Jun 1983 to 12 Apr 1985
Bramston Beach Region	Report No.W12.1	16 Dec 1981 to 28 Oct 1985
Hay Point Region	Report No. W13.1	22 Mar 1977 to 25 May 1987
Hay Point Region	Report No. W13.2	22 Mar 1977 to 31 Oct 1996
Gold Coast Region	Report No. W14.1	20 Feb 1987 to 30 Jun 1994
Gold Coast Region	Report No. W14.2	20 Feb 1987 to 28 Feb 1997
Kirra	Report No. W15.1	25 Aug 1988 to 30 Jun 1994
Kirra	Report No. W15.2	25 Aug 1988 to 28 Feb 1997
Repulse Bay	Report No. W16.1	2 Jun 1994 to 22 Oct 1995
Hayman Island	Report No. W17.1	26 Oct 1995 to 14 Oct 1996
Tweed Region	Report No. W18.1	15 Jan 1995 to 28 Feb 1997
Lucinda	Report No. W19.1	2 Mar 1995 to 13 May 1996
Annual summary for season 2000–01	Report No. 2004.3	1 Nov 2000 to 31 Oct 2001
Annual summary for season 2002–03	Report No. 2004.1	1 Nov 2002 to 31 Oct 2003
Dunk Island	Report No. 2004.2	18 Dec 1998 to 14 Nov 2002

Table 4

Wave recording program — summary of data capture (%)

for season 2001–02

Station	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Average
Tweed Heads	99.79	99.87	99.93	**100.0**	**100.0**	99.85	98.45	66.11	98.72	99.93	**100.0**	**100.0**	**96.89**
Gold Coast	99.93	99.60	99.66	99.48	99.60	94.44	98.86	99.16	99.19	**100.0**	99.94	**100.0**	**99.16**
Brisbane	58.75	98.59	98.65	99.93	90.73	99.79	98.45	98.75	99.75	99.46	99.03	99.52	**95.12**
Moreton Bay	92.64	96.57	87.30	94.64	95.23	93.39	89.72	69.72	33.33	88.58	87.77	45.16	**81.17**
Mooloolaba	99.93	99.53	99.86	99.86	99.20	99.79	99.46	98.26	99.40	99.46	**100.0**	**100.0**	**99.56**
Emu Park	95.00	93.56	94.97	93.90	92.81	96.74	98.59	98.47	98.86	96.77	96.60	97.98	**96.19**
Hay Point	99.72	91.46	99.40	99.30	92.92	91.80	93.01	95.34	95.83	99.66	99.23	**100.0**	**96.47**
Mackay Offshore	87.08	86.96	95.03	72.10	62.03	65.56	75.54	24.58	42.14	82.12	82.92	83.20	**71.61**
Townsville	91.39	94.22	87.90	84.15	85.08	85.00	76.95	79.03	70.77	80.38	75.63	69.35	**81.65**
Dunk Island	84.93	98.39	98.79	98.52	97.52	94.45	83.15	96.04	94.49	96.98	54.72	72.24	**89.19**
Cairns	99.72	99.87	97.72	98.21	97.45	99.65	98.85	99.59	98.45	99.67	97.64	96.16	**98.58**
Weipa	87.50	95.70	91.06	99.11	85.02	82.57	90.06	96.25	90.66	94.16	84.31	90.86	**90.60**

Denotes directional site in 2001–02

Table 5
Significant meteorological events for season 2001–02 (see notes at end of table)

Tweed Heads Storm threshold value: 2.0m					
Date	Time	Hs	Hmax	Tp	Event
22/11/2001	1400	2.40	4.17	13.48	A 996hPa low in Tasman Sea.
26/01/2002	1000	**2.85 (3.10)**	**4.92 (5.13)**	10.89	Severe weather warning for coastal communities between Sandy Cape and Coolangatta. A 1000hPa low centred near New Caledonia combining with a high moving across the Tasman Sea creating a strong pressure gradient over the southern Coral Sea. Gusty southeasterly winds 30–35 knots.
30/01/2002	1230	2.49	4.03	9.72	A large high is almost stationary near New Zealand. A low about 998hPa is located southwest of New Caledonia and is moving slowly west-southwest. Sandy Cape to Coolangatta, south to southeasterly winds 25–30 knots.
05/02/2002	2230	2.31	4.00	8.77	A 1006hPa low in Coral Sea, and high just south of Tasmania.
09/03/2002	0230	2.49 (2.74)	4.12 (5.53)	11.22	A 1026hPa high near Tasmania extending ridge along southeast Queensland coast. South to southeasterly winds 25–30 knots.
23/03/2002	1900	2.09	3.74	9.10	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. Southeasterly winds 25–30 knots.
31/03/2002	0800	2.64 (2.93)	4.27 (4.39)	11.08	A 1025hPa high moving east through Bass Strait and a low off New South Wales are directing vigorous 25–35 knot south to southeasterly winds over southern Queensland coast.
06/04/2002	0030	2.05	3.54	8.55	A ridge from a 1034hPa high over the Great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly winds 25–30 knots between Cape Moreton and Torres Strait
17/04/2002	0630	2.08	3.61	8.87	Low off northern New South Wales
01/05/2002	1030	2.01	3.24	10.02	Large 1031hPa high near Tasmania extending ridge of high pressure along eastern seaboard. Southeast winds 25–30 knots
04/05/2002	0030	2.13	3.68	7.51	A 1034hPa high just off the southeast coast of Australia extends a firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
13/05/2002	0300	2.01	3.40	10.35	Low east of New South Wales and high over South Australia
29/05/2002	2300	2.07	3.33	16.00	Low south of New Zealand and two highs over South Australia, T.C. Upia off New Guinea.
02/06/2002	2300	2.38 (2.61)	3.95 (3.83)	8.53	A 1034hPa high centred over Victoria moving east. Trough deepening off south Queensland coast. South to southeasterly winds 25–30 knots.
05/06/2002	0030	2.10	3.61	7.49	A 1027hPa high over western Tasman Sea moving slowly east. Trough located well east of Townsville. South to southeasterly winds 30–40 knots Bowen to Cape Moreton.
30/06/2002	1900	2.68 (2.93)	4.32 (4.49)	16.68	Large 1035hPa high near Adelaide, with deep low over southern Tasman Sea. Southwest to southeasterly winds 20–30 knots.
29/07/2002	2030	2.05	3.28	14.54	A 1027hPa high located east of New South Wales combined with a 1016hPa low over the Queensland–New South Wales border to produce ridge along coast. Trough near Sydney.
26/08/2002	0100	2.47	4.51	8.22	A 1031hPa high over western Tasman Sea moving slowly eastwards. A deepening low located near New Caledonia moving east-southeast. South to southeasterly winds 25–30 knots Coolangatta to St Lawrence.
23/10/2002	1600	2.44 (2.59)	4.32 (5.11)	7.33	A vigorous front moving rapidly east across Queensland. North to northwesterly winds 25–33 knots tending West to southwest
28/10/2002	0230	2.03	3.31	8.90	A trough lying across the coast near Yeppoon moving north, with a firm coastal ridge to the south. A small low east of Double Island Point moving east. Southeasterly winds 25–40 knots.

Denotes highest ‘smoothed’ wave event. Denotes highest ‘un-smoothed’ wave event.

Table 5 (continued) Major meteorological events (see notes at end of table)

Gold Coast Storm threshold value: 2.0m					
Date	Time	Hs	Hmax	Tp	Event
26/01/2002	1130	2.54 (2.79)	4.36 (4.41)	10.56	Severe weather warning for coastal communities between Sandy Cape and Coolangatta. A 1000hPa low centred near New Caledonia combining with a high moving across the Tasman Sea creating a strong pressure gradient over the southern Coral Sea. Gusty southeasterly winds 30–35 knots.
29/01/2002	1600	2.14	3.50	9.98	A large high is almost stationary near New Zealand. A low about 998hPa is located southwest of New Caledonia and is moving slowly west-southwest. Sandy Cape to Coolangatta, south to southeast winds 25–30 knots.
06/02/2002	0930	2.15	3.63	9.33	A large high southeast of Tasmania and a weak low off the southern Queensland coast.
07/03/2002	2130	2.16	3.39	9.61	A 1026hPa high over southern Tasman Sea moving east towards New Zealand extends weakening ridge to Queensland coast. TC Des 985hPa located near New Caledonia moving southeast.
01/04/2002	2030	2.21	3.70	7.72	A 1031hPa high just east of Tasmania moving east. A 1004hPa low in northern Coral Sea. Southeasterly winds 25–33 knots.
30/05/2002	0300	2.29 (2.50)	3.45 (4.05)	16.41	Low south of Solomon Islands, low off northern New South Wales coast, high located over South Australia.
03/06/2002	1700	2.40 (2.52)	4.34 (4.54)	8.35	A 1035hPa high centred over Victoria moving slowly east. Trough deepening off central Queensland coast. South to southeasterly winds 30–40 knots Cape Moreton to Sandy Cape.
19/06/2002	1530	2.33 (2.42)	3.88 (4.32)	12.71	Complex low in northern Tasman Sea. Low east of Double Island Point. Large 1032hPa high over Victoria. Strong south to southeasterly winds St Lawrence to Coolangatta, and in Gulf.
30/06/2002	2100	**2.84 (3.14)**	**4.53 (5.32)**	16.19	Large 1035hPa high near Adelaide, with deep low over southern Tasman Sea. Southwesterly to southeasterly winds 20–30 knots.
30/07/2002	0100	2.03	3.52	14.38	A 1029hPa high over Victorian/New South Wales border and a low off the New South Wales coast.
26/08/2002	0330	2.31 (2.65)	4.05 (5.16)	8.48	A 1031hPa high over western Tasman Sea moving slowly eastwards. A deepening low located near New Caledonia moving east-southeast. South to southeasterly winds 25–30 knots Coolangatta to St Lawrence.
27/10/2002	2330	2.00	3.57	7.95	A trough lying across the coast near Double Island Point with a firm ridge to the south. Southeast winds 25–30 knots.
Brisbane **Storm threshold value: 4.0m**					
Date	Time	Hs	Hmax	Tp	Event
22/11/2001	0600	4.01	6.37	12.27	A 996hPa low in Tasman Sea.
31/03/2002	1000	4.48 (4.78)	**7.84 (9.38)**	10.62	A 1025hPa high moving east through Bass Strait and a low off New South Wales are directing vigorous 25–33 knot south/southeasterly winds over southern Queensland coast.
19/06/2002	1500	**4.61 (5.06)**	7.59 (7.35)	12.50	Complex low developed in northern Tasman Sea. Low east of Double Island Point. Large 1032hPa high over Victoria. South to southeasterly winds 34–40 knots St Lawrence to Coolangatta. Southeasterly winds 25–30 knots in Gulf.
30/06/2002	1200	4.28	7.09	15.23	Large 1035hPa high near Adelaide, with deep low over southern Tasman Sea. Southwesterly to southeasterly winds 20–30 knots.
Moreton Bay **Storm threshold value: 1.0m**					
Date	Time	Hs	Hmax	Tp	Event
18/11/2001	1800	1.00	1.80	4.07	Coastal waters Sandy Cape to Coolangatta. A trough moving across southern Queensland moving off the south coast in afternoon/evening. 25–30 knot north to northwesterly winds swinging round to southerly 25–30 knots.
24/11/2001	1700	1.06 (1.11)	1.92 (1.98)	4.26	Double Island Point to Coolangatta, expect winds 25–30 knots in afternoon/evening. A trough over inland Queensland and a ridge over the southern Coral Sea are generating a strong pressure gradient over southeast Queensland.
28/10/2002	0001	**1.30 (1.62)**	**2.26 (2.90)**	4.28	A trough lying across the coast near Yeppoon moving north, with a firm coastal ridge to the south. A small low east of Double Island Point moving east. Southeasterly winds 25–40 knots.

Table 5 (continued) Major meteorological events (see notes at end of table)

Mooloolaba Storm threshold value: 2.0m					
Date	Time	Hs	Hmax	Tp	Event
27/01/2002	1230	2.74 (2.93)	4.59	10.81	Severe weather warning for coastal communities between Sandy Cape and Coolangatta. A 1000hPa low centred near New Caledonia combining with a high moving across the Tasman Sea creating a strong pressure gradient over the southern Coral Sea. Gusty southeasterly winds 30–35 knots.
04/03/2002	2030	2.27 (2.42)	3.88 (4.40)	7.97	Combination of 1024hPa high near Tasmania moving into Tasman Sea and complex area of low pressure 1001hPa in Coral Sea directing southeasterly winds along southeast Queensland.
23/03/2002	0930	2.08	3.77	6.99	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. South easterly winds 25–30 knots.
02/04/2002	1130	2.26 (2.46)	3.91	7.59	Large 1031hPa high moving slowly east across Tasman Sea. A 1004hPa tropical low in northern Coral Sea. Southeasterly winds 25–30 knots.
06/04/2002	0001	2.01	3.20	7.61	A ridge from a 1034hPa high over the Great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly winds 25–30 knots between Cape Moreton and Torres Strait
28/04/2002	2230	2.12	3.71	8.22	Large high near Tasmania extending a firm ridge along eastern seaboard. Southeasterly winds 25–30 knots.
04/05/2002	0730	2.29 (2.57)	4.17 (4.32)	8.52	A 1034hPa high off the southeast coast of Australia extends a firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
03/06/2002	1900	**2.93 (3.15)**	**5.02 (5.43)**	8.88	A 1035hPa high centred over Victoria moving slowly east. Trough deepening off central Queensland coast. South to southeasterly winds 30–40 knots Cape Moreton to Sandy Cape.
19/06/2002	1430	2.22 (2.45)	3.76 (4.13)	6.39	Complex low developed in northern Tasman Sea. Low east of Double Island Point. Large 1032hPa high over Victoria. South to southeasterly winds 34–40 knots St Lawrence to Coolangatta. Southeasterly winds 25–30 knots in Gulf.
27/08/2002	1700	2.62 (2.71)	4.29	11.33	A 1030hPa high over southwest Tasman Sea has a firm ridge up east coast. A deepening low located near New Caledonia moving east-southeast. South to southeasterly winds 25–30 knots Coolangatta to St Lawrence.
28/10/2002	0200	2.61 (2.95)	4.79 (5.49)	7.60	A trough lying across the coast near Yeppoon moving north, with a firm coastal ridge to the south. A small low east of Double Island Point moving east. Southeasterly winds 25–40 knots.
Emu Park **Storm threshold value: 2.0m**					
Date	Time	Hs	Hmax	Tp	Event
17/12/2001	1830	2.20 (2.30)	3.85 (4.04)	6.59	A complex area of low-pressure 1003hPa near Mackay combined with rising pressure to the south is expected to increase winds between Double Island Point and Bowen, with gale force winds developing off the Capricorn coast.
04/03/2002	2000	2.28 (2.36)	3.76 (3.89)	7.05	Combination of 1024hPa high near Tasmania moving into Tasman Sea and complex area of low pressure 1001hPa in Coral Sea directing southeasterly winds along southeast Queensland.
14/03/2002	2000	2.01	3.45	6.17	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over New South Wales and southern Queensland coasts. Southeasterly winds 25–30 knots.
23/03/2002	1630	2.03	3.43	6.35	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. Southeasterly winds 25–30 knots.
01/04/2002	1830	2.14 (2.21)	3.70 (4.44)	6.85	A 1031hPa high just east of Tasmania moving east. A 1004hPa low in northern Coral Sea. Southeasterly winds 25–33 knots.
06/04/2002	1130	2.03	3.37	6.83	Ridge from 1034hPa high over Great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly winds 25–30 knots between Cape Moreton and Torres Strait
29/04/2002	1700	2.17	4.08	6.80	Large 1034hPa high near Tasmania extending ridge of high pressure along east coast. Southeasterly winds 25–30 knots
08/05/2002	1630	2.06	3.55	6.46	A 1027hPa high centred over the western Tasman Sea and another high 1028hPa over New South Wales extends a firm

Table 5 (continued) Major meteorological events (see notes at end of table)

					ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
04/06/2002	1300	**2.97 (3.19)**	**5.05**	7.56	A 1035hPa high centred over Victoria moving slowly east. Trough located off central Queensland coast. South to southeasterly winds 30–40 knots Yeppoon to Fraser Island.
28/10/2002	2100	2.29 (2.39)	4.04	7.28	A trough lying across the coast near Yeppoon moving north, with a firm coastal ridge to the south. A small low east of Double Island Point moving east. Southeasterly winds 25–40 knots.
Hay Point Storm threshold value: 1.5m					
Date	Time	Hs	Hmax	Tp	Event
14/11/2001	2130	1.73 (1.80)	2.98 (3.24)	5.87	Southeasterly winds to 25–30 knots for coastal waters Cardwell and Cape Grenville. A firm ridge extends along the east Queensland coast from a 1029hPa high in Great Australian Bight and 998hPa low in Tasman Sea.
05/03/2002	0030	1.88 (1.99)	3.27 (3.76)	6.00	Combination of a 1026hPa high east of Tasmania moving into Tasman Sea and TC Des 993hPa in Coral Sea directing strong southeasterly winds 25–33 knots along southeast Queensland.
13/03/2002	2130	1.59 (1.71)	2.52 (2.61)	5.51	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over NSW and southern Queensland coasts. Southeast winds 25–30 knots.
23/03/2002	2030	1.56	2.65	5.93	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. Southeasterly winds 25–30 knots.
02/04/2002	0030	1.69 (1.83)	2.89 (3.56)	5.86	A large 1031hPa high moving slowly east across Tasman Sea. A 1004hPa tropical low in northern Coral Sea. Southeasterly winds 25–30 knots.
06/04/2002	1930	1.73	2.97	6.08	A ridge from a 1034hPa high over the Great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly 25–30 knots between Cape Moreton and Torres Strait
30/04/2002	0030	**1.94 (2.12)**	3.34 (4.35)	6.18	Large 1030hPa high east of southern New South Wales and another high over the Bight extending a firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots
08/05/2002	2030	1.52	2.54	5.66	A 1027hPa high centred over the western Tasman Sea and another high 1028hPa over New South Wales extends a firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
05/06/2002	0030	1.82 (1.99)	**3.35 (3.53)**	8.68	A 1027hPa high over western Tasman Sea moving slowly east. Trough located well east of Townsville. South to southeasterly winds 30–40 knots Bowen to Cape Moreton.
09/08/2002	2100	1.52	2.55	5.49	A 1029hPa high located over New South Wales.
28/10/2002	2300	1.62	2.93	5.84	A trough lying across the coast near Yeppoon moving north, with a firm coastal ridge to the south. A small low east of Double Island Point moving east. Southeasterly winds 25–40 knots.
Mackay Storm threshold value: 2.0m					
Date	Time	Hs	Hmax	Tp	Event
05/03/2002	0200	2.88 (2.98)	5.02	7.83	Combination of a 1026hPa high east of Tasmania moving into Tasman Sea and TC Des 993hPa in Coral Sea directing strong southeasterly winds 25–33 knots along southeast Queensland.
14/03/2002	0000	2.17	3.84	7.02	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over New South Wales and southern Queensland coasts. Southeasterly winds 25–30 knots.
24/03/2002	0230	2.07	3.69	6.62	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. Southeasterly winds 25–30 knots.
01/04/2002	2330	2.53 (2.68)	4.76	7.73	A 1031hPa high just east of Tasmania moving east. A 1004hPa low in northern Coral Sea. Southeasterly winds 25–33 knots.
06/04/2002	2030	2.41	4.42	7.46	Ridge from 1034hPa high over the great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly winds 25–30 knots between Cape Moreton and Torres Strait
28/04/2002	2300	2.06	3.47	6.80	Large high near Tasmania extending a firm ridge along eastern seaboard. Southeasterly winds 25–30 knots.

Table 5 (continued) Major meteorological events (see notes at end of table)

02/05/2002	0200	2.88 (3.08)	4.76	7.74	Large 1034hPa high near Victorian–New South Wales border, and another high Tasmania extending firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
05/05/2002	0600	2.24	3.81	6.59	A 1027hPa high just off the southeast coast of Australia extends a firm ridge of high pressure along eastern seaboard.
09/05/2002	0100	2.23	3.55	6.58	A 1027hPa high in the Tasman Sea extends a ridge of high pressure along eastern seaboard.
05/06/2002	0000	**3.58 (3.75)**	**6.14 (6.17)**	8.26	A 1027hPa high over western Tasman sea moving slowly east. Trough located well east of Townsville. South to southeasterly winds 30–40 knots Bowen to Cape Moreton.
12/09/2002	0700	2.01	3.81	5.90	A 1030hPa high over southeast Australia, producing a strengthening ridge along the coast. South to southeasterly winds 25–30 knots.
15/09/2002	0700	2.05	3.23	7.00	A 1033hPa high over the Tasman Sea moving slowly east. Southeasterly winds 25–30 knots.
29/10/2002	0130	2.21	3.84	7.15	A 1021hPa high located near Brisbane.
Townsville Storm threshold value: 1.5m					
Date	Time	Hs	Hmax	Tp	Event
19/01/2002	2200	1.52	2.73	5.92	A 1025hPa high east of Victoria.
13/03/2002	2000	1.62 (1.71)	2.83 (3.11)	6.59	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over New South Wales and southern Queensland coasts. Southeasterly winds 25–30 knots.
01/04/2002	2030	1.50	2.49	5.74	A 1031hPa high just east of Tasmania moving east. A 1004hPa low in northern Coral Sea. Southeasterly winds 25–33 knots.
06/04/2002	0000	1.51	2.59	6.25	Ridge from 1034hPa high over the Great Australian Bight extends along the coast. A trough remains over the northern Coral Sea. South to southeasterly winds 25–30 knots between Cape Moreton and Torres Strait
02/05/2002	1400	**1.65 (1.70)**	**3.03 (3.18)**	6.36	Large 1034hPa high near Victorian–New South Wales border. Another high over Tasmania extending firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots.
10/08/2002	2230	1.62 (1.81)	2.99 (3.44)	5.75	A 1030hPa high located over northern New South Wales and another 1030hPa high offshore, just to the east.
12/09/2002	2300	1.59	2.95	6.56	1030hPa high over southeast Australia, producing strengthening ridge along the coast. South to southeasterly winds 25–30 knots.
01/10/2002	2000	1.60	2.73	6.11	A 1026hPa high centred over New South Wales moving east, extending a firm ridge along Queensland east coast. Southeasterly winds 25–30 knots.
Dunk Island Storm threshold value: 1.0m					
Date	Time	Hs	Hmax	Tp	Event
19/01/2002	1100	1.46	2.62	5.43	A 1025hPa high east of Victoria.
17/02/2002	0800	1.17	2.15	4.87	Weak low in southern Gulf of Carpentaria. Northwesterly winds 25–30 knots.
05/03/2002	1000	1.35	2.41	5.52	Combination of a 1026hPa high east of Tasmania moving into Tasman Sea and TC Des 993hPa in Coral Sea directing strong southeasterly winds 25–33 knots along southeast Queensland.
14/03/2002	0830	1.45 (1.65)	2.62	5.76	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over New South Wales and southern Queensland coasts. Southeasterly winds 25–30 knots.
20/03/2002	0930	1.11	2.03	4.82	A 1027hPa high in Great Australian Bight.
23/03/2002	1100	1.51	2.56	6.24	A large 1030hPa high in Tasman Sea with a firm ridge along the Queensland coast. Southeasterly winds 25–30 knots.
02/04/2002	0730	**1.53 (1.65)**	**2.86 (3.16)**	5.35	Large 1031hPa high moving east across Tasman Sea. A 1004hPa tropical low in Coral Sea. Southeast winds 25–30 knots.
12/04/2002	0900	1.51	2.58	5.22	Large high over south island of New Zealand.
15/04/2002	1830	1.03	1.89	4.52	A high east of Tasmania and a trough in Coral Sea.
26/04/2002	0230	1.05	1.88	4.87	Trough in Coral Sea
01/05/2002	0300	1.19	1.85	6.30	A 1031hPa high near Tasmania extending high pressure ridge along eastern seaboard. Southeasterly winds 25–30 knots
06/05/2002	0600	1.01	1.71	5.32	A 1024hPa high over western Tasman Sea with high 1028hPa over New South Wales. Southeasterly winds 25–30 knots.

Table 5 (continued) Major meteorological events (see notes at end of table)

Cairns Storm threshold value: 1.0m					
Date	Time	Hs	Hmax	Tp	Event
14/03/2002	0900	1.05	1.74	4.37	Strong high 1031hPa in Great Australian Bight extending firm ridge of high pressure over New South Wales and southern Queensland coasts. Southeasterly winds 25–30 knots.
01/04/2002	1830	1.00	1.82	4.50	A 1031hPa high just east of Tasmania moving east. A 1004hPa low in northern Coral Sea. Southeasterly winds 25–33 knots.
07/04/2002	1130	1.05	1.85	4.49	Ridge from 1035hPa high over Great Australian Bight extends along the coast. A trough remains over the Coral Sea. South to southeasterly winds 25–30 knots from St Lawrence to Torres Strait
01/05/2002	1000	**1.25**	2.19	4.67	Large 1031hPa high near Tasmania extending a firm ridge of high pressure along eastern seaboard. Southeasterly winds 25–30 knots
11/05/2002	1700	1.02	1.87	4.23	Strong pressure rises over New South Wales. Low in Tasman Sea, drifting northeast away from coast and 1026hPa high over Victorian–New South Wales border. These two systems producing tight pressure gradient off south coast of Queensland with strong south to southeasterly winds 25–30 knots.
19/06/2002	1600	1.21	**2.20**	4.53	Complex low in northern Tasman Sea. Low east of Double Island Point. Large 1032hPa high over Victoria. South to southeasterly winds 34–40 knots St Lawrence to Coolangatta.
23/06/2002	0830	1.06	1.91	4.48	A 1030hPa high over New South Wales extending a firm ridge along tropical coast. Southeasterly winds 25–30 knots Torres Strait to Cardwell.
18/07/2002	1230	1.04	1.84	4.20	Large 1032hPa high over New South Wales. Southeasterly winds 25–30 knots.
15/08/2002	1600	1.04	1.80	4.44	A localised band of strong winds near northern edge of cloud band between Cairns and Cooktown.
13/09/2002	0430	1.10	2.15	4.85	1030hPa high over New South Wales. South to southeasterly winds 25–30 knots.
01/10/2002	1500	1.16	1.97	4.32	A 1026hPa high centred over New South Wales moving east, extending a firm ridge along Queensland east coast. Southeasterly winds 25–30 knots.
Weipa **Storm threshold value: 1.0m**					
Date	Time	Hs	Hmax	Tp	Event
17/12/2001	1700	1.60	2.62	6.61	A complex 1003hP area of low pressure near Mackay combined with rising pressure to the south.
03/01/2002	1830	**2.10 (2.29)**	**3.35**	8.65	Tropical cyclone Bernie formed in southern Gulf of Carpentaria. 987hPa on 3 January, category 2. A trough located between Fraser Island and Brisbane.
03/02/2002	1030	1.29	2.03	9.03	Trough running across bottom of Gulf.
09/02/2002	0830	1.55	2.67	7.81	Vigorous trough located at southern Gulf.
11/02/2002	1830	1.84 (2.04)	3.21 (3.96)	8.09	Lows off Tasmania and Queensland. Trough off Queensland coast, southeasterly winds 25–30 knots.
20/02/2002	2230	1.74	2.69	8.71	997hPa low over Northern Territory with a trough in southern Gulf of Carpentaria.

Denotes highest 'smoothed' wave event. Denotes highest 'un-smoothed' wave event.

Notes: The Hsig values presented in column (1) and the Hmax values presented in column (2) are the maximum values recorded for each event and are not necessarily coincident in time.

Due to possible statistical errors arising from finite length records used in calculating wave climate, the above storm peak Hsig and Hmax values are derived from the time series smoothed by a simple three hourly moving average following the recommendation of Forristall G.Z., Heideman J.C., Leggett I.M., Roskam B. and Vanderschuren L. (1996), "Effect of Sampling Variability on Hindcast and Measured Wave Heights", *J. Waterway, Port, Costal and Ocean Engineering*, Vol 122, No. 5, September/October 1996. **Values shown in brackets are the un-smoothed heights. All wave plots that follow display un-smoothed data!**

The Tp values presented in column (3) and the Hsig values presented in column (1) are coincident as a single event on the date shown.

For the seasonal year, the highest Significant Wave Height (Hsig) was 4.61m (or 5.06m un-smoothed) recorded at Brisbane station on the 19 June, 2002 during the presence of a low off Double Island Point and a large 1032hPa high over Victoria generating 34–40 knot south to southeast winds between St Lawrence and Coolangatta. The highest Maximum Wave Height (Hmax) was 7.84m (or 9.38m un-smoothed), also recorded at Brisbane station on the 31 March 2002 resulting from vigorous 25–33 knot south to southeast winds produced by a 1025hPa high moving east through Bass Strait and a low off New South Wales.

Meteorological information was obtained from the *Monthly Weather Review* published by the Bureau of Meteorology (Brisbane).

Table 6

Queensland cyclone details for season 2001–02
The track of tropical cyclone *Bernie* is shown in figure 13.

Advice	Time (AEST)	Latitude	Longitude	Central Pressure	Maximum Winds	Category
3	1/01/2002 2330	-13.5	137.8	1001	80	TL
4	2/01/2002 0530	-14.0	138.8	1001	80	TL
5	0830	-14.0	139.0	1001	80	TL
6	1130	-14.2	139.4	1001	80	TL
7	1400	-14.5	139.5	1001	80	TL
8	1700	-14.7	139.3	999	80	TL
9	2000	-14.8	139.0	999	80	TL
10	2300	-15.0	138.8	999	80	TL
11	3/01/2002 0200	-15.0	138.8	999	80	TL
12	0500	-15.0	138.8	999	80	TL
13	0800	-14.6	138.8	997	80	TL
14	1100	-14.6	138.8	997	80	TL
15	1400	-14.6	138.8	995	100	1
16	1700	-15.0	138.9	992	100	1
17	2000	-15.1	138.9	992	100	1
18	2300	-15.2	138.9	987	110	1
19	4/01/2002 0200	-15.4	138.9	985	130	2
20	0500	-15.5	138.9	985	130	2
21	0800	-15.6	138.9	985	130	2
22	1100	-15.6	139.0	985	130	2
23	1400	-16.0	139.1	985	130	2
24	1700	-16.2	139.0	985	130	2
25	2000	-16.6	138.8	985	130	2
26	2300	-16.9	138.7	990	100	1
27	5/01/2002 0100	-17.2	138.5	995	75	TL

Tropical cyclone advice information supplied by the Bureau of Meteorology

Notes: Two other tropical cyclones, *Des* and *Upia* occurred during 2001–02. Their details are not shown in either table 6 or figure 13 because they occurred outside the Queensland region, however they did have some impact on wave conditions at some stations.

Wave recording sites—Locality plan

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure A

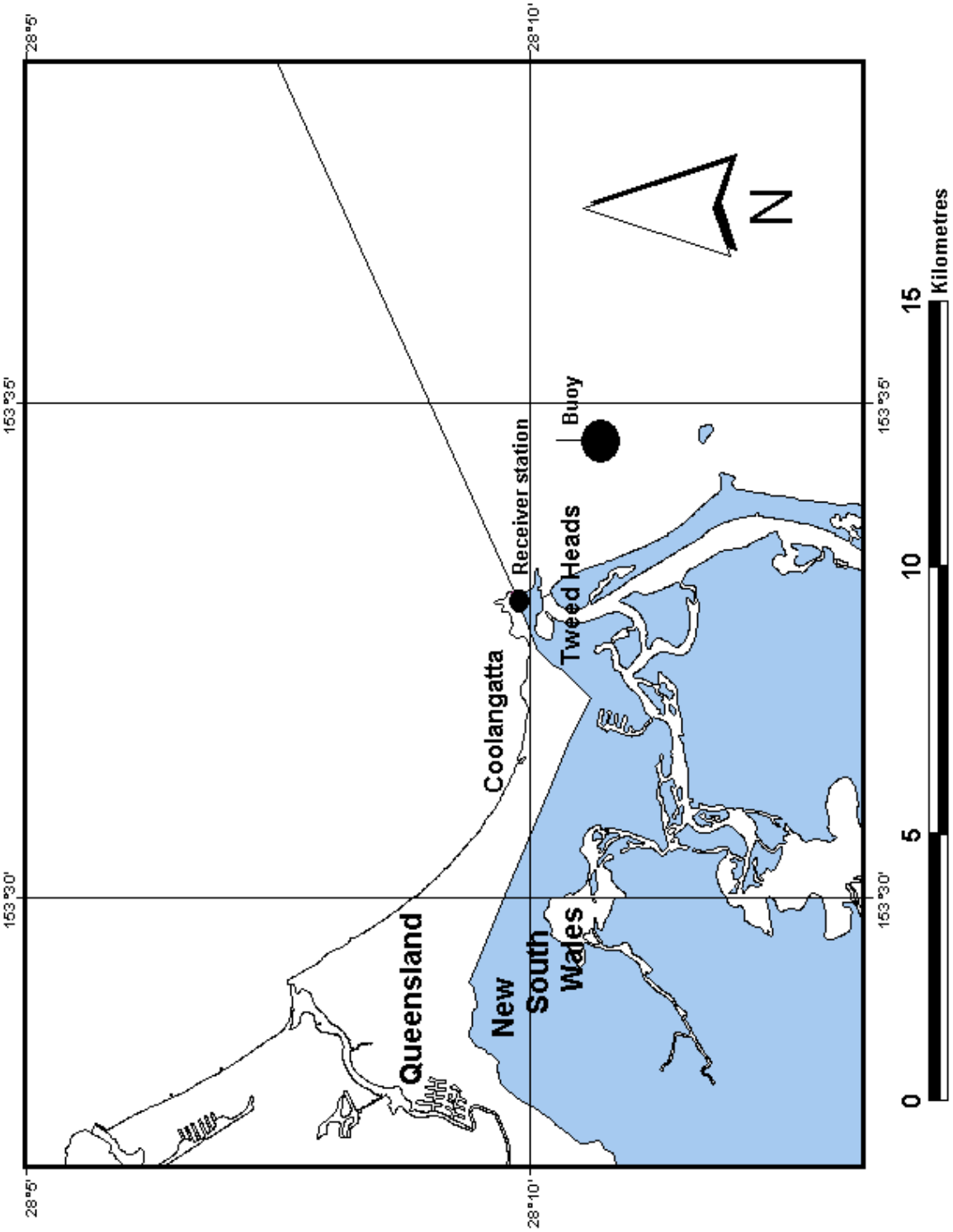
Tweed

Wave recording station

Details of wave recorder installation

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	355.262
Gaps in Data from Selected Dates (Days)	=	9.738
Gaps in Data from Analysed Records (Days)	=	9.738
Gaps in Data from Duration Analysis (Days)	=	9.738
Number of Records Used in Analysis	=	16,979

HAT at nearest standard port: Tweed River breakwater, 1.89m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
28° 10.74'	153° 34.73'	29.5	24/04/2001	12/06/2002
28° 10.60'	153° 34.60'	25.0	12/06/2002	15/06/2002
28° 10.745'	153° 34.597'	25.0	25/06/2002	

Tweed region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001-02

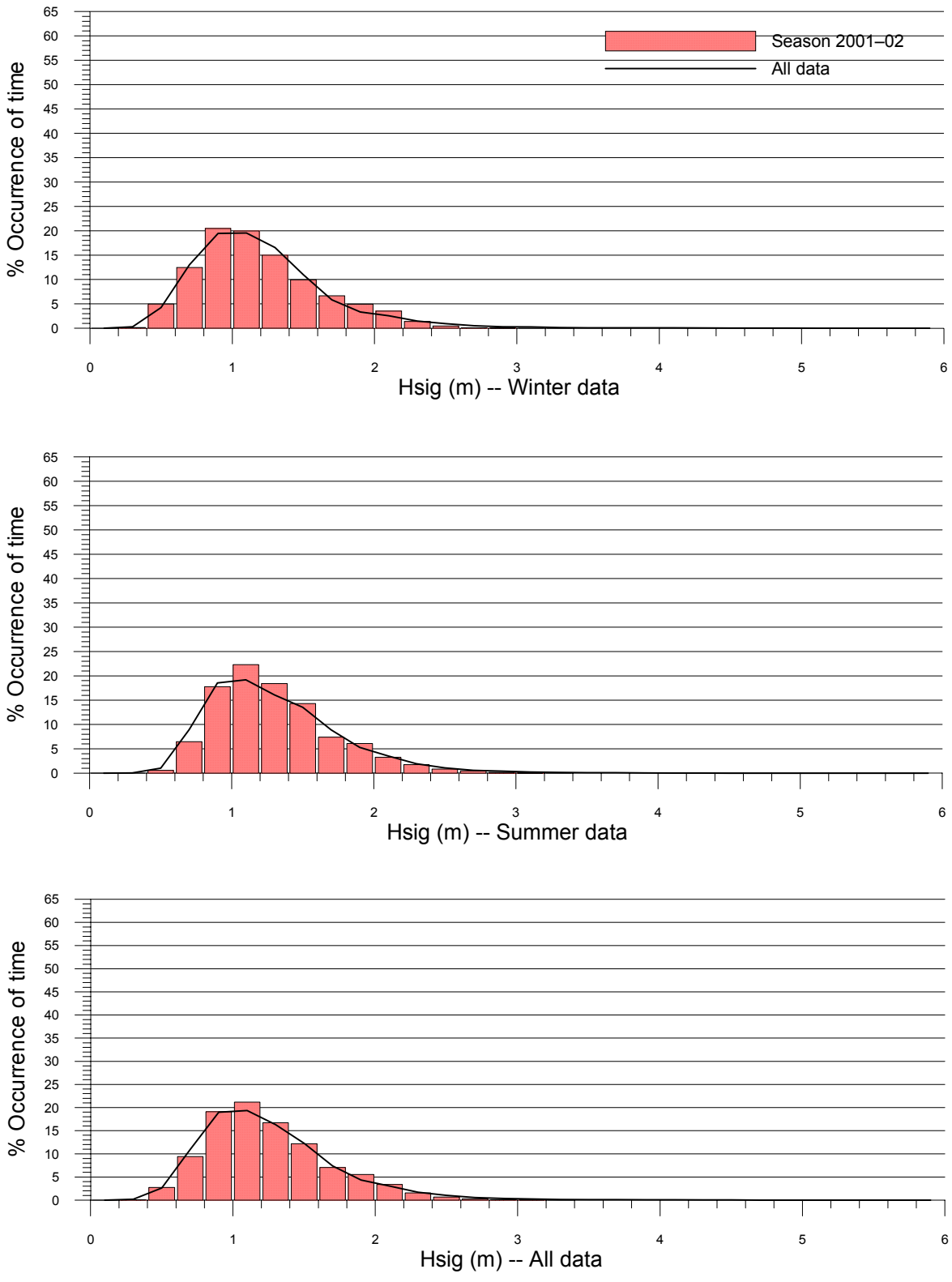
Figure 1.1

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001-02

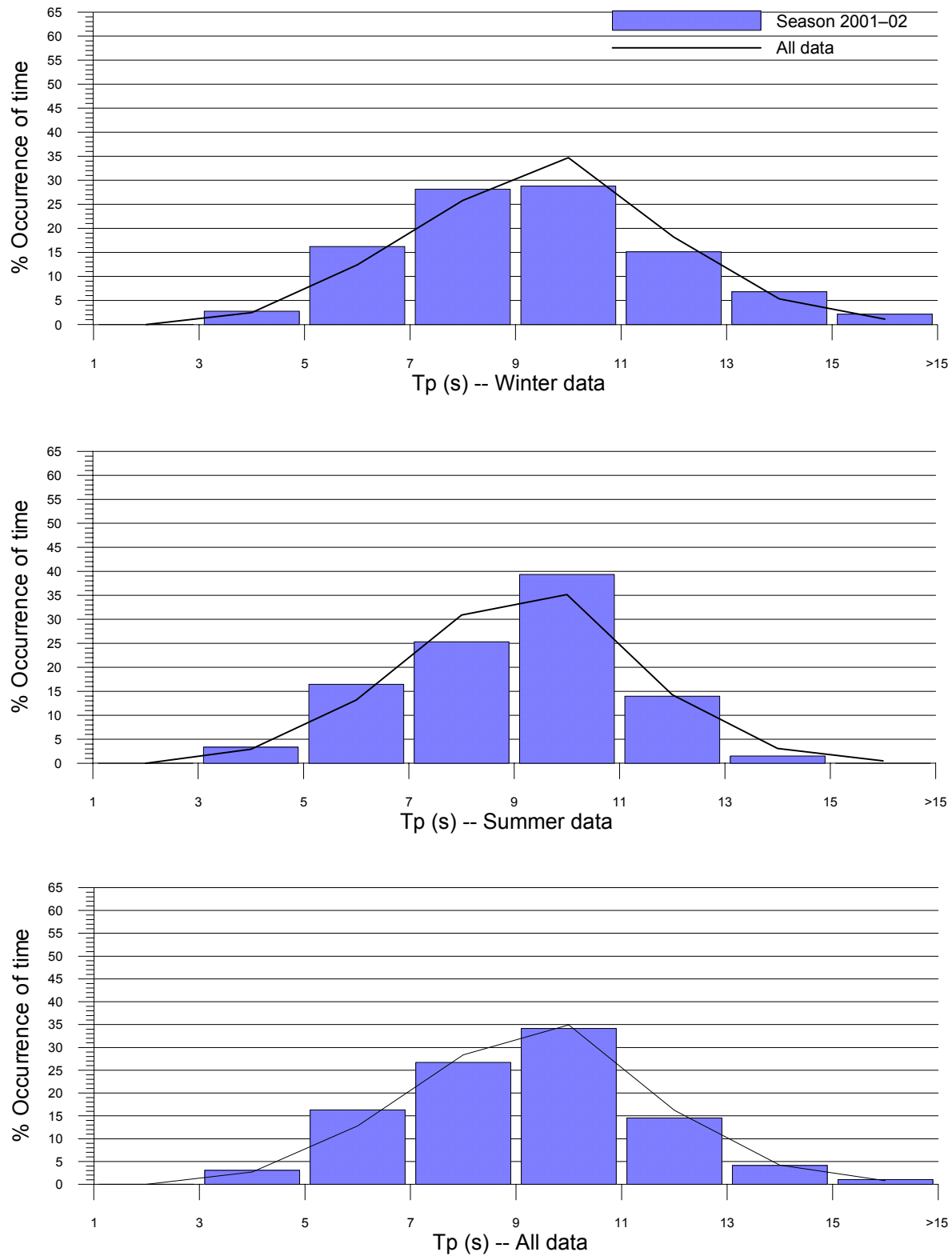
Figure 1.2

Tweed region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)



Tweed region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001-02	Figure 1.3



Tweed region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

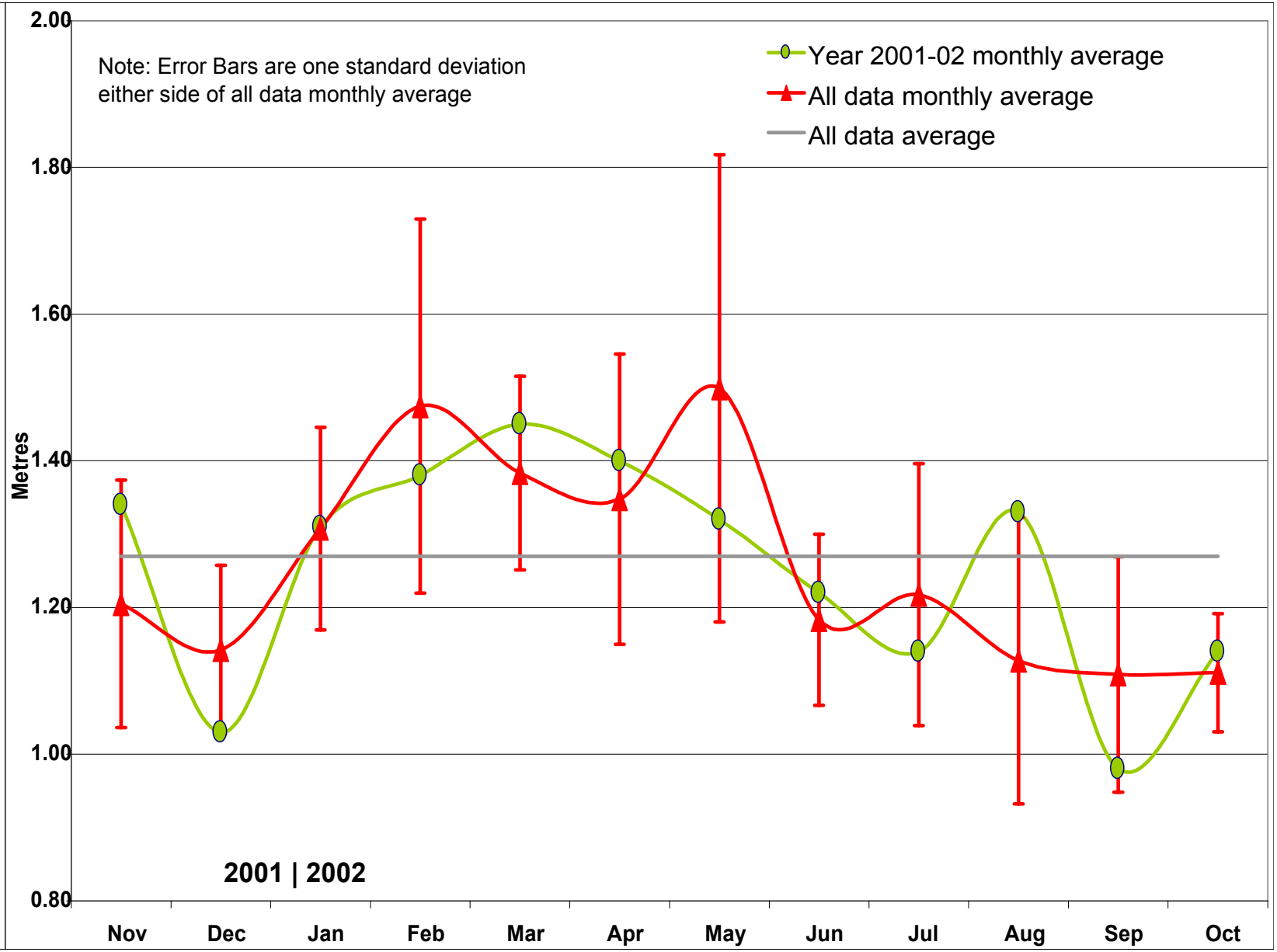
Figure 1.4

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 1.5

Tweed Heads region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001-02

Figure 1.6

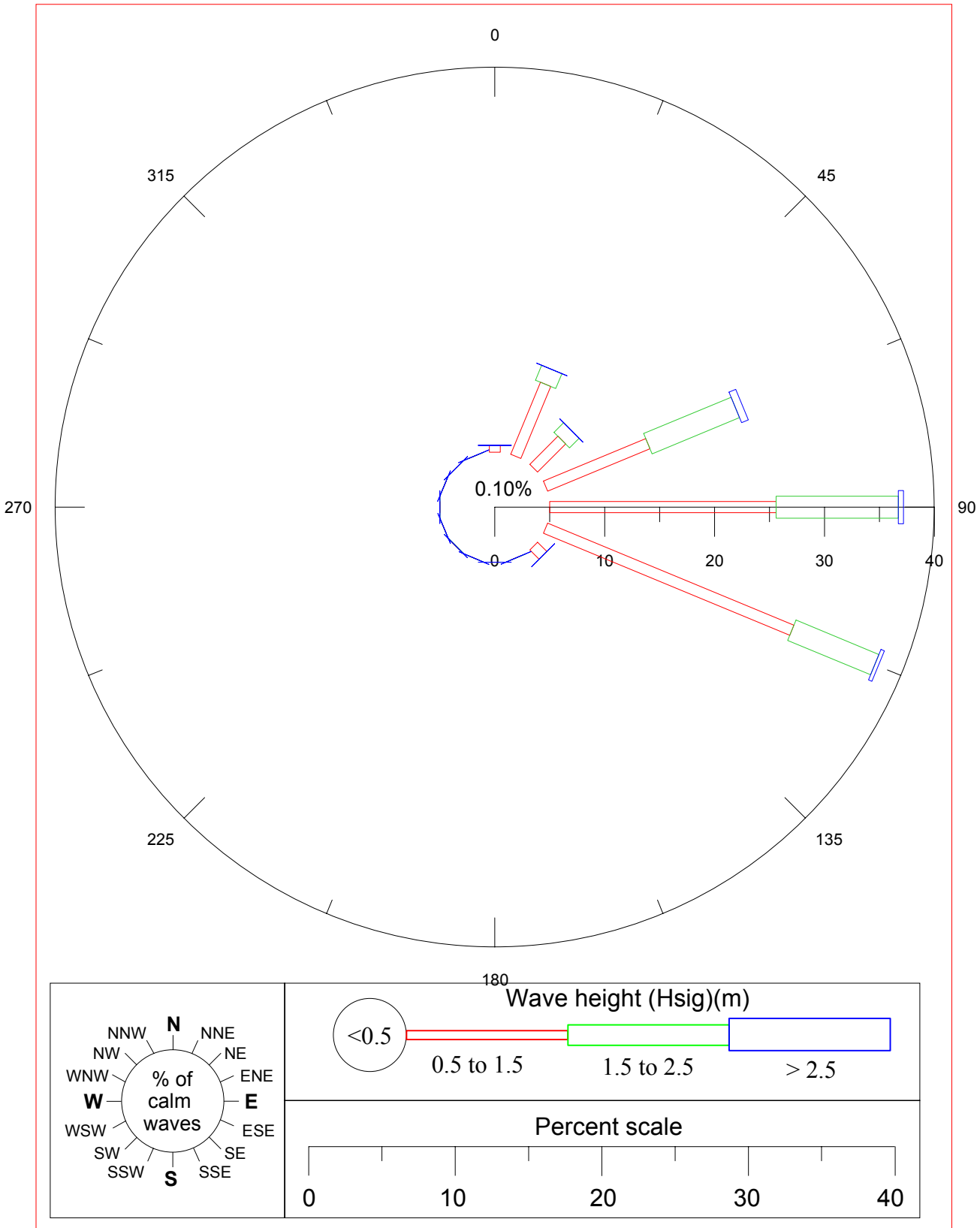
Tweed region—Daily wave recordings

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 1.7

Tweed region—Water temperature and peak direction recordings



Tweed region—Directional wave rose

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 1.8

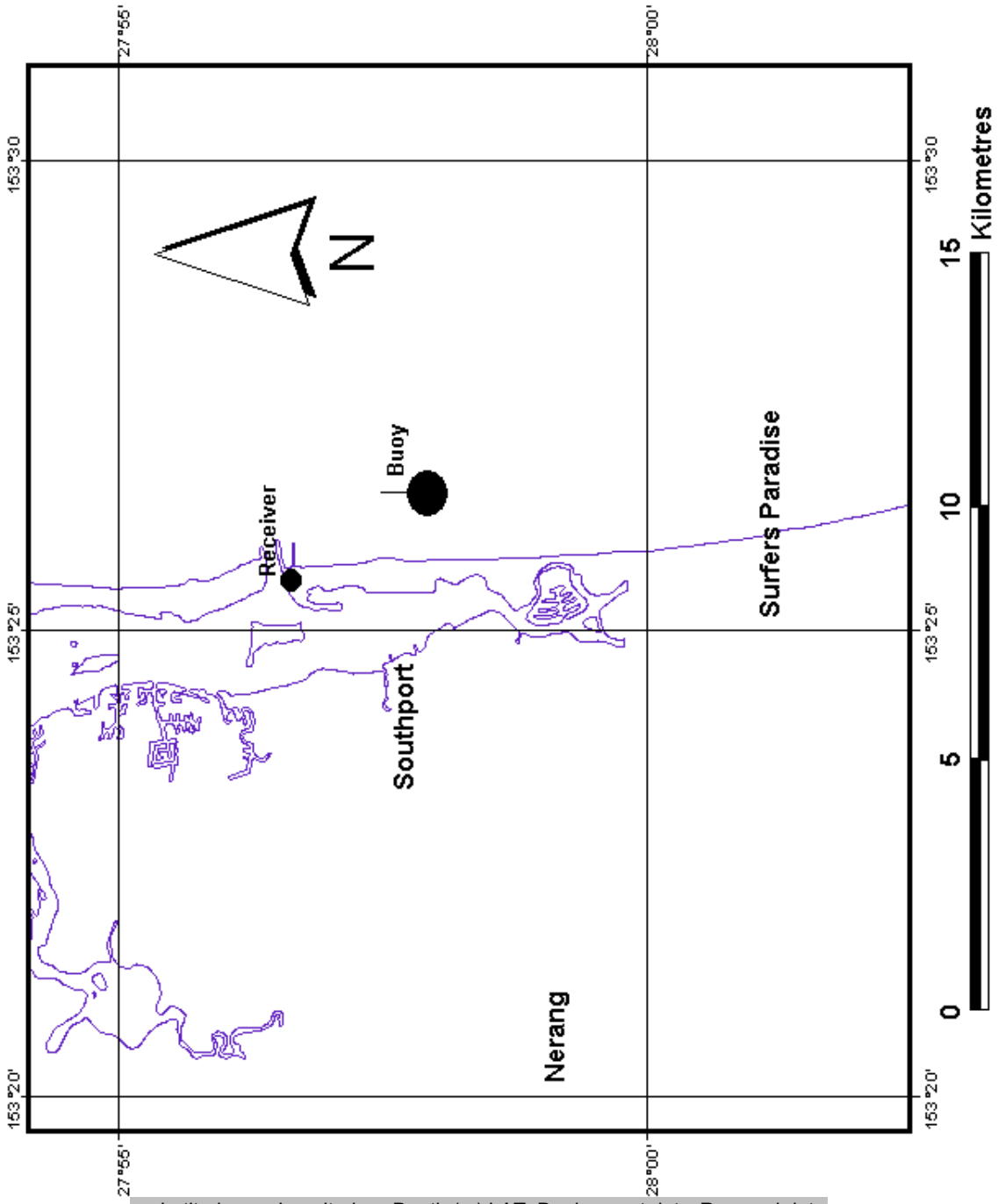
Gold Coast

Wave recording station

Details of wave recorder installation

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	363.708
Gaps in Data from Selected Dates (Days)	=	1.292
Gaps in Data from Analysed Records (Days)	=	1.292
Gaps in Data from Duration Analysis (Days)	=	1.292
Number of Records Used in Analysis	=	17,375

HAT at nearest standard port: Gold Coast seaway, 1.89m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
27° 57.86'	153° 26.47'	15.2	12/02/2001	10/04/2002
27° 57.891'	153° 26.518'	15.5	10/04/2002	21/03/2003
27° 57.843'	153° 26.528'	15.5	21/03/2003	

Gold Coast region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

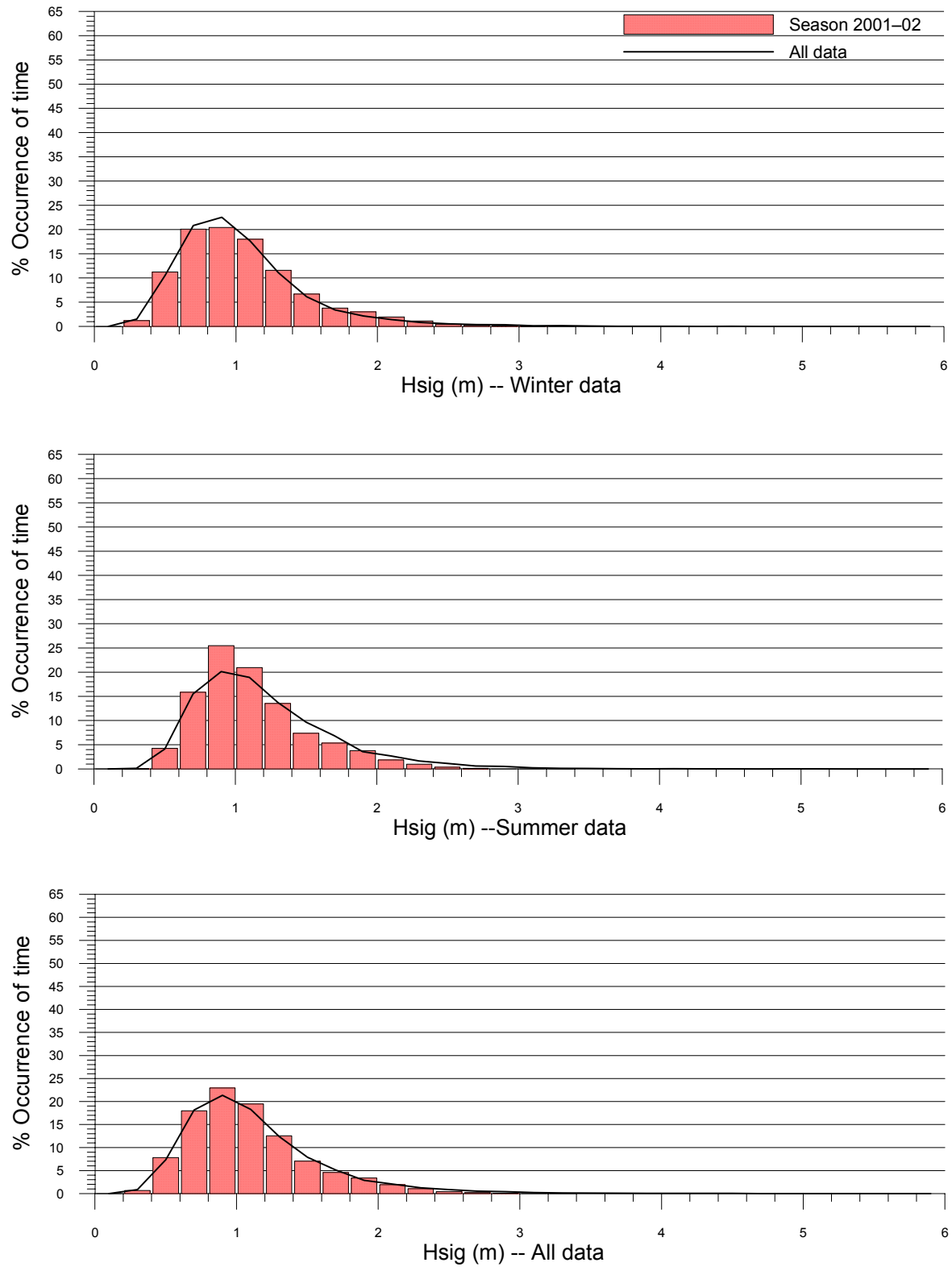
Figure 2.1

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 2.2

Gold Coast region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

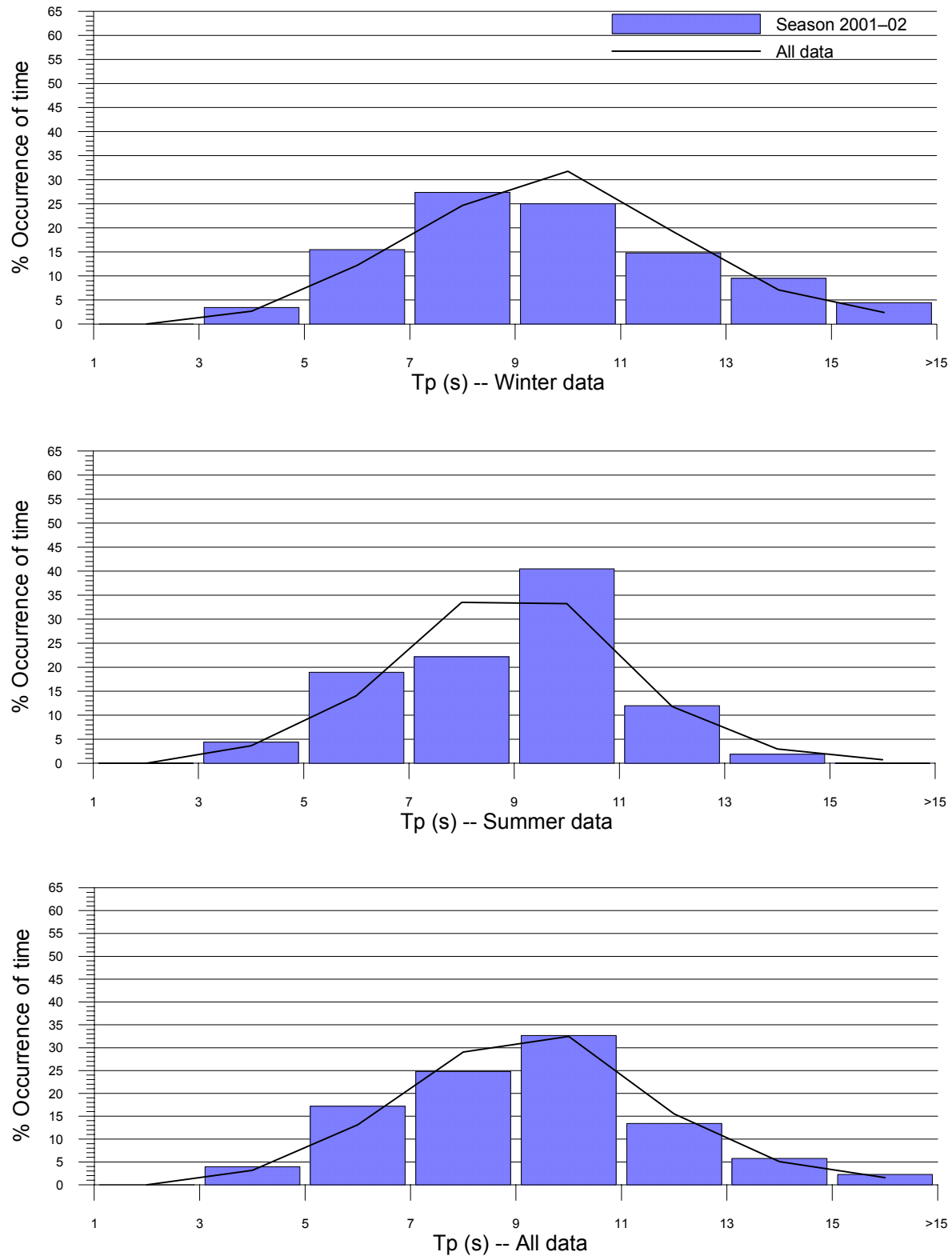


Gold Coast region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 2.3



Gold Coast region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

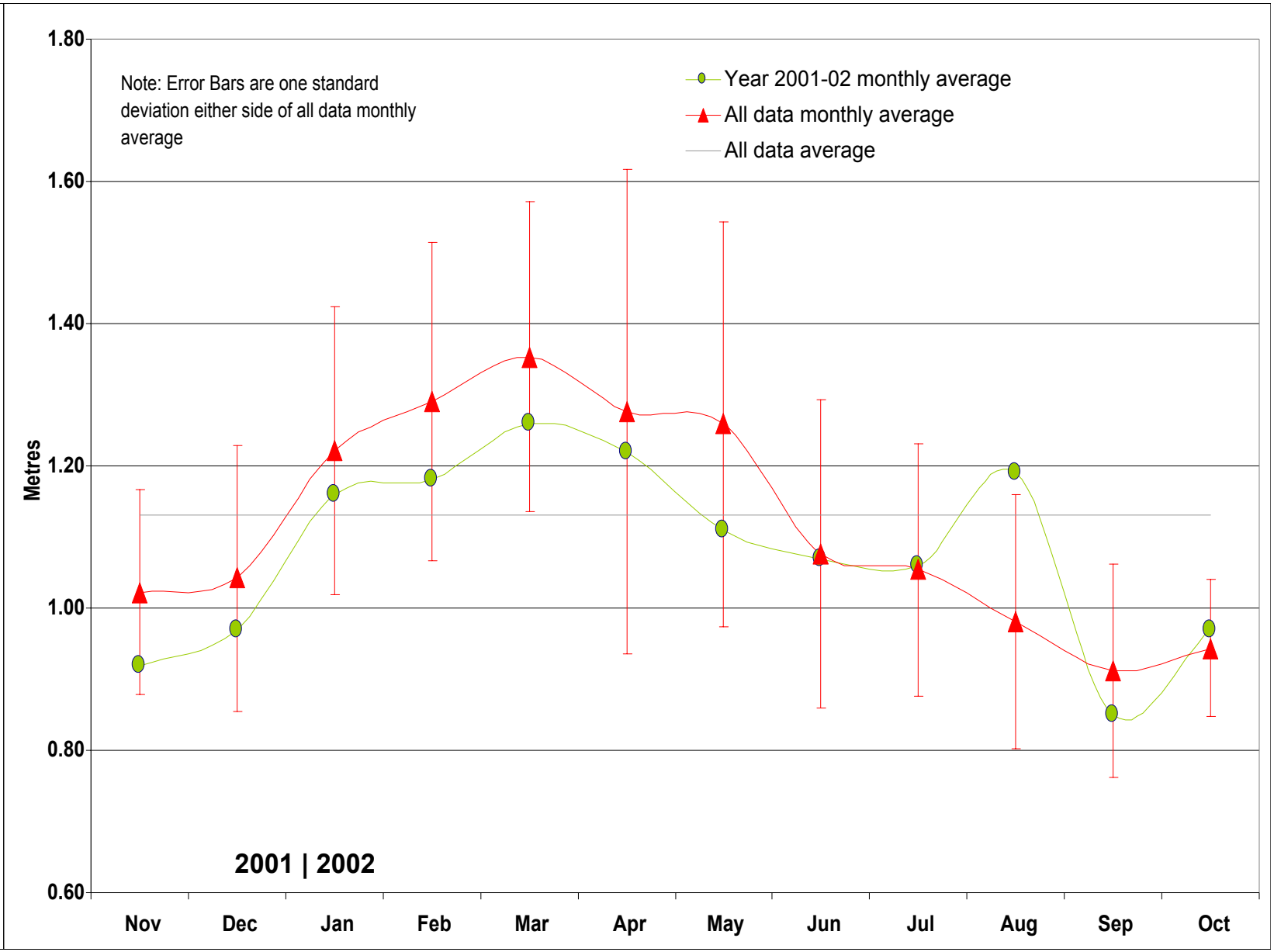
Figure 2.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 2.5

Gold Coast region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 2.6

Gold Coast region—Daily wave recordings

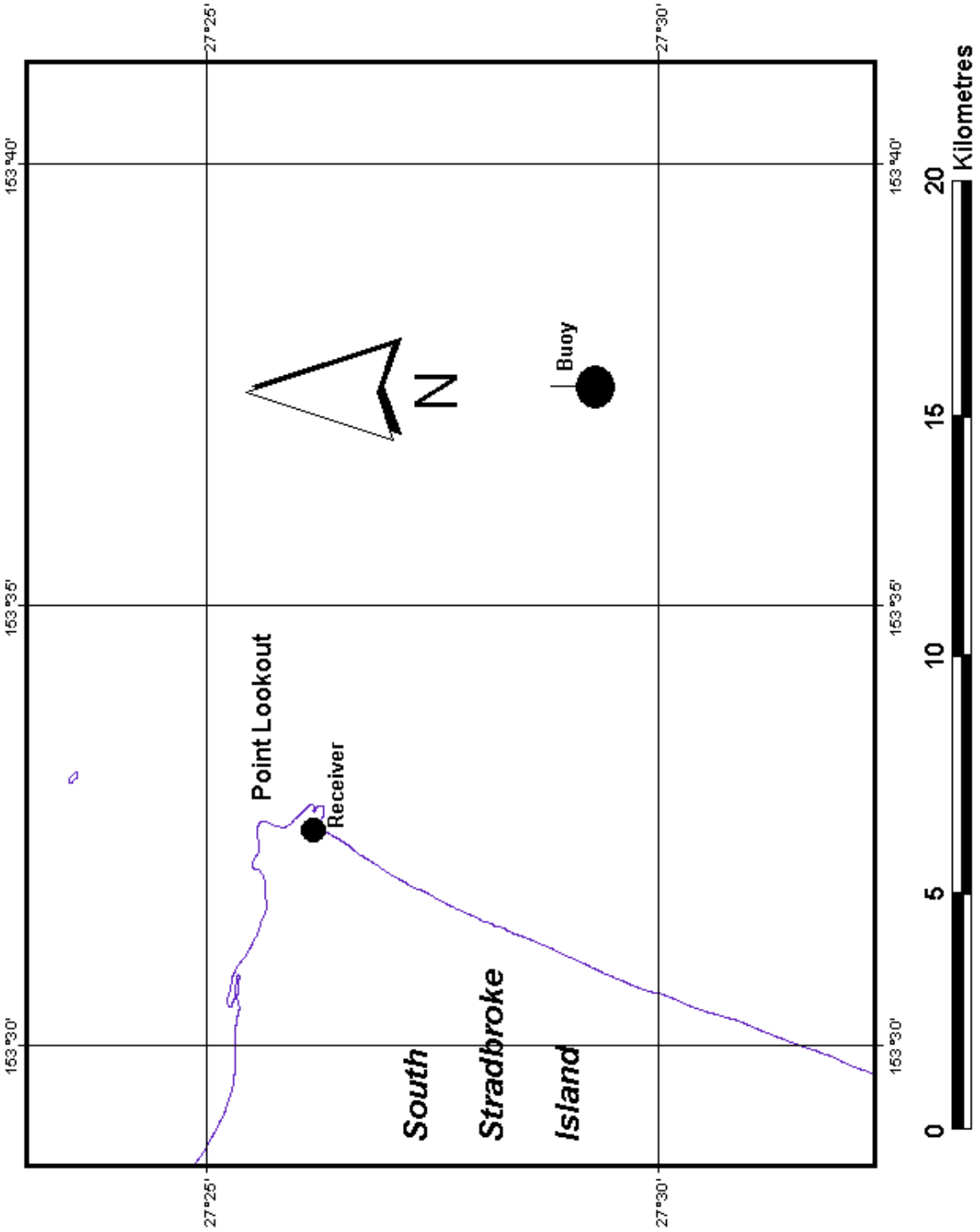
Brisbane

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	355.188
Gaps in Data from Selected Dates (Days)	=	9.812
Gaps in Data from Analysed Records (Days)	=	9.812
Gaps in Data from Duration Analysis (Days)	=	9.812
Number of Records Used in Analysis	=	16, 899

HAT at nearest standard port: Gold Coast seaway, 1.89m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
27° 29.60'	153° 37.44'	70.0	13/06/2001	10/03/2002
27° 29.392'	153° 37.49'	70.0	10/03/2002	27/11/2002
27° 29.582'	153° 37.53'	70.0	06/12/2002	19/06/2003
27° 29.595'	153° 37.451'	70.0	19/06/2003	

Brisbane region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

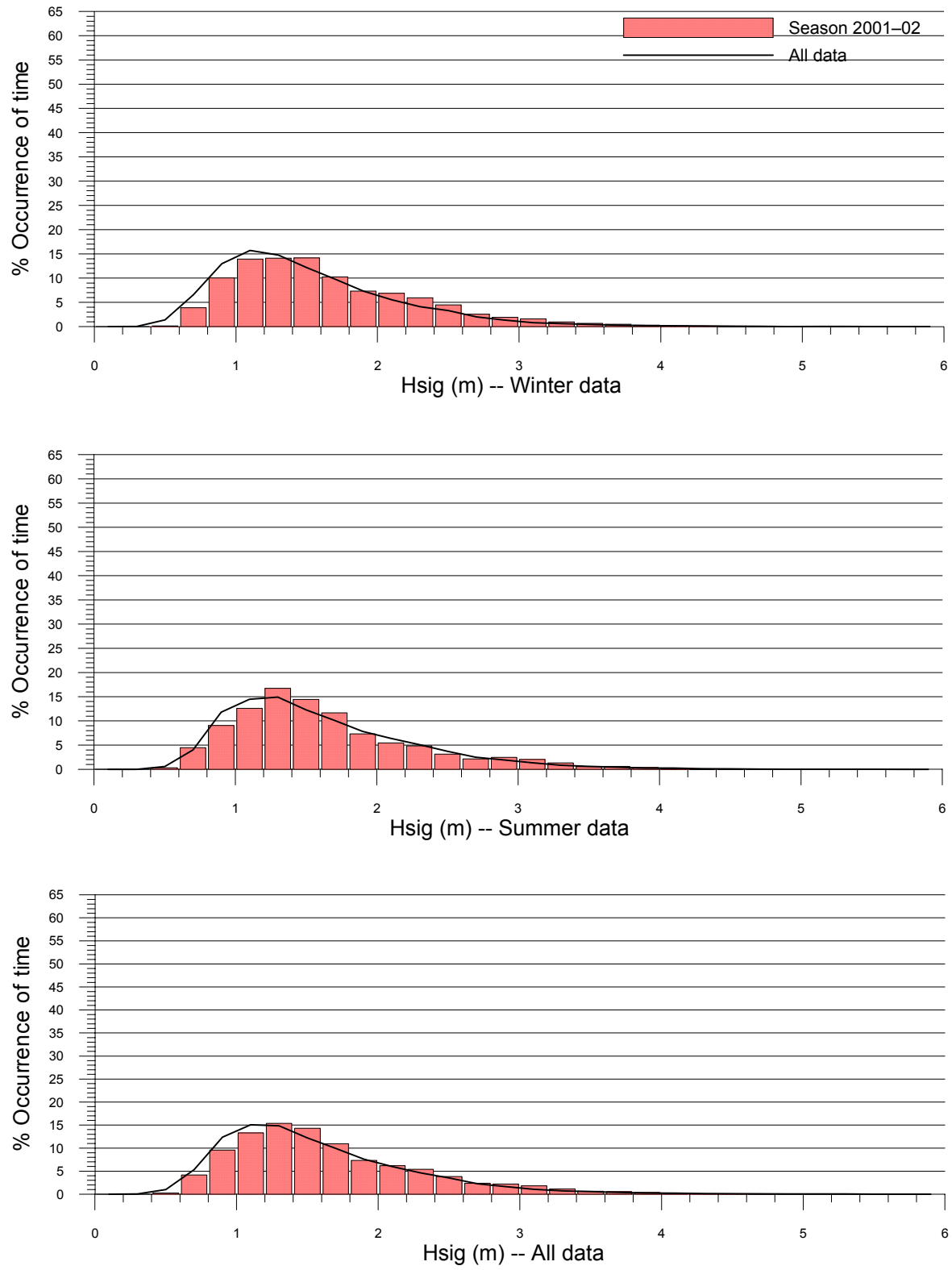
Figure 3.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.2

Brisbane region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

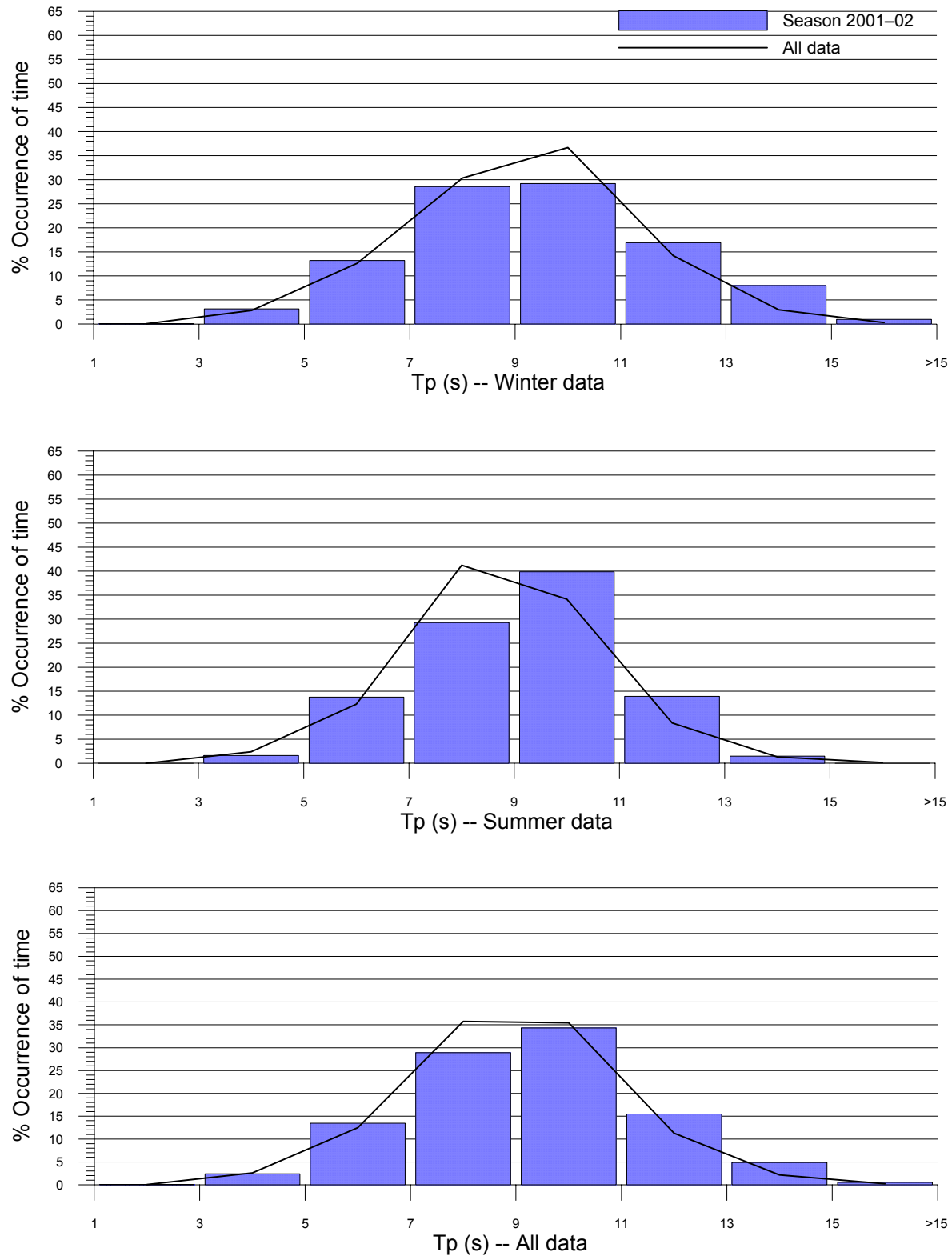


Brisbane region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.3



Brisbane region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

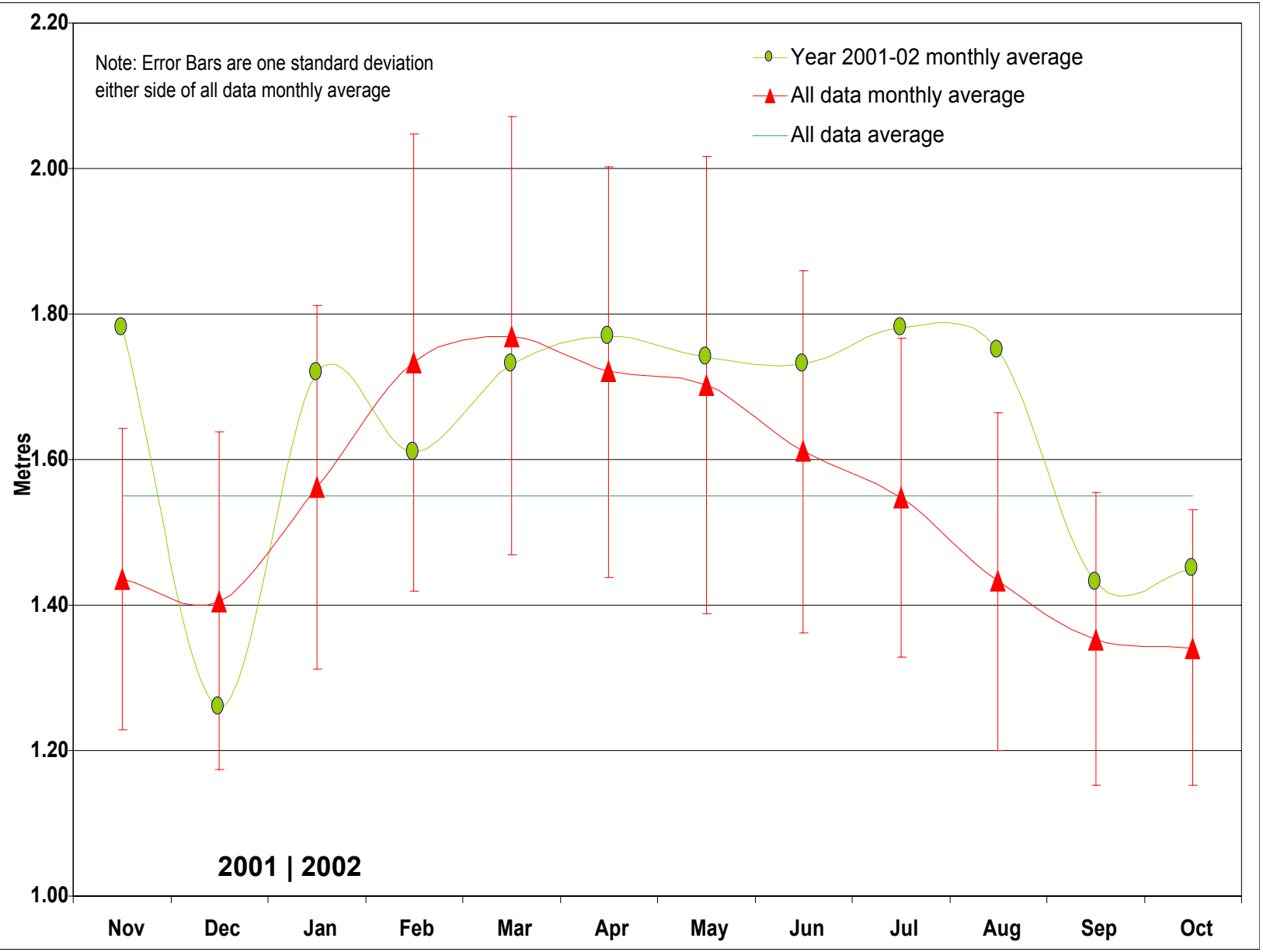
Figure 3.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.5

Brisbane region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.6

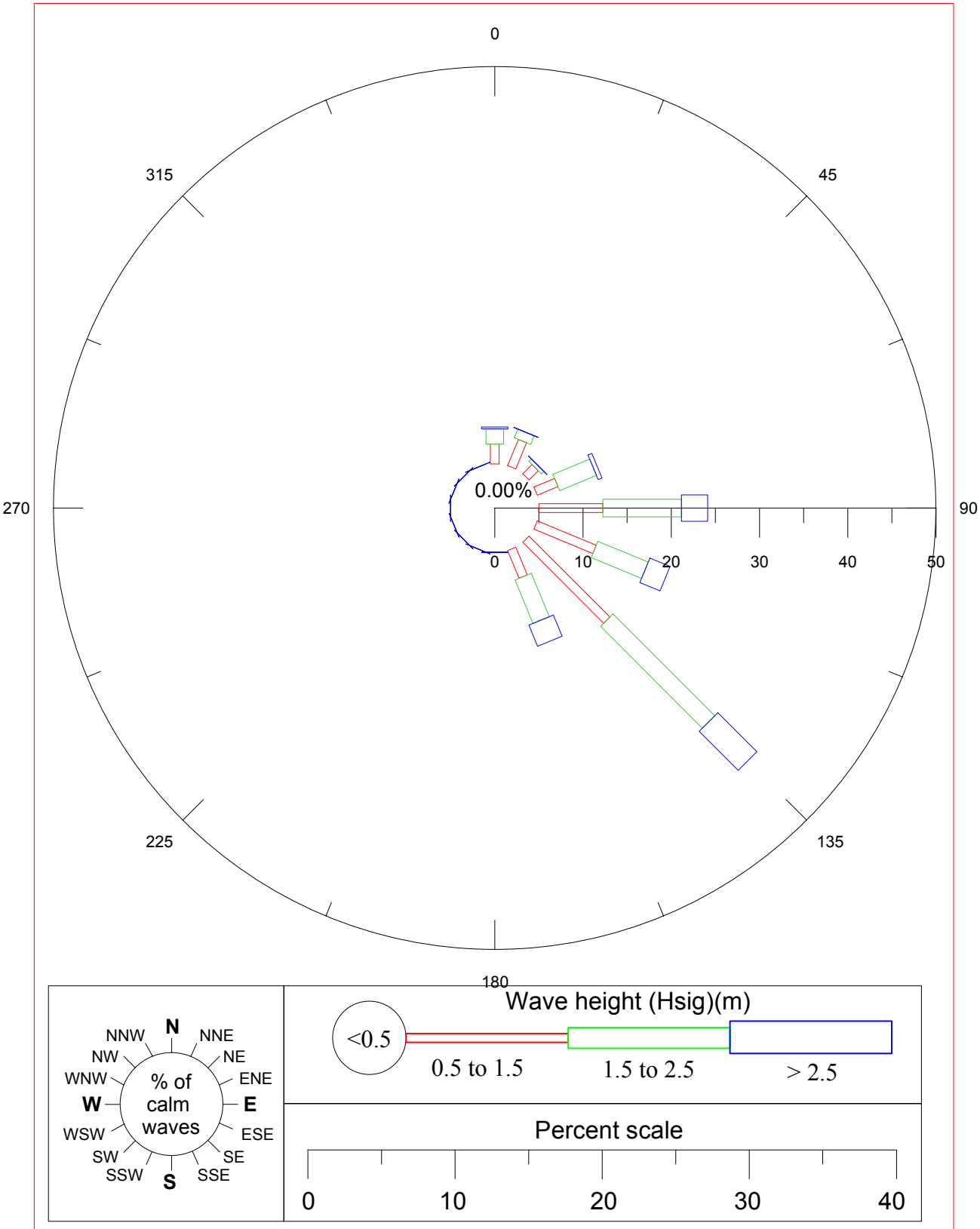
Brisbane region—Daily wave recordings

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.7

Brisbane region—Water temperature and peak direction recordings



Brisbane region—Directional wave rose

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 3.8

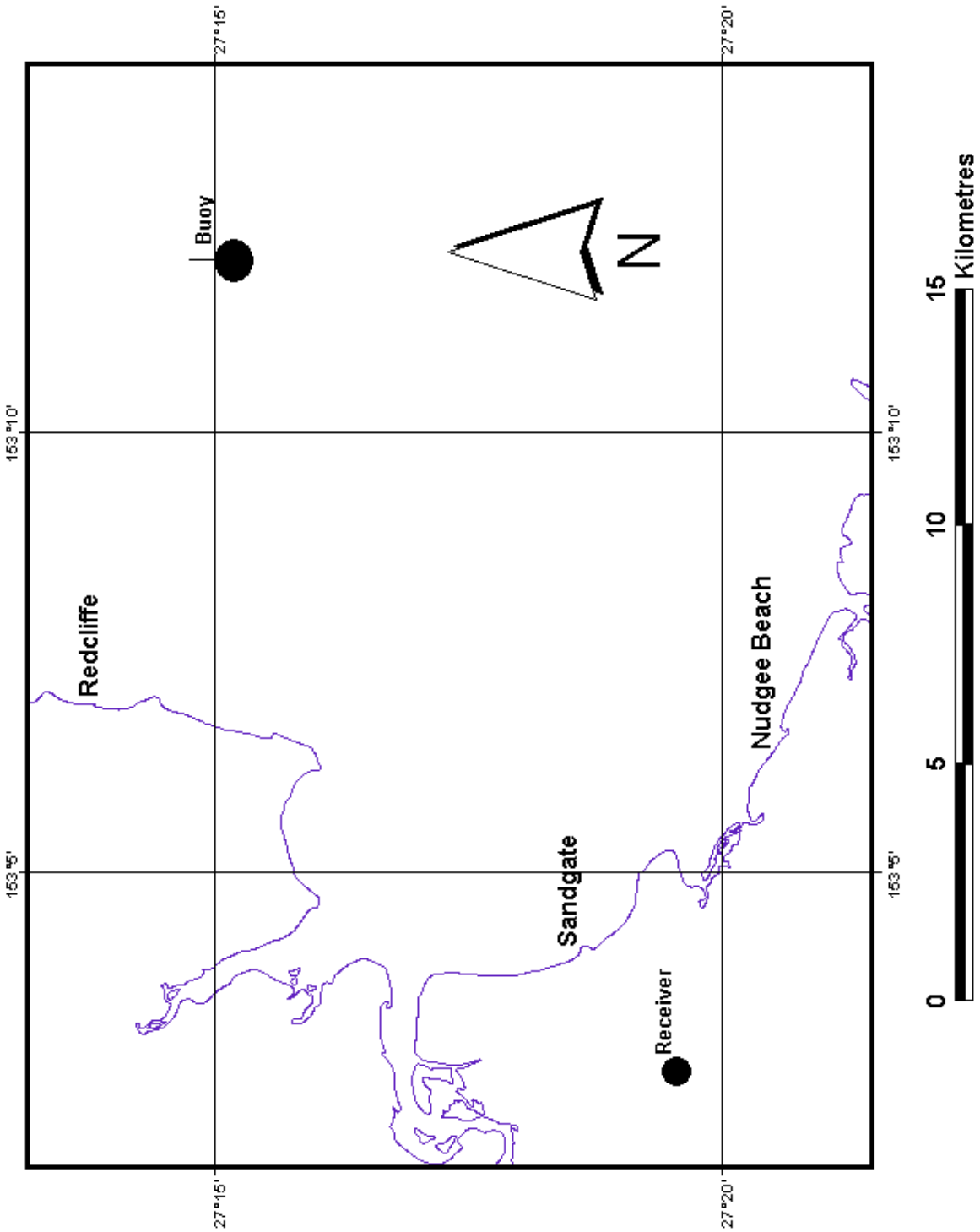
Moreton Bay

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	325.394
Gaps in Data from Selected Dates (Days)	=	39.606
Gaps in Data from Analysed Records (Days)	=	39.605
Gaps in Data from Duration Analysis (Days)	=	39.605
Number of Records Used in Analysis	=	14,148

HAT at nearest standard port: Brisbane bar, 2.71m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
27° 15.00'	153° 11.93'	10.4	18/10/2001	12/01/2002
27° 15.00'	153° 11.925'	10.4	15/01/2002	24/07/2002
27° 15.01'	153° 11.918'	10.8	30/07/2002	11/10/2002
27° 15.01'	153° 11.918'	10.8	25/10/2002	

Moreton Bay region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

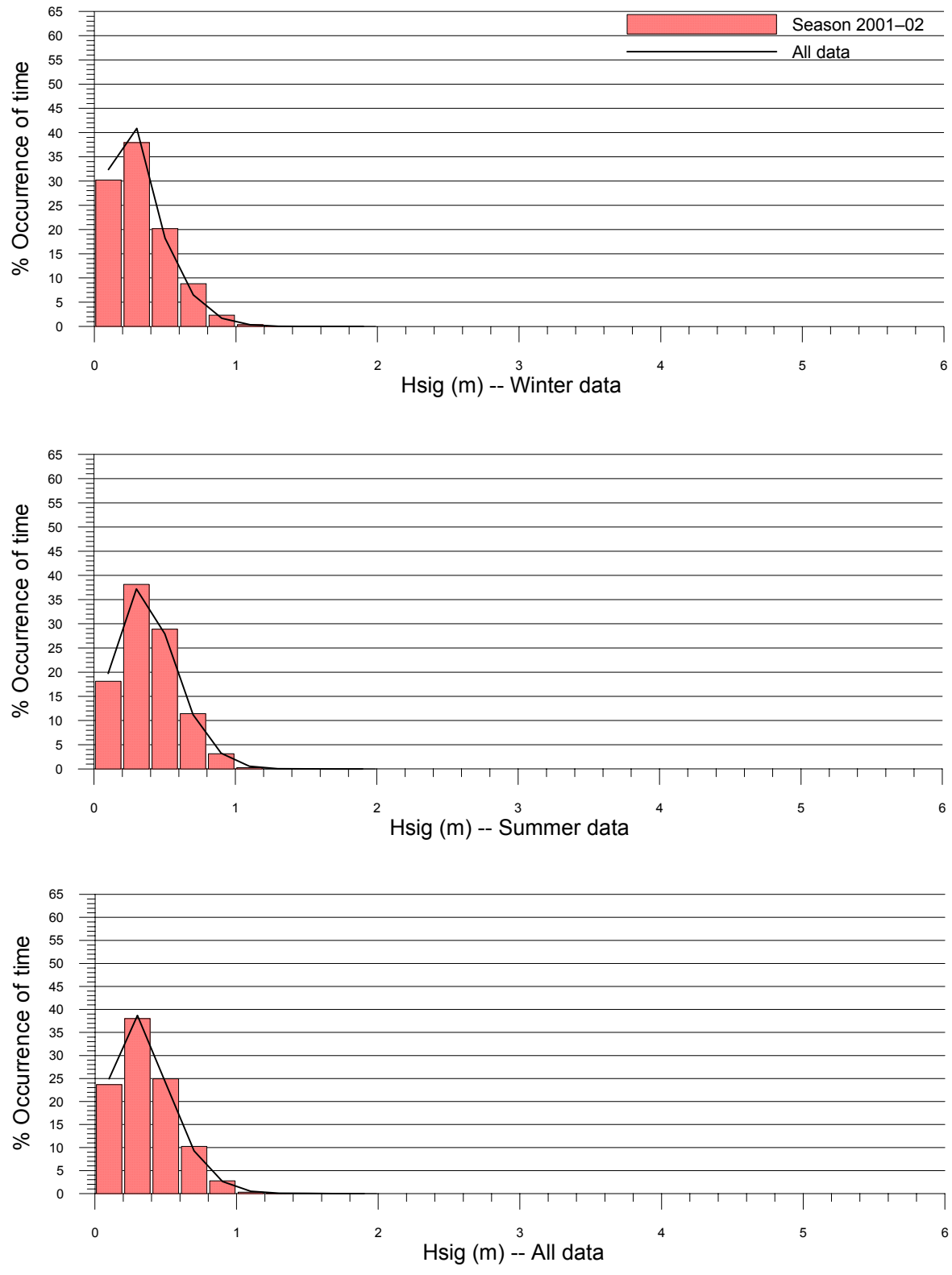
Figure 4.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 4.2

Moreton Bay region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

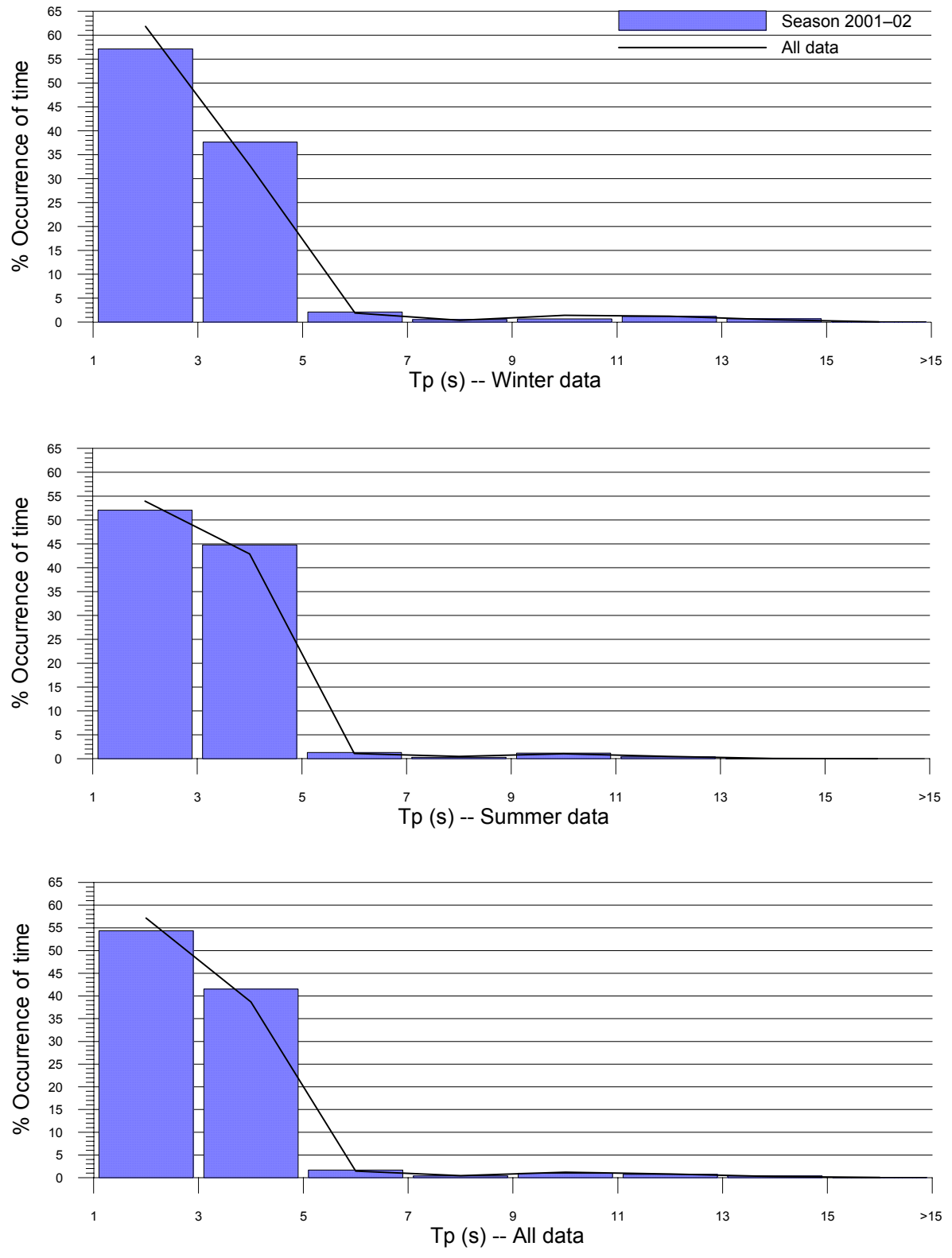


Moreton Bay region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 4.3



Moreton Bay region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

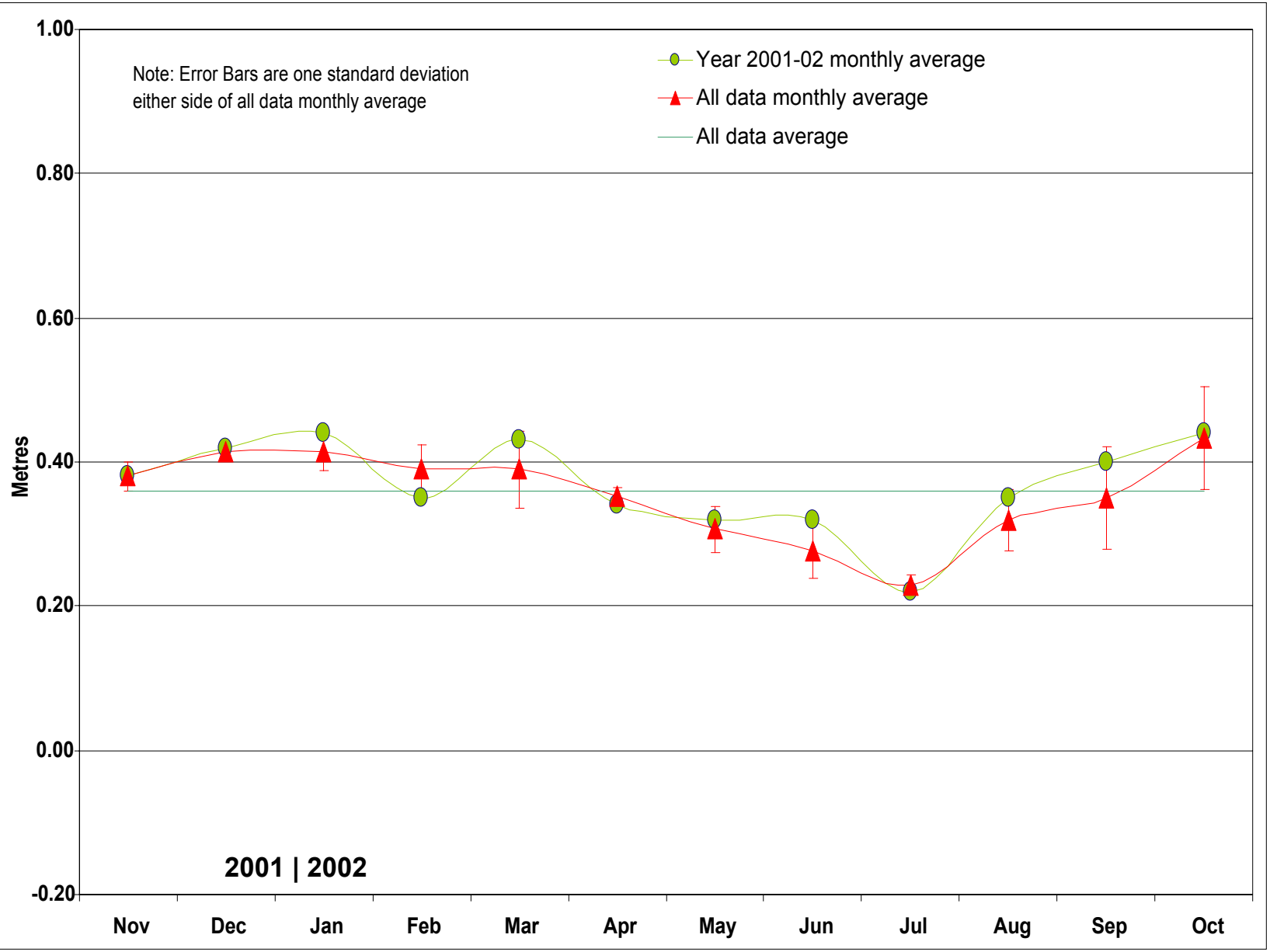
Figure 4.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 4.5

Moreton Bay region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 4.6

Moreton Bay region—Daily wave recordings

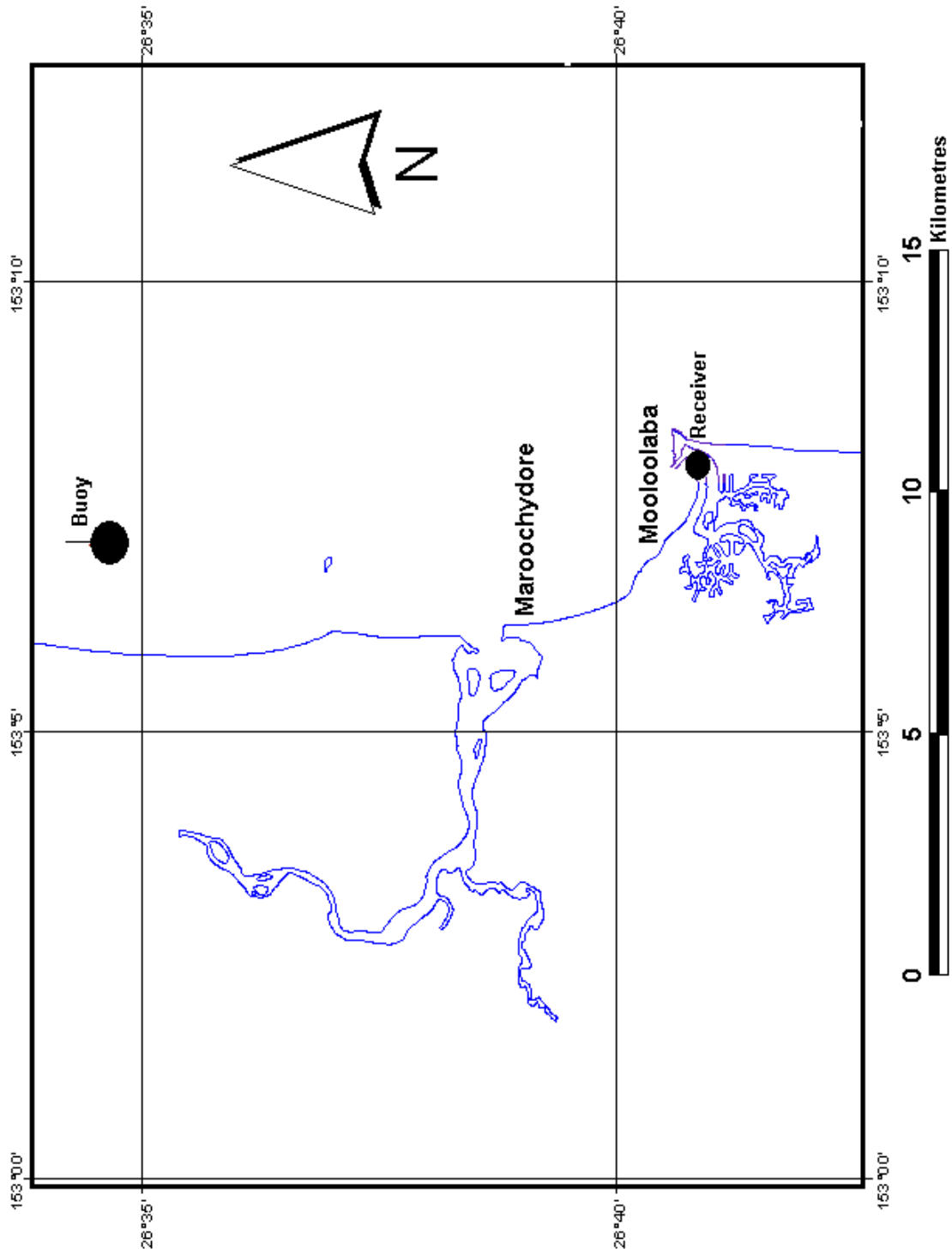
Mooloolaba

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	364.874
Gaps in Data from Selected Dates (Days)	=	0.126
Gaps in Data from Analysed Records (Days)	=	0.125
Gaps in Data from Duration Analysis (Days)	=	0.125
Number of Records Used in Analysis	=	17,437

HAT at nearest standard port: Mooloolaba, 2.13m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
26° 34.34'	153° 07.00'	19.7	23/08/2001	29/08/2002
26° 34.36'	153° 07.09'	21.0	29/08/2002	

Mooloolaba region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

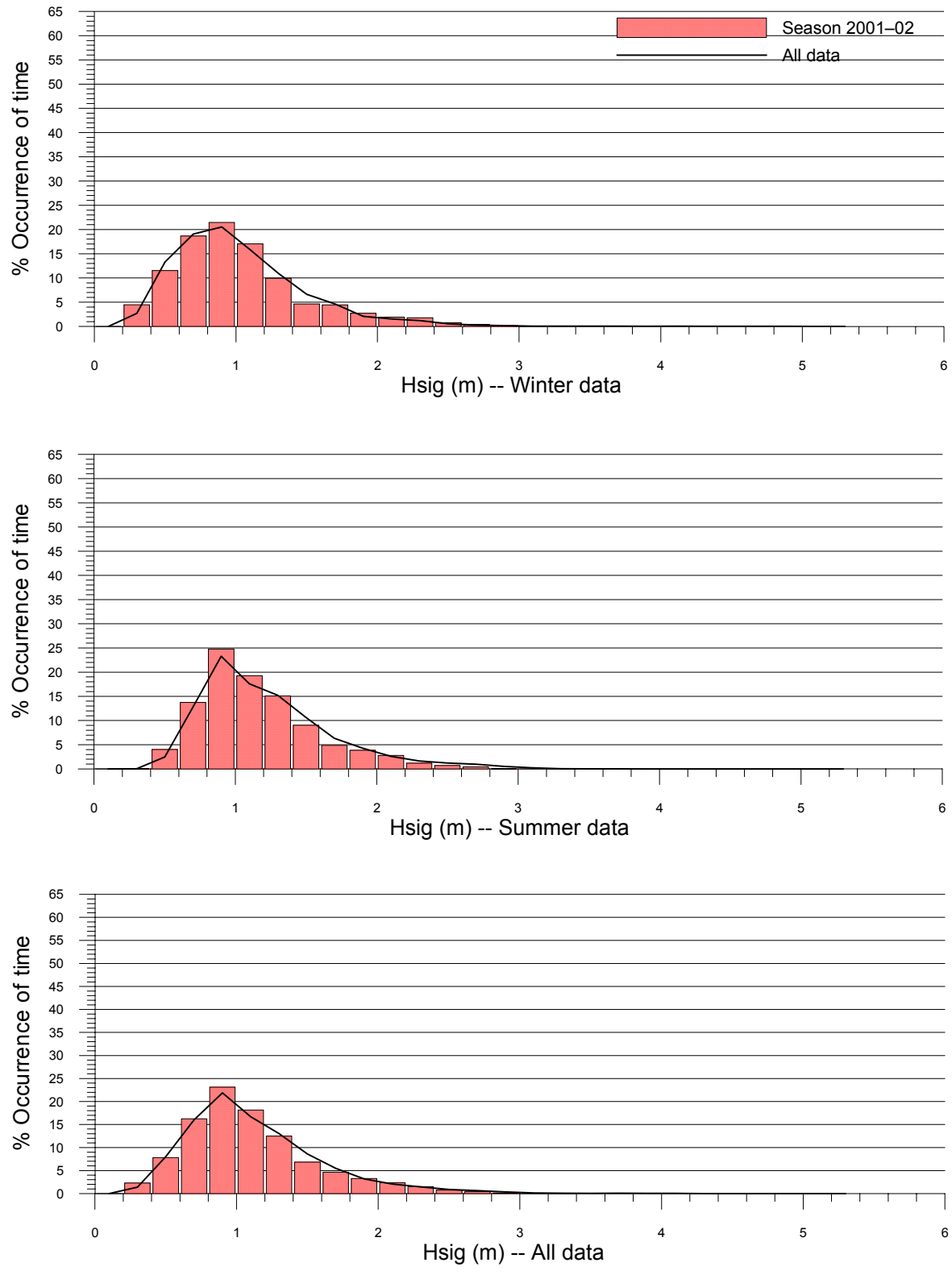
Figure 5.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 5.2

Mooloolaba region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

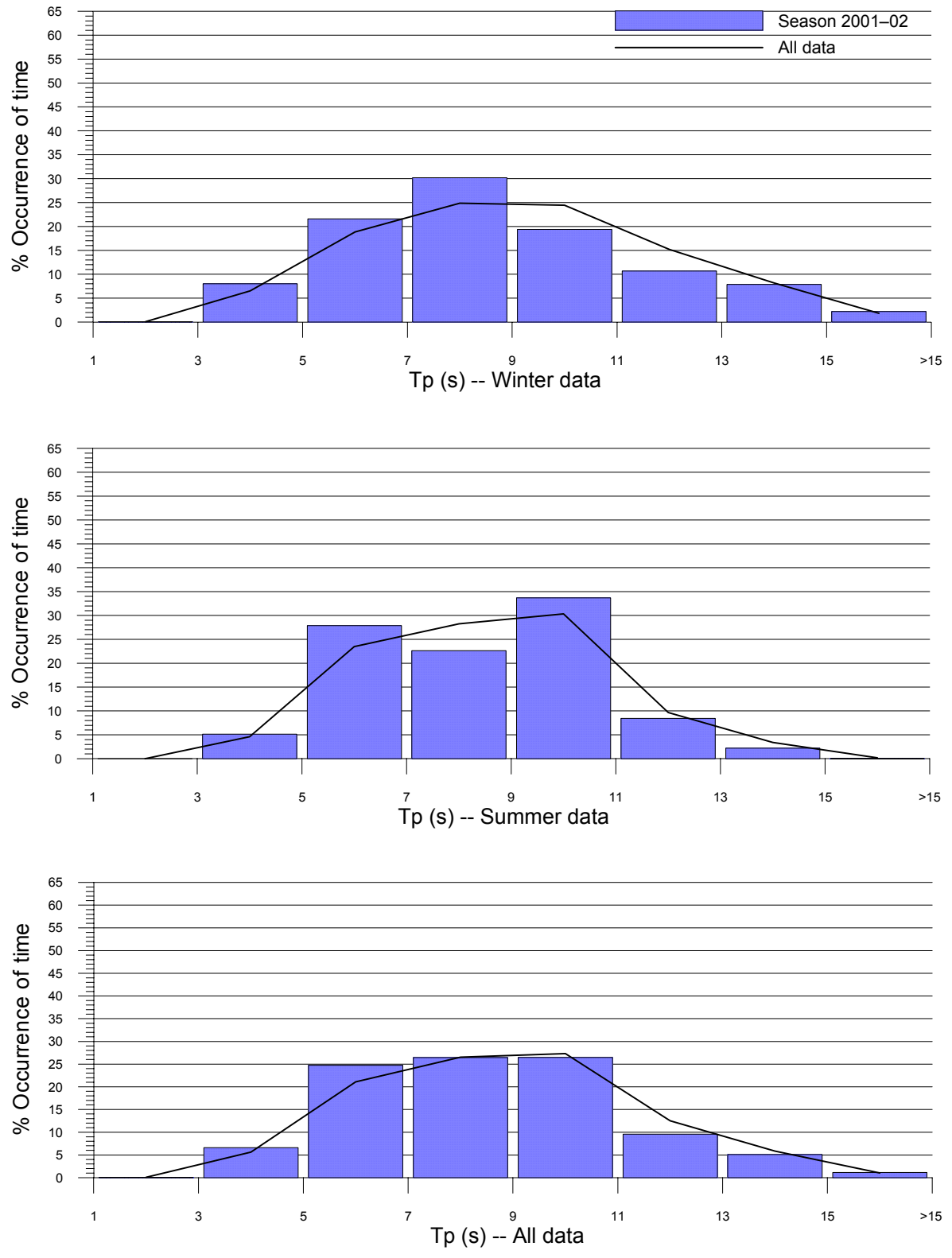


Mooloolaba region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 5.3



Mooloolaba region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

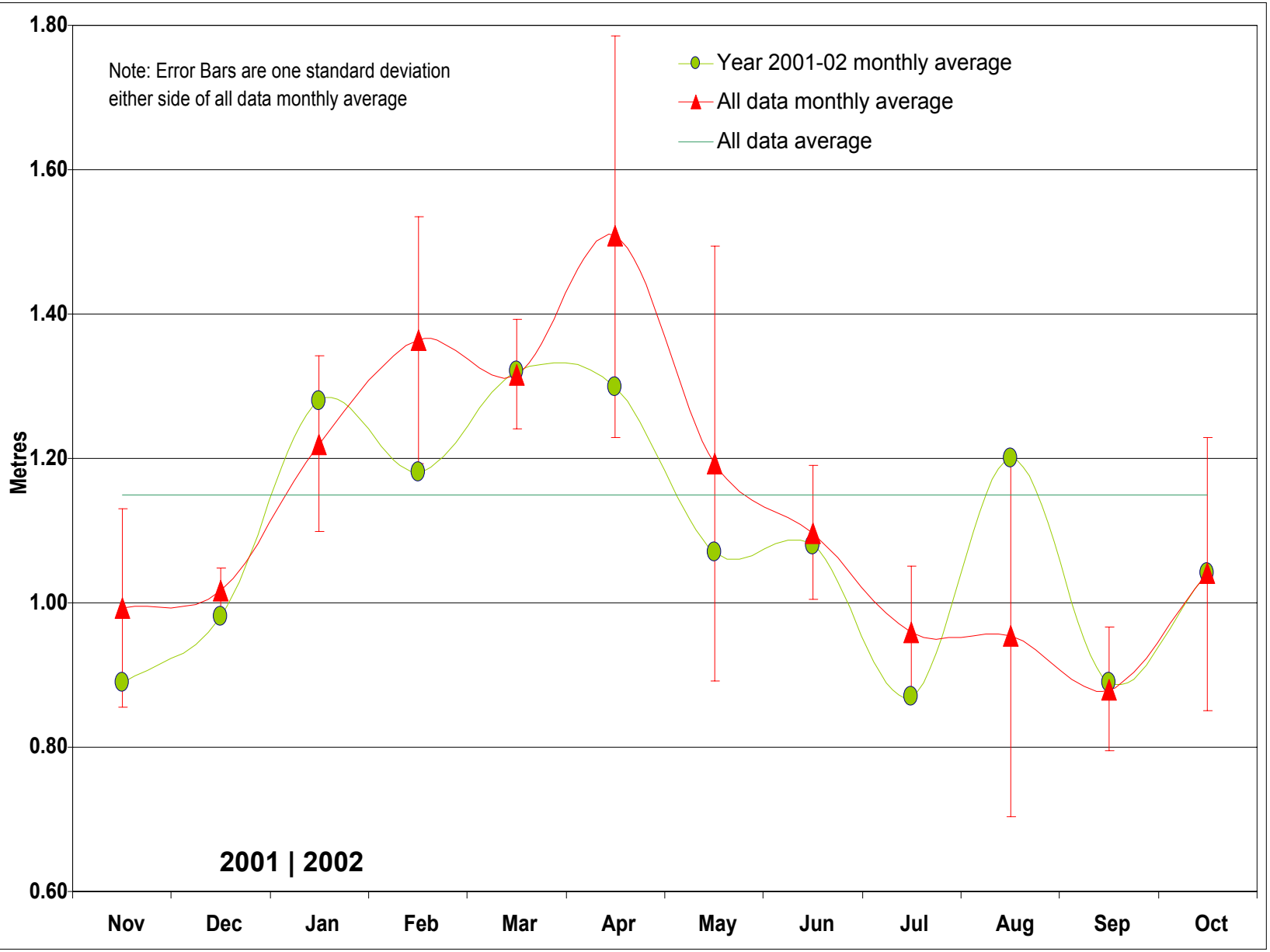
Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 5.4

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 5.5

Mooloolaba region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 5.6

Mooloolaba region—Daily wave recordings

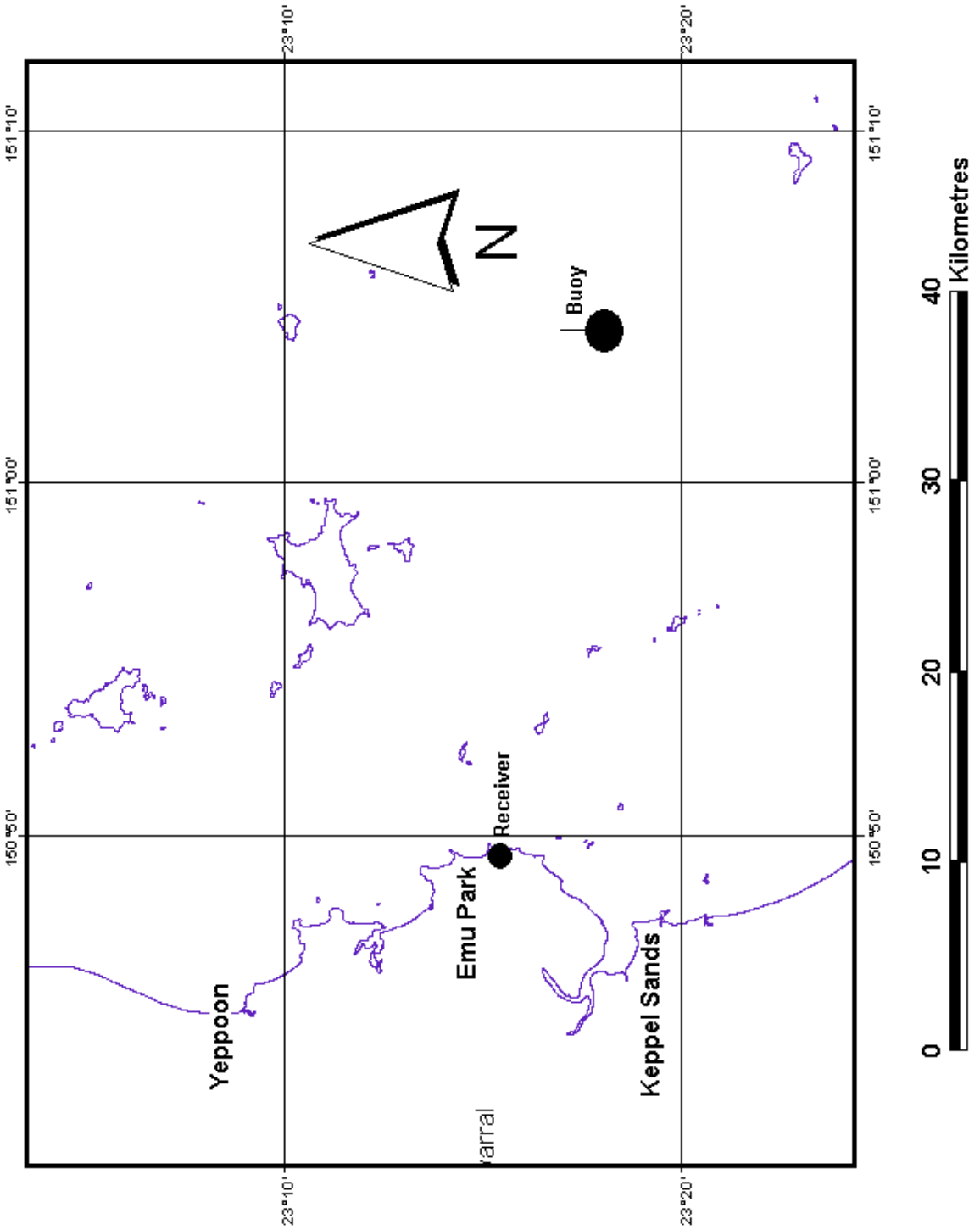
Emu Park

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	364.104
Gaps in Data from Selected Dates (Days)	=	0.896
Gaps in Data from Analysed Records (Days)	=	0.896
Gaps in Data from Duration Analysis (Days)	=	0.896
Number of Records Used in Analysis	=	16,050

HAT at nearest standard port: Middle Island, 5.3m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
23° 18.48'	151° 04.52'	18.0	08/12/2000	19/03/2002
23° 18.5'	151° 04.44'	18.0	19/03/2002	

Emu Park region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

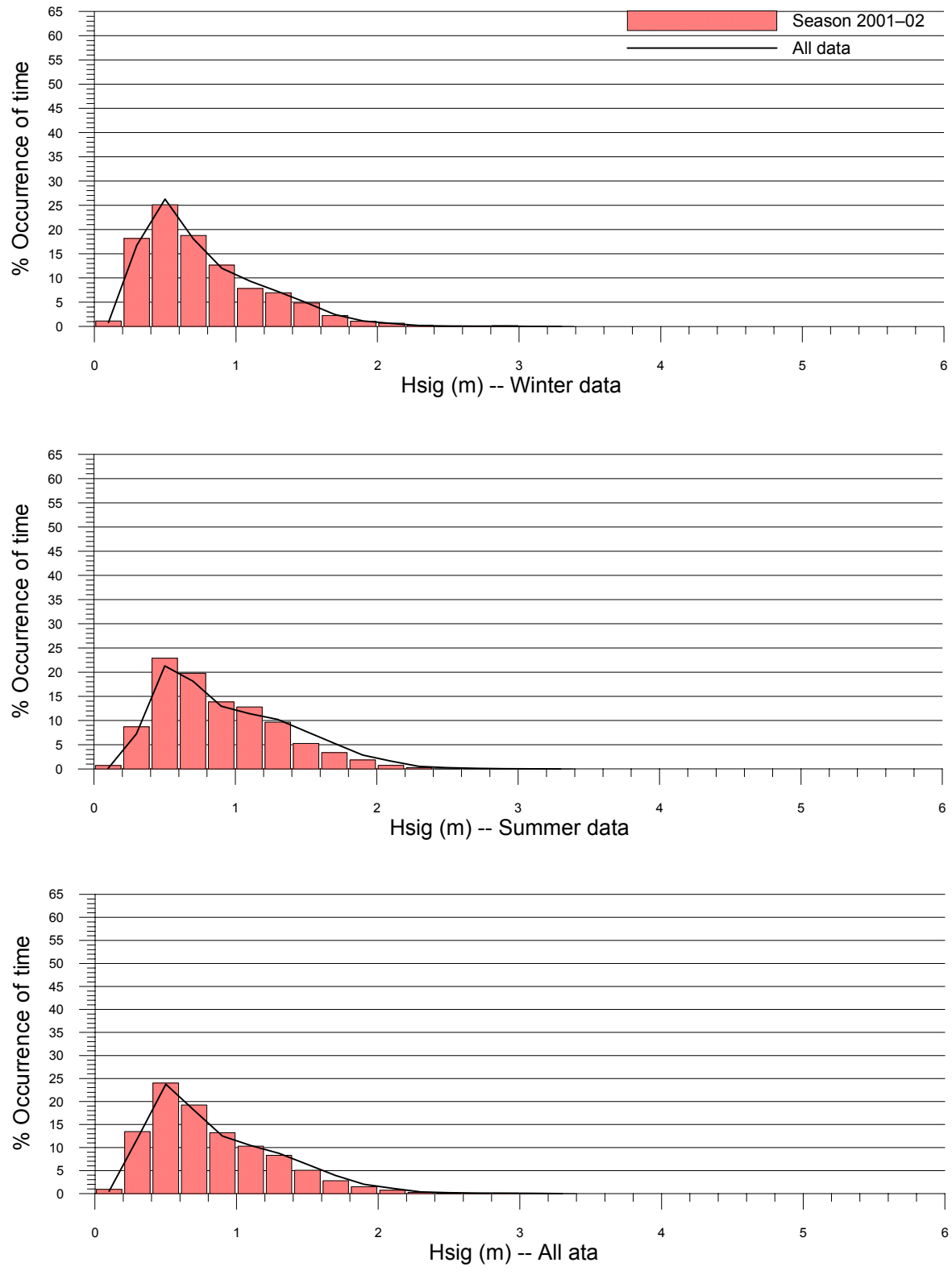
Figure 6.1

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.2

Emu Park region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

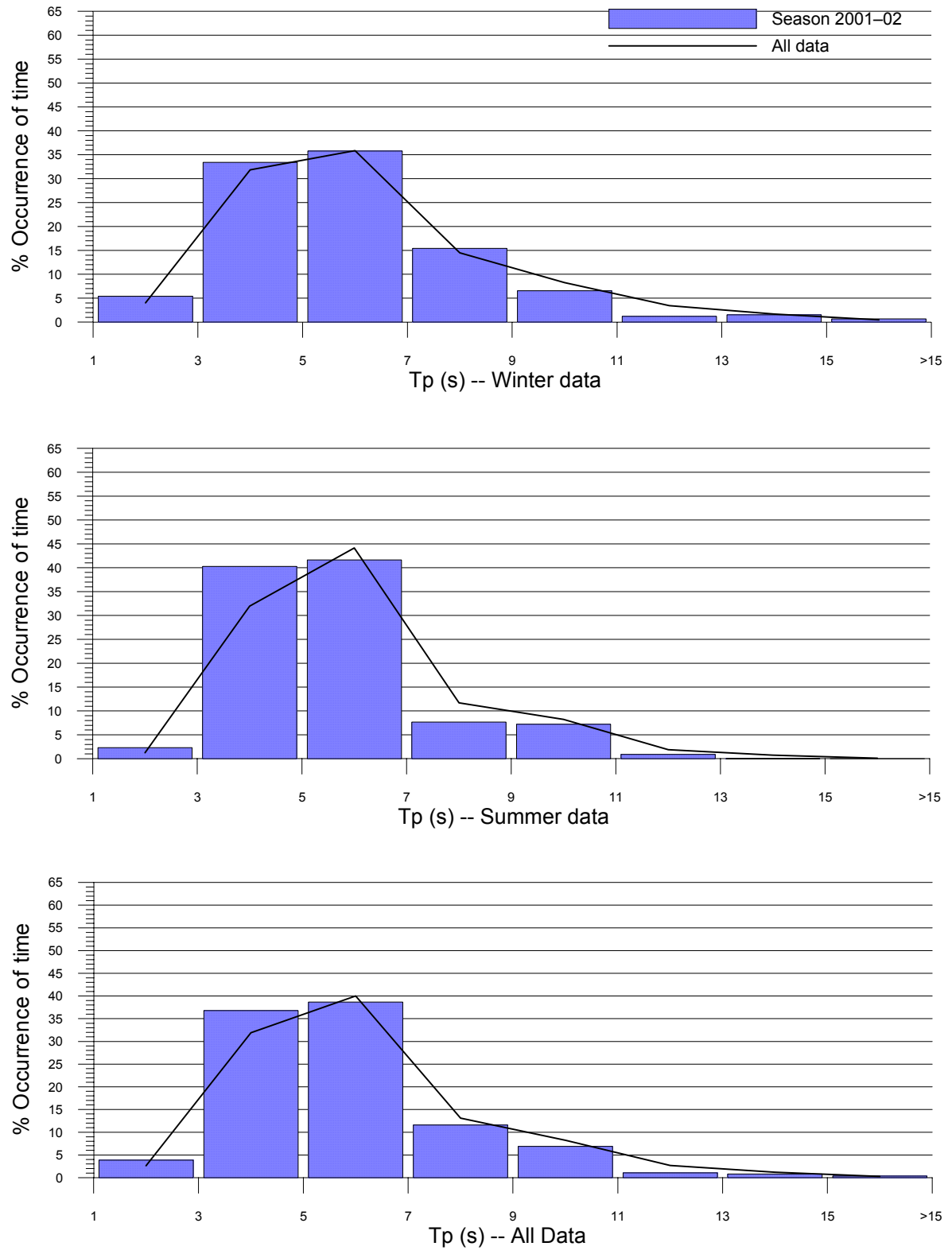


Emu Park region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.3



Emu Park region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

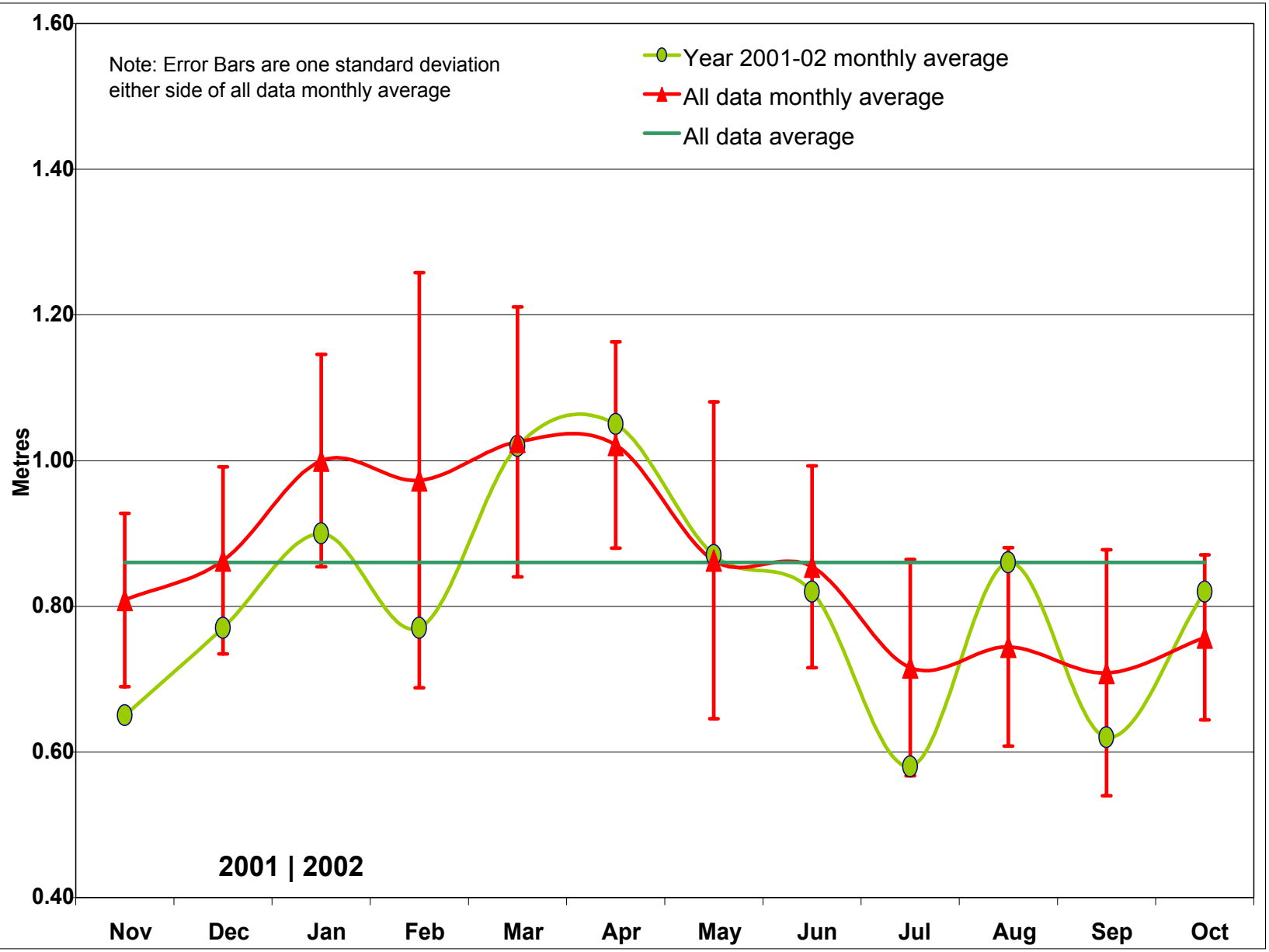
Figure 6.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.5

Emu Park region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.6

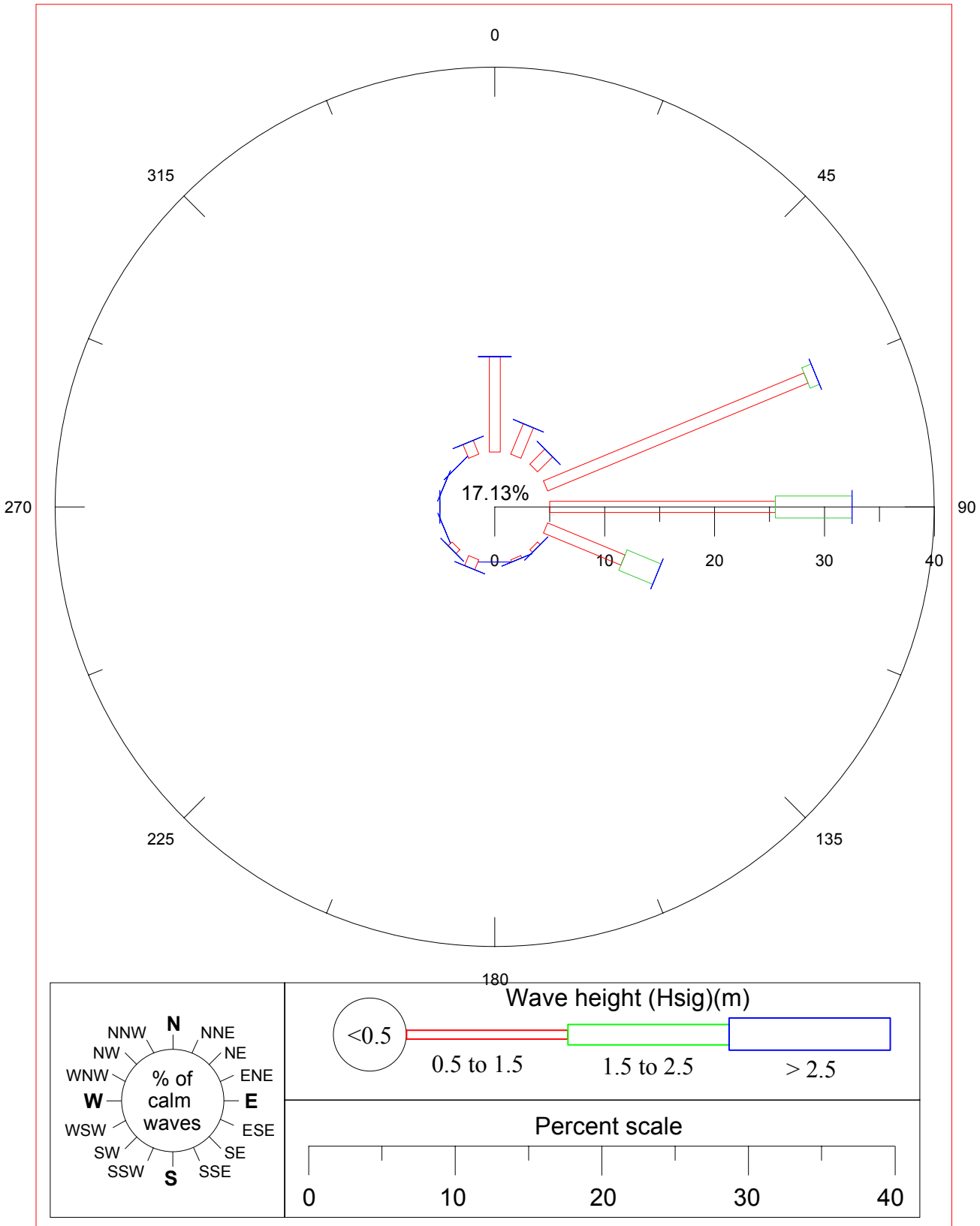
Emu Park region—Daily wave recordings

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.7

Emu Park region—Water temperature and peak direction recordings



Emu Park region—Directional wave rose

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 6.8

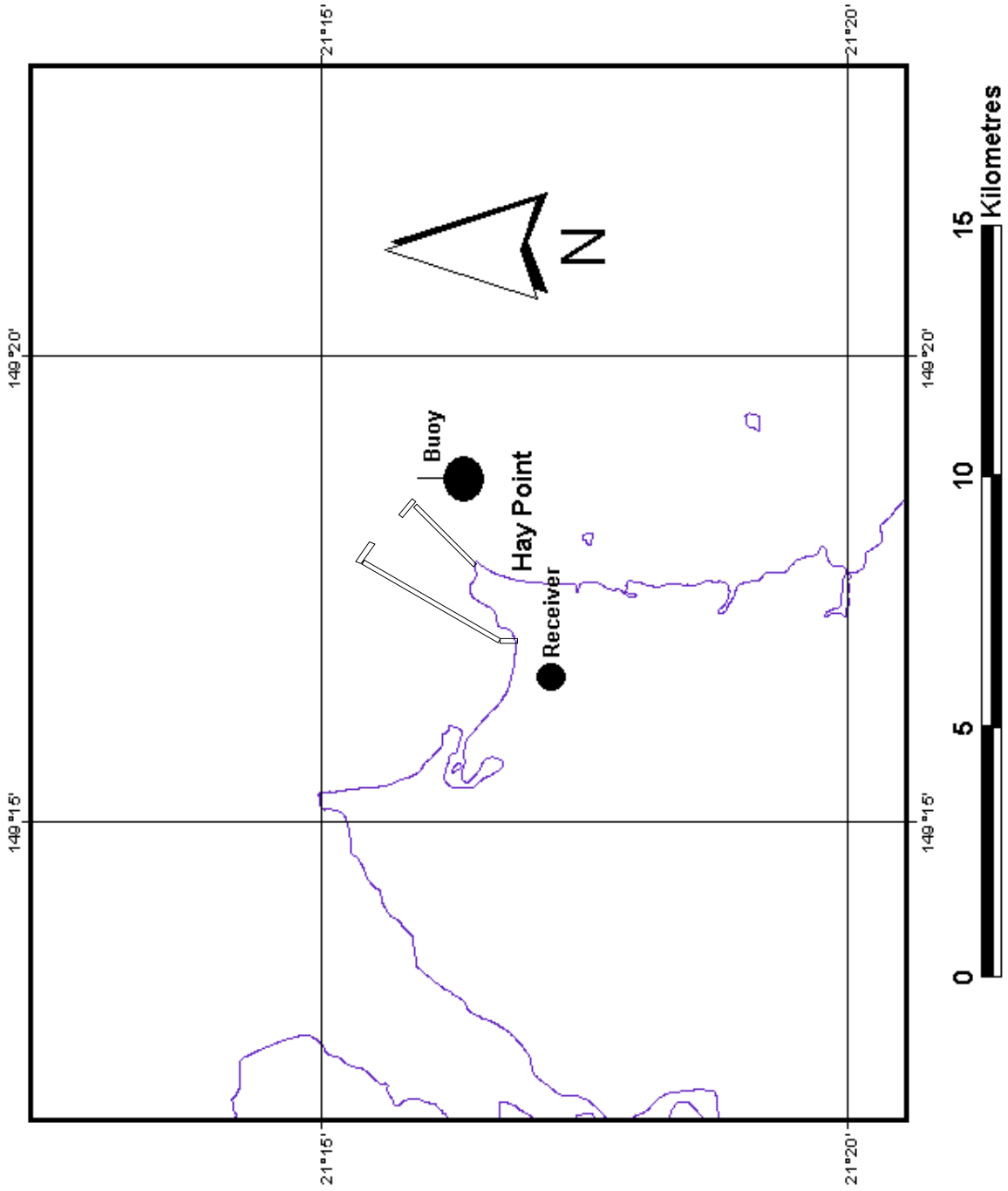
Hay Point

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	356.100
Gaps in Data from Selected Dates (Days)	=	8.900
Gaps in Data from Analysed Records (Days)	=	8.900
Gaps in Data from Duration Analysis (Days)	=	8.900
Number of Records Used in Analysis	=	16,830

HAT at nearest standard port: Hay Point, 7.14m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
21° 16.14'	149° 18.83'	11.0	18/01/2001	19/04/2002
21° 16.14'	149° 18.83'	11.0	19/04/2002	17/05/2002
21° 16.14'	149° 18.83'	11.0	17/05/2002	15/05/2003
21° 16.41'	149° 18.73'	11.5	15/05/2003	

Hay Point region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

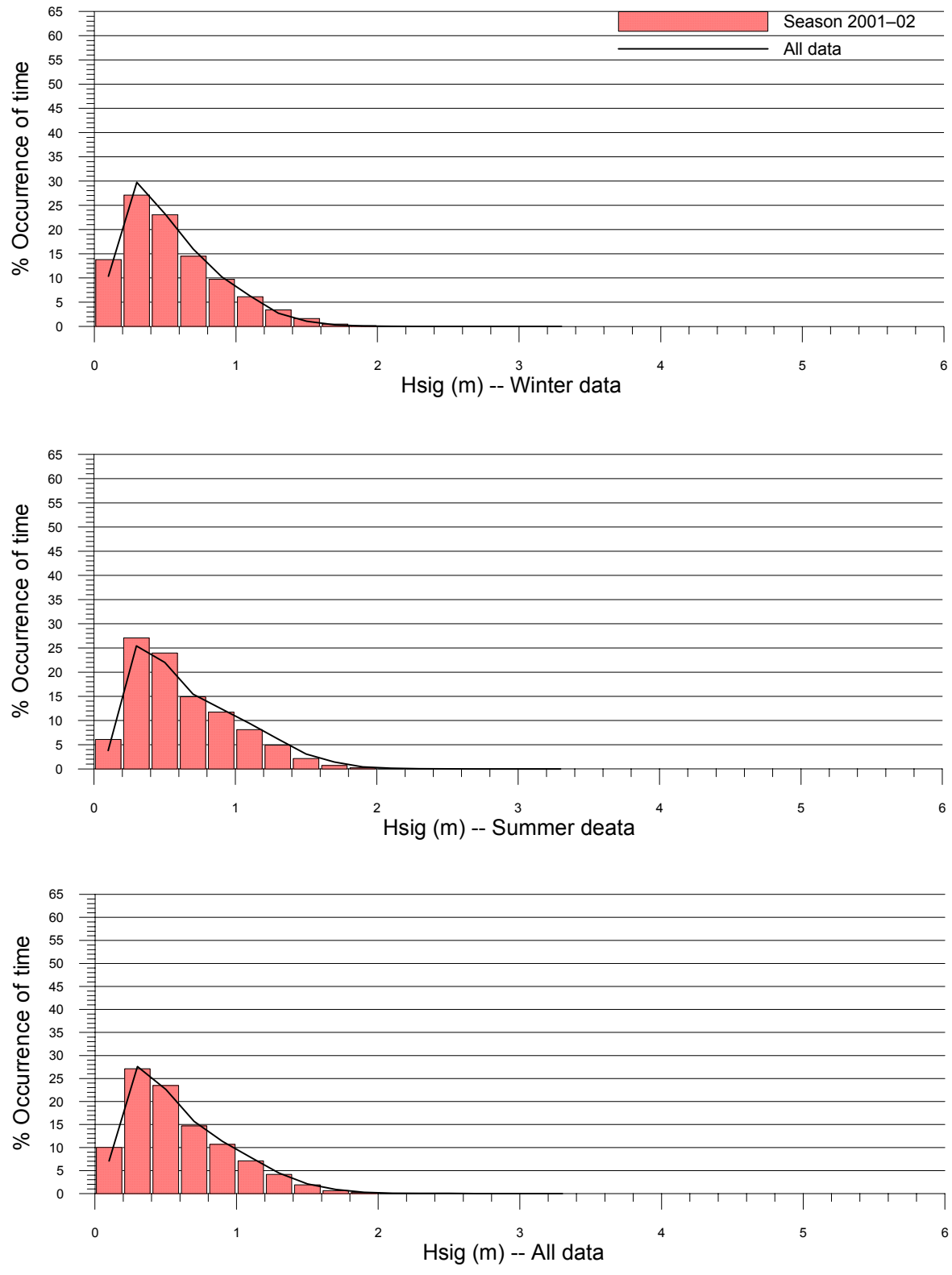
Figure 7.1

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

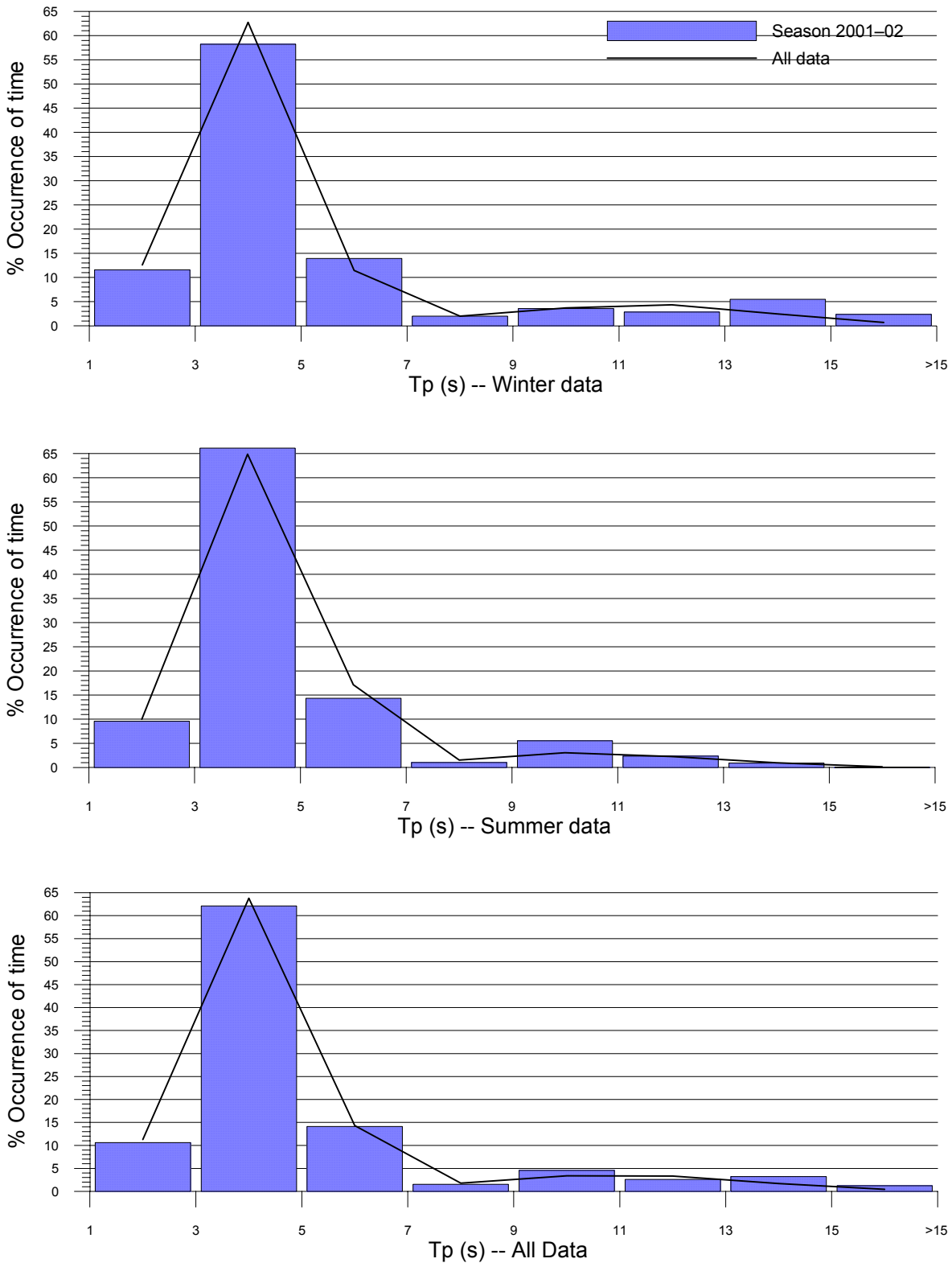
Figure 7.2

Hay Point region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)



Hay Point region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 7.3



Hay Point region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

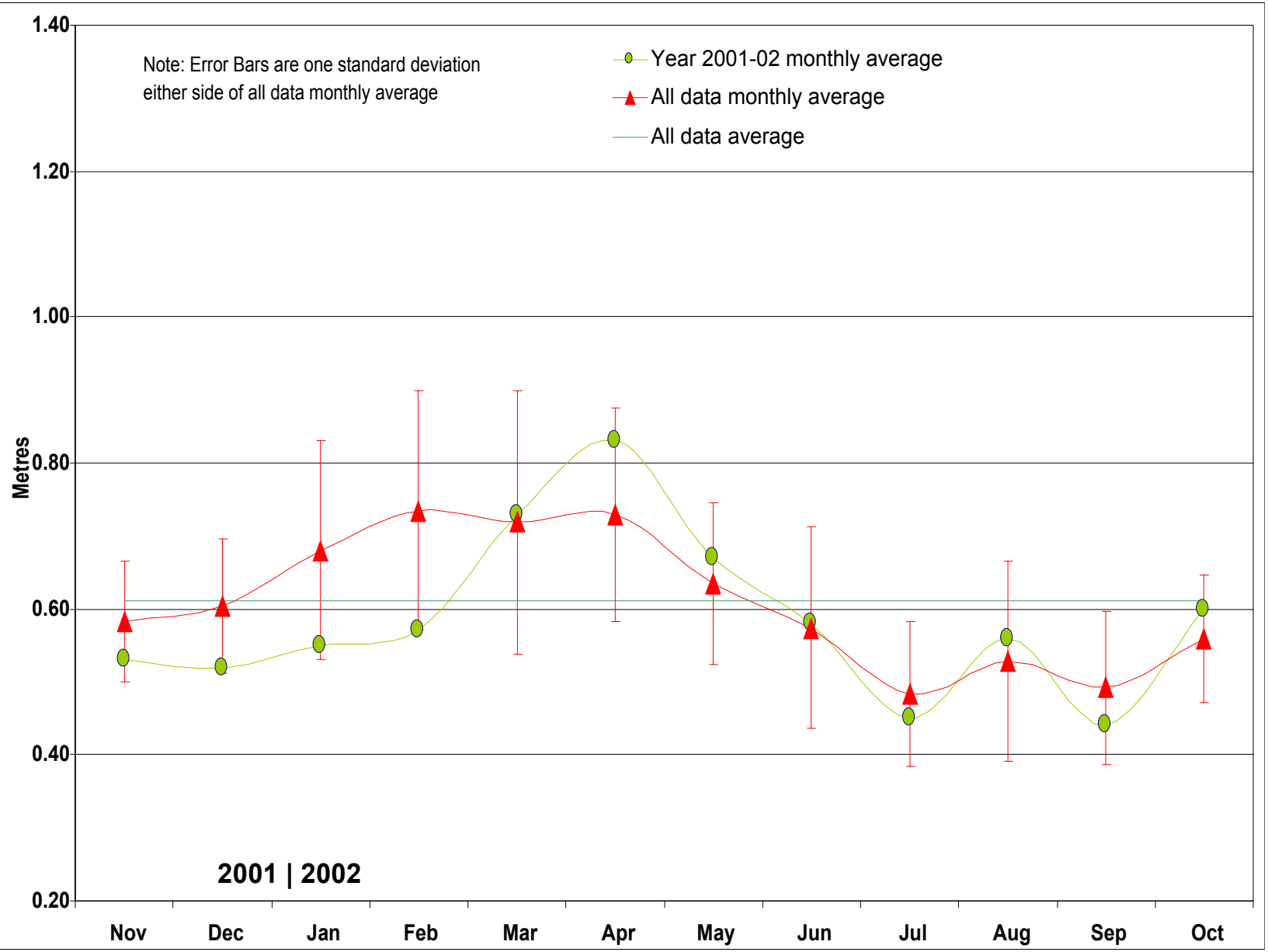
Figure 7.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 7.5

Hay Point region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 7.6

Hay Point region—Daily wave recordings

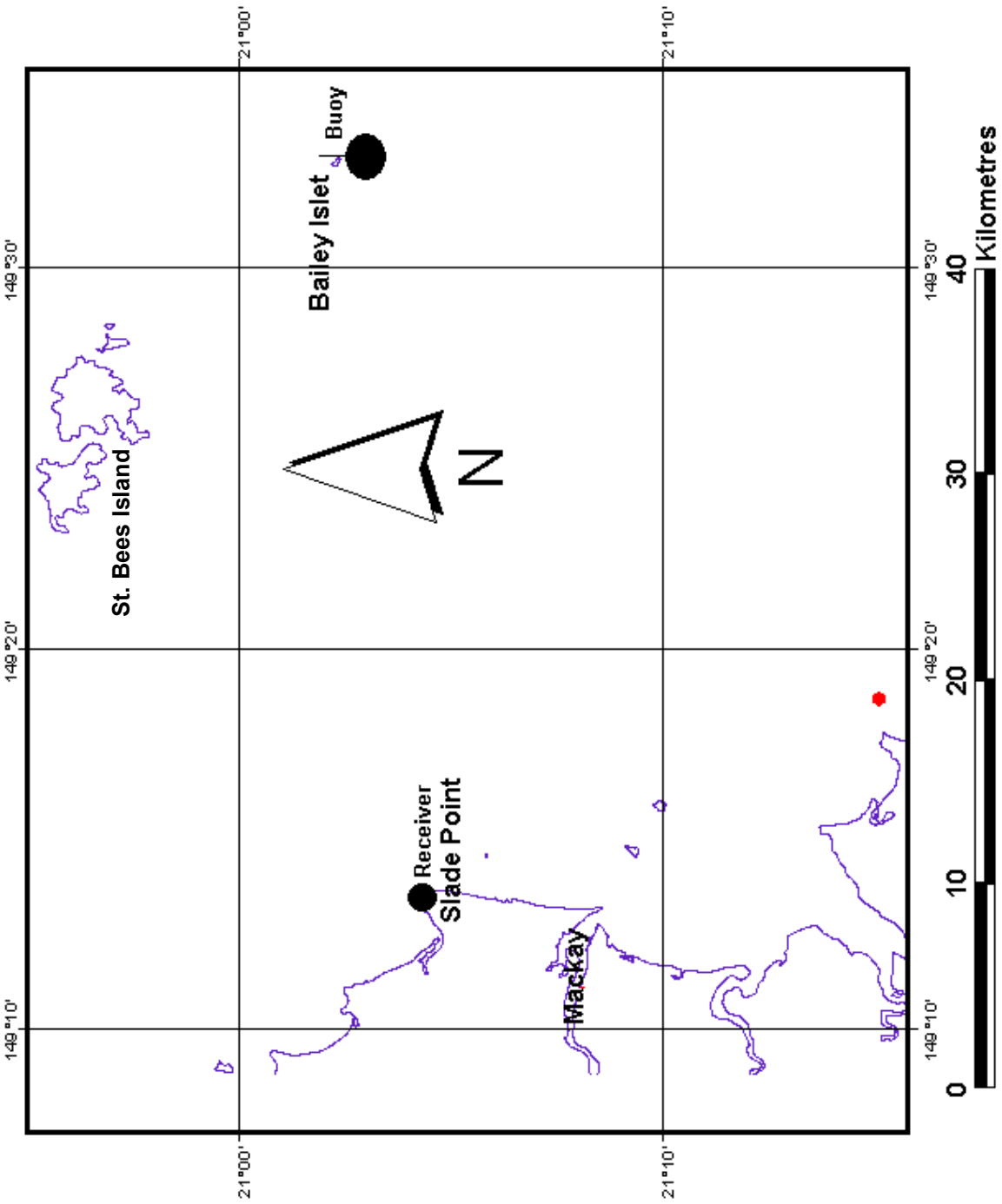
Mackay

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	323.484
Gaps in Data from Selected Dates (Days)	=	41.516
Gaps in Data from Analysed Records (Days)	=	41.496
Gaps in Data from Duration Analysis (Days)	=	41.496
Number of Records Used in Analysis	=	10,912

HAT at nearest standard port: Saint Bees Island, 5.72m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
21° 02.52'	149° 32.78'	29.0	21/11/2000	12/02/2002
21° 02.495'	149° 32.806'	26.0	12/02/2002	16/07/2002
21° 02.593'	149° 32.875'	31.0	16/07/2002	

Mackay region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

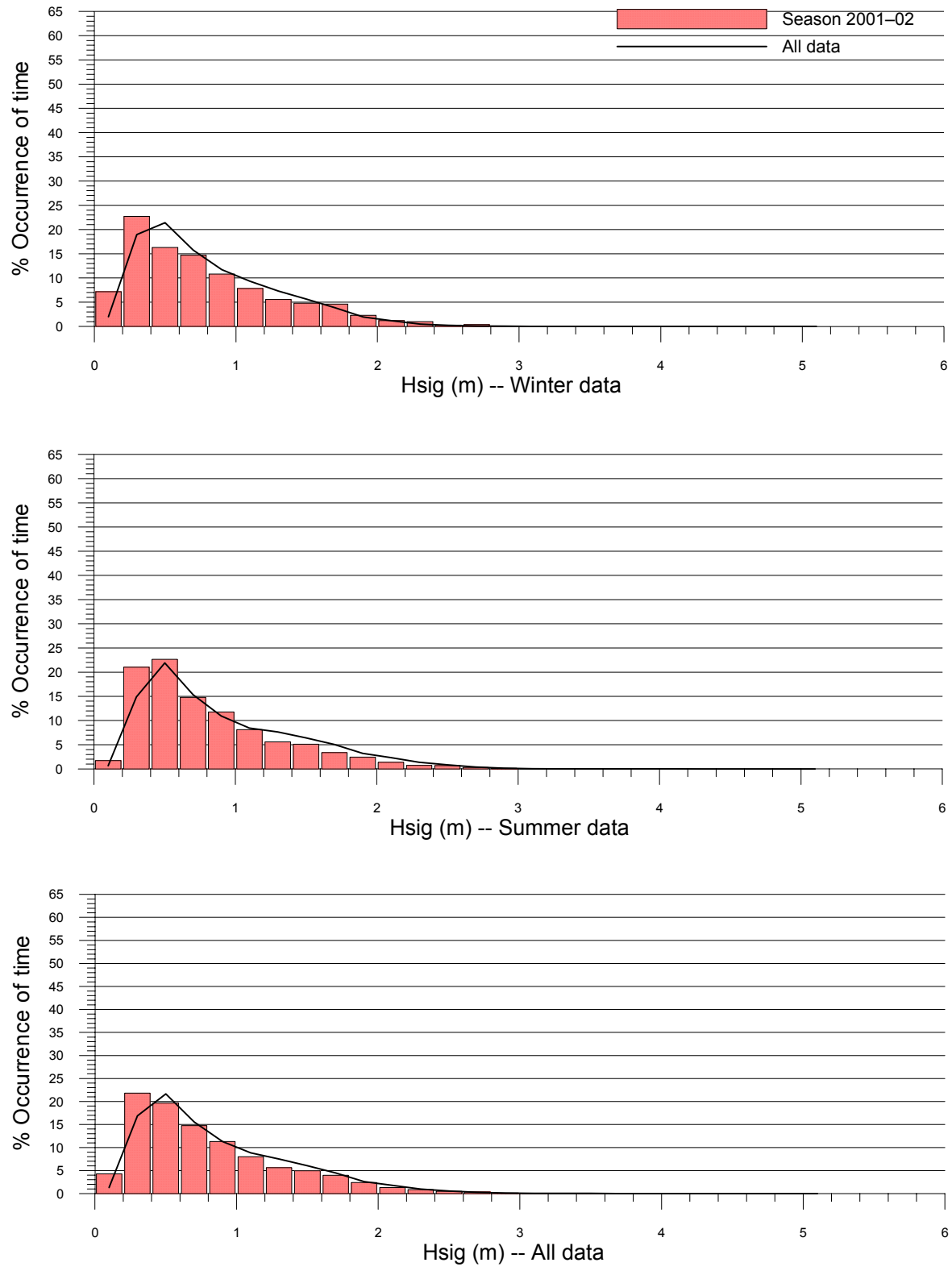
Figure 8.1

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 8.2

Mackay region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

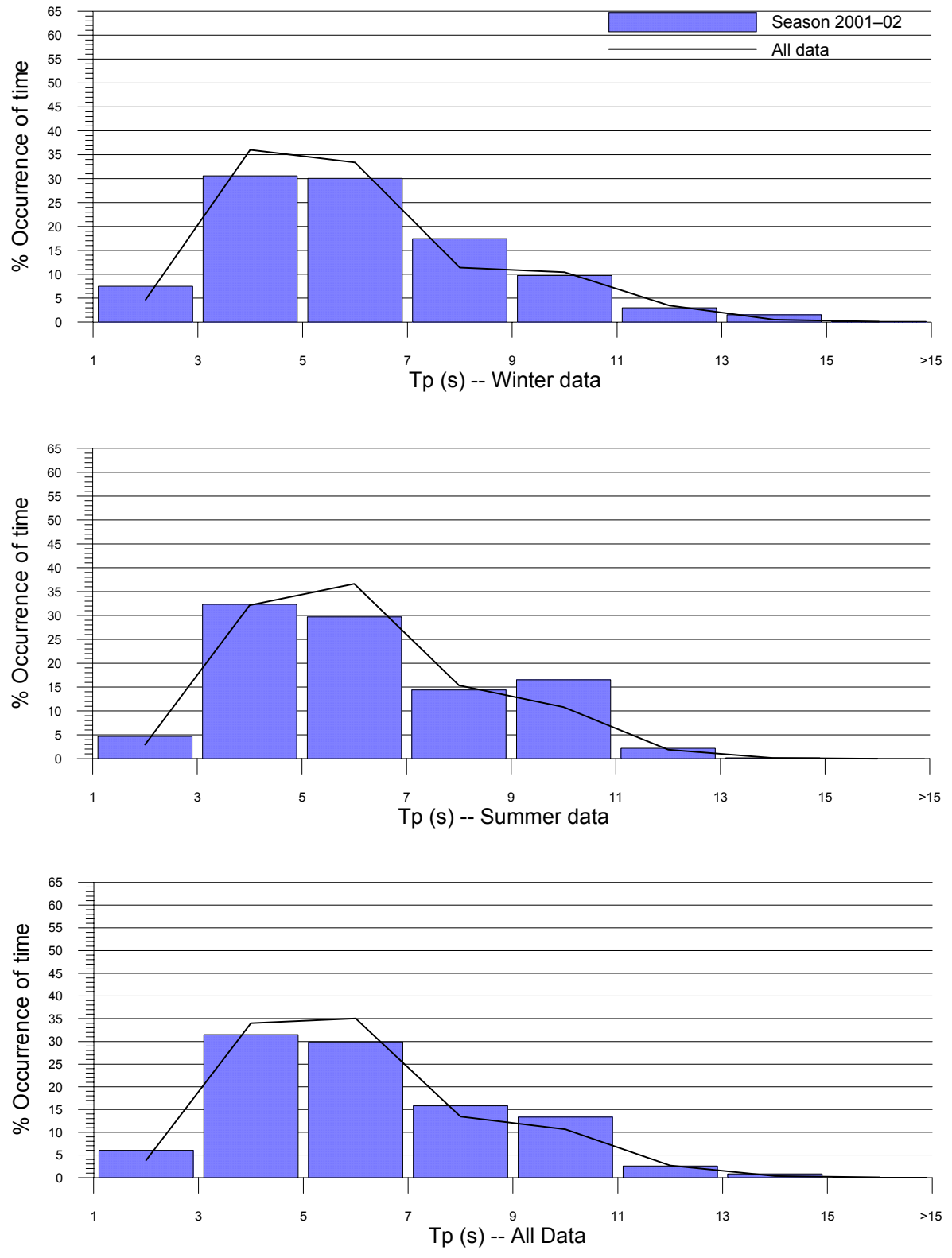


Mackay region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 8.3



Mackay region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

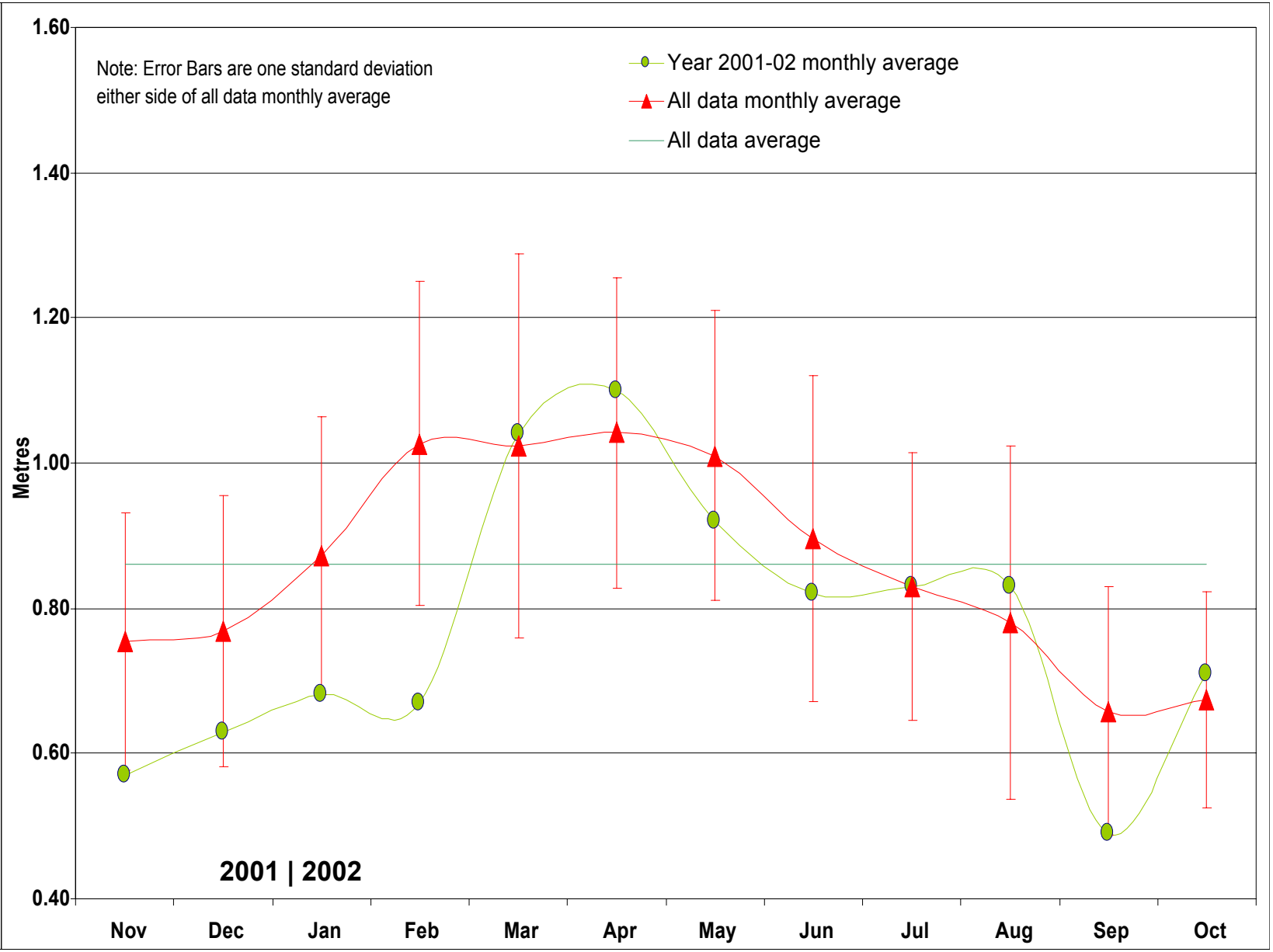
Figure 8.4

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 8.5

Mackay region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 8.6

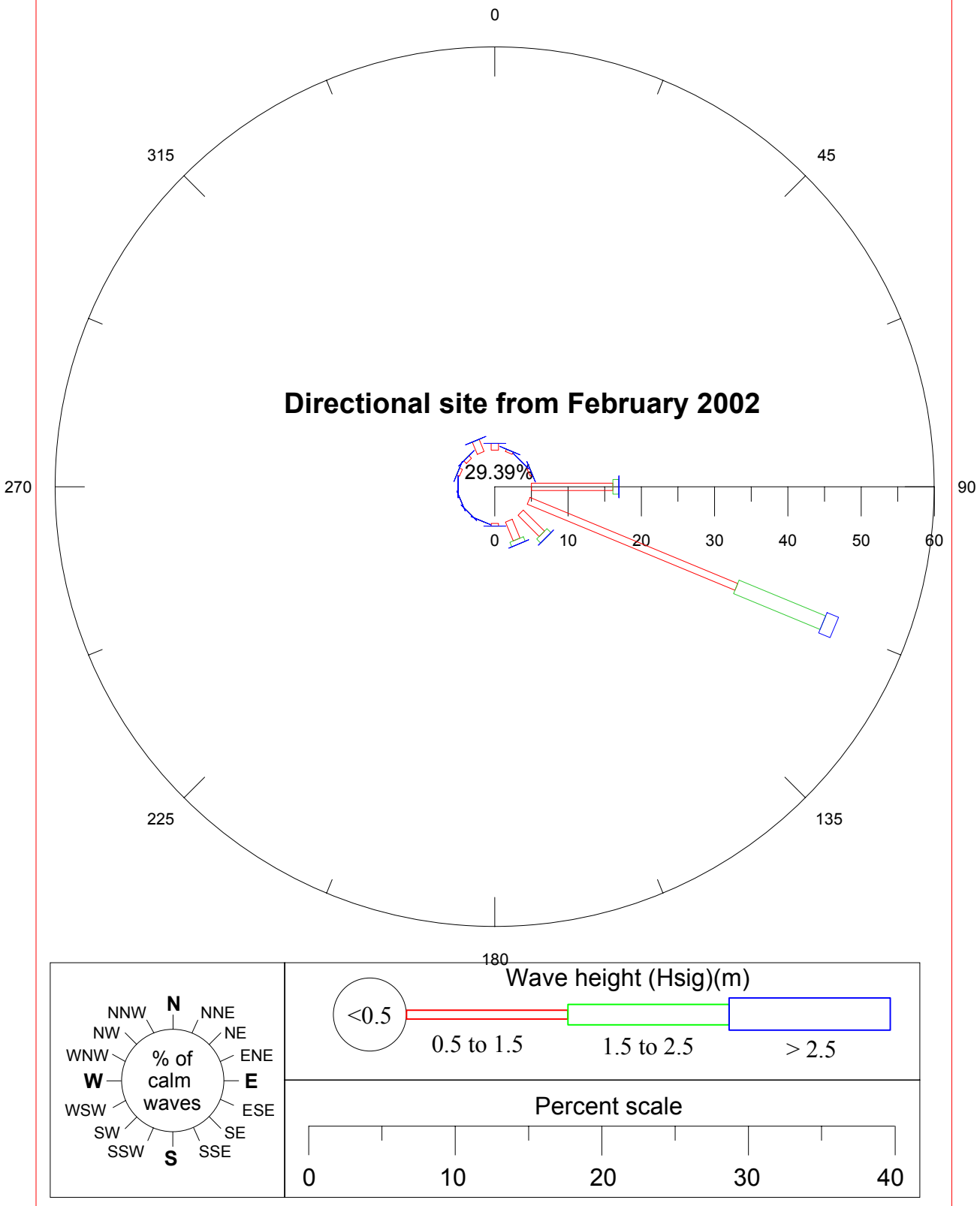
Mackay region—Daily wave recordings

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 8.7

Mackay region—Water temperature and peak direction recordings



Mackay region—Directional wave rose

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 8.8

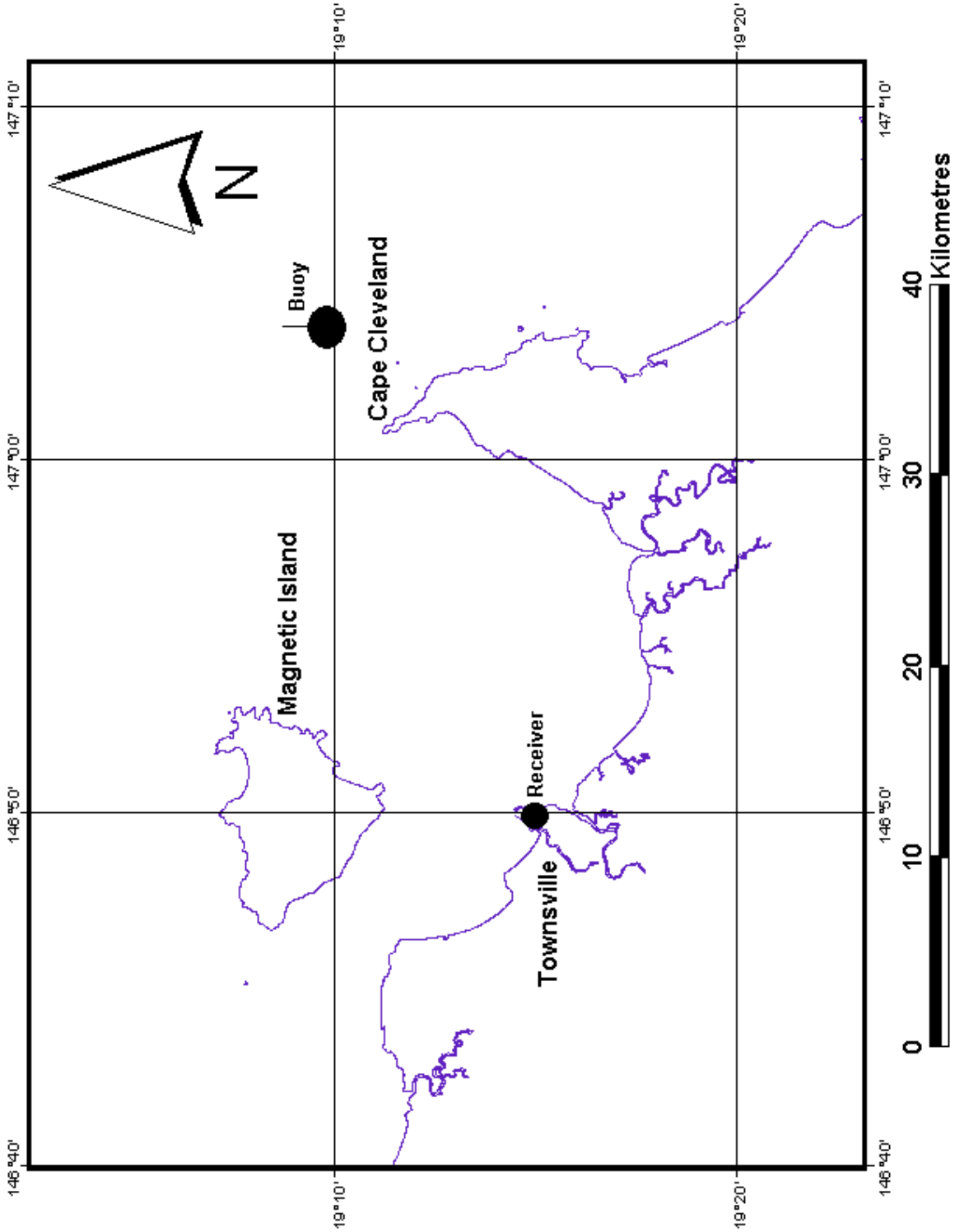
Townsville

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	346.604
Gaps in Data from Selected Dates (Days)	=	18.396
Gaps in Data from Analysed Records (Days)	=	18.396
Gaps in Data from Duration Analysis (Days)	=	18.396
Number of Records Used in Analysis	=	14,289

HAT at nearest standard port: Cape Ferguson, 3.73m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
19° 09.47'	147° 03.77'	15.1	07/08/2001	15/10/2002
19° 09.37'	147° 03.803'	16.3	15/10/2002	18/04/2003
19° 09.487'	147° 03.793'	15.5	20/05/2003	

Townsville region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

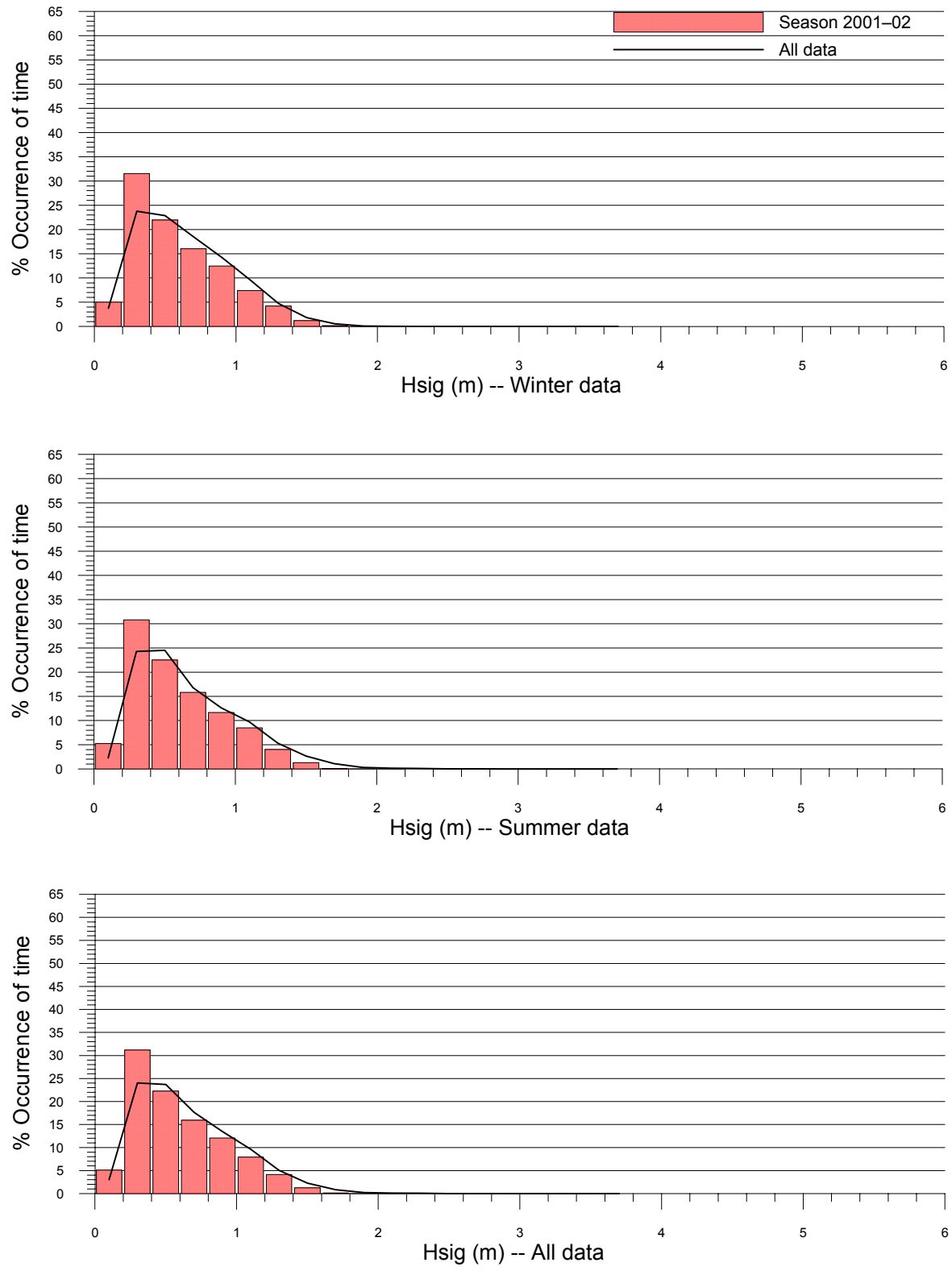
Figure 9.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.2

Townsville region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

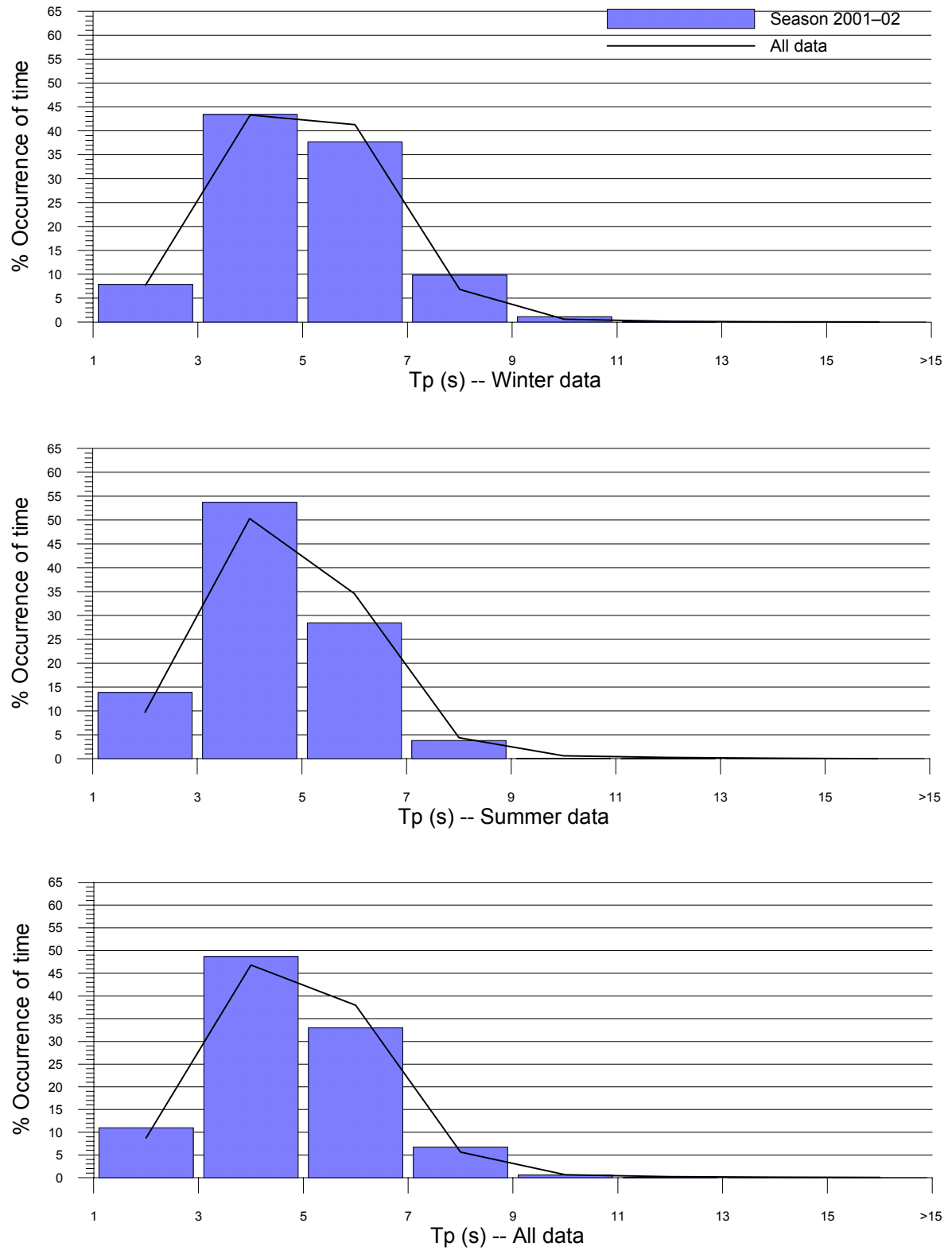


Townsville region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.3



Townsville region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

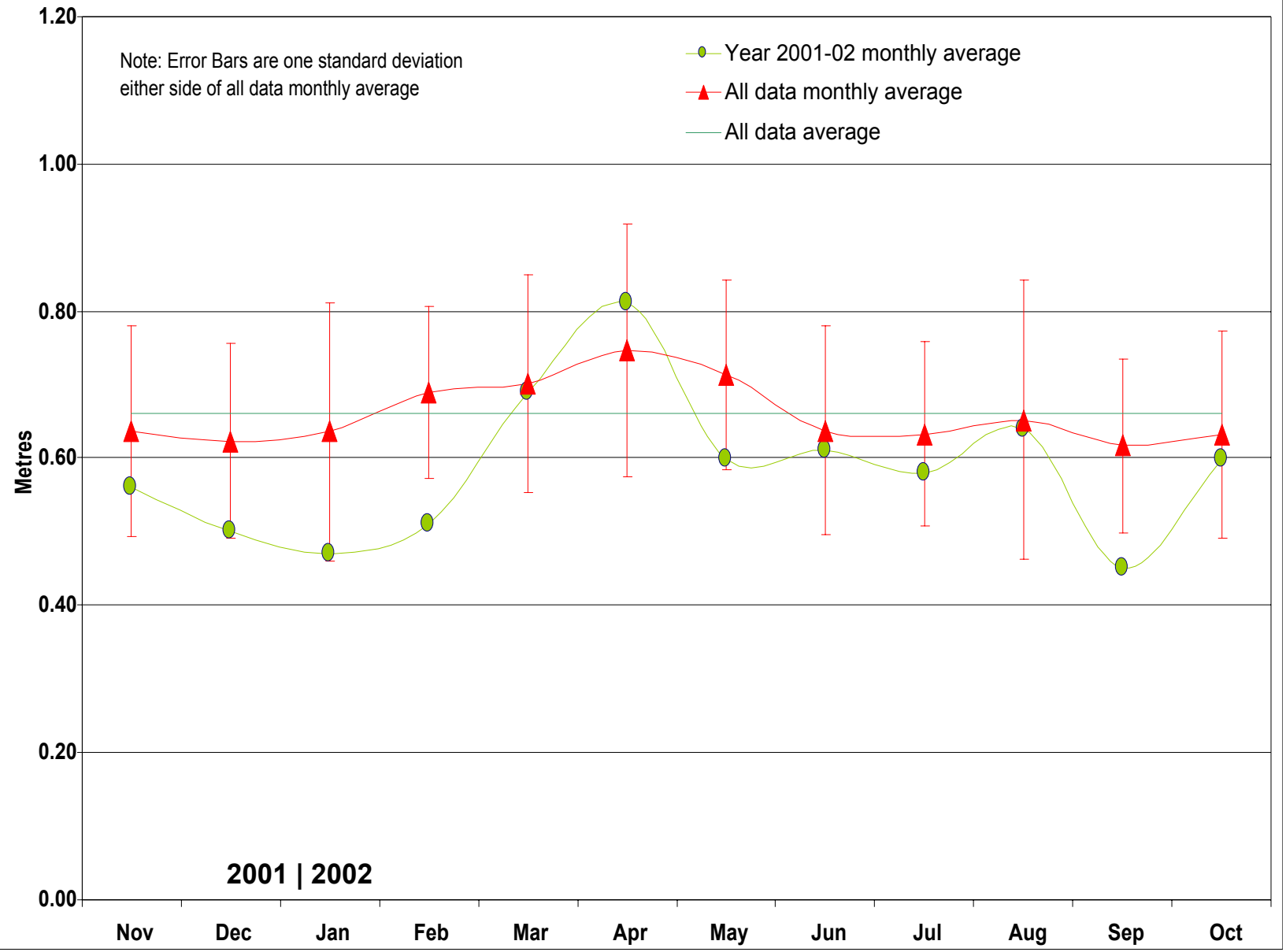
Figure 9.4

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.5

Townsville region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.6

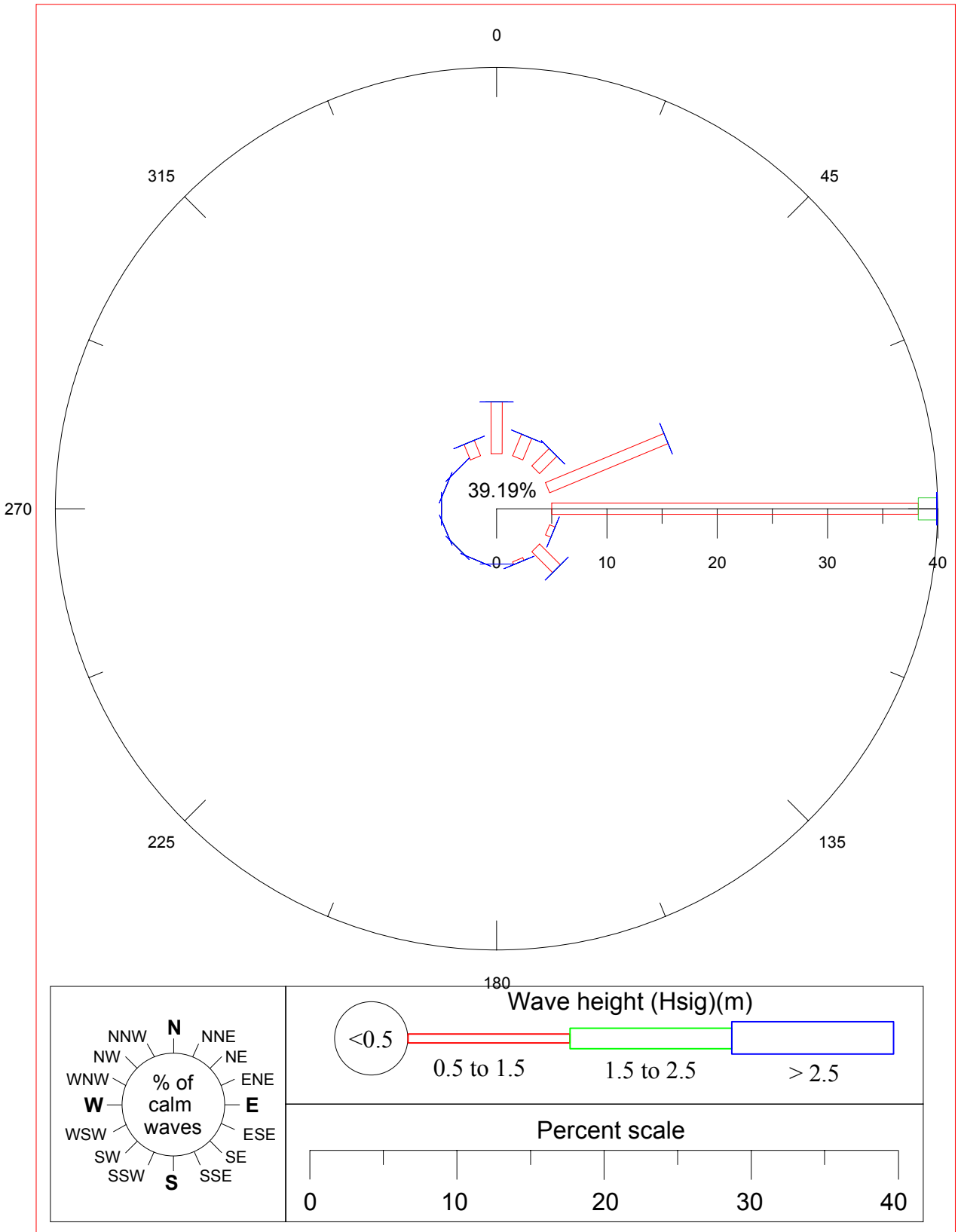
Townsville region—Daily wave recordings

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.7

Townsville region—Water temperature and peak direction recordings



Townsville region—Directional wave rose

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 9.8

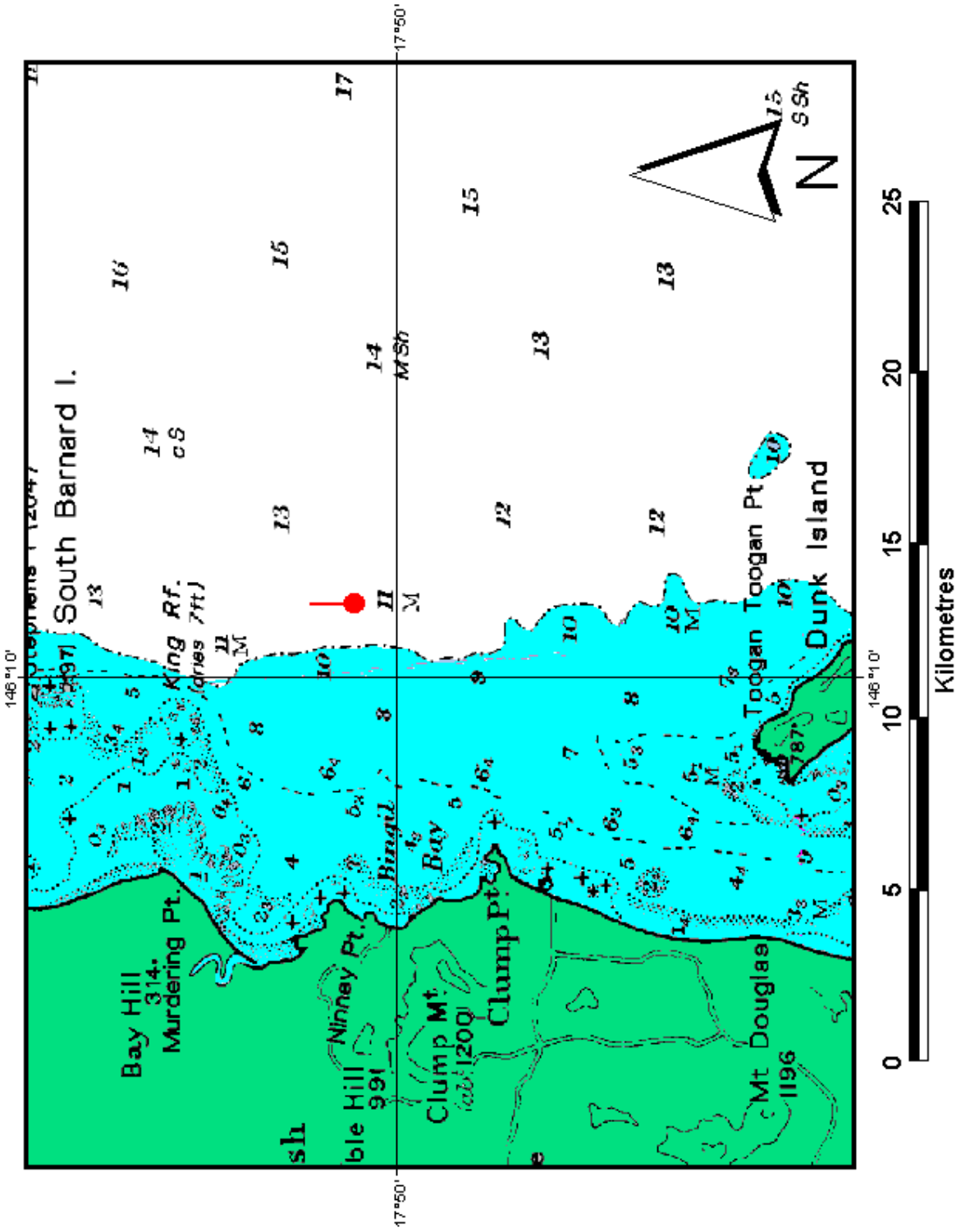
Dunk Island

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	343.500
Gaps in Data from Selected Dates (Days)	=	21.500
Gaps in Data from Analysed Records (Days)	=	21.500
Gaps in Data from Duration Analysis (Days)	=	21.500
Number of Records Used in Analysis	=	15,520

HAT at nearest standard port: South Barnard Island, 3.4m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
17° 49.09'	146° 11.13'	20.0	14/11/2000	08/10/2001
17° 52.04'	146° 11.15'	20.0	27/11/2001	11/11/2002

Dunk Island region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

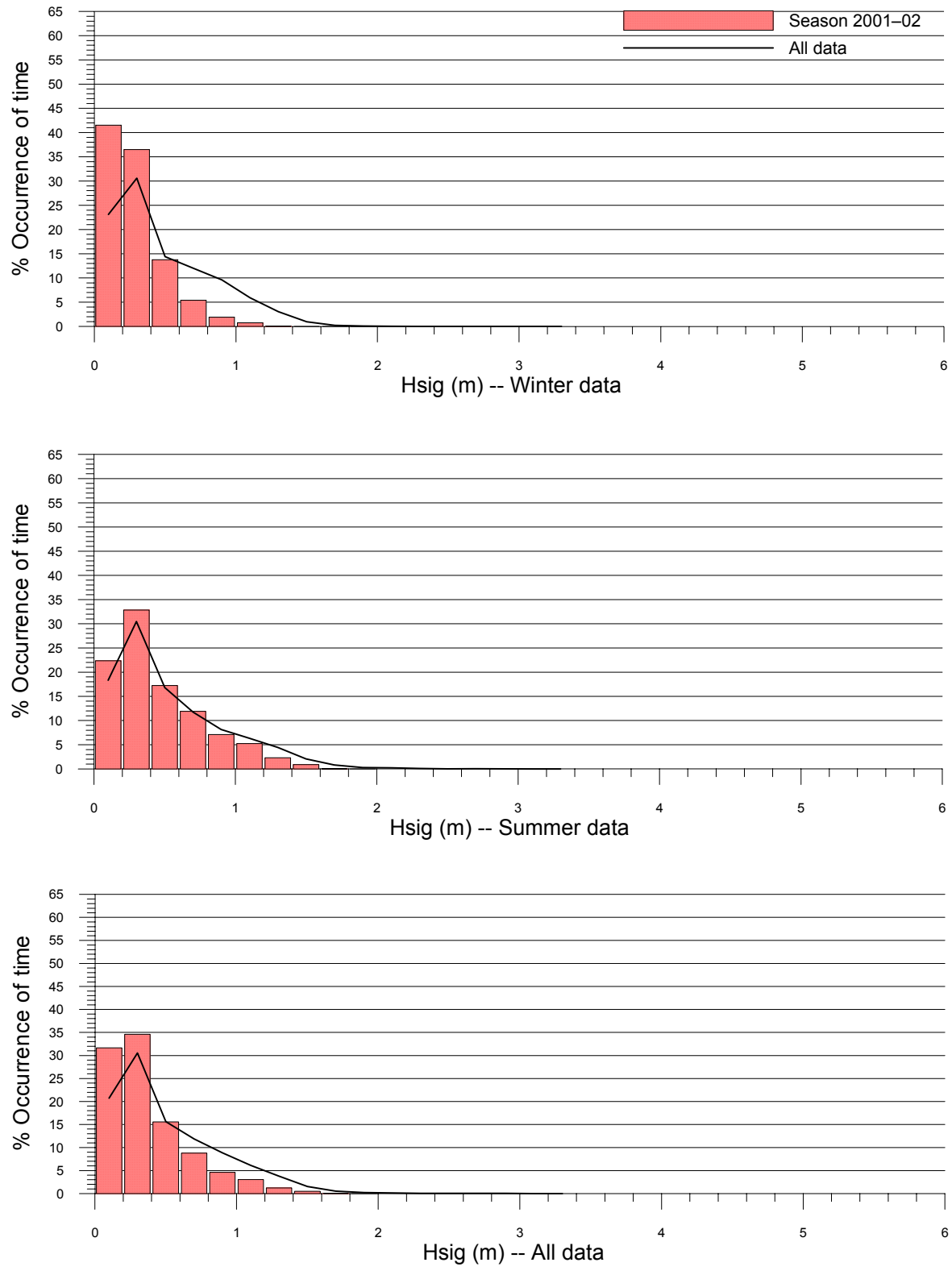
Figure 10.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

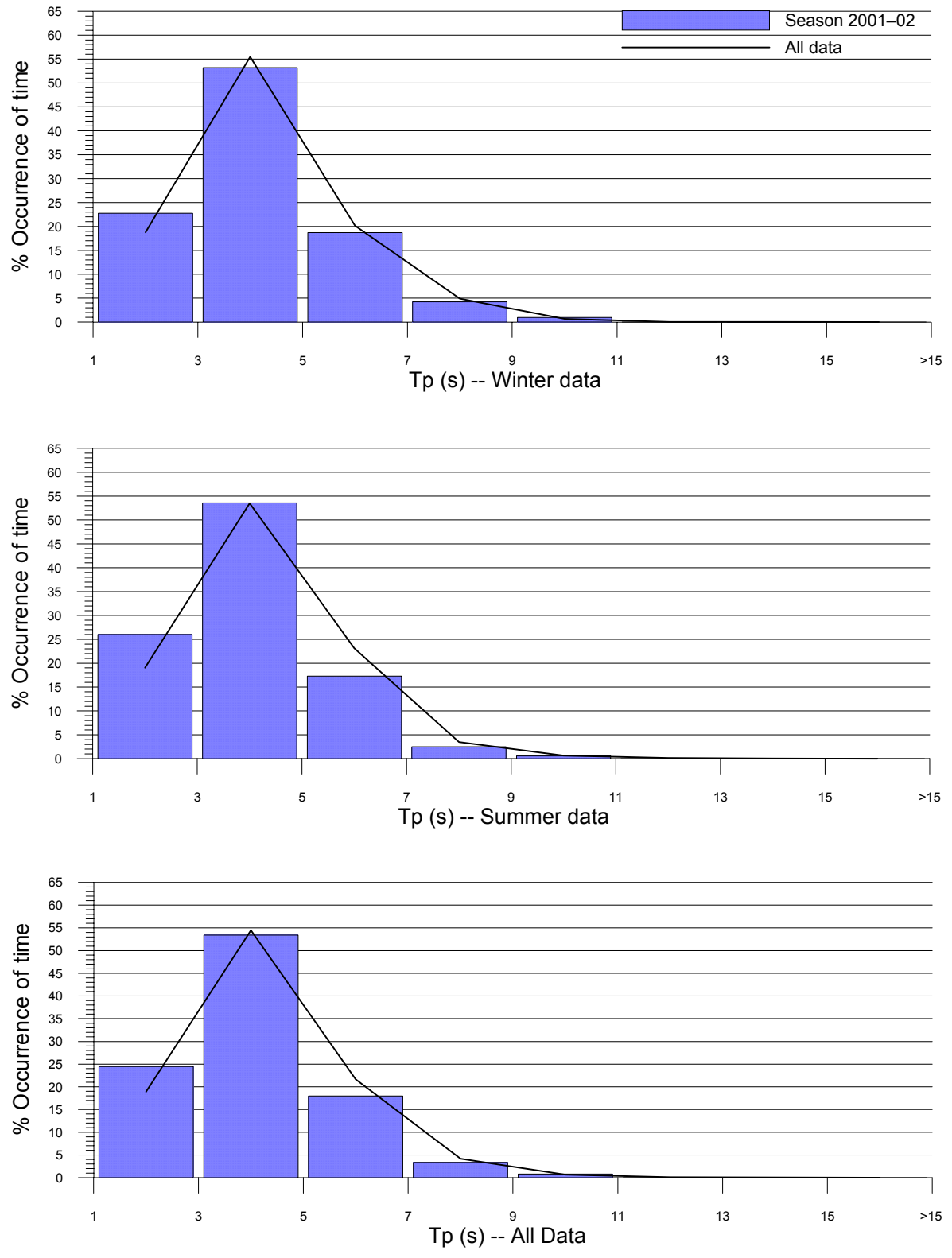
Figure 10.2

Dunk Island region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)



Dunk Island region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 10.3



Dunk Island region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

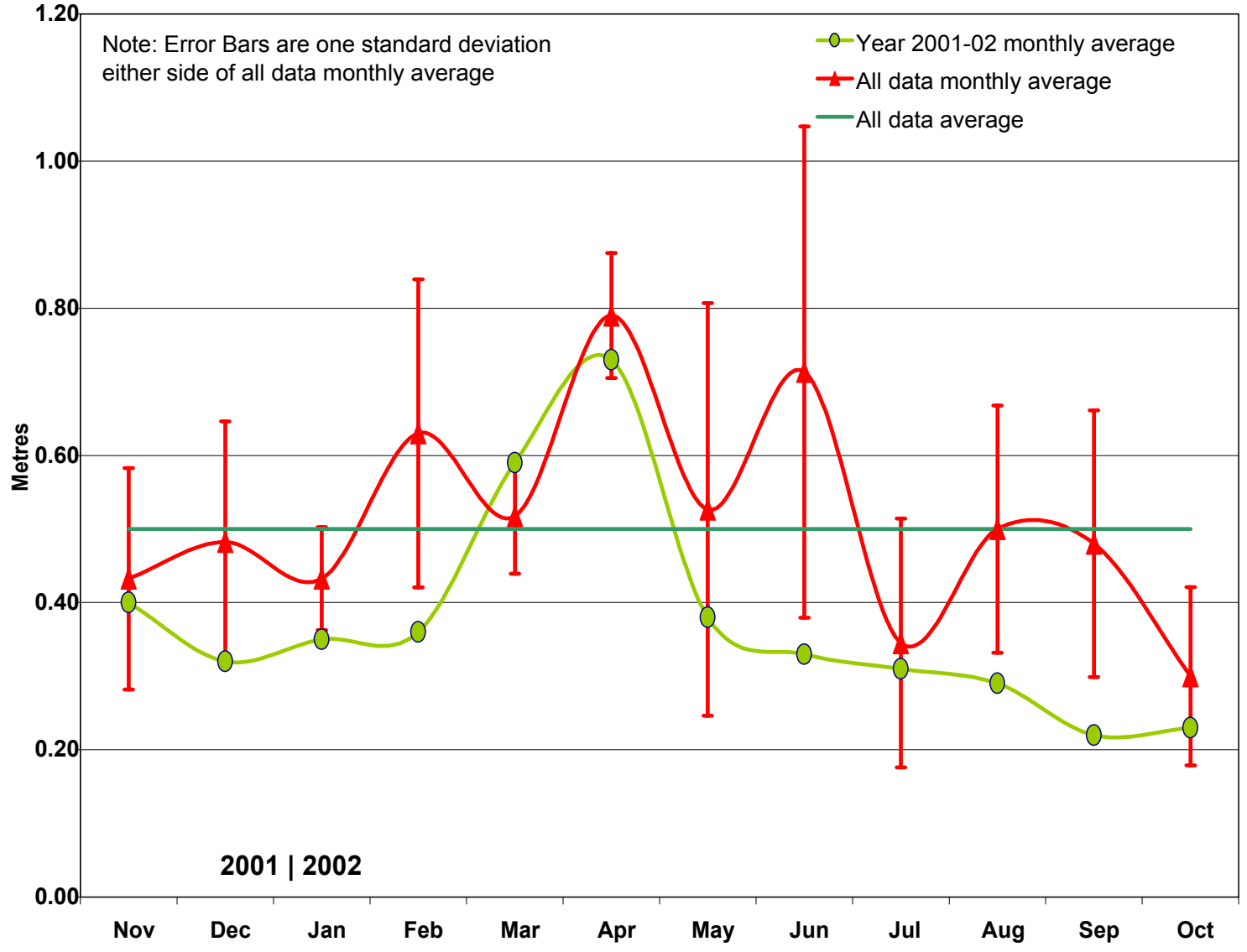
Figure 10.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 10.5

Dunk region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 10.6

Dunk Island region—Daily wave recordings

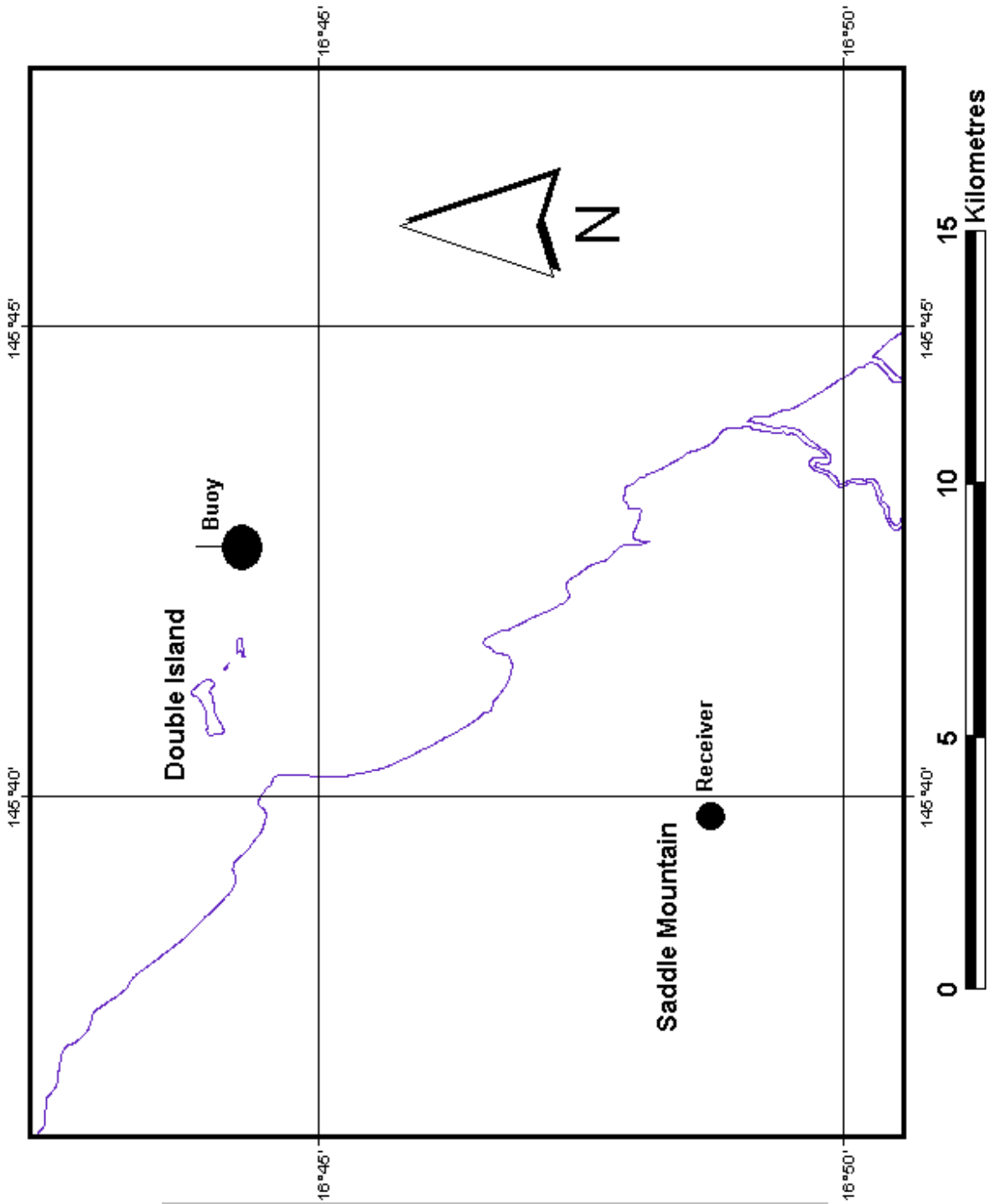
Cairns

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	364.791
Gaps in Data from Selected Dates (Days)	=	0.209
Gaps in Data from Analysed Records (Days)	=	0.208
Gaps in Data from Duration Analysis (Days)	=	0.208
Number of Records Used in Analysis	=	17,272

HAT at nearest standard port: Palm Cove, 3.1m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
16° 44.01'	145° 42.59'	12.5	10/11/2000	08/11/2001
16° 44.05'	145° 42.58'	12.5	08/11/2001	11/11/2002
16° 44.04'	145° 42.54'	12.5	11/11/2002	

Cairns region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

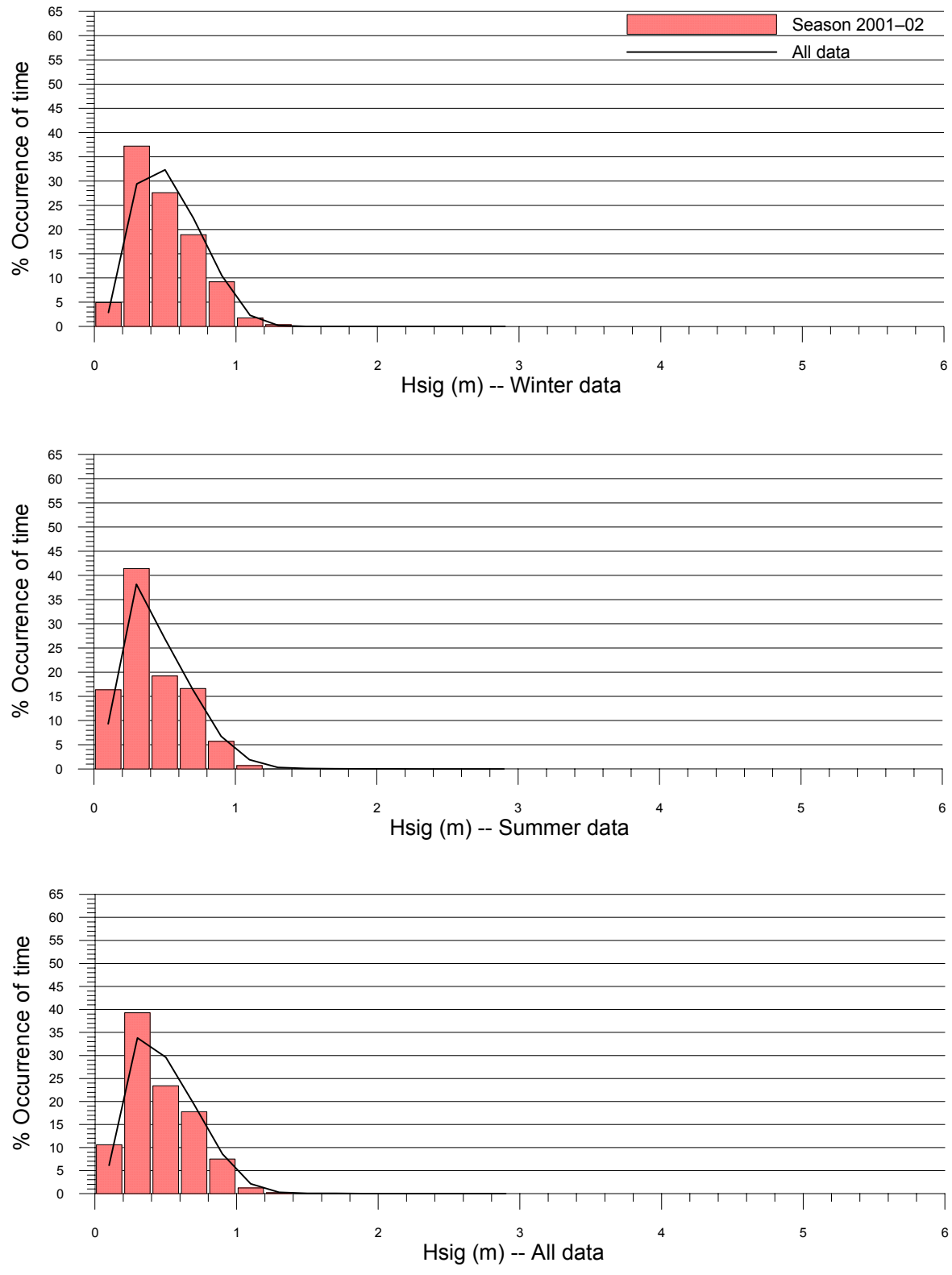
Figure 11.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

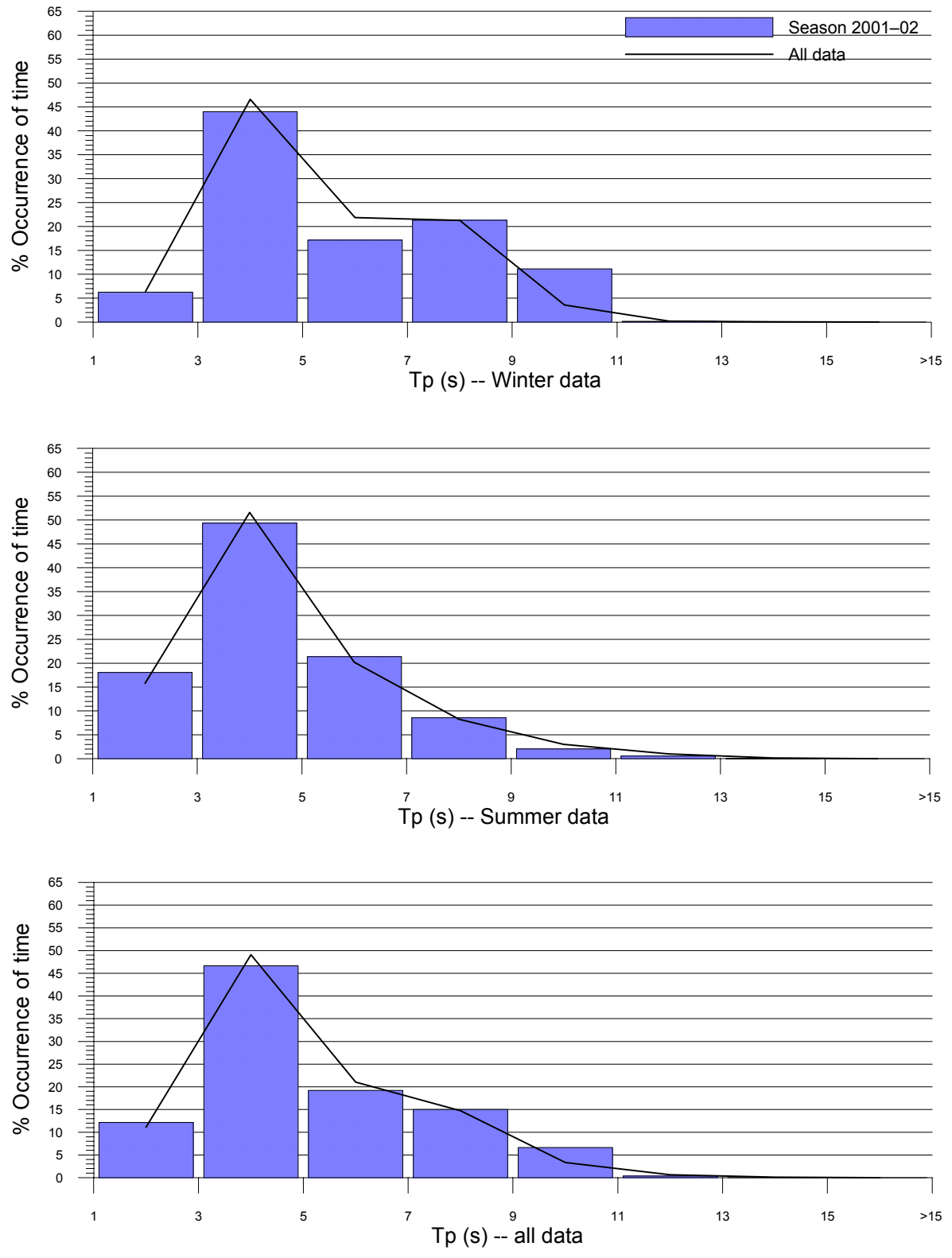
Figure 11.2

Cairns region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)



Cairns region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 11.3



Cairns region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

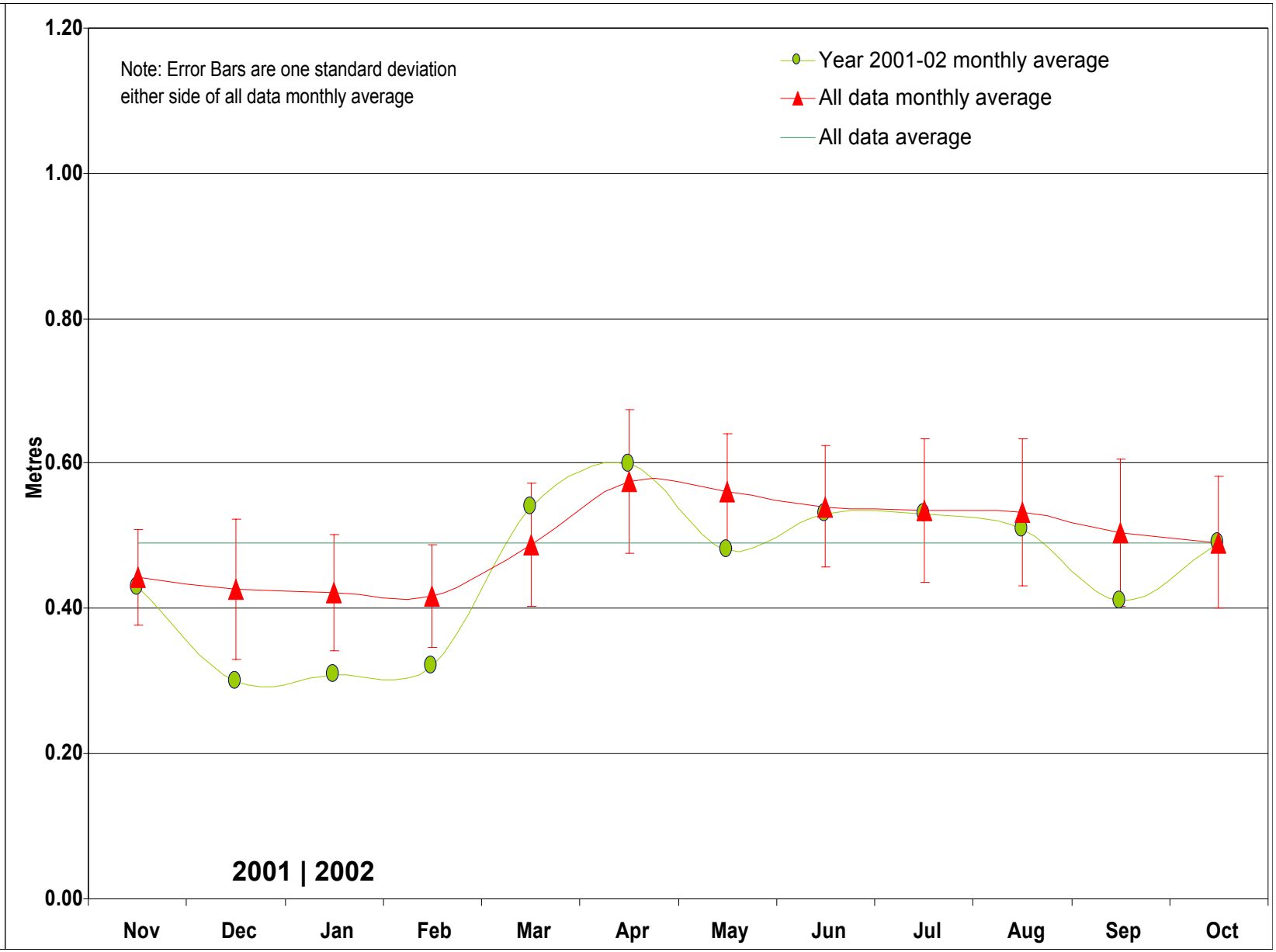
Figure 11.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 11.5

Cairns region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)



Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 11.6

Cairns region—Daily wave recordings

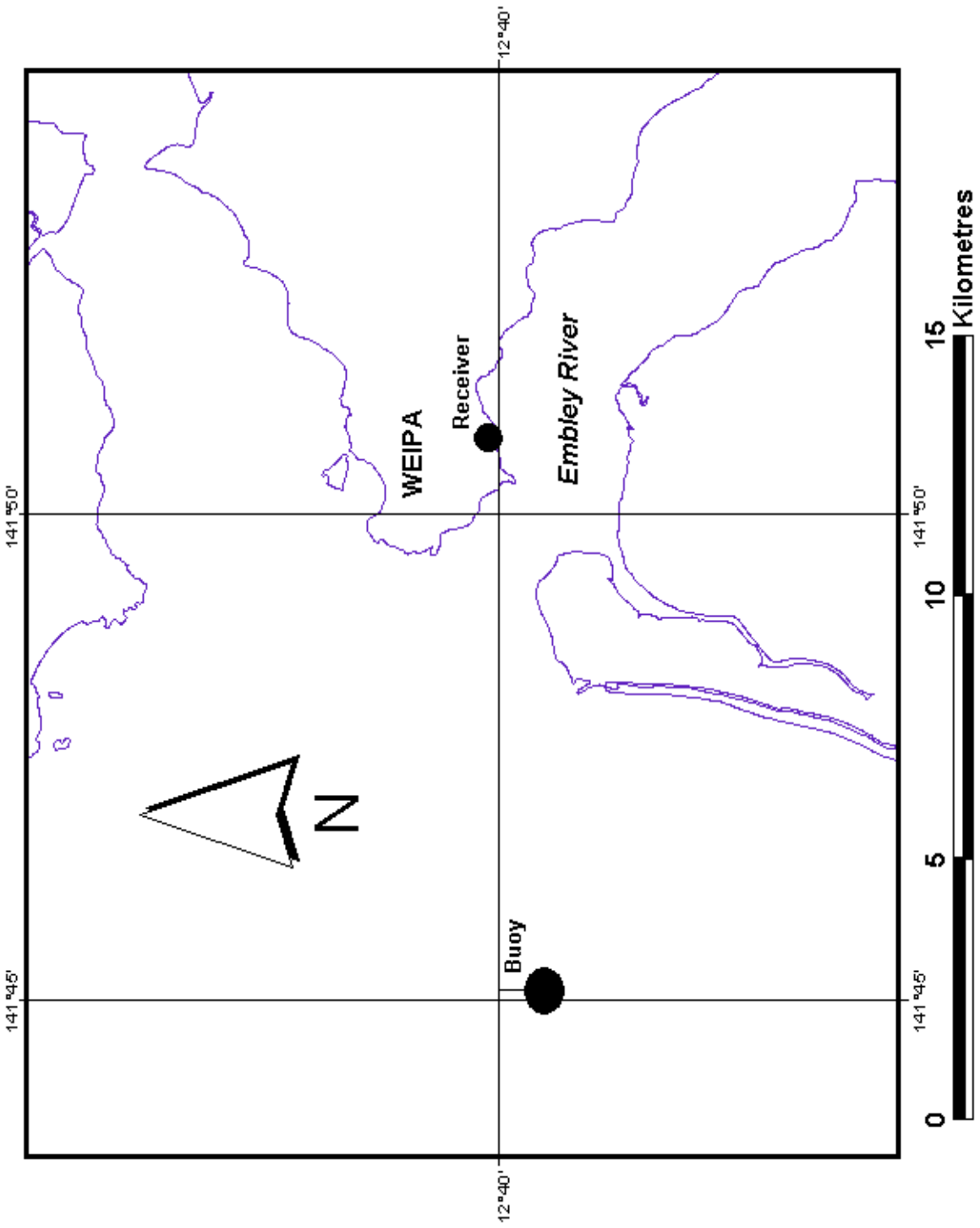
Weipa

Wave recording station

Details of wave recorder station

Maximum Possible Analysis Days (Last record–First record)	=	365.000
Total Days Used in Analysis	=	355.791
Gaps in Data from Selected Dates (Days)	=	9.209
Gaps in Data from Analysed Records (Days)	=	9.208
Gaps in Data from Duration Analysis (Days)	=	9.208
Number of Records Used in Analysis	=	15,852

HAT at nearest standard port: Weipa, 3.38m



Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
12° 40.52'	141° 45.15'	4.2	29/05/2001	19/06/2002
12° 40.55'	141° 45.09'	5.2	19/06/2002	25/06/2003
12° 40.56'	141° 45.11'	5.2	25/06/2003	

Weipa region—Locality plan

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

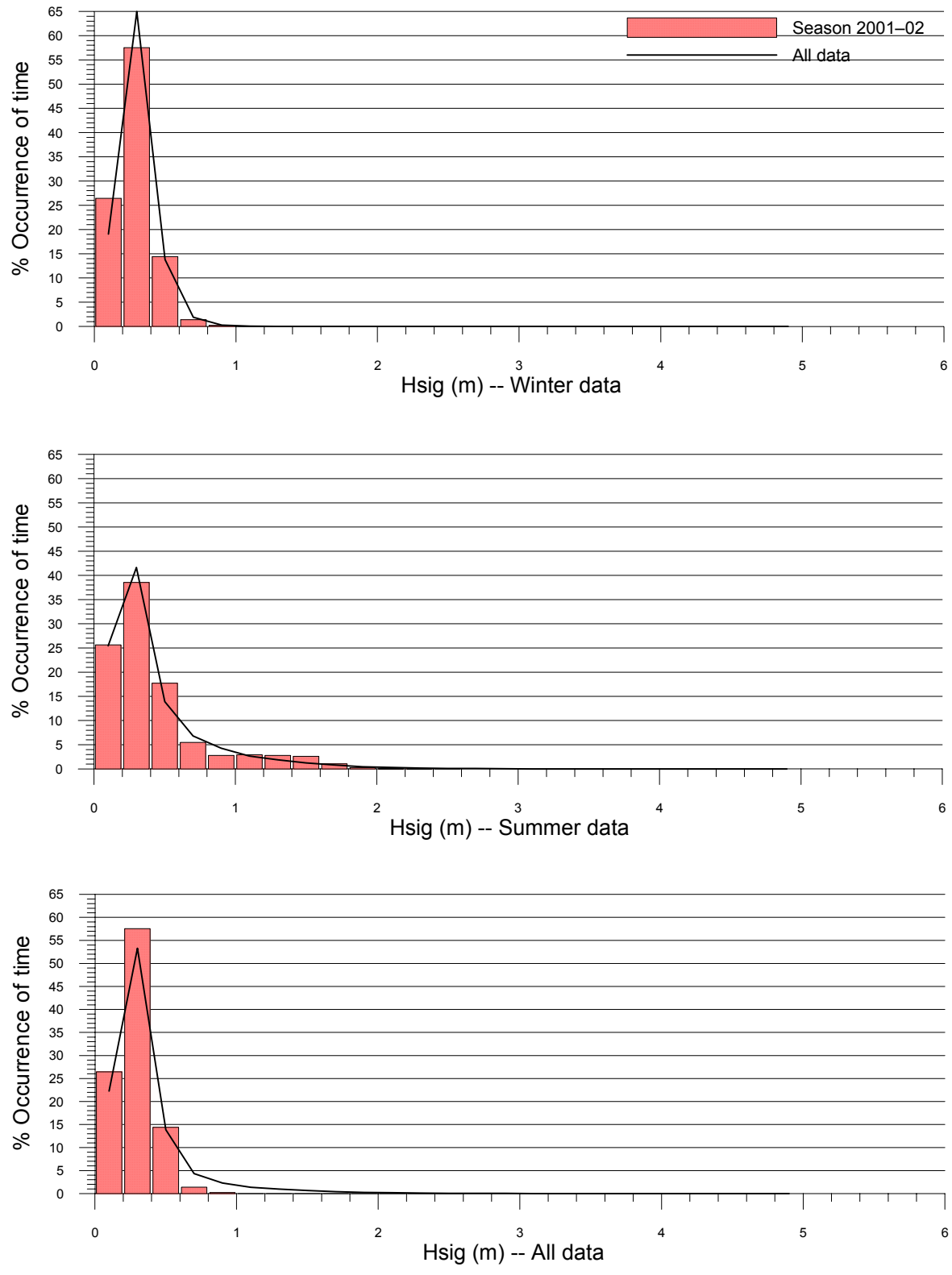
Figure 12.1

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 12.2

Weipa region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)

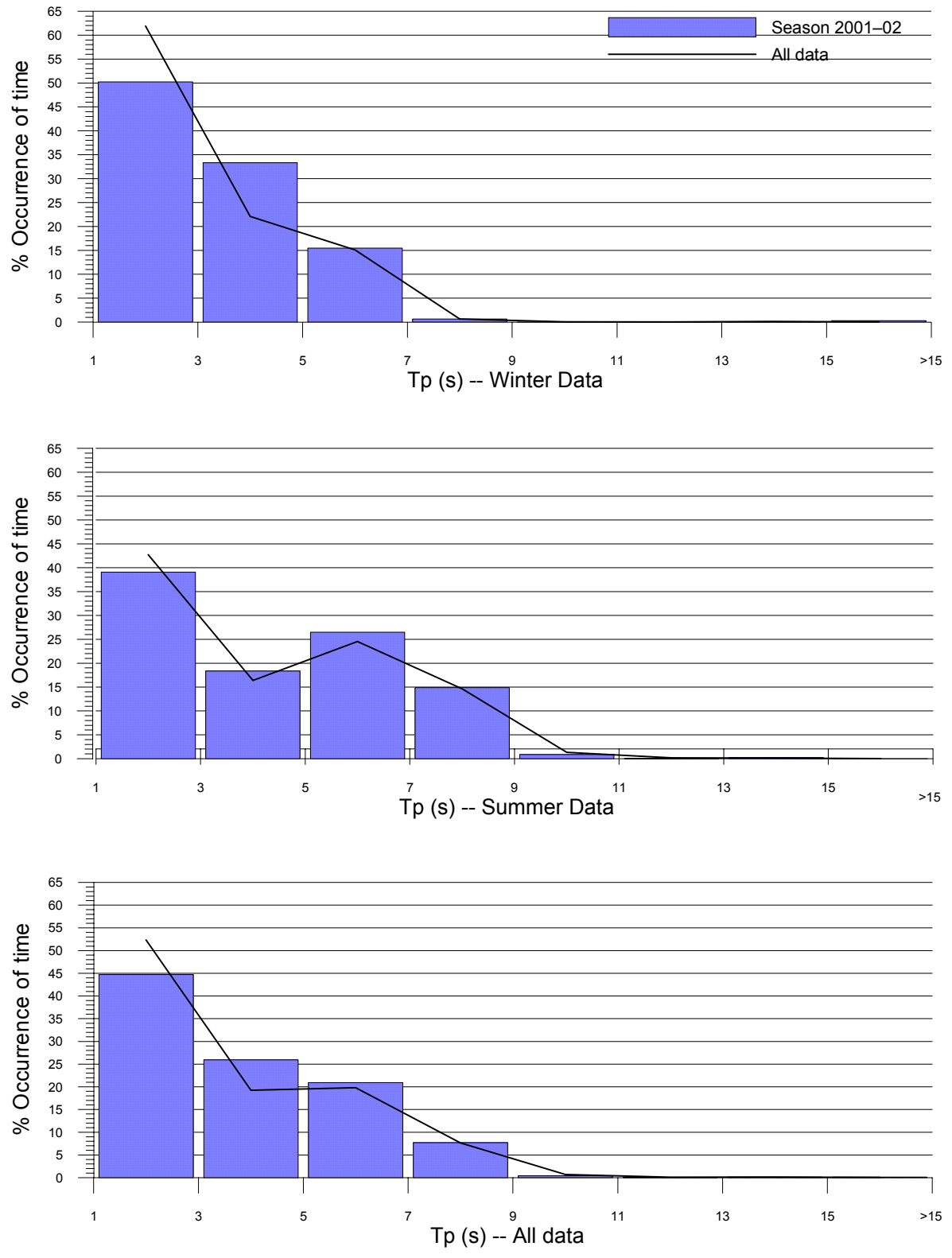


Weipa region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 12.3



Weipa region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

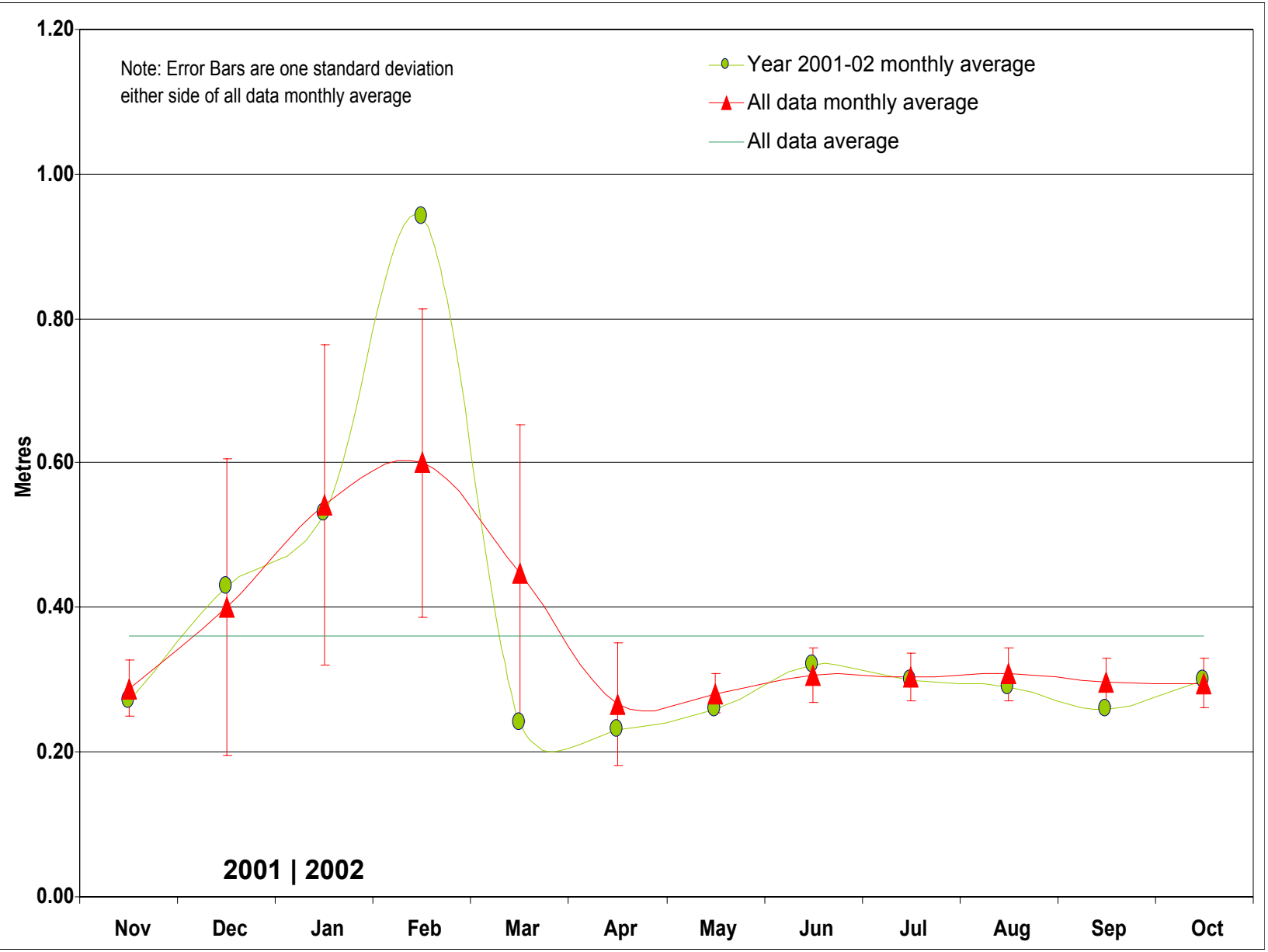
Figure 12.4

Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 12.5

Weipa region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)

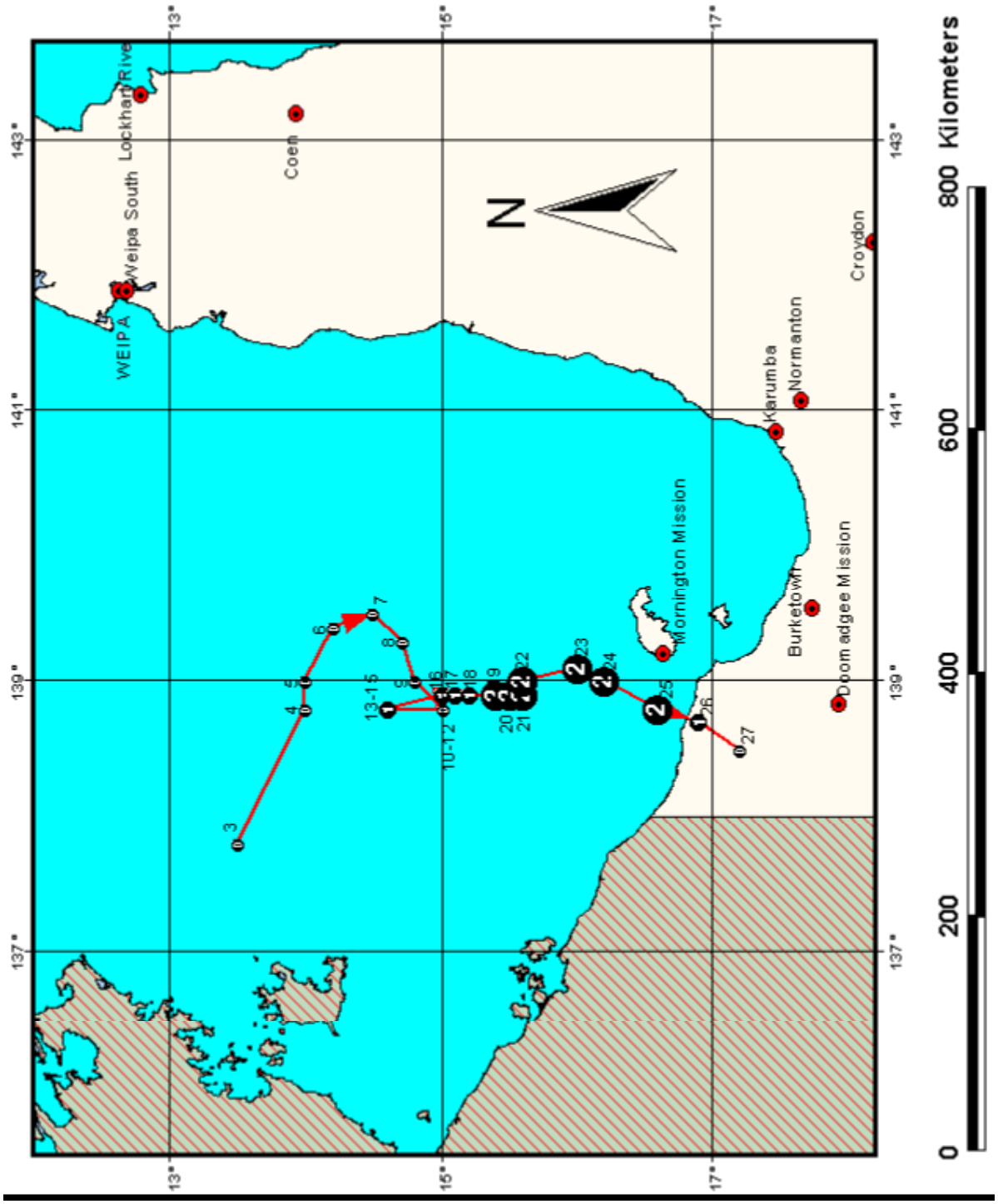


Queensland Government Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 12.6

Weipa region—Daily wave recordings



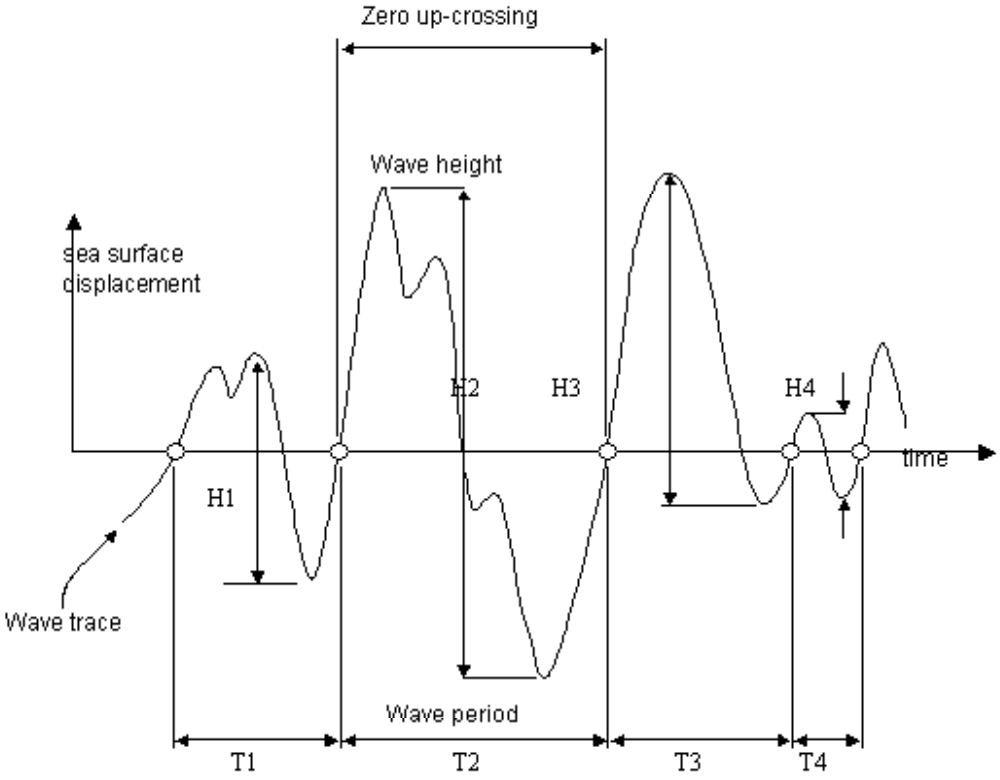
Cyclone track 2001–2002
Tropical cyclone *Bernie*
(refer to table 6 for advice details)

Queensland Government Environmental Protection Agency	Wave data recording program Annual summary for season 2001–02	Figure 13

Zero crossing analysis

A direct, repeatable and widely accepted method to extract representative statistics from wave traces recorded by a Waverider buoy is the zero crossing method. For the zero upcrossing method, the method employed by the Agency, a wave is defined as the portion of the record between two successive zero upcrossings. The waves are ranked, with their corresponding periods, and statistical wave parameters computed.

An explanation of wave parameters is presented in the Glossary of terms.



Zero up–crossing analysis

Queensland Government
Environmental Protection Agency

Wave data recording program
Annual summary for season 2001–02

Figure 14

Glossary of terms

Wave parameter	Description
H_s	Significant wave height defined as average of highest $\frac{1}{3}$ of zero up-crossing wave heights
TH_{sig}	The average period of the highest $\frac{1}{3}$ of zero up-crossing wave heights
H_{rms}	Root mean square wave height from the time domain
H_{max}	The maximum zero up-crossing wave height in a record
T_c	The crest period
T_z	The zero crossing period from the time domain
H10	Average of the highest 10 percent of all waves in a record
TH10	The period of the H10 waves
TH_{max}	Period of maximum height, zero up-crossing
Tz_{max}	The maximum zero crossing in a record
H_{m0}	Estimate of the significant wave height from frequency domain $4\sqrt{m_0}$
T_{02}	Average period from spectral moments 0 and 2, defined by $\sqrt{m_0 / m_2}$
T_p	Period at the peak spectral energy
Dir_p	Direction the Peak Period waves are coming from (in ° magnetic)