



Wave data recording program

Queensland wave climate annual summary for season 2000–01

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Foreword

This summary of wave climate in Queensland is the earliest of the series of technical wave reports that will be prepared annually by the Coastal Services Unit. It represents a change in the way wave data is presented by the Environmental Protection Agency (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 will cover the year from 1 November to 31 October. The start of the reporting year therefore coincides with the start of the annual cyclone season that 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 (for the first time), plots of monthly average significant wave heights and directional wave rose (where possible).

Cover photo: The photo on the cover of this report shows ideal surfing waves breaking on northern Gold Coast beaches during storm events emanating from a 992hPa low in the Tasman Sea in July 2001.

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 2000–01 seasonal year.

The data recorded covers the period from 1 November, 2000 to 31 October, 2001, which embraces all of the seasonal variations for one year, and includes the 2000–01 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:

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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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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 collect 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, and 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 varies in duration, and they are associated with specific projects, to assess wave conditions or to monitor works. These stations are operated in conjunction with (and jointly funded by) other agencies.

The 2000–01 site groups are shown in table 1.

Table 1
Wave recording stations
for season 2000–01

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 the first of 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, 2000 to 31 October, 2001.

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 EPA's 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 0.39s intervals (2.56Hz), is recorded in bursts of 4096 points (approximately 26min) and recorded on the hard disk of the computer.

Directional Waverider receiver stations also comprise a PC-based system utilising the Datawell WAREC Wave-direction receiver/digitiser. The water level data, digitised at 0.78s 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 Agency are calibrated before deployment and also after recovery. Normally, a buoy is calibrated once every twelve 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 varied 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) half-hourly 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.

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 2000–01 seasonal year is shown in table 5. Wave parameters Hsig, Hmax, Tp, and other relevant information are listed for each event. Only cyclone or storm 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 names and dates of all cyclones that occurred along the Queensland coastline during the 2000–01 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 2000–01 seasonal year. Detailed station location maps are presented for all sites in figures 1.1 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.

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Table 2
Wave recording history

Site	Start date	End date	Restart	End date	Total years
Cairns Nearshore	04/05/1975	31/10/2001			26.51
Mackay Offshore	19/09/1975	31/10/2001			26.13
Townsville	20/11/1975	31/10/2001			25.96
Brisbane	31/10/1976	31/10/2001			25.02
Weipa	22/12/1978	31/10/2001			22.87
Hay Point	24/03/1977	25/05/1987	03/03/1993	31/10/2001	18.84
Gold Coast	21/02/1987	31/10/2001			14.70
Tweed Heads	13/01/1995	31/10/2001			6.80
Emu Park	24/07/1996	31/10/2001			5.27
Dunk Island	18/12/1998	31/10/2001			2.87
Mooloolaba	20/04/2000	31/10/2001			1.53
Moreton Bay	19/10/2000	31/10/2001			1.03

denotes a directional site in year 2000–01

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 2000–01 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 below. 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	31/10/2001	6.80
Emu Park	24/07/1996	31/10/2001	5.27
Brisbane	20/01/1997	31/10/2001	4.78
Townsville	12/10/2000	31/10/2001	1.05

This report covers the seasonal year from 1 November, 2000 to 31 October, 2001 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* (2000)
Datawell, *Manual of the Digital Waverider Receiver Type DIWAR* (1992)
Datawell, *Operations and Service Manual for Directional Waverider* (2001)
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 reports in this series

Wave data recording program, Cairns Region	Report No. W01.1	2 May 1975 to 3 Sept 1978
Wave data recording program, Cairns Region	Report No. W01.2	2 May 1975 to 11 Jun 1985
Wave data recording program, Cairns Region	Report No. W01.3	2 May 1975 to 30 Apr 1997
Wave data recording program, Mackay Region	Report No. W02.1	17 Sept 1975 to 5 Nov 1976
Wave data recording program, Mackay Region	Report No. W02.2	17 Sept 1975 to 23 Aug 1985
Wave data recording program, Mackay Region	Report No. W02.3	17 Sept 1975 to 30 Oct 1996
Wave data recording program, Townsville Region	Report No. W03.1	16 July 1975 to 23 Feb 1979
Wave data recording program, Townsville Region	Report No. W03.2	19 Nov 1975 to 29 Dec 1987
Wave data recording program, Townsville Region	Report No. W03.3	19 Nov 1975 to 30 Apr 1997
Wave data recording program, Sunshine Coast Region	Report No. W04.1	5 Apr 1974 to 5 Jul 1977
Wave data recording program, Burnett Heads Region	Report No. W05.1	5 May 1976 to 5 Mar 1982
Wave data recording program, Burnett Heads Region	Report No. W05.2	5 May 1976 to 13 Oct 1988
Wave data recording program, Abbot Point Region	Report No. W06.1	6 May 1977 to 9 Aug 1979
Wave data recording program, Abbot Point Region	Report No. W06.2	6 May 1977 to 31 Oct 1996
Wave data recording program, Weipa Region	Report No. W07.1	21 Dec 1978 to 7 Apr 1983
Wave data recording program, Weipa Region	Report No. W07.2	21 Dec 1978 to 30 Apr 1997
Wave data recording program, Gladstone Region	Report No. W08.1	19 Dec 1979 to 16 May 1983
Wave data recording program, Brisbane Region	Report No. W09.1	30 Oct 1976 to 30 Jun 1983
Wave data recording program, Brisbane Region	Report No. W09.2	30 Oct 1976 to 30 Jun 1994
Wave data recording program, Brisbane Region	Report No. W09.3	30 Oct 1976 to 28 Feb 1997
Wave data recording program, Bowen Region	Report No. W10.1	14 Sept 1978 to 15 Nov 1984
Wave data recording program, Moreton Island Region	Report No. W11.1	15 Jun 1983 to 12 Apr 1985
Wave data recording program, Bramston Beach Region	Report No. W12.1	16 Dec 1981 to 28 Oct 1985
Wave data recording program, Hay Point Region	Report No. W13.1	22 Mar 1977 to 25 May 1987
Wave data recording program, Hay Point Region	Report No. W13.2	22 Mar 1977 to 31 Oct 1996
Wave data recording program, Gold Coast Region	Report No. W14.1	20 Feb 1987 to 30 Jun 1994
Wave data recording program, Gold Coast Region	Report No. W14.2	20 Feb 1987 to 28 Feb 1997
Wave data recording program, Kirra	Report No. W15.1	25 Aug 1988 to 30 Jun 1994
Wave data recording program, Kirra	Report No. W15.2	25 Aug 1988 to 28 Feb 1997
Wave data recording program, Repulse Bay	Report No. W16.1	2 Jun 1994 to 22 Oct 1995
Wave data recording program, Hayman Island	Report No. W17.1	26 Oct 1995 to 14 Oct 1996
Wave data recording program, Tweed Region	Report No. W18.1	15 Jan 1995 to 28 Feb 1997
Wave data recording program, Lucinda	Report No. W19.1	2 Mar 1995 to 13 May 1996
Annual summary for season 2001–02	Report No. 2004.4	1 Nov 2001 to 31 Oct 2002
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 2000–01

Station	Data capture (%) (Based on active periods)												Average
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	
Tweed Heads	100.00	99.90	99.93	99.86	99.93	95.76	97.85	99.51	98.32	100.00	99.86	99.93	99.24
Gold Coast	100.00	99.90	90.79	62.65	99.66	99.65	99.87	99.30	98.39	99.67	99.31	99.59	95.73
Brisbane	98.33	100.00	99.92	99.85	99.87	99.31	99.66	99.65	98.19	99.59	99.86	99.66	99.49
Moreton Bay	89.58	95.76	97.92	92.04	92.81	92.22	86.76	89.72	90.86	87.43	90.54	92.55	91.52
Mooloolaba	98.92	99.40	100.00	99.33	99.26	98.06	99.33	99.38	99.53	99.19	98.82	99.60	99.24
Emu Park	91.39	93.95	94.76	97.82	95.16	86.11	99.06	99.17	99.60	99.47	95.28	95.83	95.63
Hay Point	100.00	99.39	99.80	99.85	99.80	99.58	98.79	99.93	99.46	99.46	99.30	99.67	99.59
Mackay	26.11	86.02	93.60	72.47	77.42	62.50	93.01	82.08	98.08	96.69	84.58	87.77	80.03
Townsville	57.49	67.96	71.71	40.63	80.44	88.40	91.53	90.63	91.53	91.53	92.85	92.20	79.74
Dunk Island	30.56	74.13	79.03	99.86	65.32	96.94	99.19	99.86	100.00	97.18	99.86	35.28	81.43
Cairns	48.75	100.00	100.00	99.41	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.93	95.67
Weipa	85.41	98.37	81.44	97.39	71.10	66.67	88.64	91.45	91.79	89.59	81.11	82.32	85.44

Denotes a directional site in 2000–01

Table 5
Major meteorological events

Meteorological event	Central pressure	Date	Estimated position of cyclone relative to buoy (km)	Maximum Hsig recorded (Note 1) (m)	Maximum Hmax recorded (Note 2) (m)	Tp (Note 3) (s)
Tweed: 2m threshold (Hsig)						
High in Tasman Sea	1024	15/11/2000		2.11	3.63	7.22
High in Tasman Sea and Low off Moreton coast	1020	20/01/2001		2.95	4.96	9.93
High in Tasman Sea and Low over Central Queensland	1008					
	1028	2/02/2001		3.95 (4.39)	6.59	10.16
High in Tasman Sea and Monsoon trough in Torres Strait	1004					
	1020	8/02/2001		2.16	3.57	9.28
High in Tasman Sea	1020	19/02/2001		2.17	3.51	9.29
Low in north Tasman Sea	1000	5/03/2001		3.02 (3.27)	4.72	11.09
High in Tasman Sea and Low over northeast New South Wales	1032	9/03/2001		2.40	4.17	9.15
	1008					
High over Great Australian Bight and Monsoon Lows in the Coral Sea	1028	2/04/2001		2.10	3.57	11.42
	1008					
High in the Tasman Sea and Tropical cyclone Sose in New Hebrides area	1020	11/04/2001	1600 E	3.87 (4.15)	5.91	15.29
	990					
High west of Tasmania and Low well off the Moreton coast	1004	22/05/2001		2.25	3.93	9.38
	1028					
Low between New Caledonia and New Zealand	992	5/07/2001		3.44 (3.95)	5.65	13.64
High in Tasman Sea and Low over northern New South Wales	1032	26/07/2001		2.49	4.17	7.36
	1020					
High off Queensland coast	1016	1/09/2001		2.06	3.59	6.60
Highs over Victoria and Low in Tasman Sea	1031	27/09/2001		2.05	3.51	11.06
	1012					
High over Central Queensland and Low in Tasman Sea	1017	5/10/2001		2.01	3.34	11.43
	1008					
Gold Coast: 2m threshold (Hsig)						
High in Tasman Sea and Low over central Queensland	1020	19/01/2001		2.89	5.04	10.06
	1004					
High in Tasman Sea and Low over southeast Queensland	1024	1/02/2001		3.86 (4.05)	6.47	9.62
	1004					
High in Tasman Sea	1020	19/02/2001		2.00	3.33	10.39
Low off Moreton coast	1000	6/03/2001		2.95 (3.27)	5.08	11.59
High in Tasman Sea and Low over northeast New South Wales	1032	9/03/2001		2.34	4.00	9.48
	1008					
High over Great Australian Bight and Monsoon Lows in Coral Sea	1028	2/04/2001		2.13	3.59	11.17
	1008					
High in Tasman Sea and Tropical cyclone Sose in New Hebrides area	1028	7/04/2001	1900 NE	2.07	3.33	7.70
	980					
High in Tasman Sea and Tropical cyclone Sose in New Hebrides area	1020	11/04/2001	1600 E	3.21 (3.37)	5.26	13.79
	990					
Brisbane: 4m threshold (Hsig)						
High in Tasman Sea and Low off Moreton coast	1020	19/01/2001		4.52	7.37	9.85
	1008					
High in Tasman Sea and Low over southeast Queensland	1024	1/02/2001		4.87 (5.43)	8.07	9.90
	1004					
Low off Moreton coast	1000	7/03/2001		4.57 (4.91)	7.19	11.37
High over Great Australian Bight	1032	12/04/2001		4.68 (5.02)	7.35	8.65
Low between New Caledonia and New Zealand	992	6/07/2001		4.11	5.95	15.21
Moreton Bay: 1.5m threshold (Hsig)						
High in Tasman Sea and Low off the Central Queensland coast	1028	2/02/2001		1.51 (1.69)	2.57	4.62
	1004					

Table 5
Major meteorological events (cont'd)

Meteorological event	Central pressure (hpa)	Date	Estimated position of cyclone relative to buoy (km)	Maximum Hsig recorded (Note 1) (m)	Maximum Hmax recorded (Note 2) (m)	Tp (Note 3) (s)
Mooloolaba: 2m threshold (Hsig)						
High in Tasman Sea	1024	13/11/2000		2.01	3.51	13.62
High in Tasman Sea	1024	17/11/2000		2.16	3.65	8.15
High in Tasman Sea	1024	1/01/2001		2.28	3.80	7.59
High in Tasman Sea and Low off Moreton	1020 1008	20/01/2001		2.48	4.21	9.71
High in Tasman Sea and Low off Central Coast	1028 1004	2/02/2001		3.52 (3.87)	5.67	9.01
High in Tasman Sea and Low in Arafura Sea	1016 1000	9/02/2001		2.17	3.76	8.79
High in Tasman Sea	1020	18/02/2001		2.01	3.51	6.63
Low off Moreton coast	1000	6/03/2001		2.48	4.31	14.89
High in Tasman Sea and Low in Coral Sea	1032 1008	28/03/2001		2.04	3.41	6.88
High over Great Australian Bight and Monsoon Lows in Coral Sea	1028 1008	2/04/2001		2.22	3.56	11.35
High in Tasman Sea and Tropical cyclone Sose in New Hebrides area	1020 990	11/04/2001	1600 E	2.87 (3.42)	4.48	14.23
High over New South Wales and Tasman Sea	1028	28/06/2001		2.06	3.51	7.75
Low between New Caledonia and New Zealand	992	6/07/2001		2.79 (3.02)	4.52	14.99
Emu Park: 2m threshold (Hsig)						
High in Tasman Sea	1024	16/11/2000		2.07	3.52	6.47
High over Tasmania	1027	31/12/2000		2.36 (2.57)	4.08	7.18
High in Tasman Sea and Monsoon trough in Torres Strait	1028 1008	6/02/2001		2.12	3.81	6.23
High in Tasman Sea	1024	14/03/2001		2.09	3.68	6.71
High in Tasman Sea and Low in Coral Sea	1028 1012	31/03/2001		2.1 (2.31)	3.47	6.63
High over Tasman Sea and Victoria	1028	28/06/2001		2.10	3.69	6.21
Mackay: 2m threshold (Hsig)						
High in Tasman Sea and Monsoon trough in Torres Strait	1024 -	26/11/2000		2.39	4.25	6.75
High in Tasman Sea	1024	1/01/2001		2.68 (2.68)	5.29	7.05
High in Tasman Sea	1024	3/01/2001		2.40	4.06	7.51
High in Tasman Sea and Monsoon trough in Torres Strait	1020 1004	8/02/2001		2.61 (2.69)	4.52	6.92
High in eastern Tasman Sea	1020	19/02/2001		2.05	3.40	6.48
Low in Coral Sea	1000	23/02/2001		2.44	3.87	7.77
High in Tasman Sea and Monsoon Lows in southern Coral Sea	1028 1012	1/04/2001		2.38	3.86	6.67
High over Victoria and developing Tropical cyclone Sose in New Hebrides area	1024 1003	5/04/2001	2100 ENE	2.51 (2.55)	4.40	7.50
High in Tasman Sea	1028	14/04/2001		2.03	3.52	7.21
High over NSW	1024	30/06/2001		2.39	4.09	7.05
High in Tasman Sea	1030	20/09/2001		2.05	3.74	6.84
Weipa: 1.5m threshold (Hsig)						
Tropical cyclone Winsome	992	11/02/2001	600 WSW	1.75	2.93	10.48
Monsoon trough over northern Australia (tropical cyclone Wylva from 16/02/2001)	1004	15/02/2001		2.54 (2.67)	4.21	8.82
Tropical cyclone Abigail	1000	26/02/2001	450 SSW	2.28 (2.46)	3.67	8.70

Table 5
Major meteorological events (cont'd)

Meteorological event	Central pressure (hpa)	Date	Estimated position of cyclone relative to buoy (km)	Maximum Hsig recorded (Note 1) (m)	Maximum Hmax recorded (Note 2) (m)	Tp (Note 3) (s)
Dunk Island: 1.5m threshold (Hsig)						
High in Tasman Sea and Monsoon trough in Torres Strait	1024	5/12/2000		1.75	2.91	5.69
High in Tasman Sea	1024	4/01/2001		1.67	3.09	5.73
High in Tasman Sea and Monsoon trough in Torres Strait	1020 1004	8/02/2001		1.81 (1.94)	3.31	5.81
High in Tasman Sea and Low in Arafura Sea	1012 996	10/02/2001		1.52	2.74	5.52
High in Tasman Sea	1020	17/02/2001		1.94 (2.16)	3.58	6.14
Tropical cyclone Abigail	1000	24/02/2001	150 ENE	1.81 (1.92)	3.22	6.01
High in Tasman Sea	1024	30/03/2001		2.05 (2.15)	3.45	6.22
High over New South Wales and formation of tropical cyclone Sose in New Hebrides area	1024 1003	5/04/2001	2250 E	1.54	2.77	5.40
High over New South Wales	1028	13/04/2001		1.75	3.29	5.88

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. & Vanderschuren L. (1996), Effect of Sampling Variability on Hindcast and Measured Wave Heights, *Journal of Waterway, Port, Coastal and Ocean Engineering*, 122 (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.

Sites listed as operational but not listed in the above table did not record wave heights exceeding the storm threshold.

For the seasonal year, the highest Significant Wave Height (Hsig) was 4.87m (5.43m un-smoothed) and the highest Maximum Wave Height (Hmax) was 8.07m (8.59m un-smoothed), both recorded at the Brisbane station on the 1 February 2001 during the presence of a High in the Tasman Sea and a Low over south-east Queensland. (The highest un-smoothed Maximum Wave Height of 8.93m was recorded on 12 April, 2001.)

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

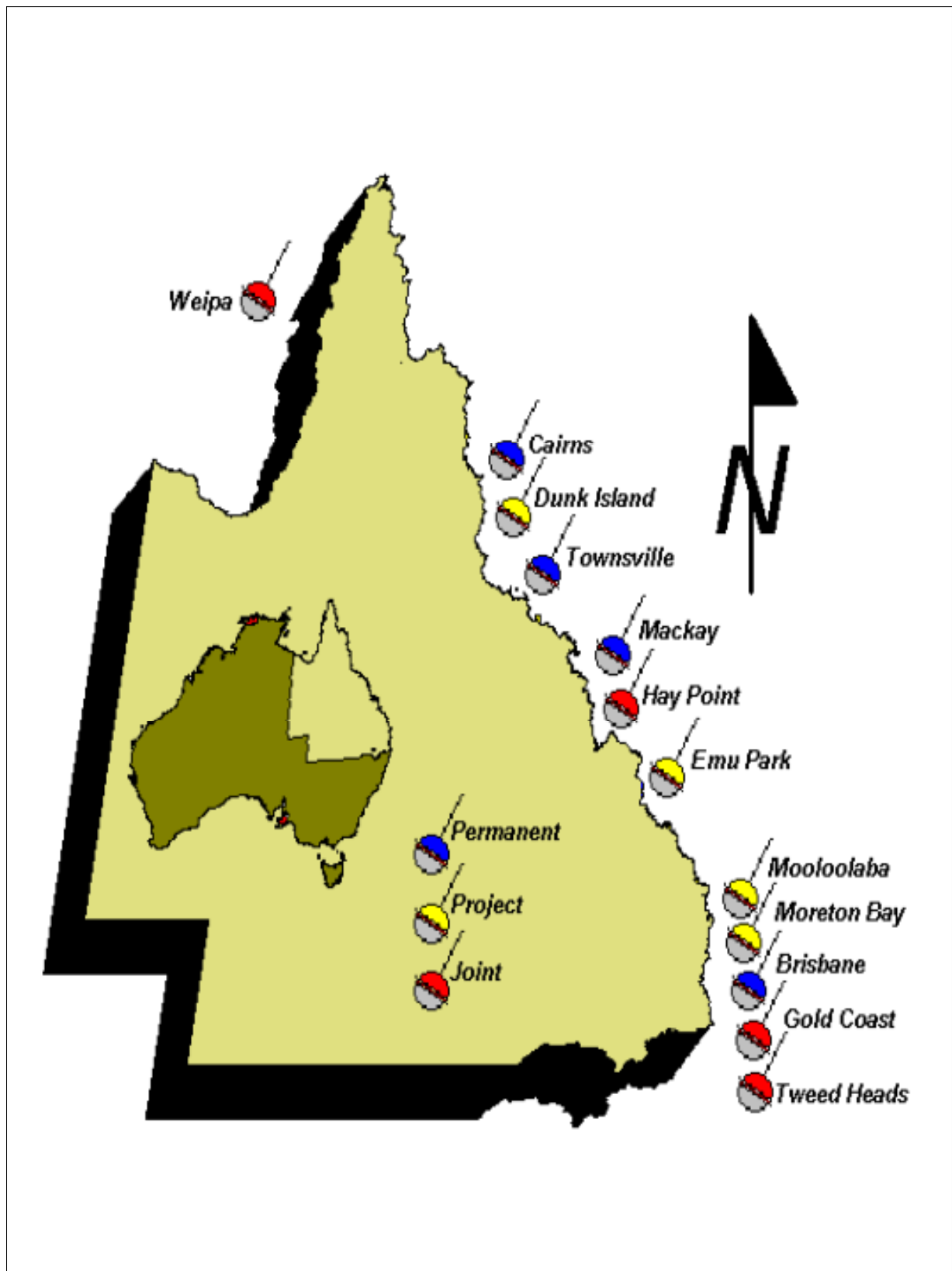
Table 6
Queensland cyclones
for season 2000–01

Cyclone	Date
Wylva	February 2001
Abigail	February 2001

Cyclone tracks are shown in figure 13.

Notes:

Tropical cyclones Winsome and Sose are not shown in table 6 or figure 13 because they occurred outside the Queensland region, however they did impact on wave conditions at some stations.



Wave recording sites—Locality plan

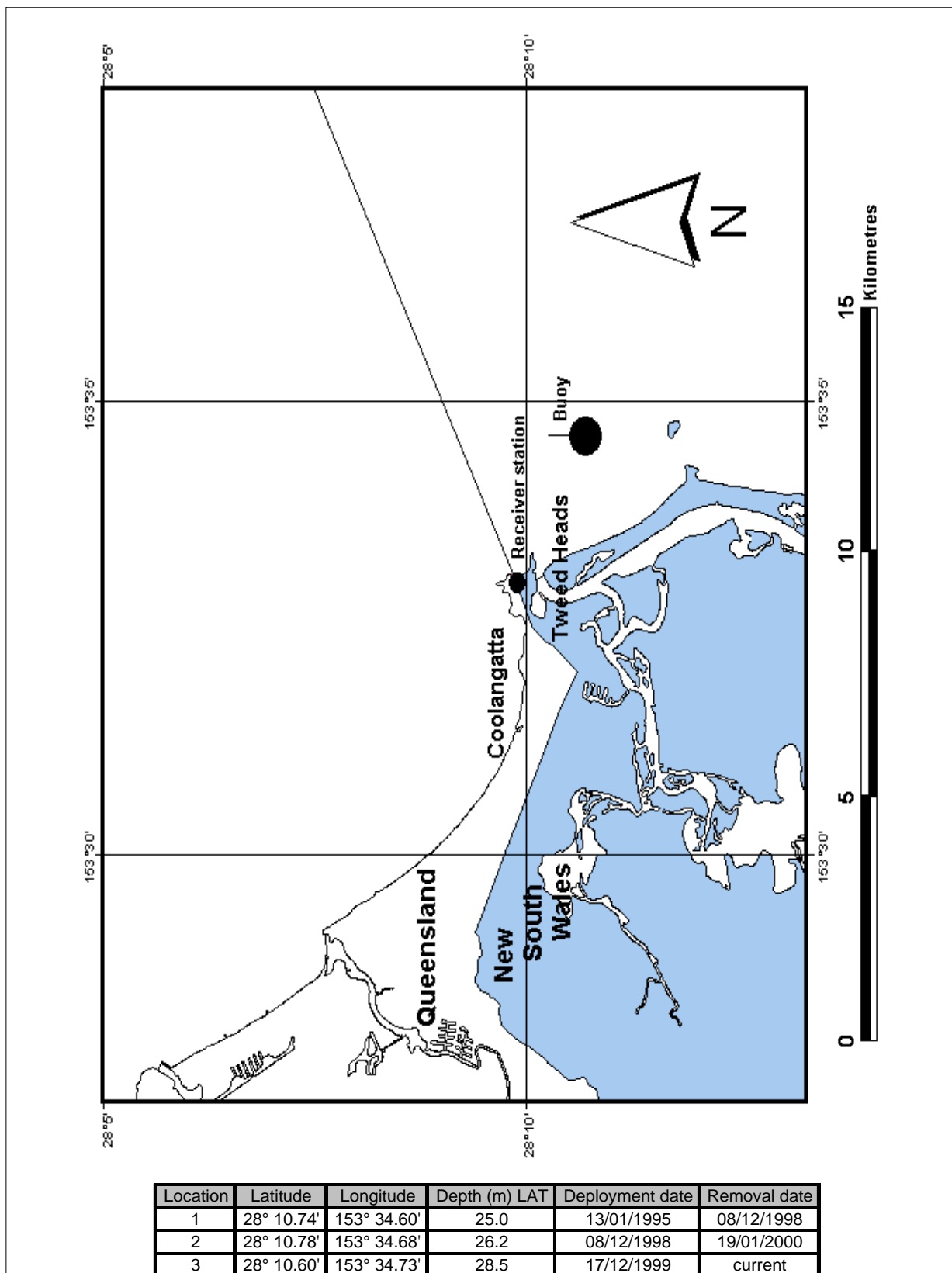
Tweed

Wave recording station

Details of wave recorder installation

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 363.467
Gaps in data from selected dates (days)	= 1.533
Gaps in data from duration analysis (days)	= 1.533
Number of records used in analysis	= 16,245

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



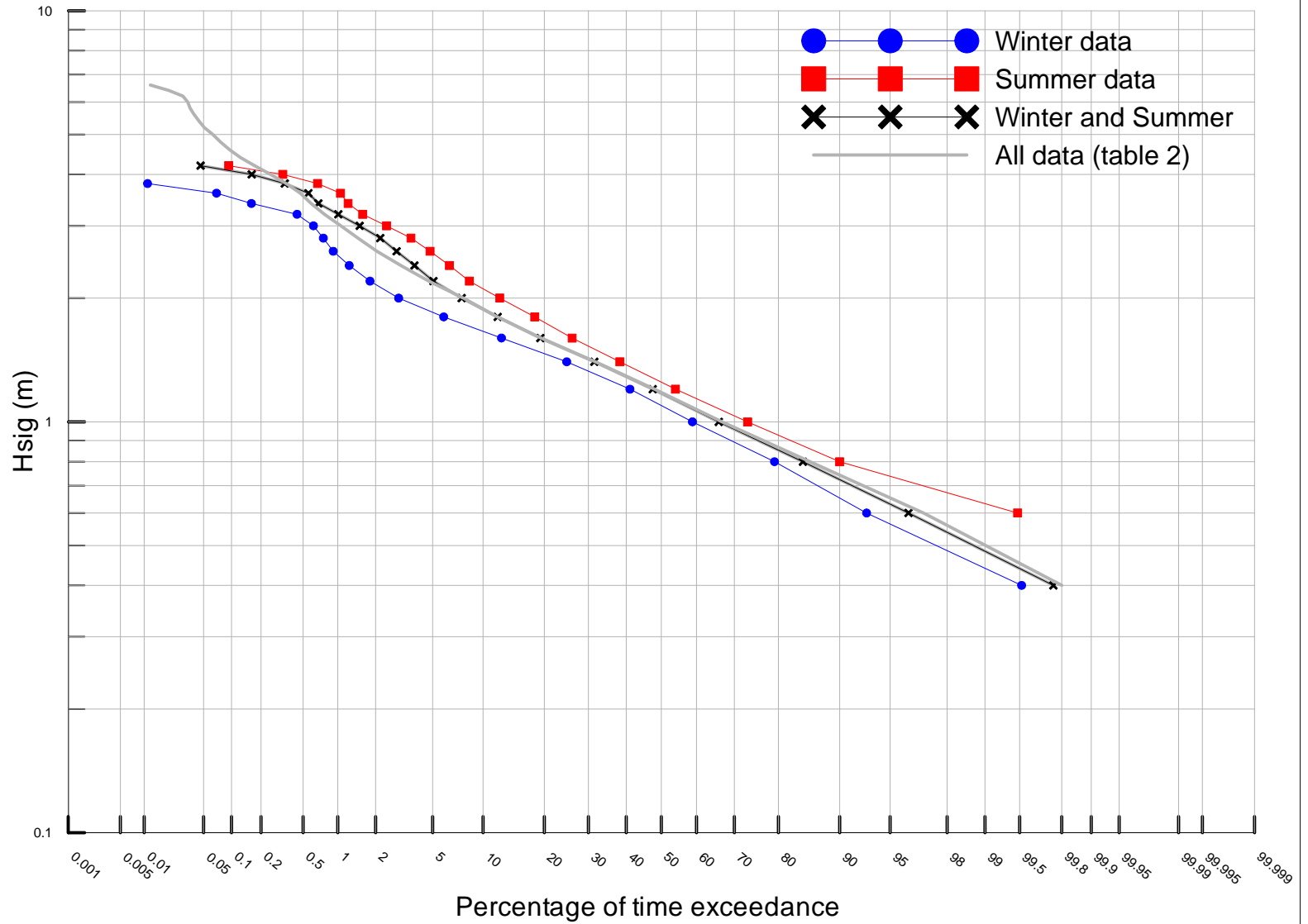
Tweed region—Locality plan

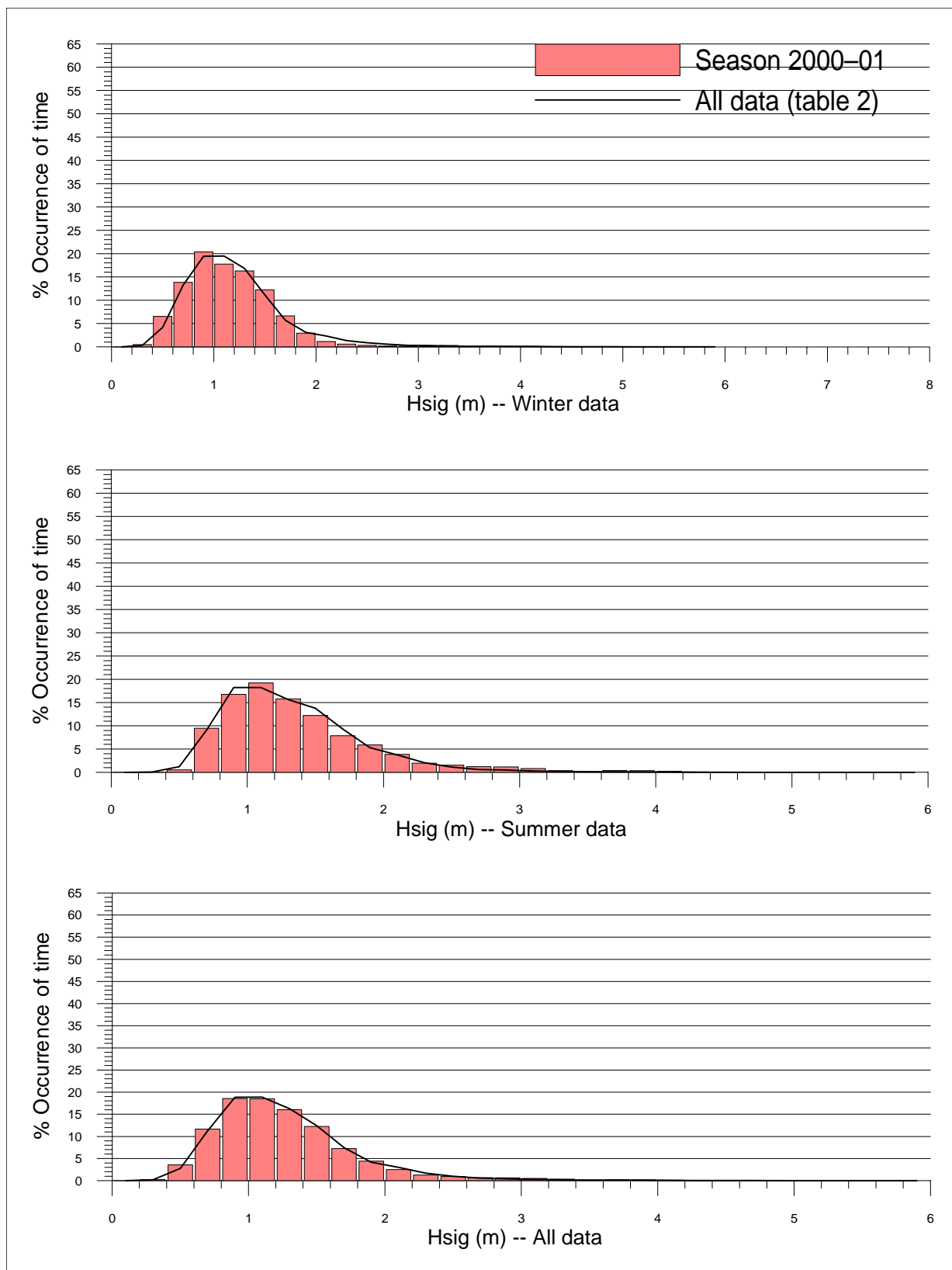


Wave data recording program
Annual summary for season 2000–01


Figure 1.1

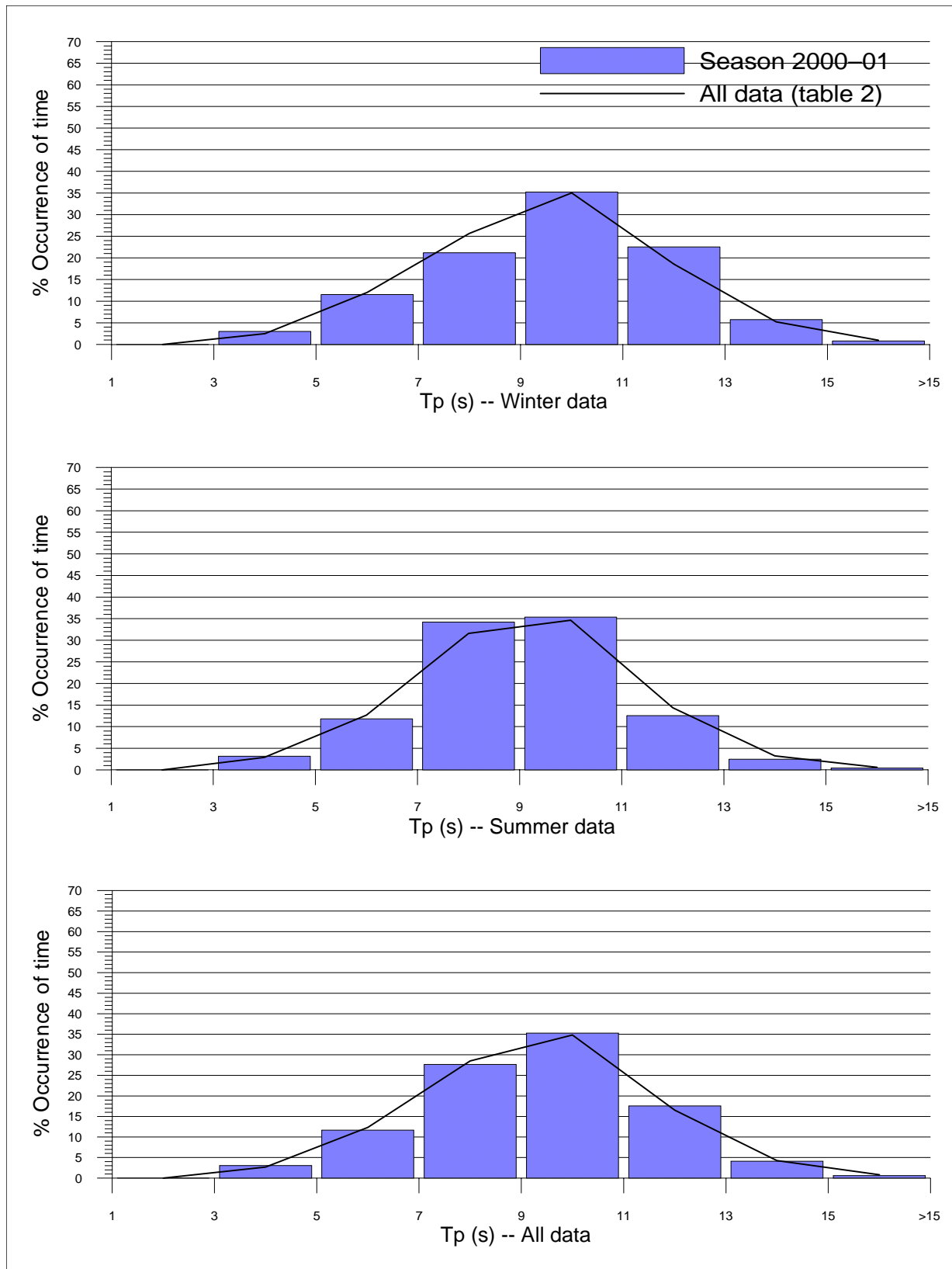
Tweed region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)





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

 <p>Queensland Government Environmental Protection Agency</p>	<p>Wave data recording program Annual summary for season 2000-01</p>	<p>Figure 1.3</p>
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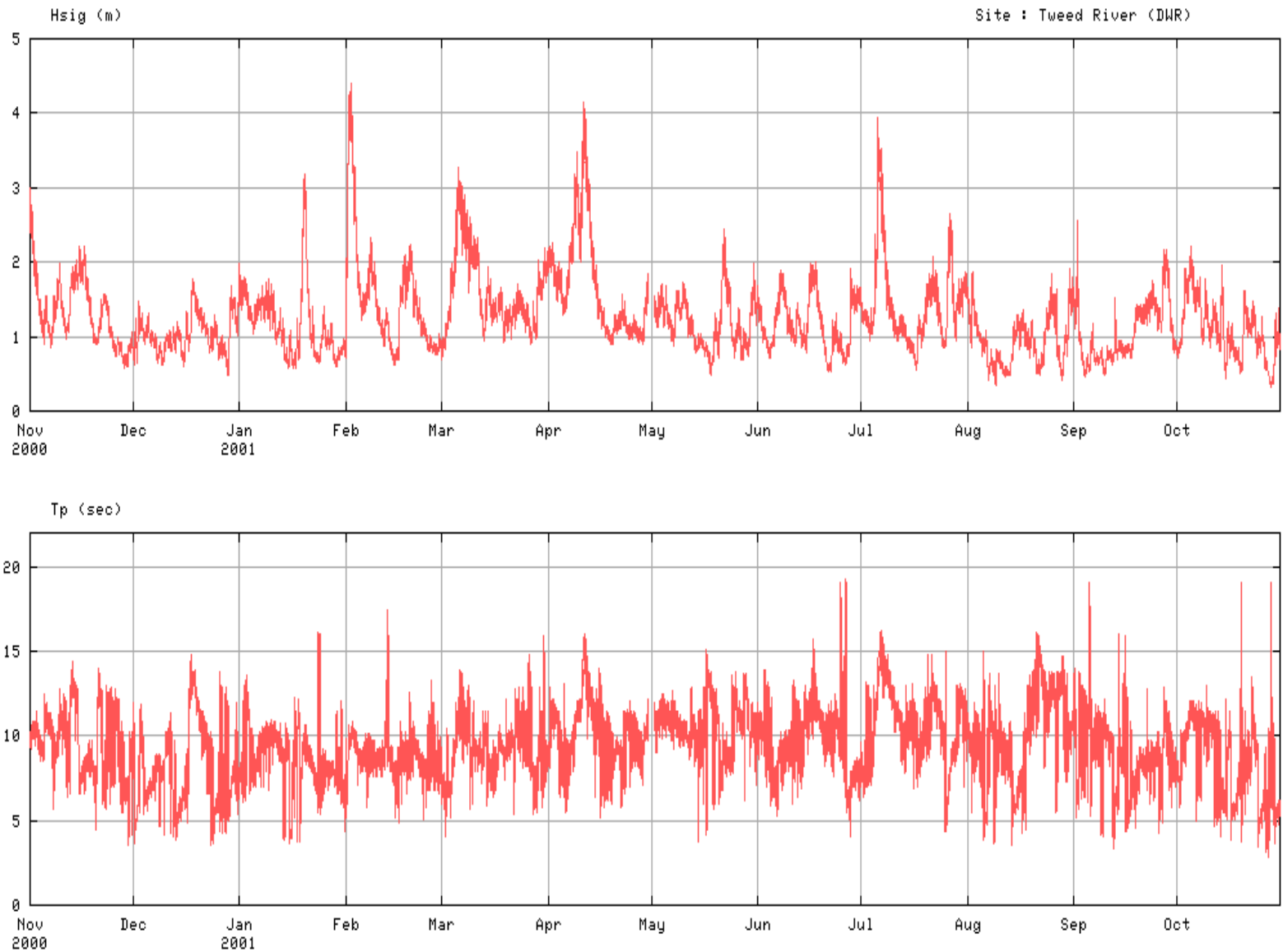
Tweed region—Histogram percentage (of time) occurrence of wave periods (T_p) for all wave heights (H_{sig})



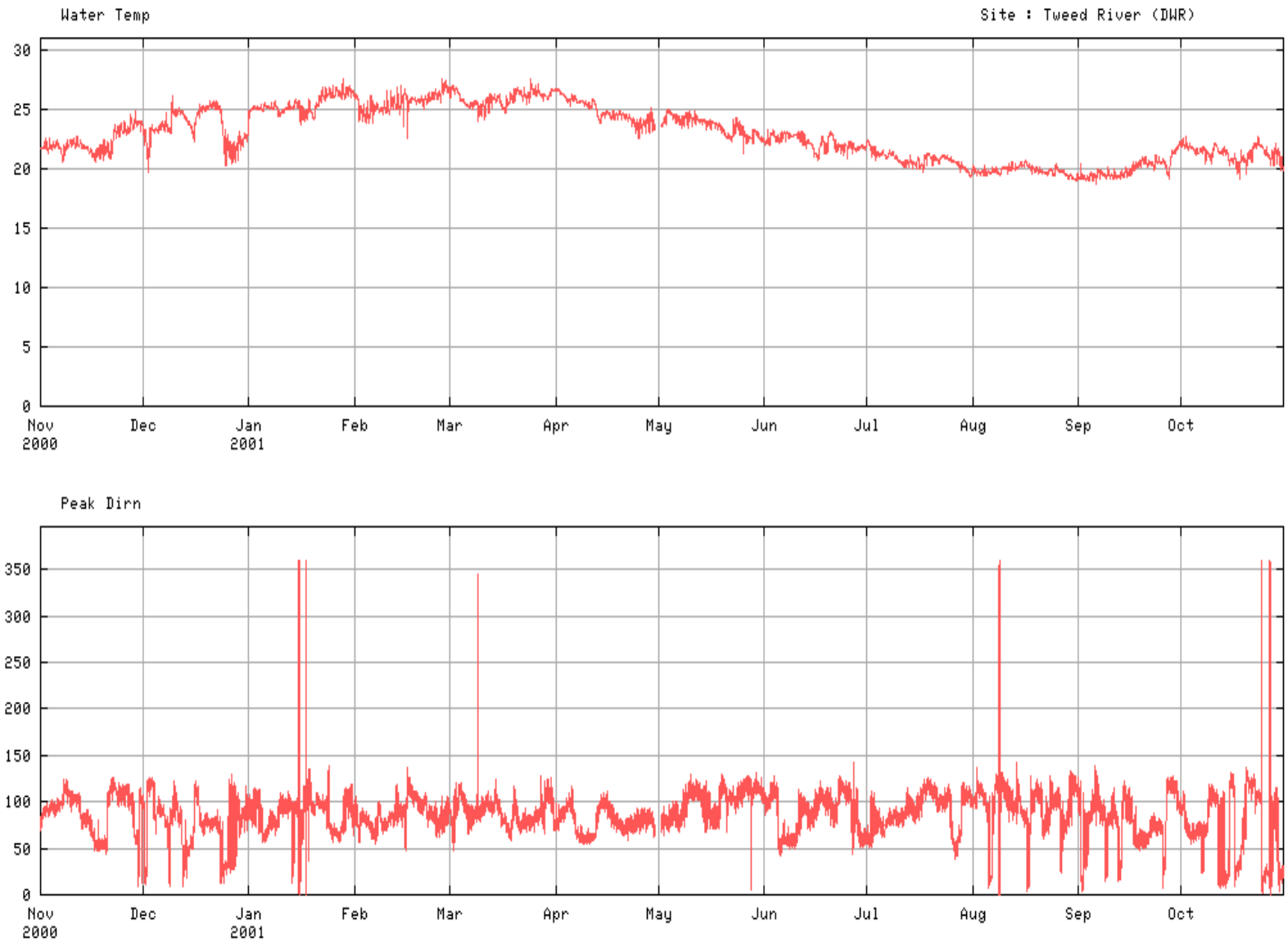
Wave data recording program
Annual summary for season 2000-01

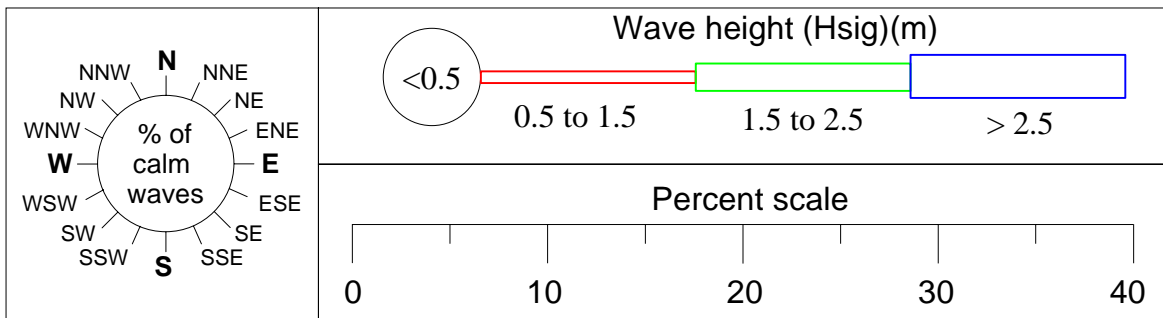
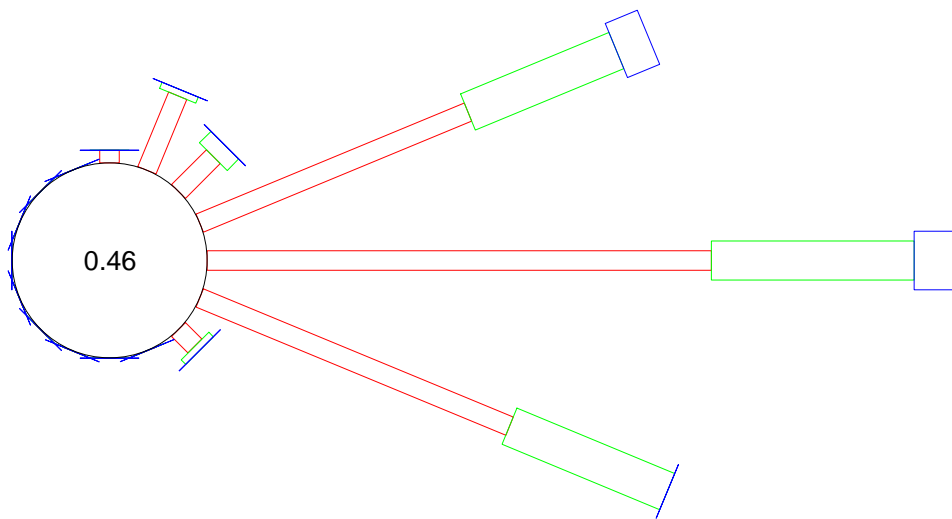
Figure 1.4

Tweed region—Daily wave recordings



Tweed region—Water temperature
and peak direction recordings





Tweed region—Directional wave rose



Wave data recording program
Annual summary for season 2000–01

Figure 1.7

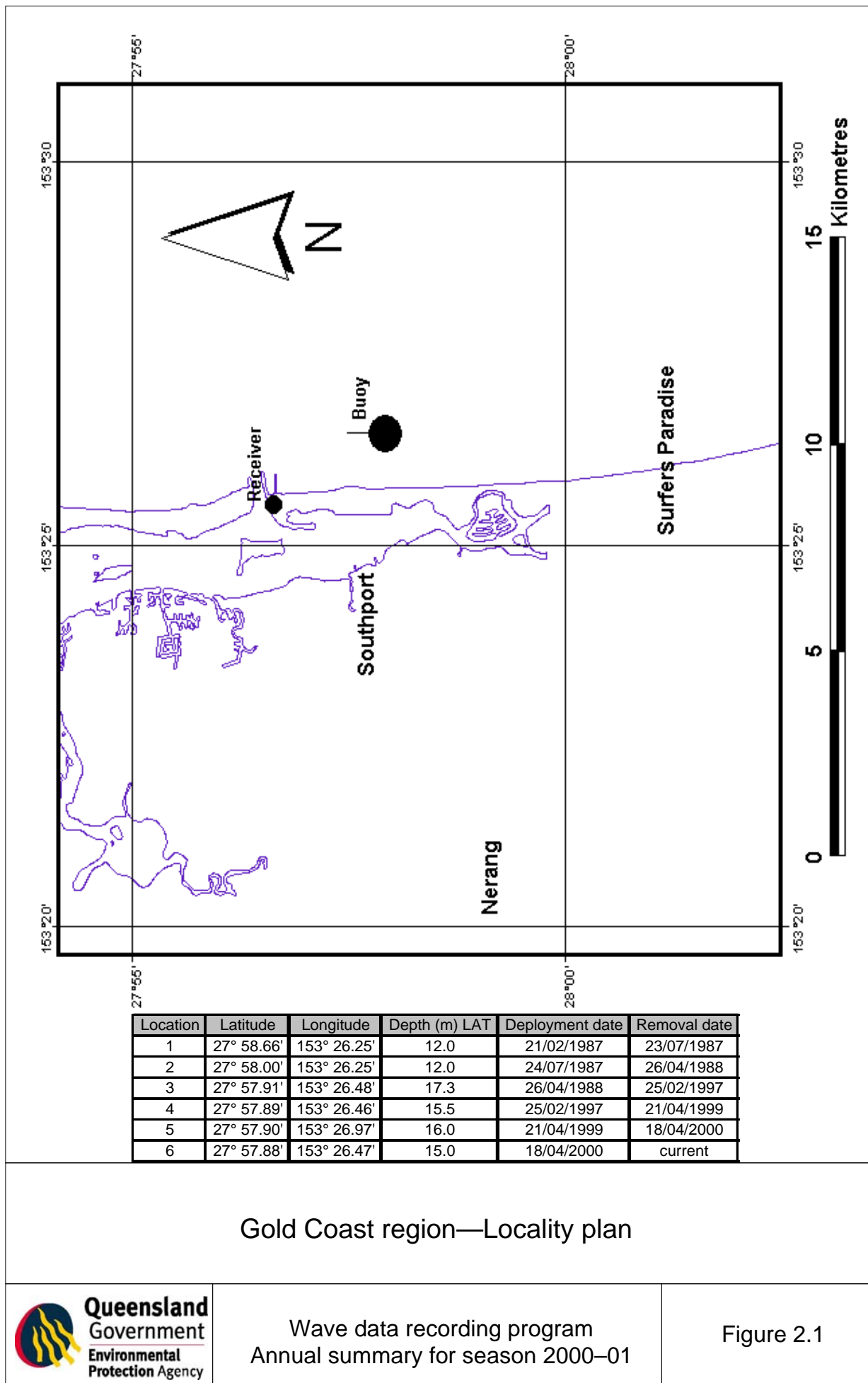
Gold Coast

Wave recording station

Details of wave recorder installation

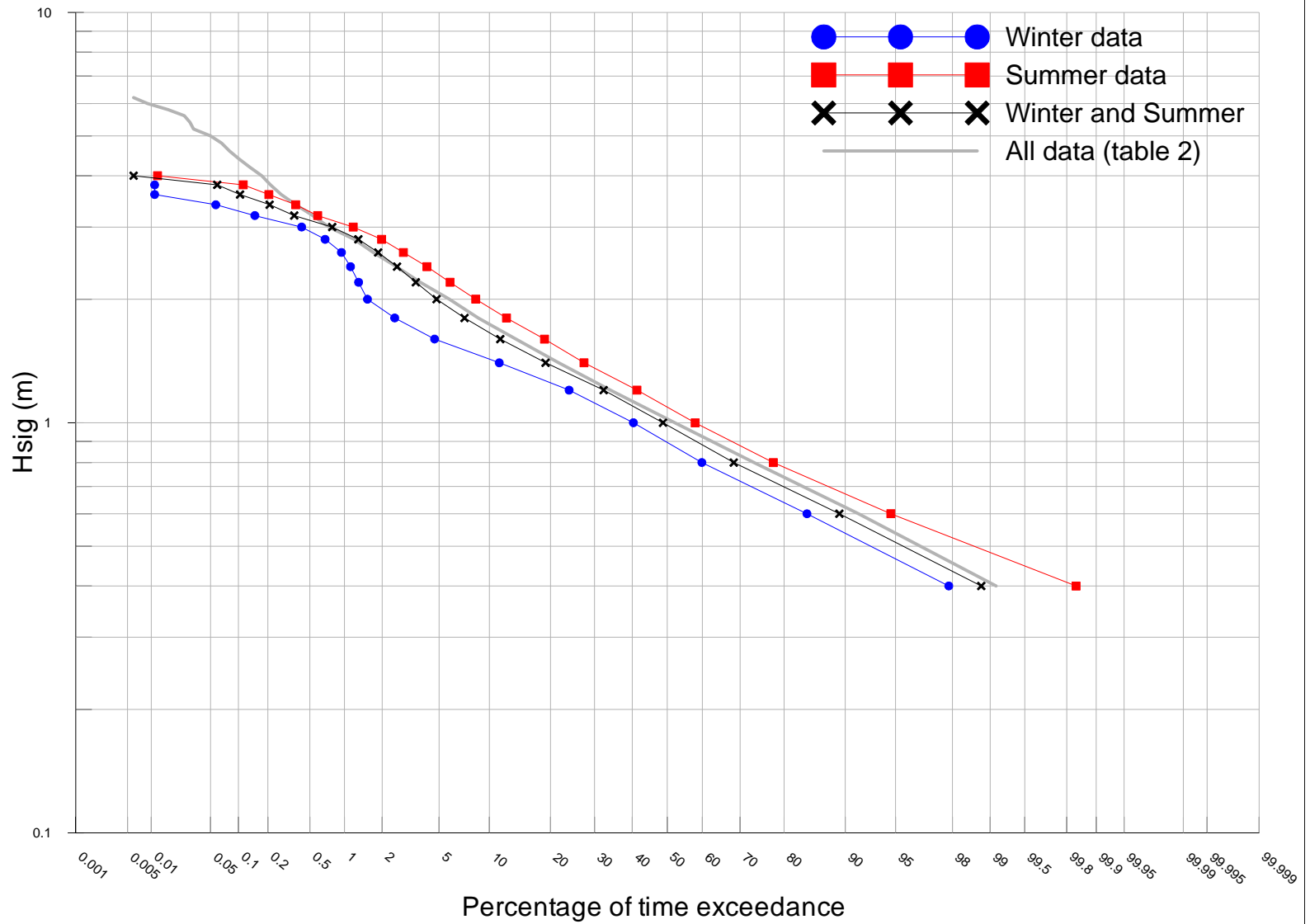
Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 352.352
Gaps in data from selected dates (days)	= 12.648
Gaps in data from duration analysis (days)	= 12.647
Number of records used in analysis	= 15,641

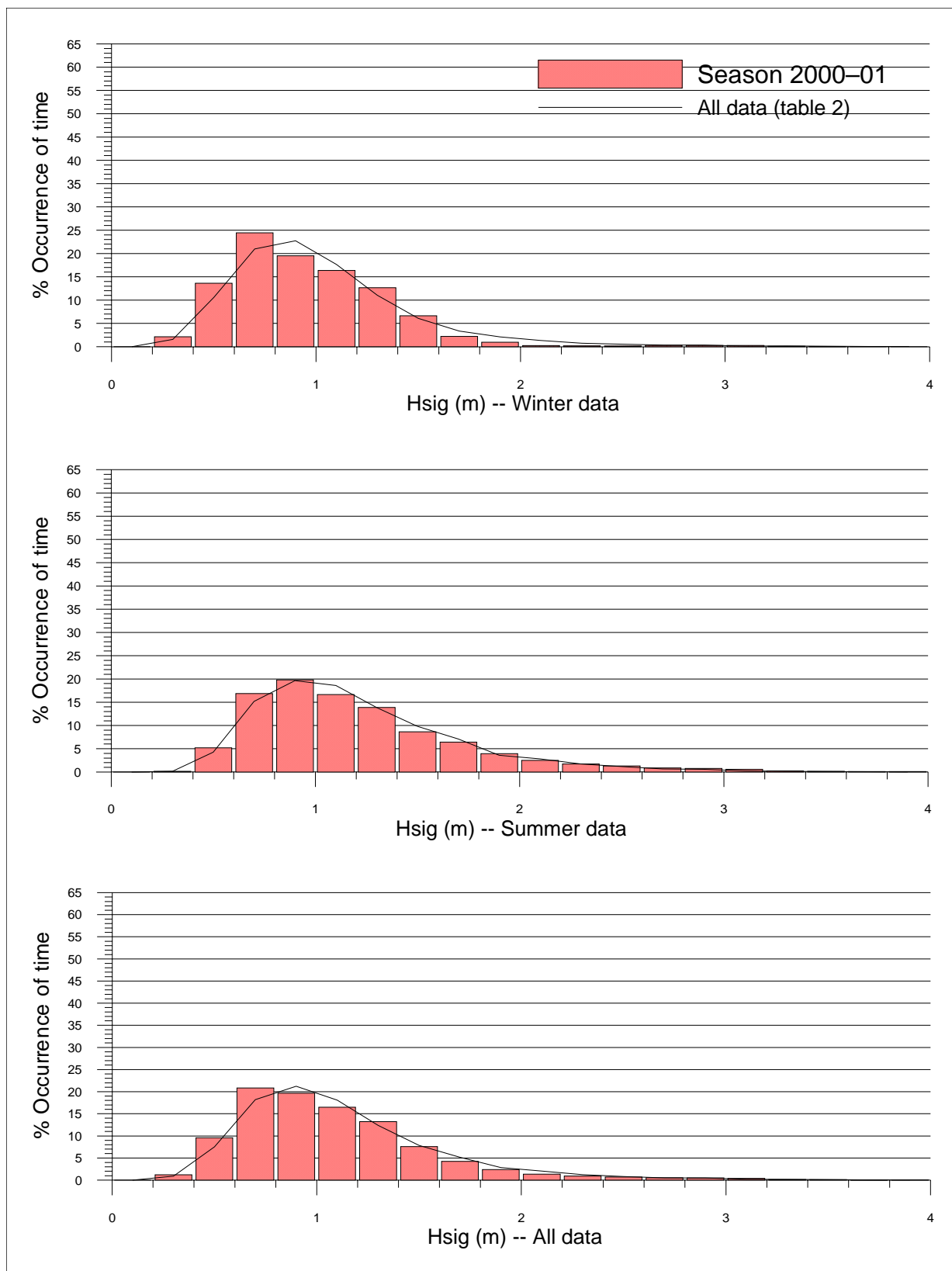
HAT at nearest standard port: Gold Coast seaway, 1.89m





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



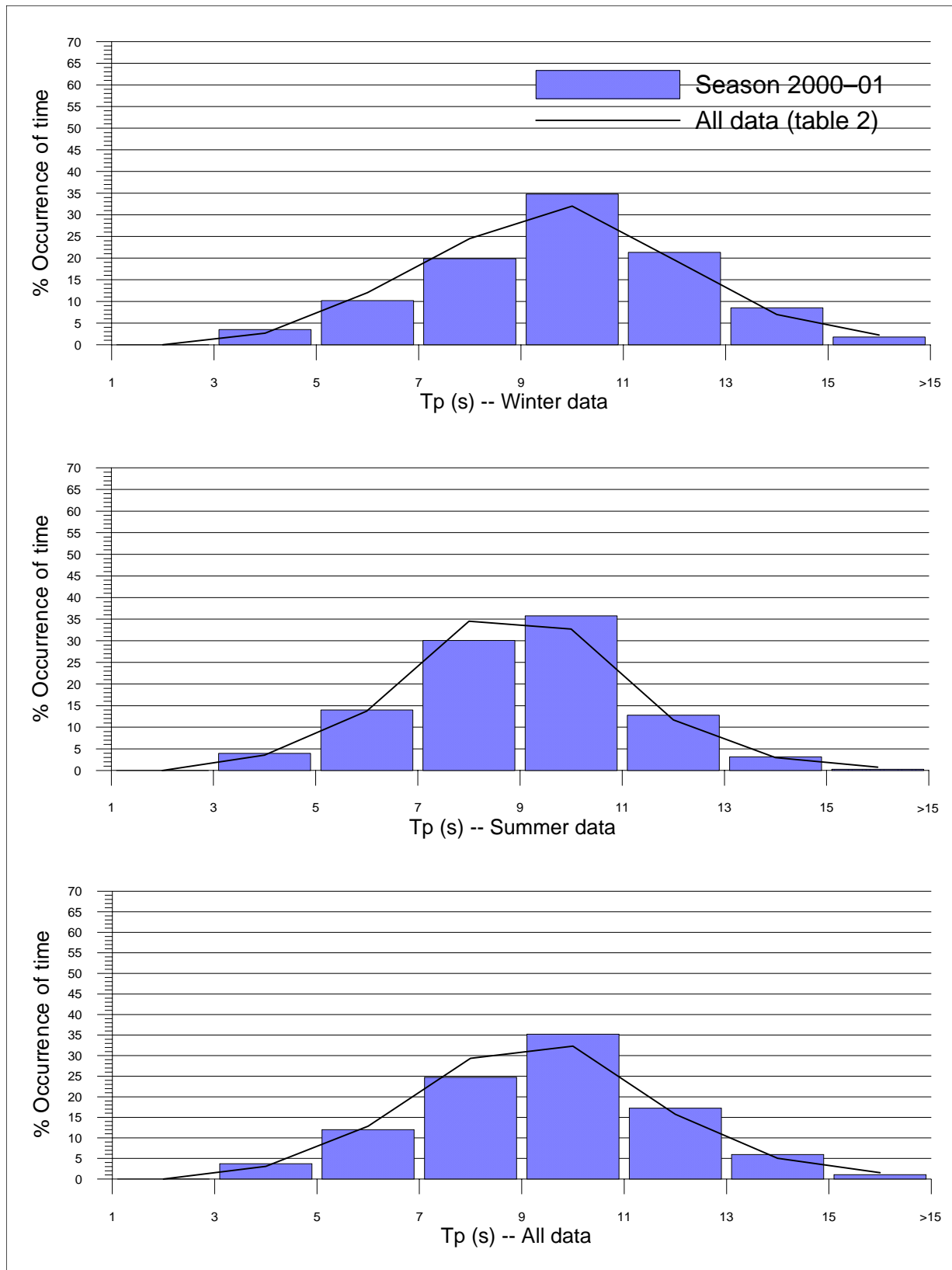


Gold Coast region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 2.3



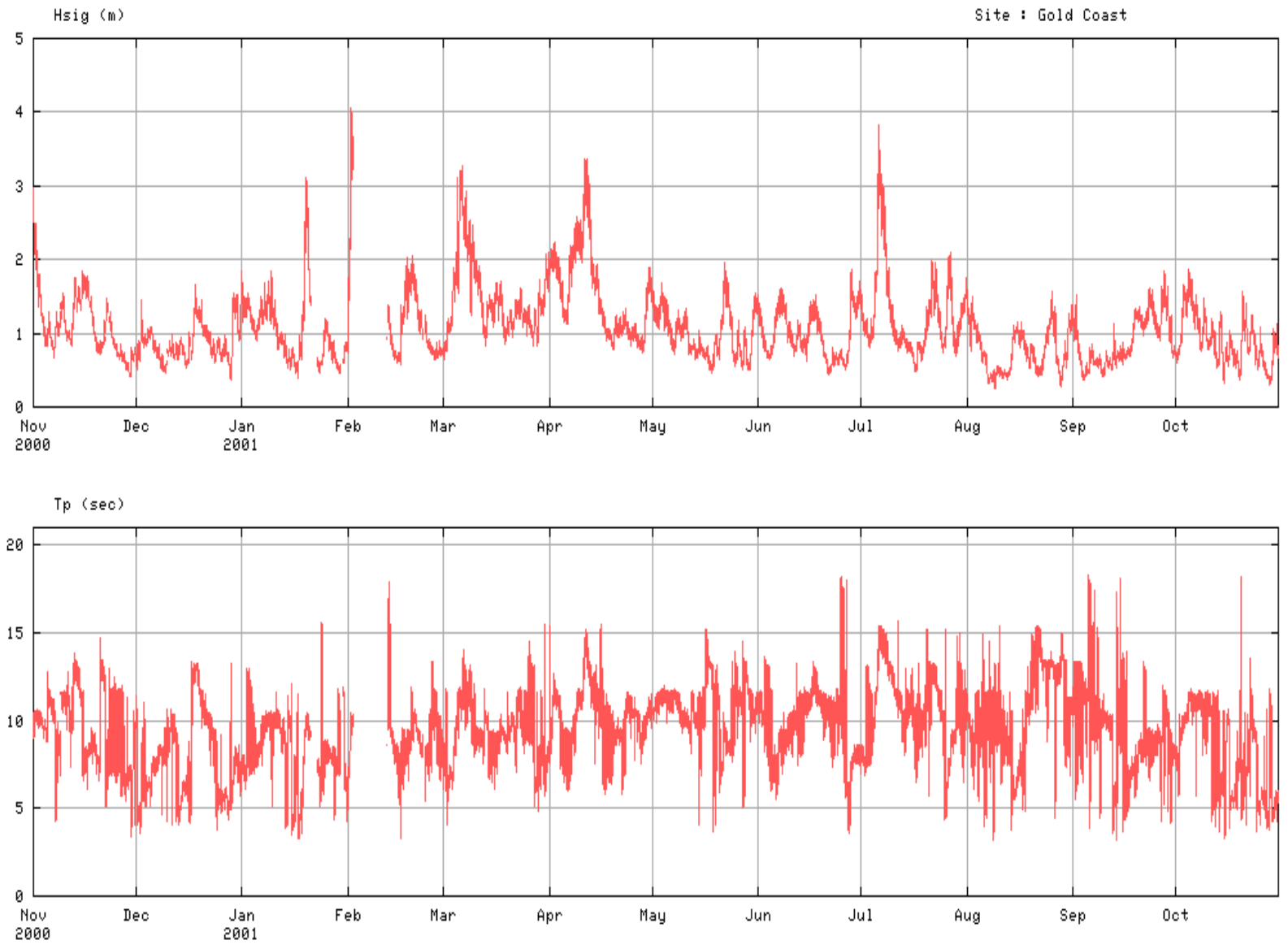
Gold Coast region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



Wave data recording program
Annual summary for season 2000-01

Figure 2.4

Gold Coast region—Daily wave recordings



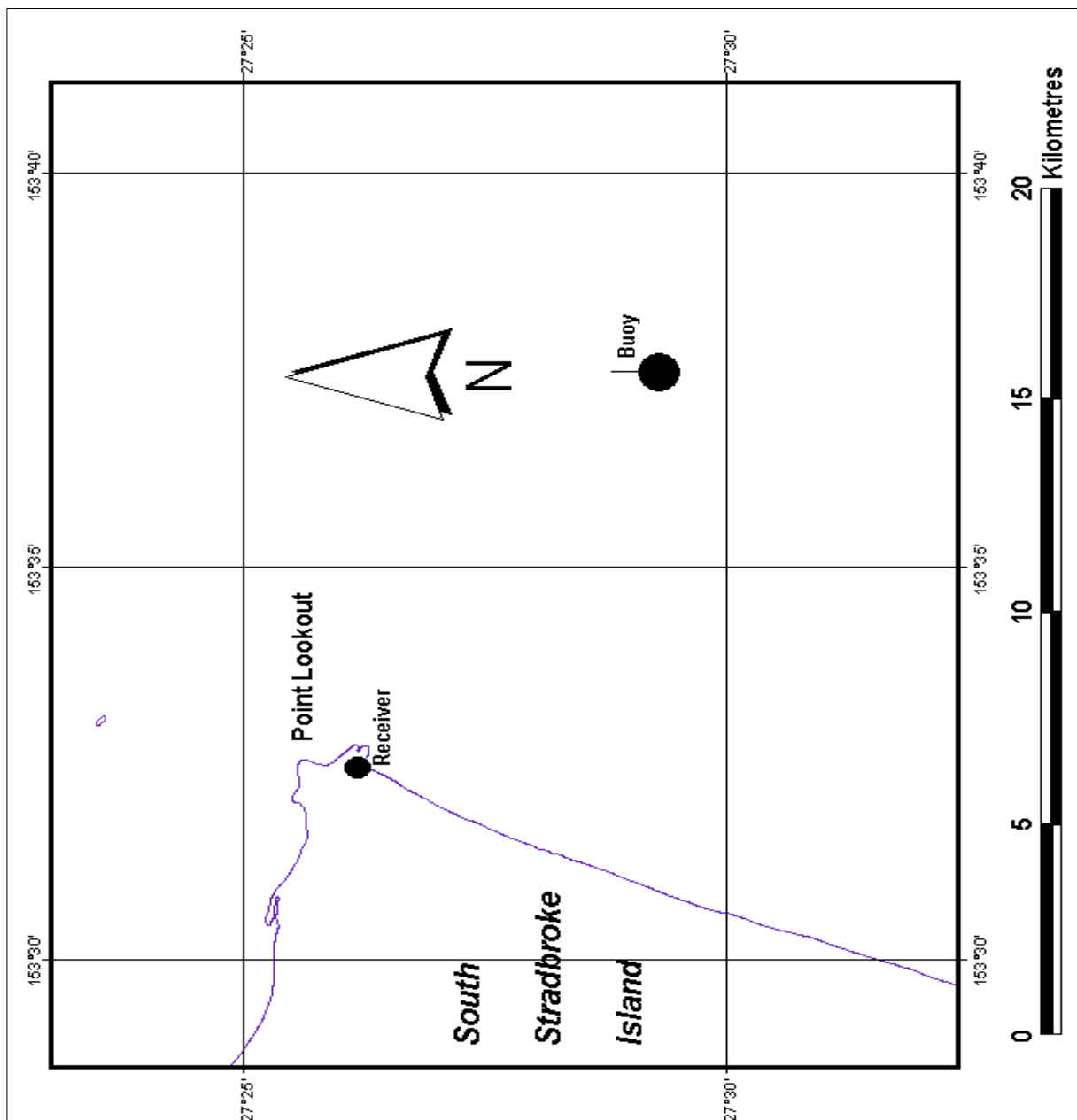
Brisbane

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 364.875
Gaps in data from selected dates (days)	= 0.125
Gaps in data from duration analysis (days)	= 0.125
Number of records used in analysis	= 15,726

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



Location	Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
1	27° 25.00'	153° 37.00'	70.0	30/10/1976	25/11/1988
2	27° 29.00'	153° 37.00'	80.0	25/11/1988	31/10/1991
3	27° 24.22'	153° 37.00'	82.0	31/10/1991	13/07/1994
4	27° 24.40'	153° 37.14'	78.0	13/07/1994	28/08/1994
5	27° 29.47'	153° 37.47'	70.0	29/08/1994	05/02/1996
6	27° 29.32'	153° 37.44'	70.0	08/02/1996	17/03/1998
7	27° 29.57'	153° 37.43'	68.0	18/03/1998	04/03/1999
8	27° 29.46'	153° 37.45'	69.5	04/03/1999	22/02/2000
9	27° 29.28'	153° 37.39'	70.0	02/03/2000	16/05/2001
10	27° 29.53'	153° 37.41'	70.0	16/05/2001	-
11	27° 29.60'	153° 37.44'	70.0	13/06/2001	current

Brisbane region—Locality plan

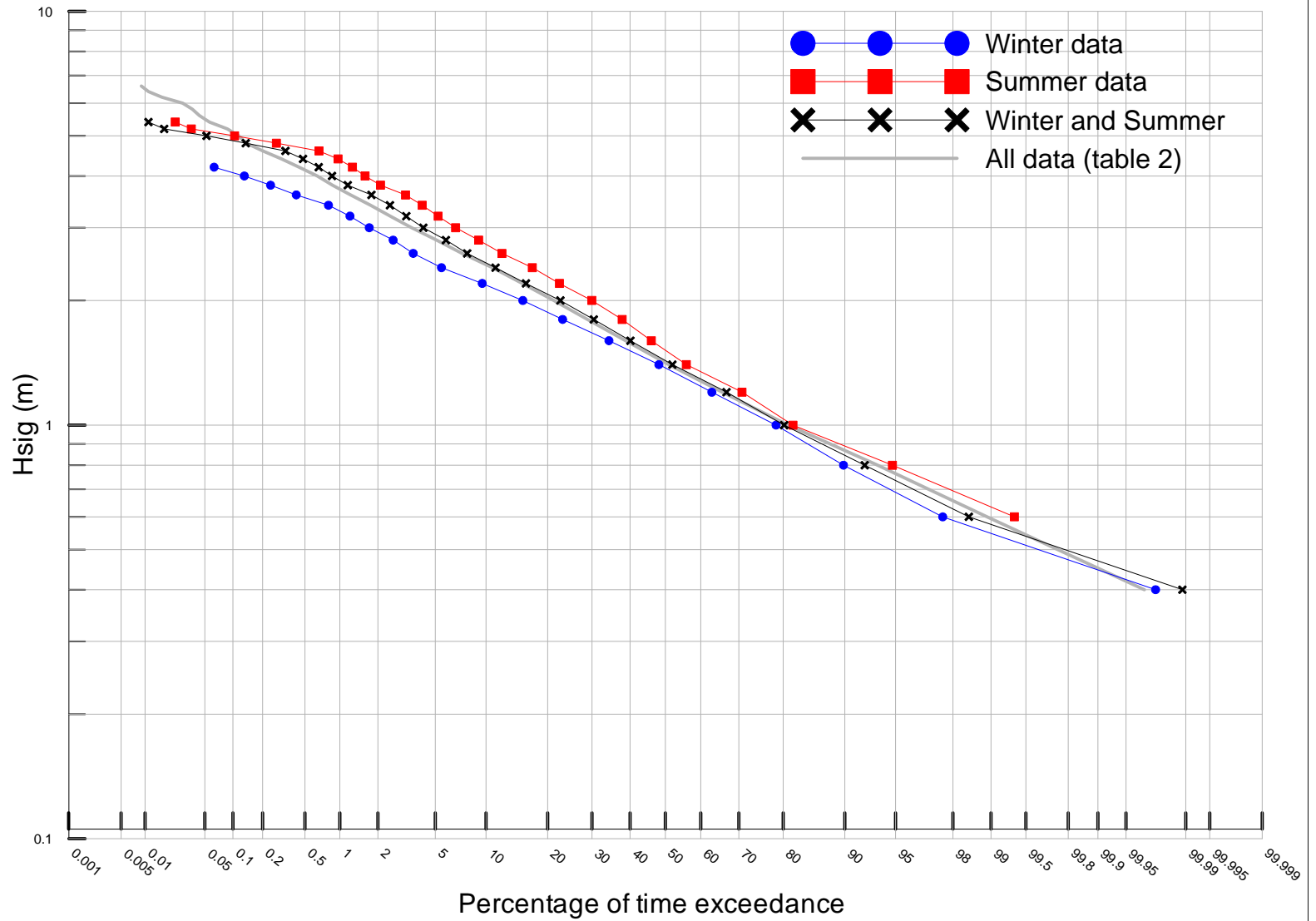


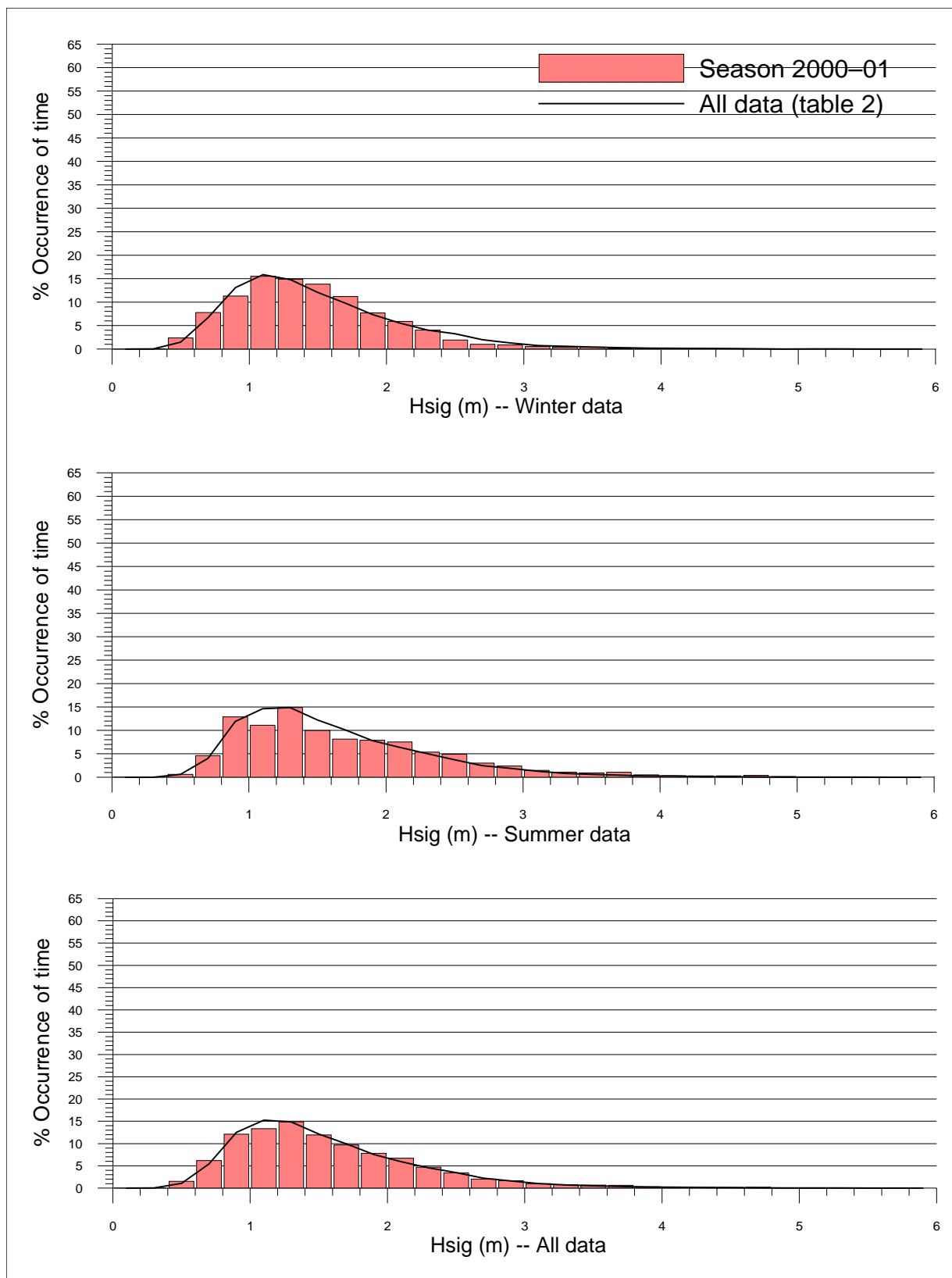
Wave data recording program
Annual summary for season 2000–01

Figure 3.1



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



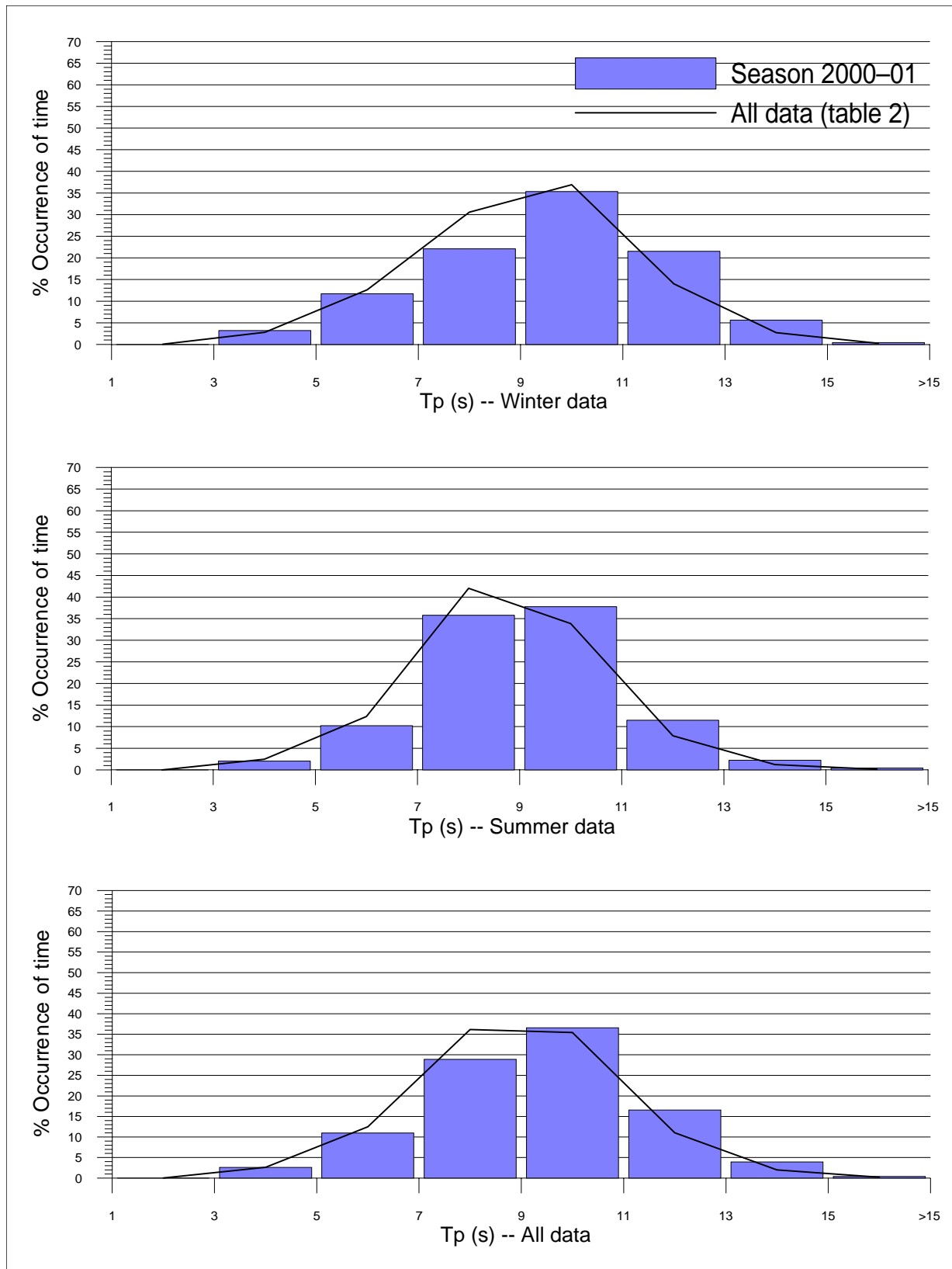


Brisbane region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 3.3



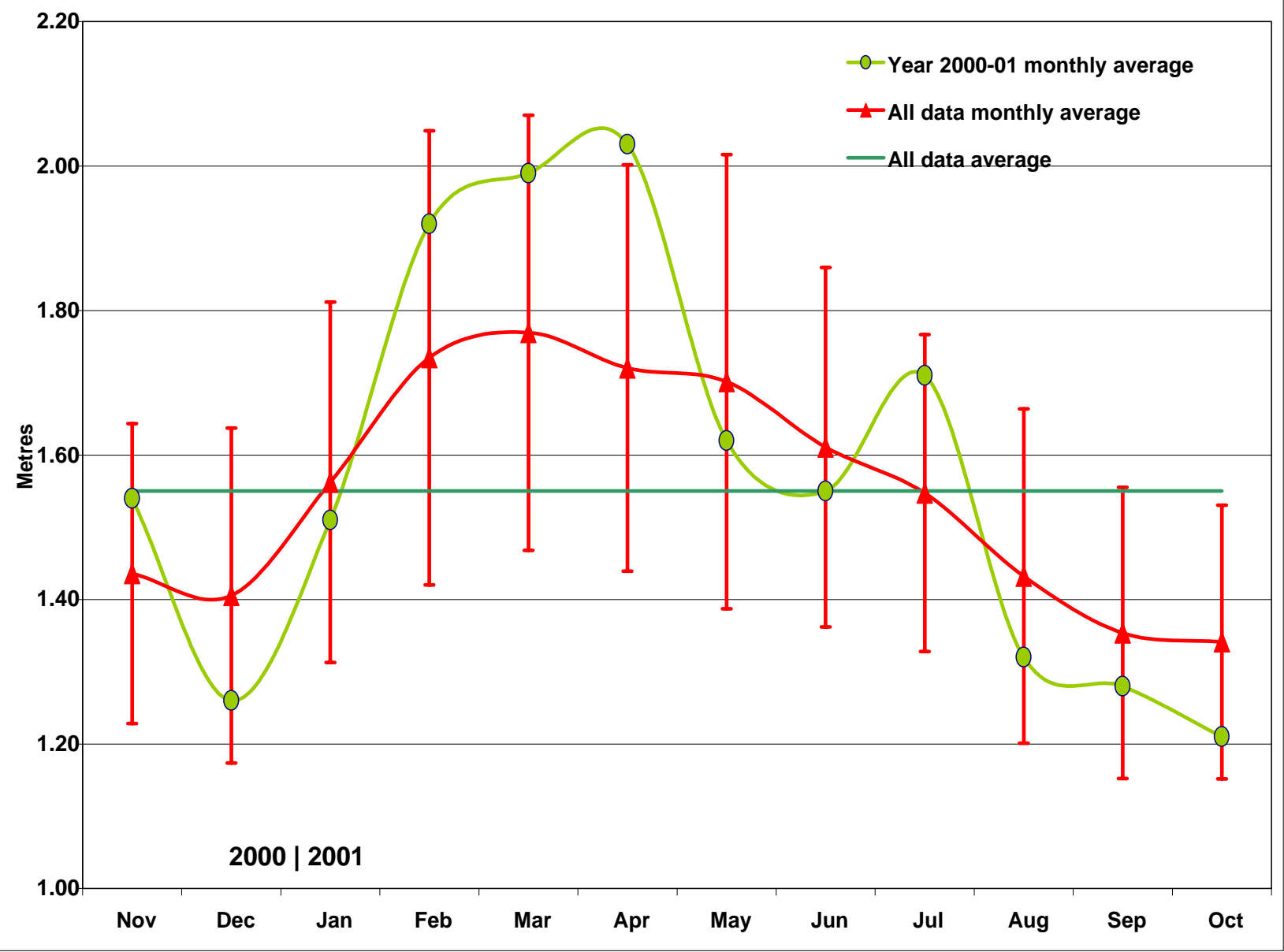
Brisbane region—Histogram percentage (of time) occurrence of wave periods (T_p) for all wave heights (H_{sig})



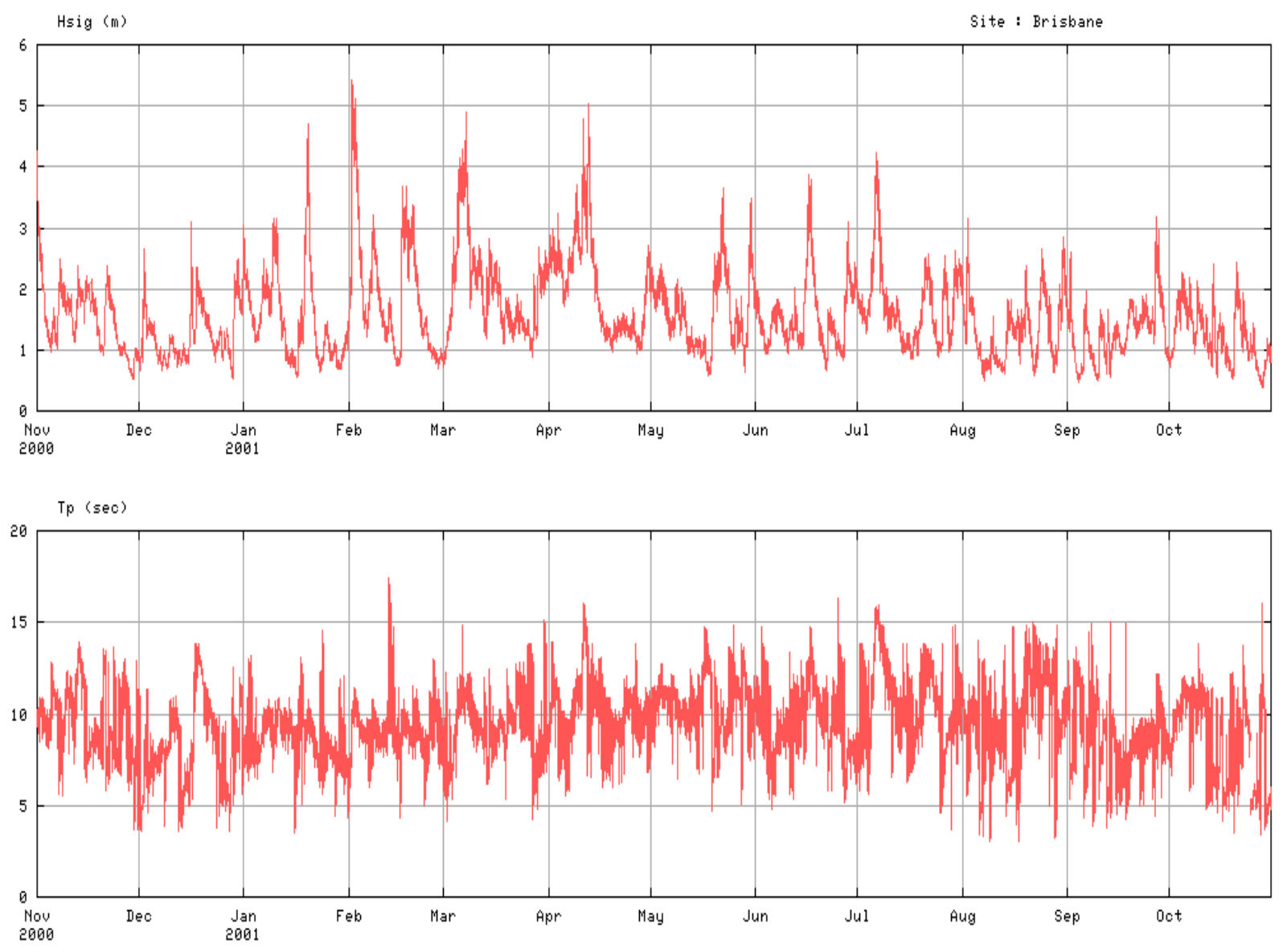
Wave data recording program
Annual summary for season 2000-01

Figure 3.4

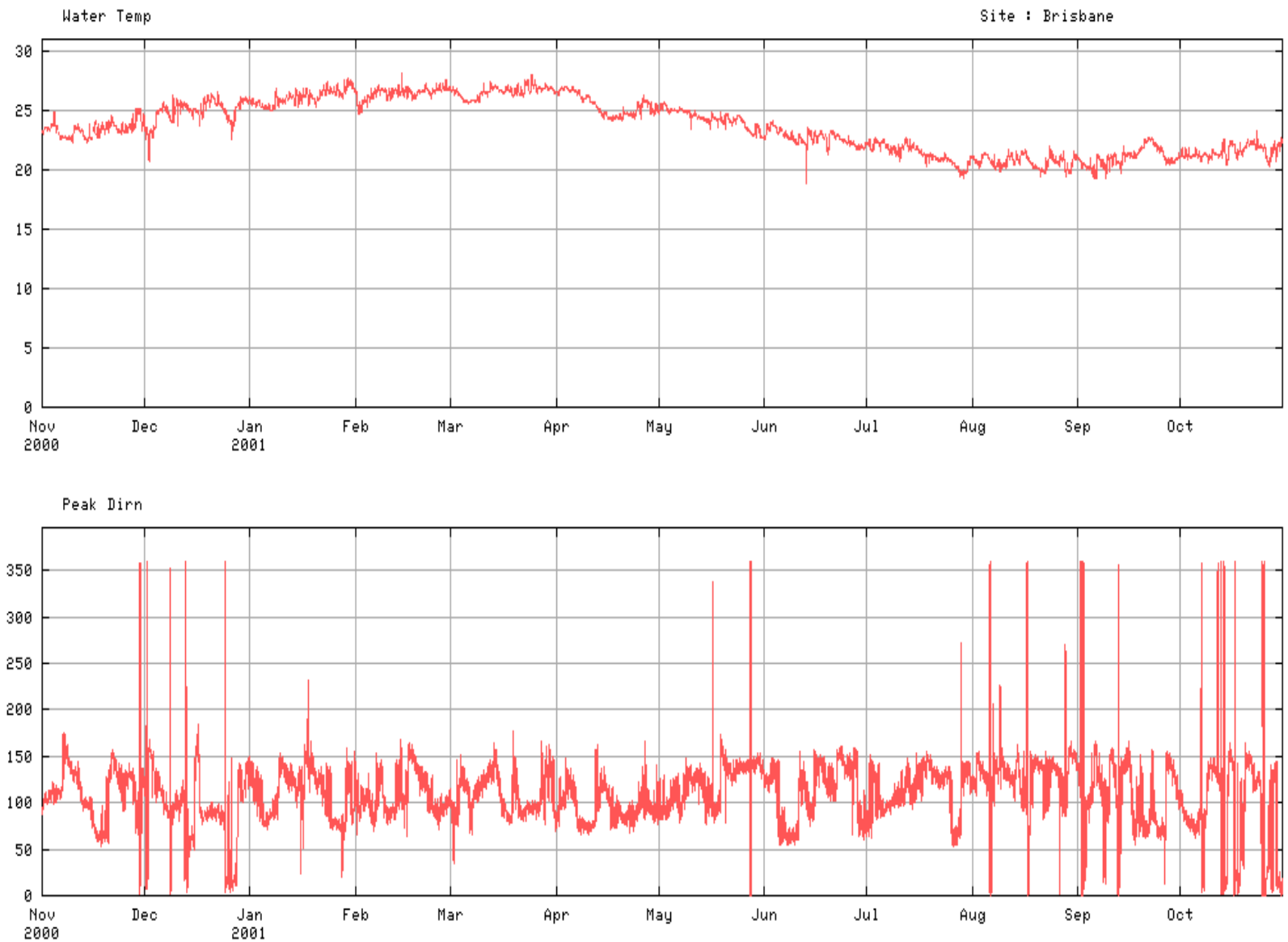
Brisbane region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)

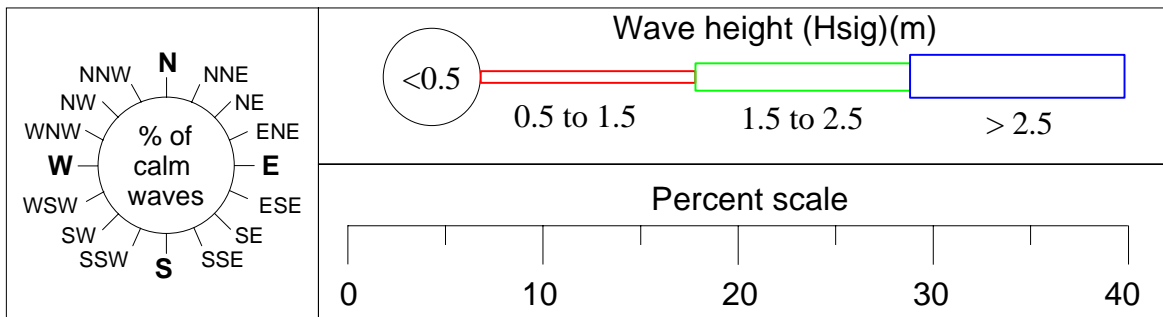
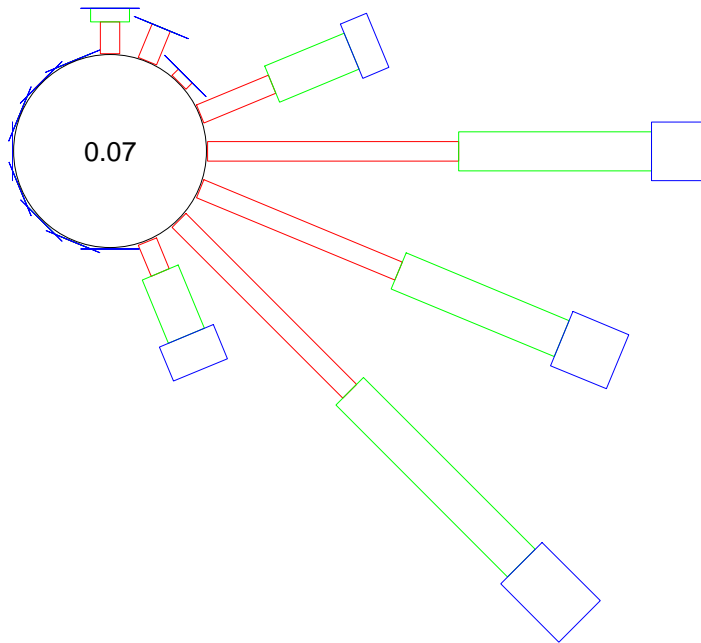


Brisbane region—Daily wave recordings



Brisbane region—Water temperature and peak direction recordings





Brisbane region—Directional wave rose



Wave data recording program
Annual summary for season 2000–01

Figure 3.8

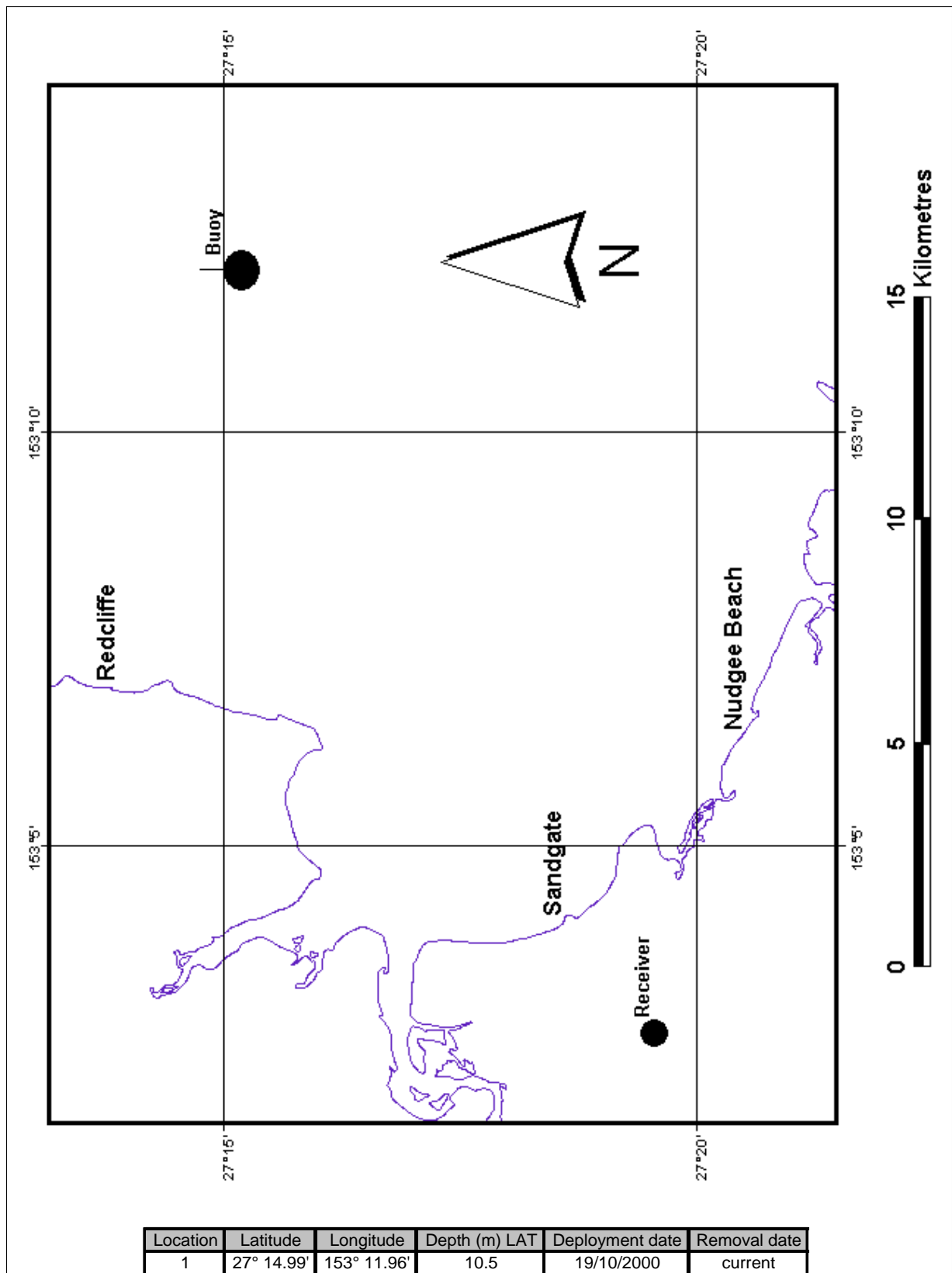
Moreton Bay

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 364.312
Gaps in data from selected dates (days)	= 0.688
Gaps in data from duration analysis (days)	= 2.250
Number of records used in analysis	= 16,132

HAT at nearest standard port: Brisbane bar, 2.71m



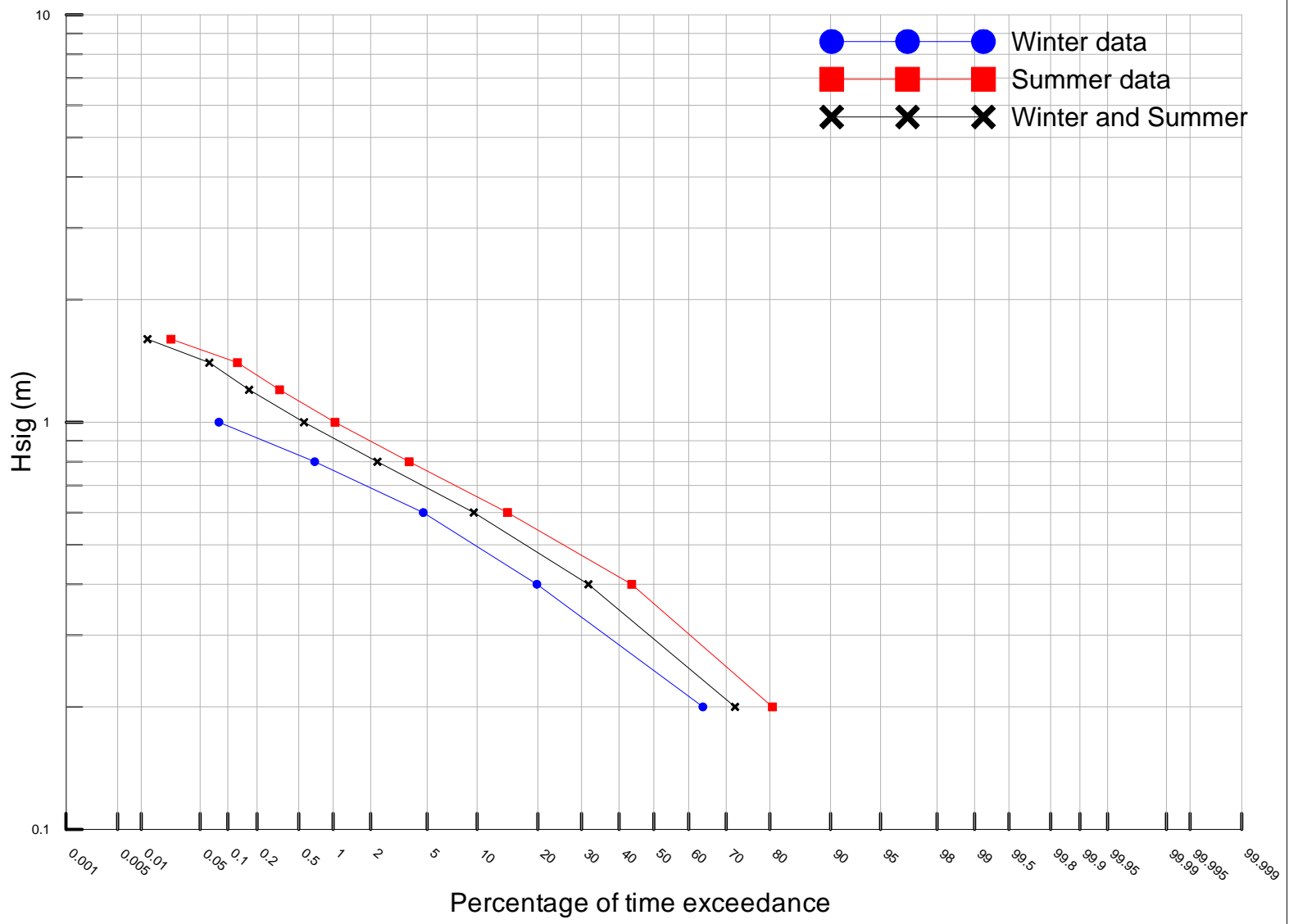
Moreton Bay region—Locality plan

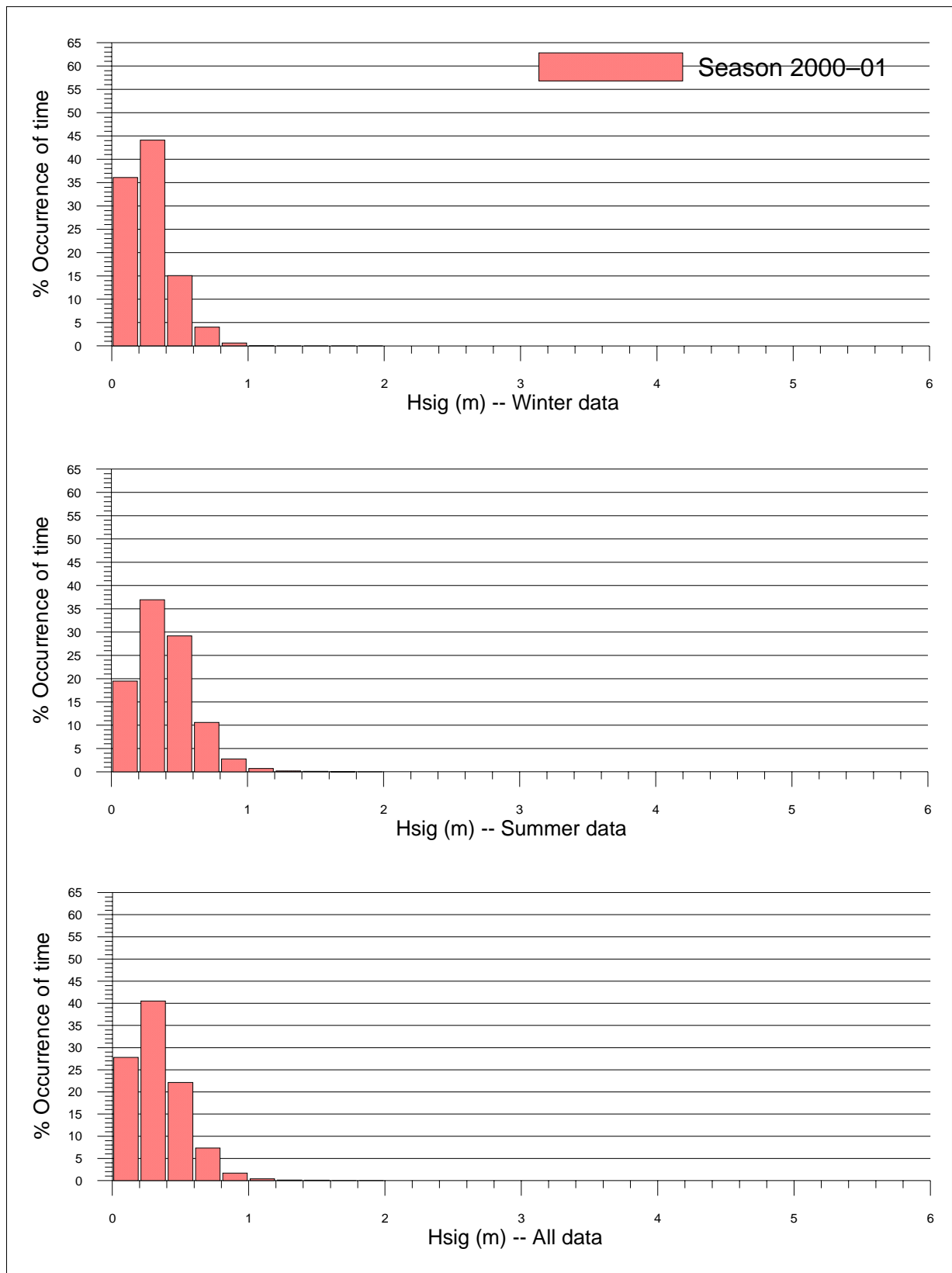


Wave data recording program
Annual summary for season 2000–01

Figure 4.1

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



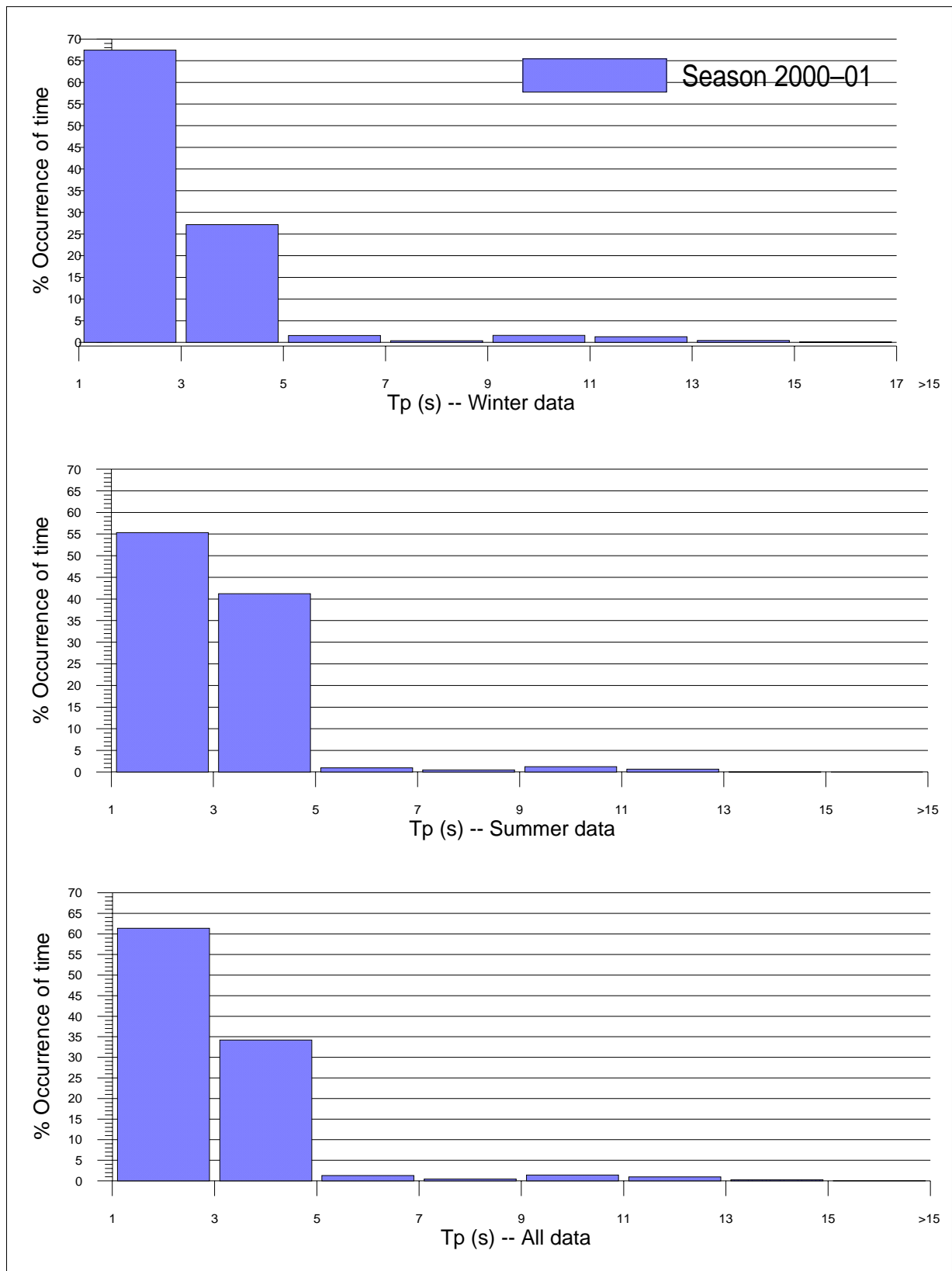


Moreton Bay region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 4.3



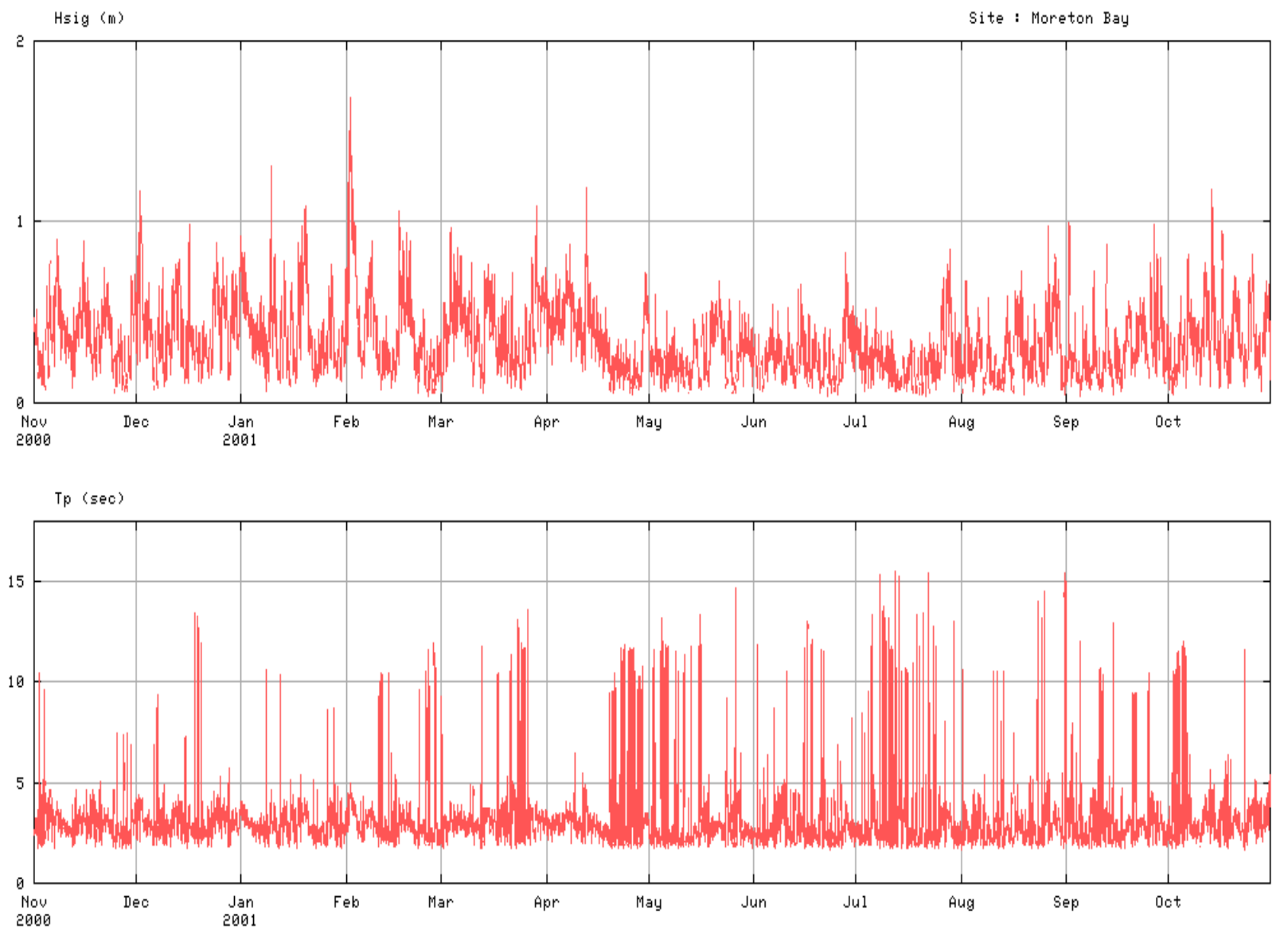
Moreton Bay region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



Wave data recording program
Annual summary for season 2000-01

Figure 4.4

Moreton Bay region—Daily wave recordings



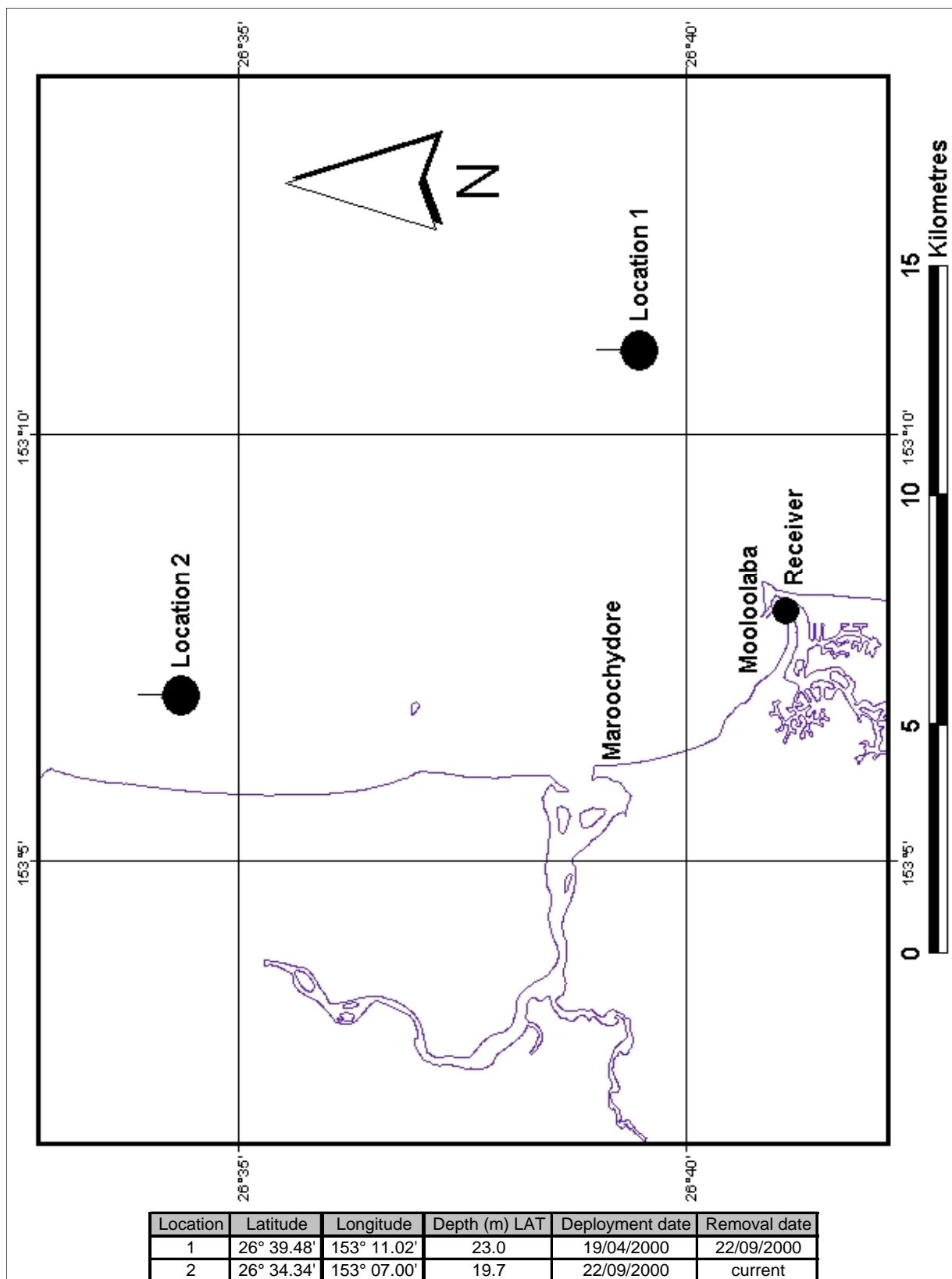
Mooloolaba

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 364.665
Gaps in data from selected dates (days)	= 0.335
Gaps in data from duration analysis (days)	= 0.334
Number of records used in analysis	= 16,535

HAT at nearest standard port: Mooloolaba, 2.13m



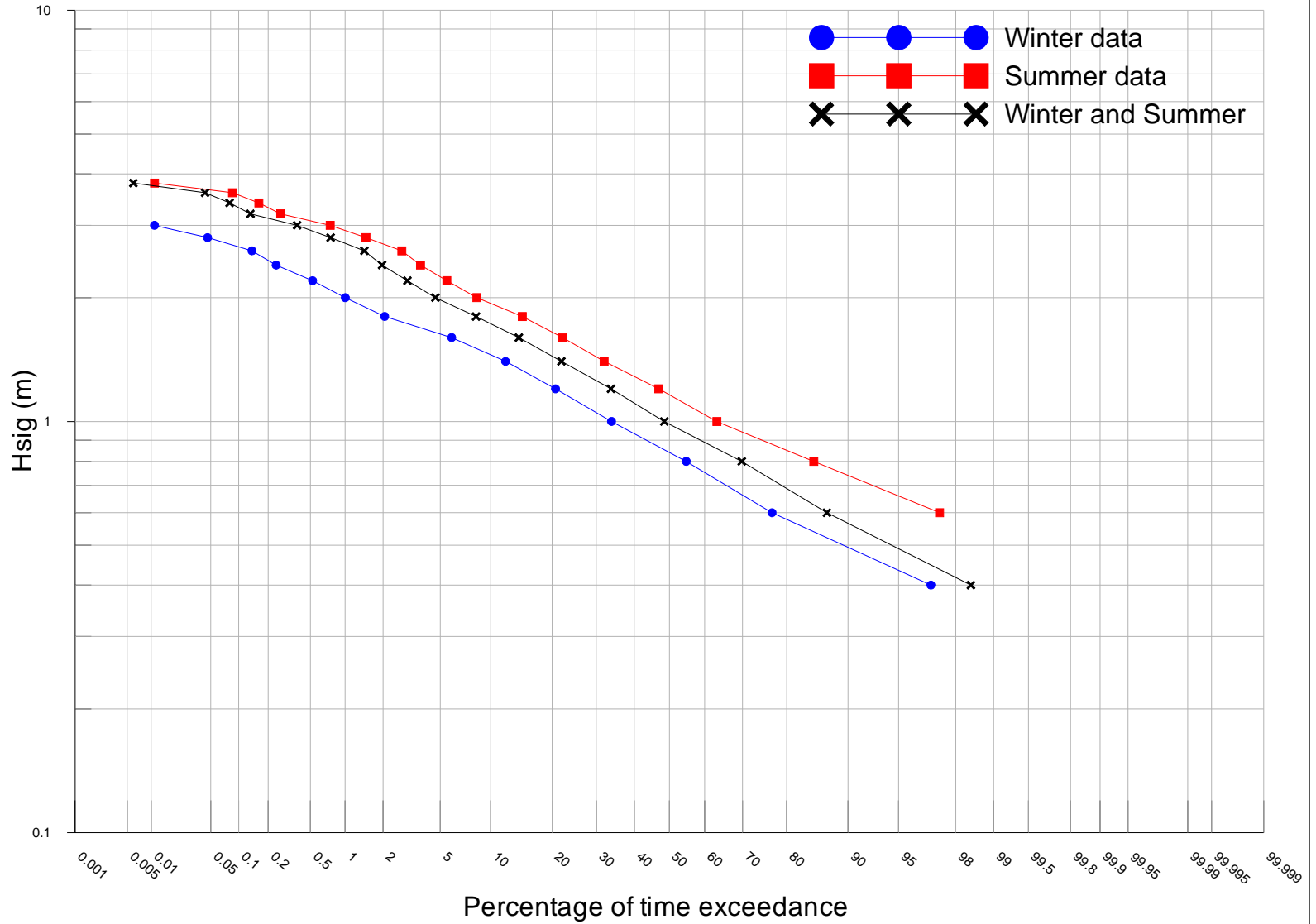
Mooloolaba region—Locality plan

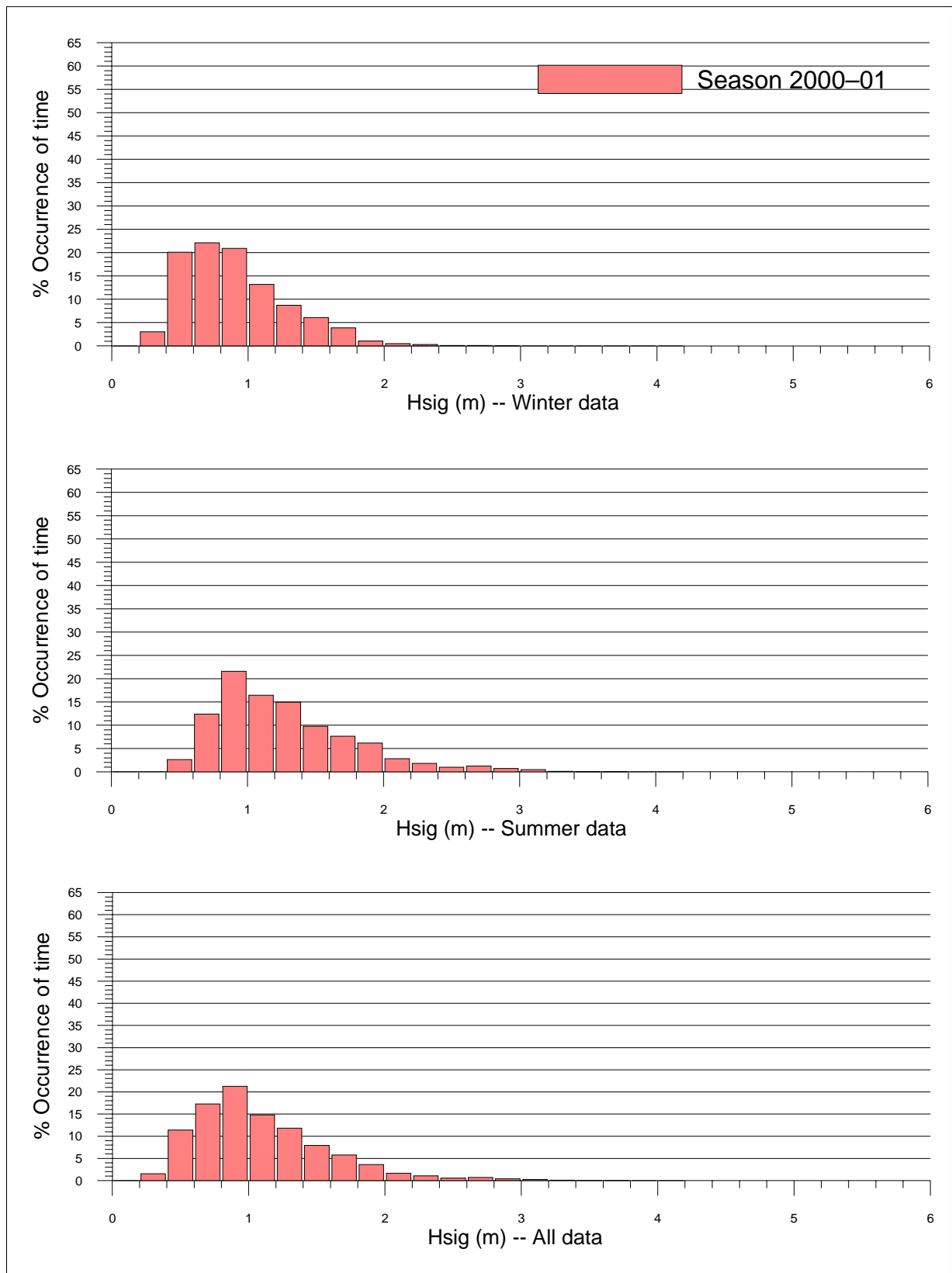


Wave data recording program
Annual summary for season 2000–01

Figure 5.1

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



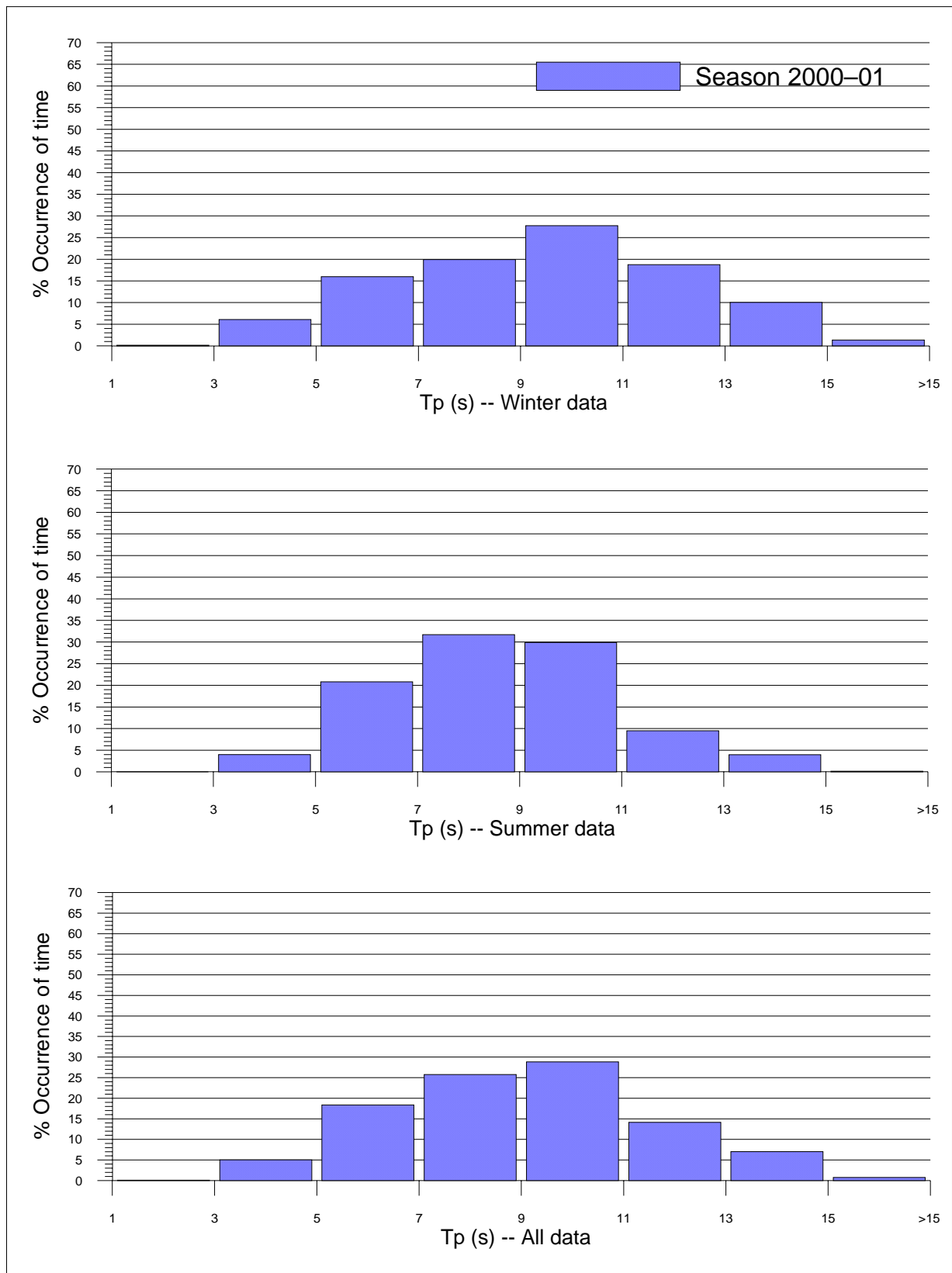


Mooloolaba region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 5.3



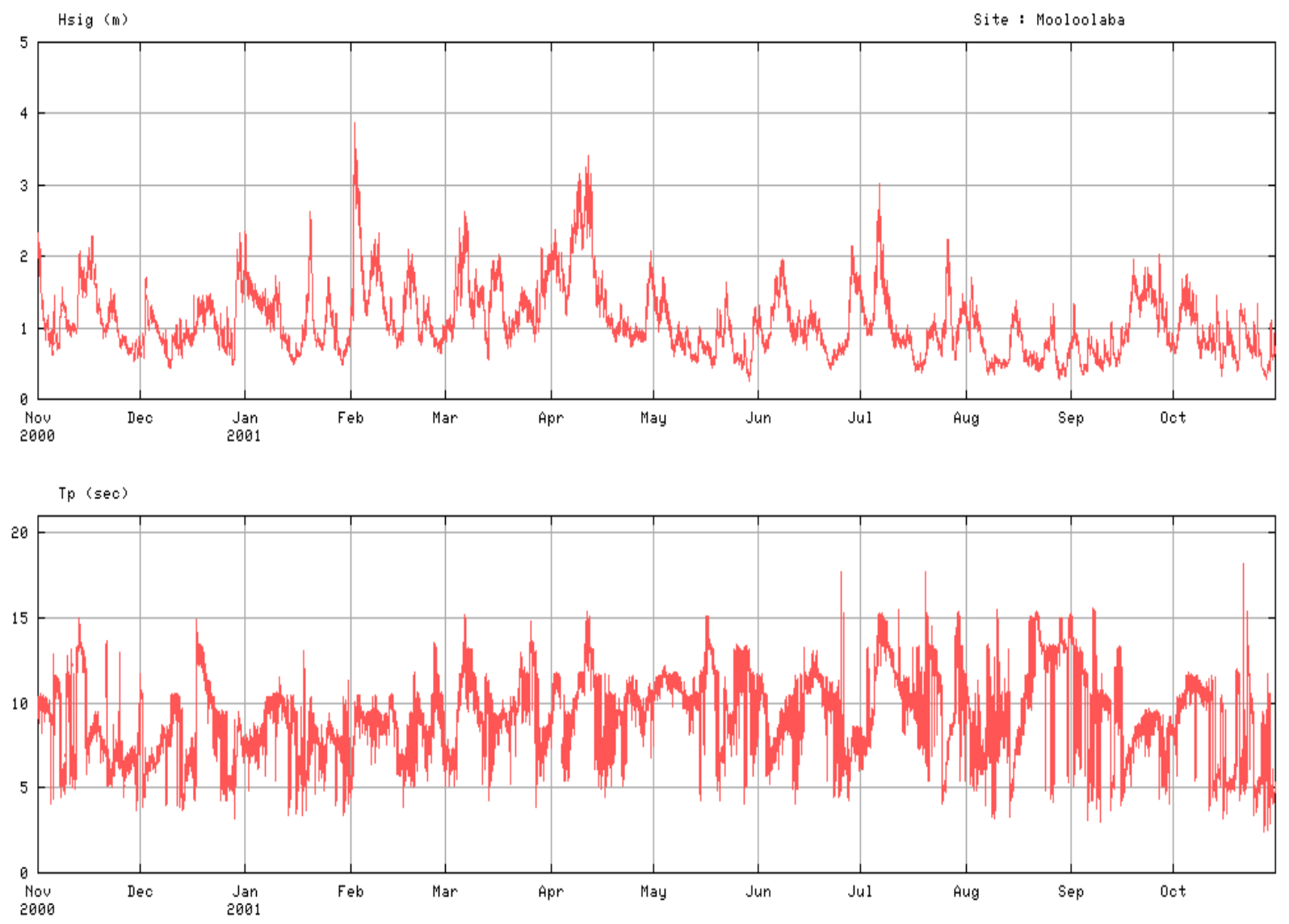
Mooloolaba region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



Wave data recording program
Annual summary for season 2000-01

Figure 5.4

Mooloolaba region—Daily wave recordings



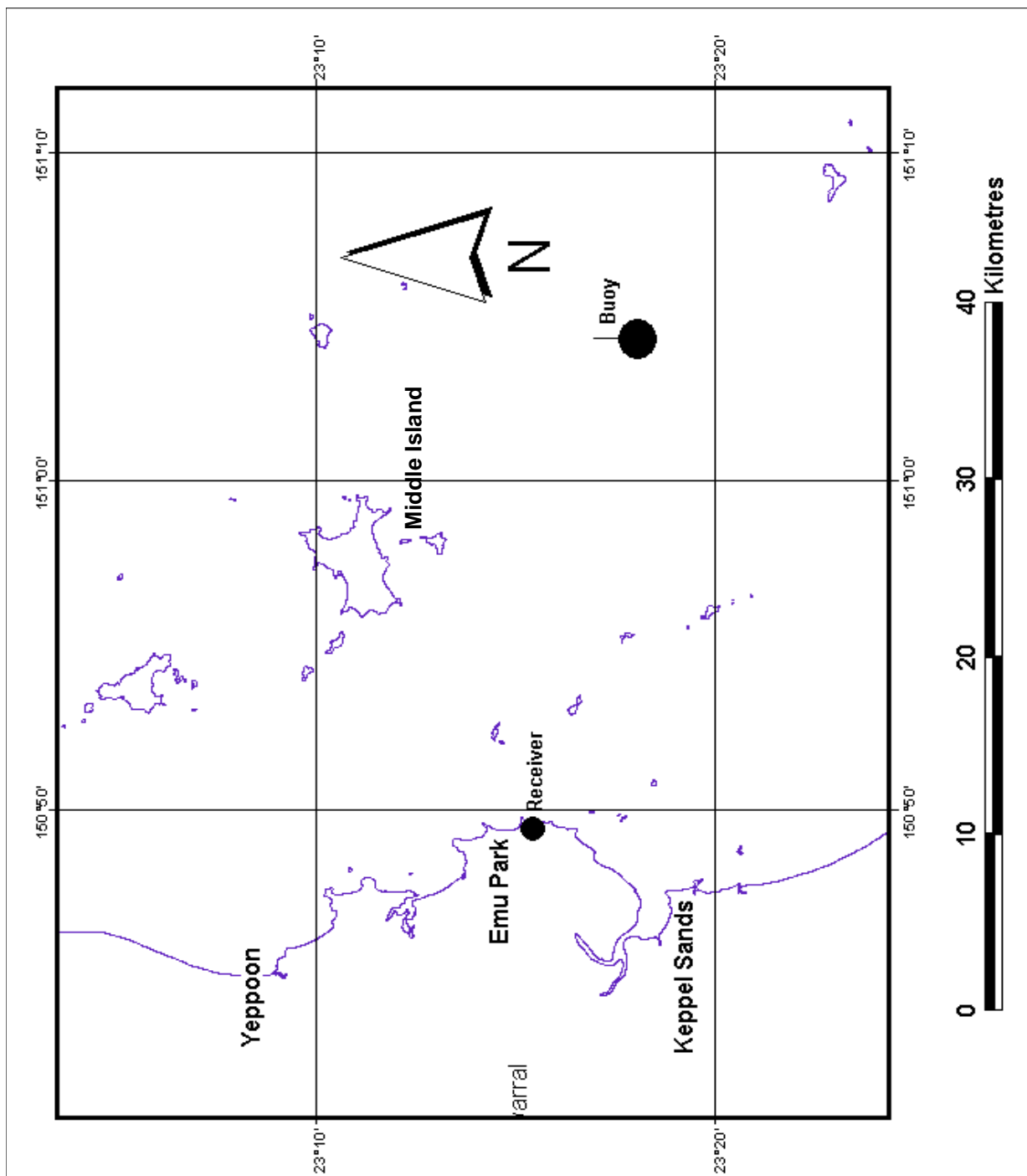
Emu Park

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 357.000
Gaps in data from selected dates (days)	= 8.000
Gaps in data from duration analysis (days)	= 8.000
Number of records used in analysis	= 8,415

HAT at nearest standard port: Middle Island, 5.3m



Location	Latitude	Longitude	Depth (m)	LAT	Deployment date	Removal date
1	23° 18.55'	151° 04.44'	20.0		24/07/1996	28/07/1997
2	23° 18.46'	151° 04.51'	17.0		28/07/1997	21/07/1998
3	23° 18.39'	151° 04.63'	20.0		21/07/1998	06/09/1999
4	23° 18.57'	151° 04.47'	19.0		06/09/1999	31/03/2000
5	23° 18.55'	151° 04.38'	20.0		31/03/2000	08/12/2000
6	23° 18.48'	151° 04.52'	18.0		08/12/2000	current

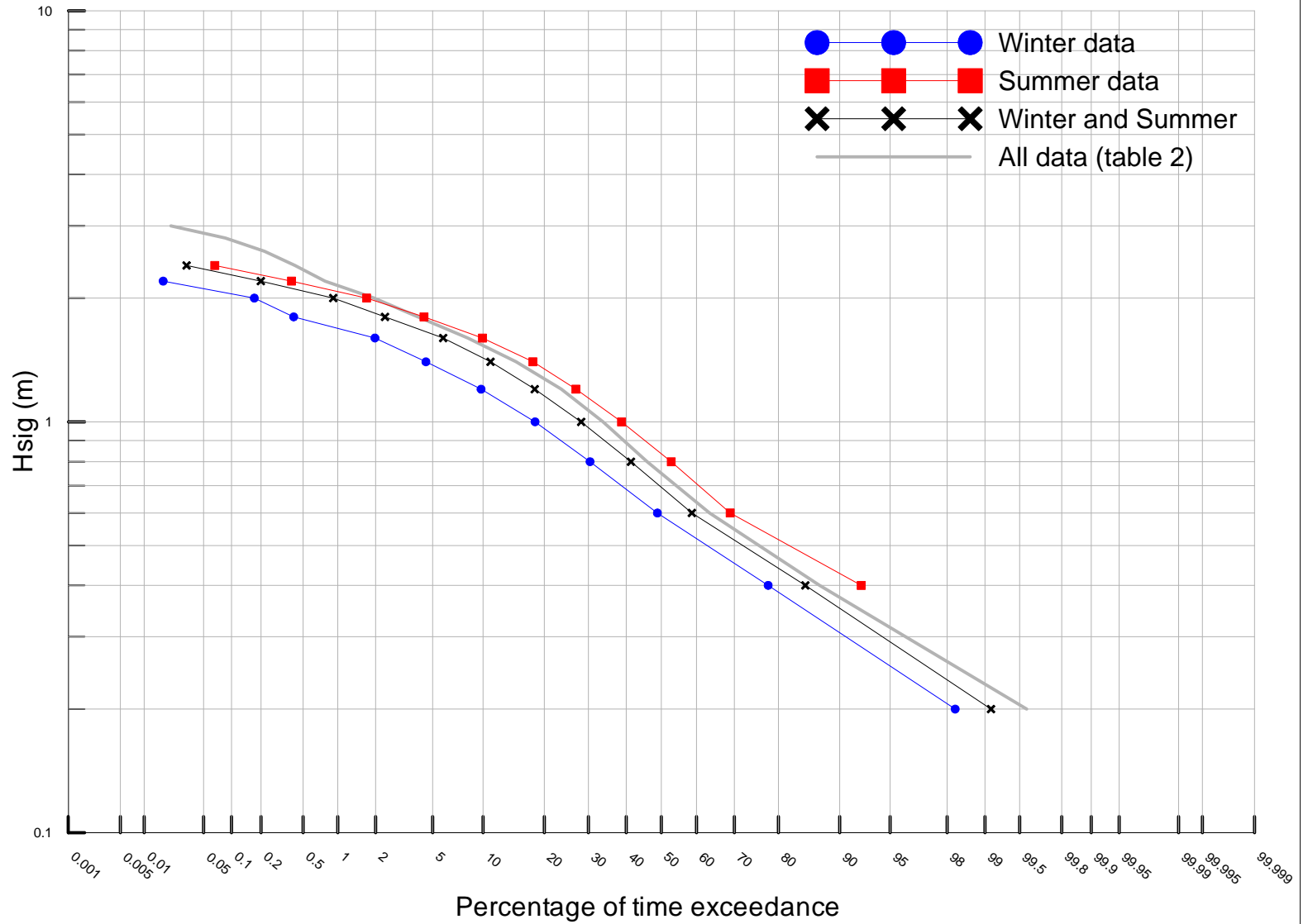
Emu Park region—Locality plan

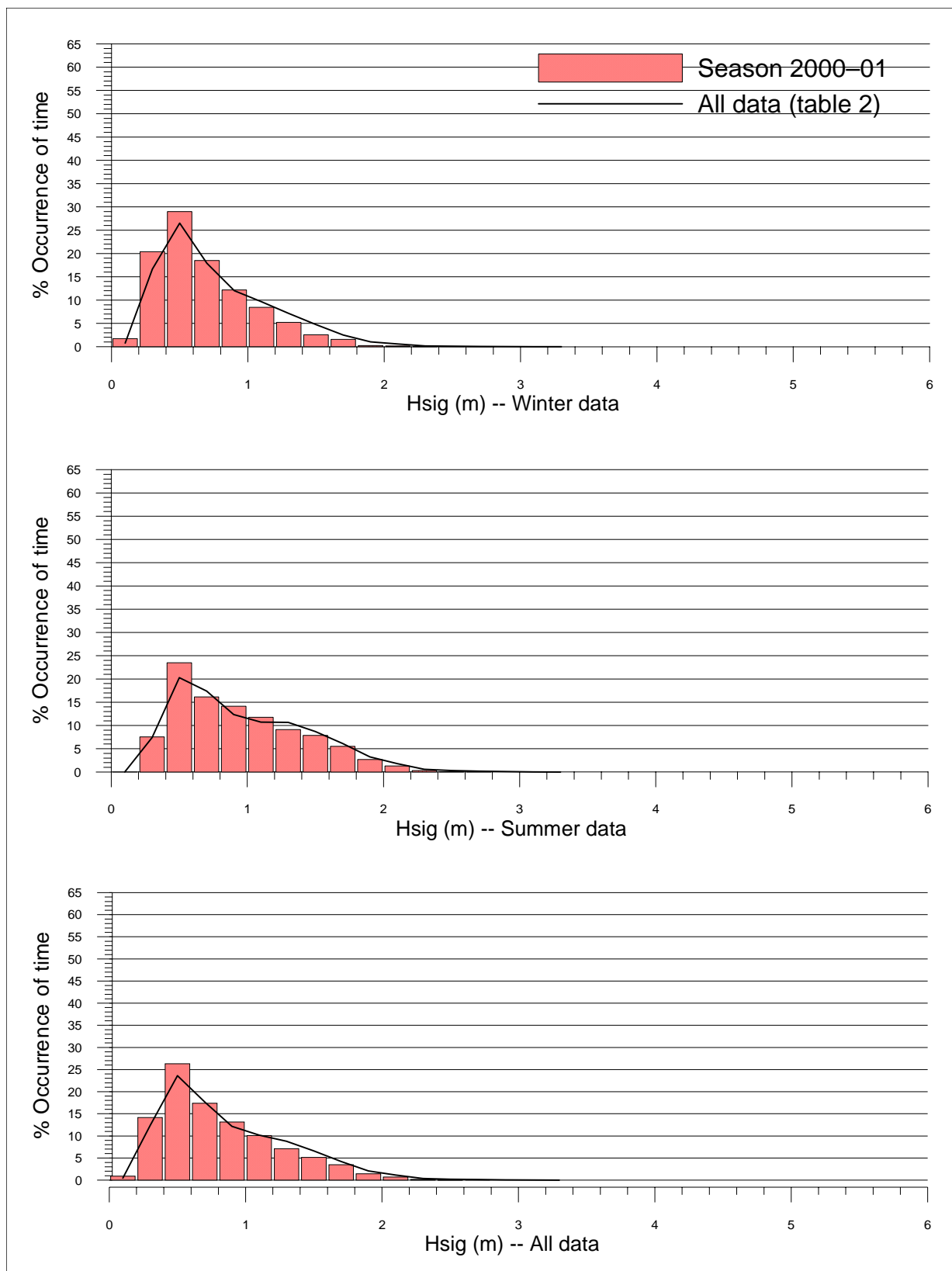


Wave data recording program
Annual summary for season 2000–01

Figure 6.1

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



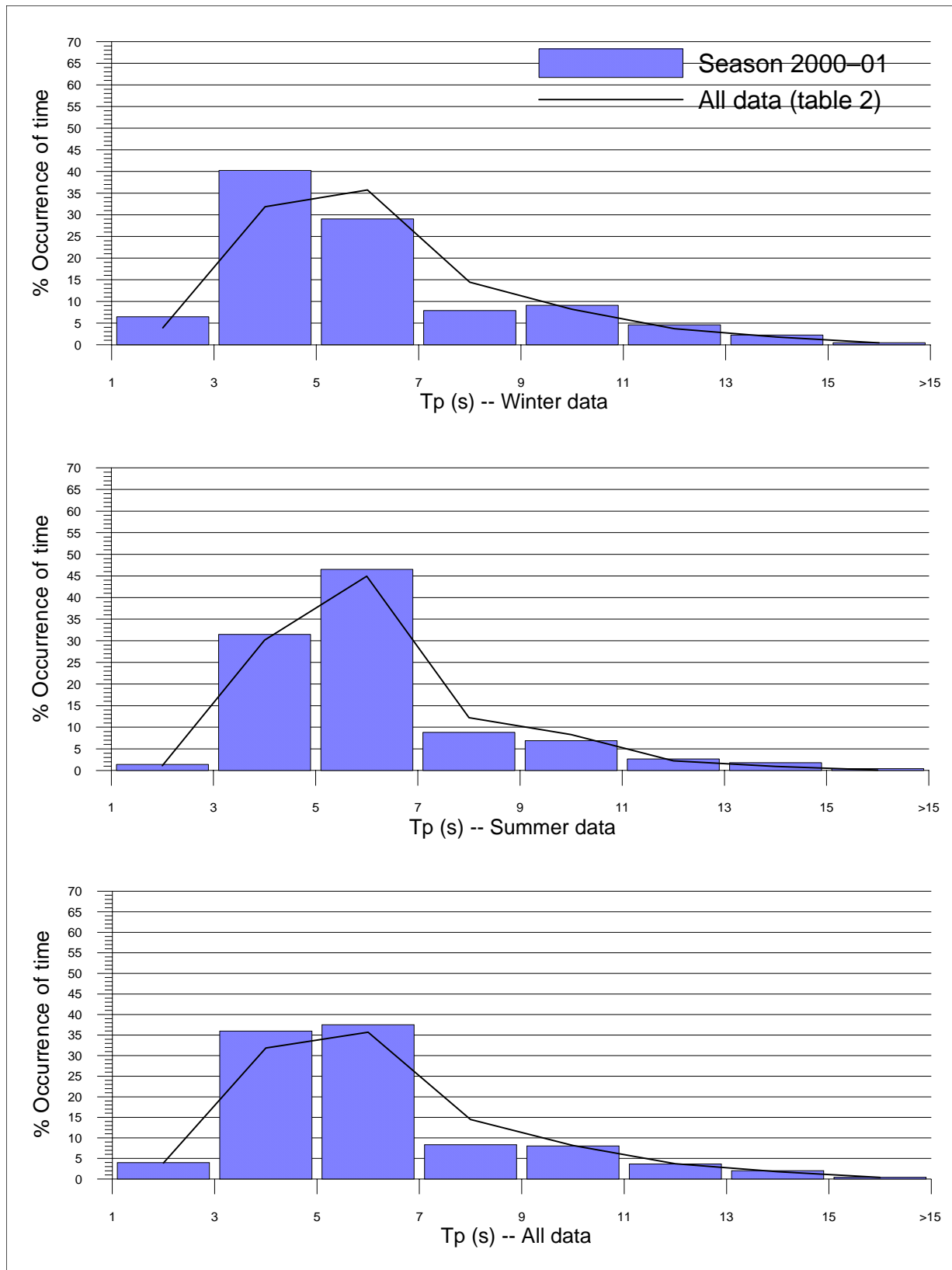


Emu Park region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 6.3



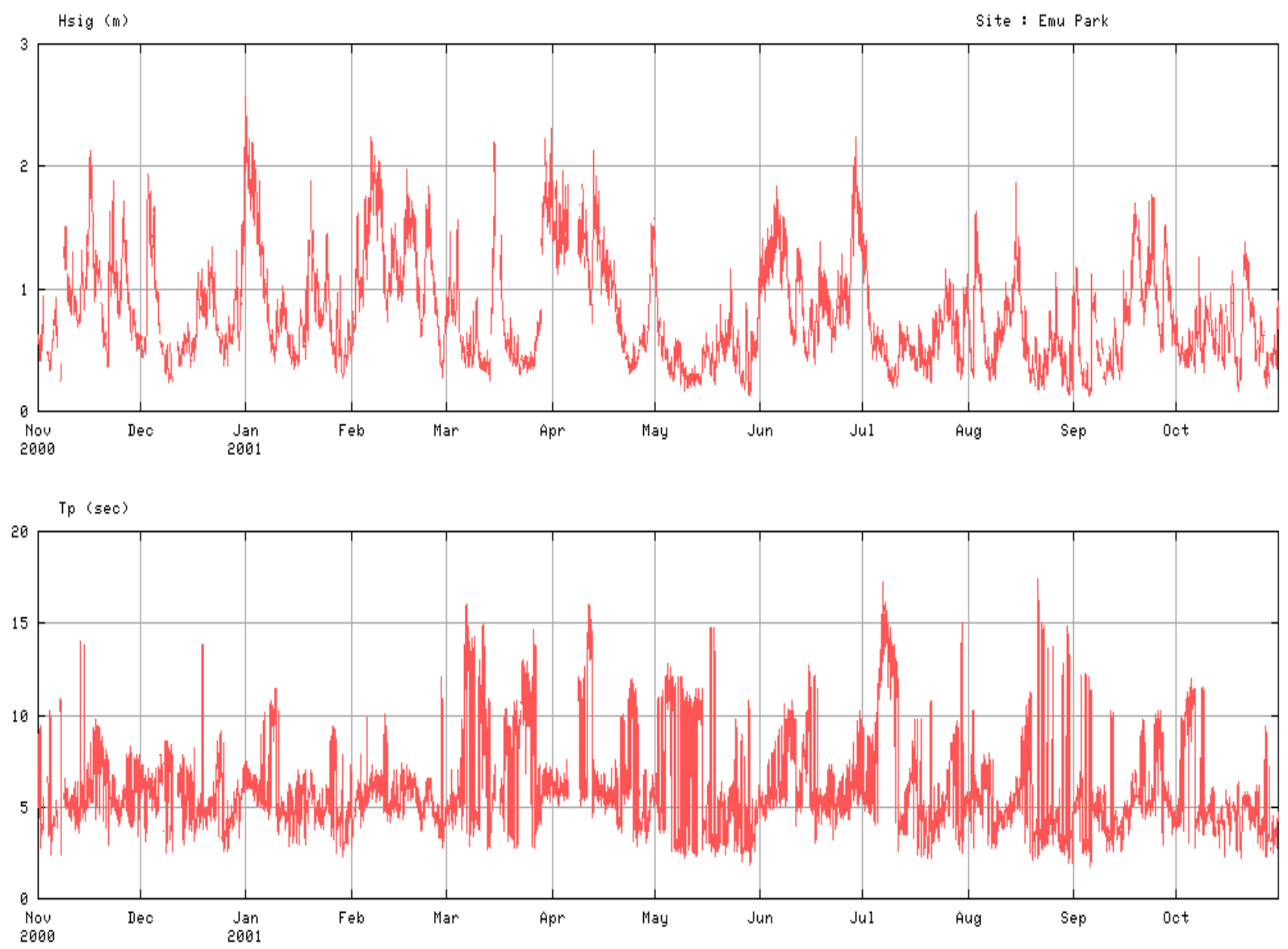
Emu Park region—Histogram percentage (of time) occurrence of wave periods (T_p) for all wave heights (H_{sig})



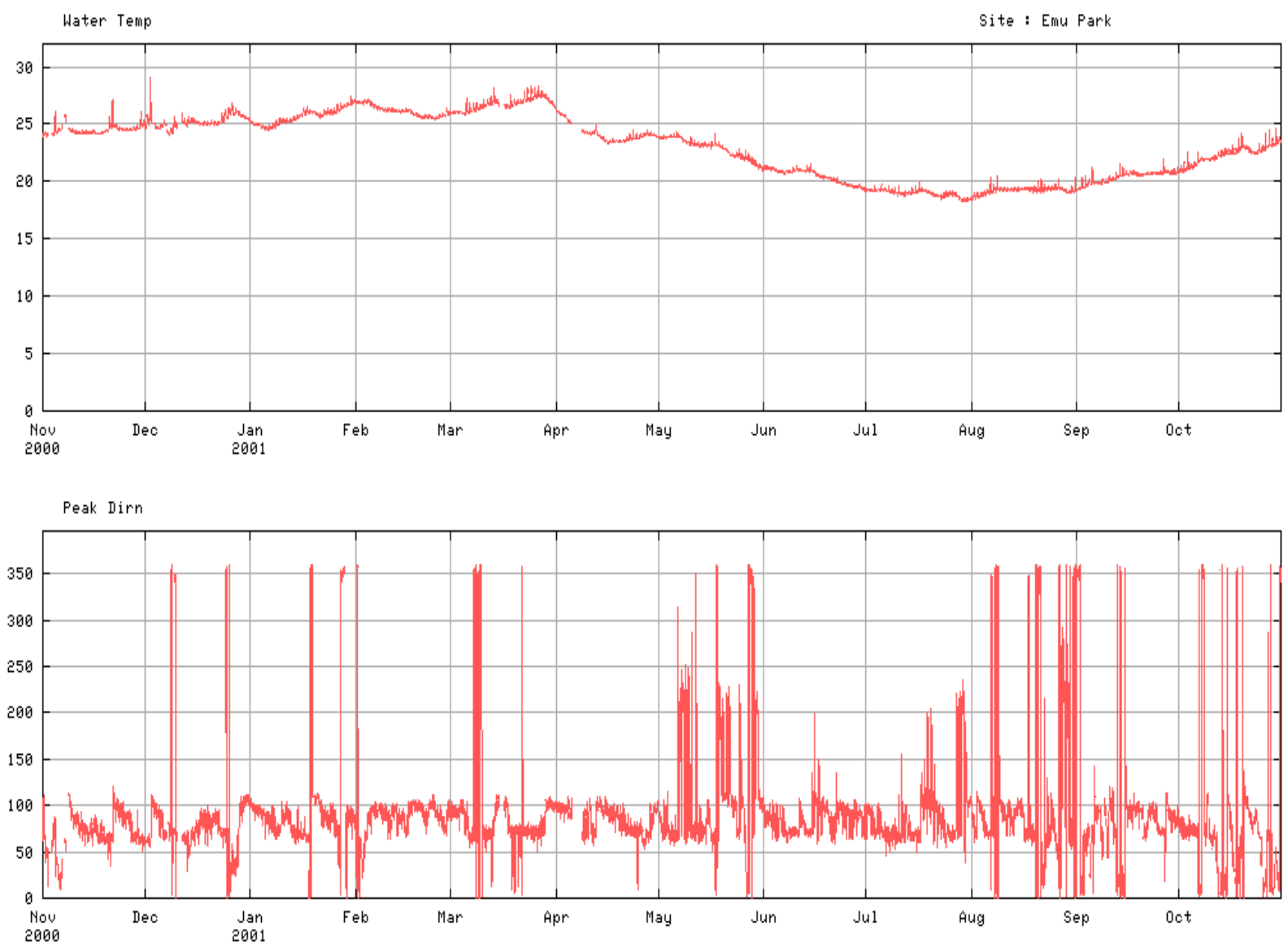
Wave data recording program
Annual summary for season 2000-01

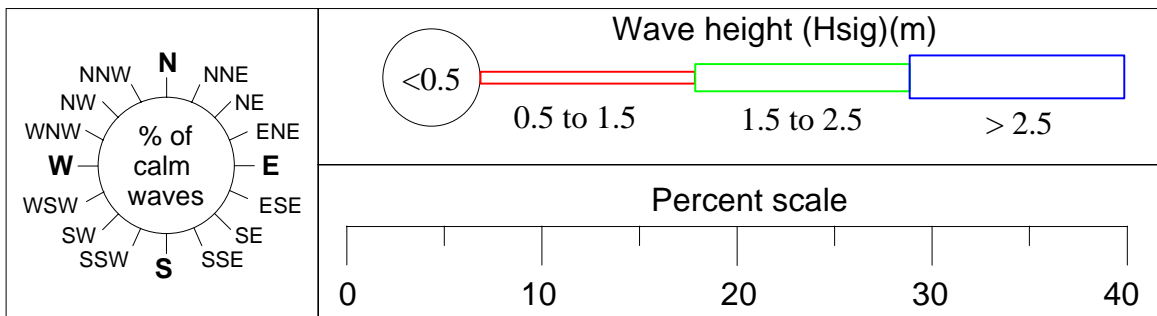
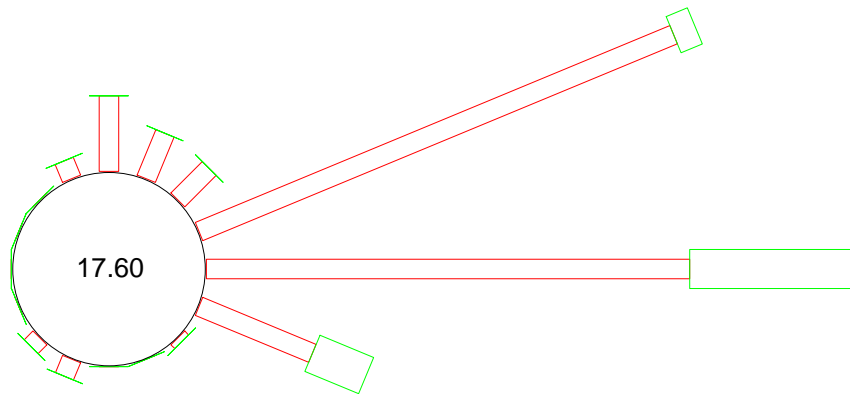
Figure 6.4

Emu Park region—Daily wave recordings



Emu Park region—Water temperature and peak direction recordings





Emu Park region—Directional wave rose



Wave data recording program
Annual summary for season 2000–01

Figure 6.7

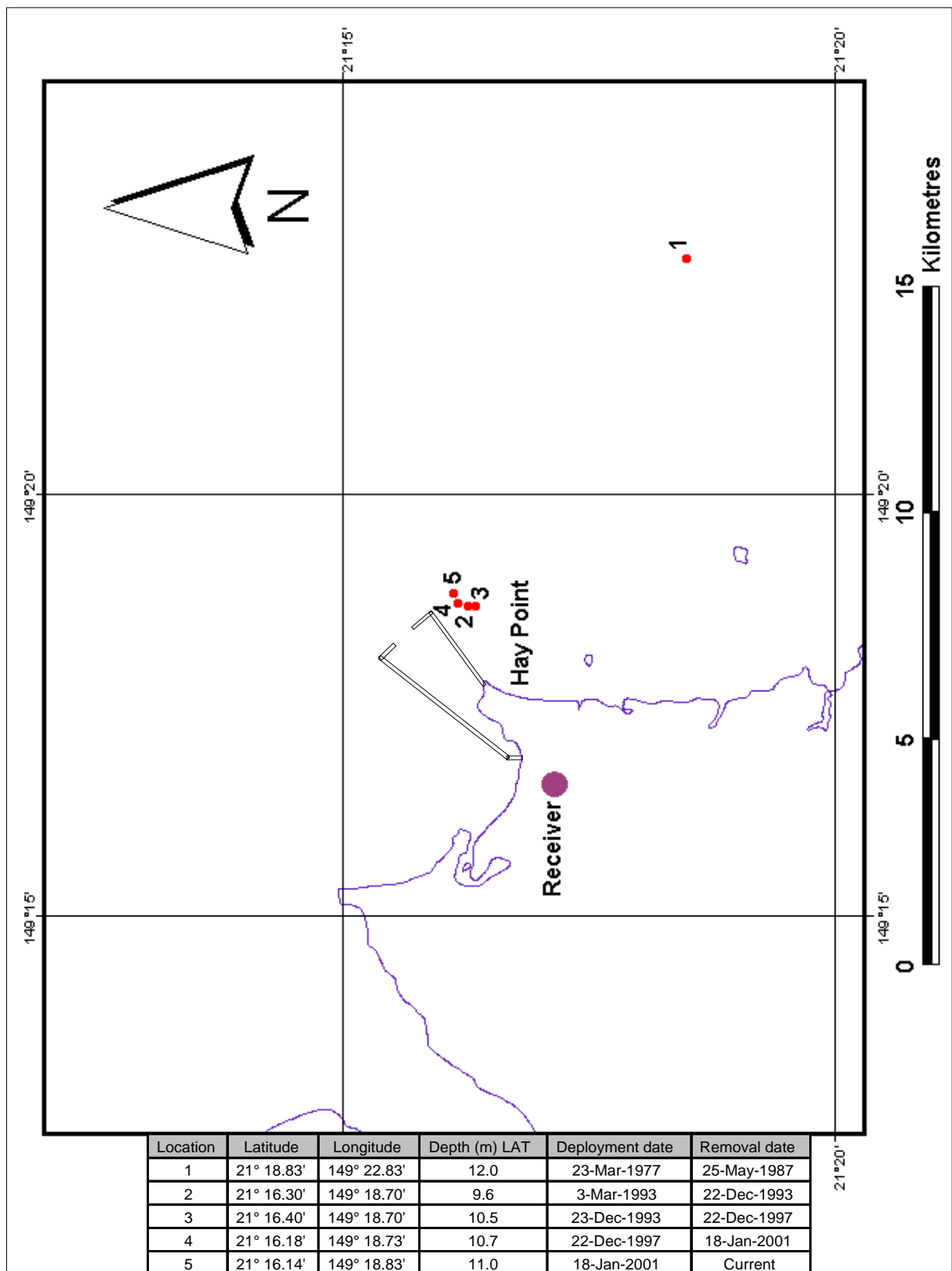
Hay Point

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 365.0
Gaps in data from selected dates (days)	= 0.001
Gaps in data from duration analysis (days)	= 0.000
Number of records used in analysis	= 17,448

HAT at nearest standard port: Hay Point, 7.14m



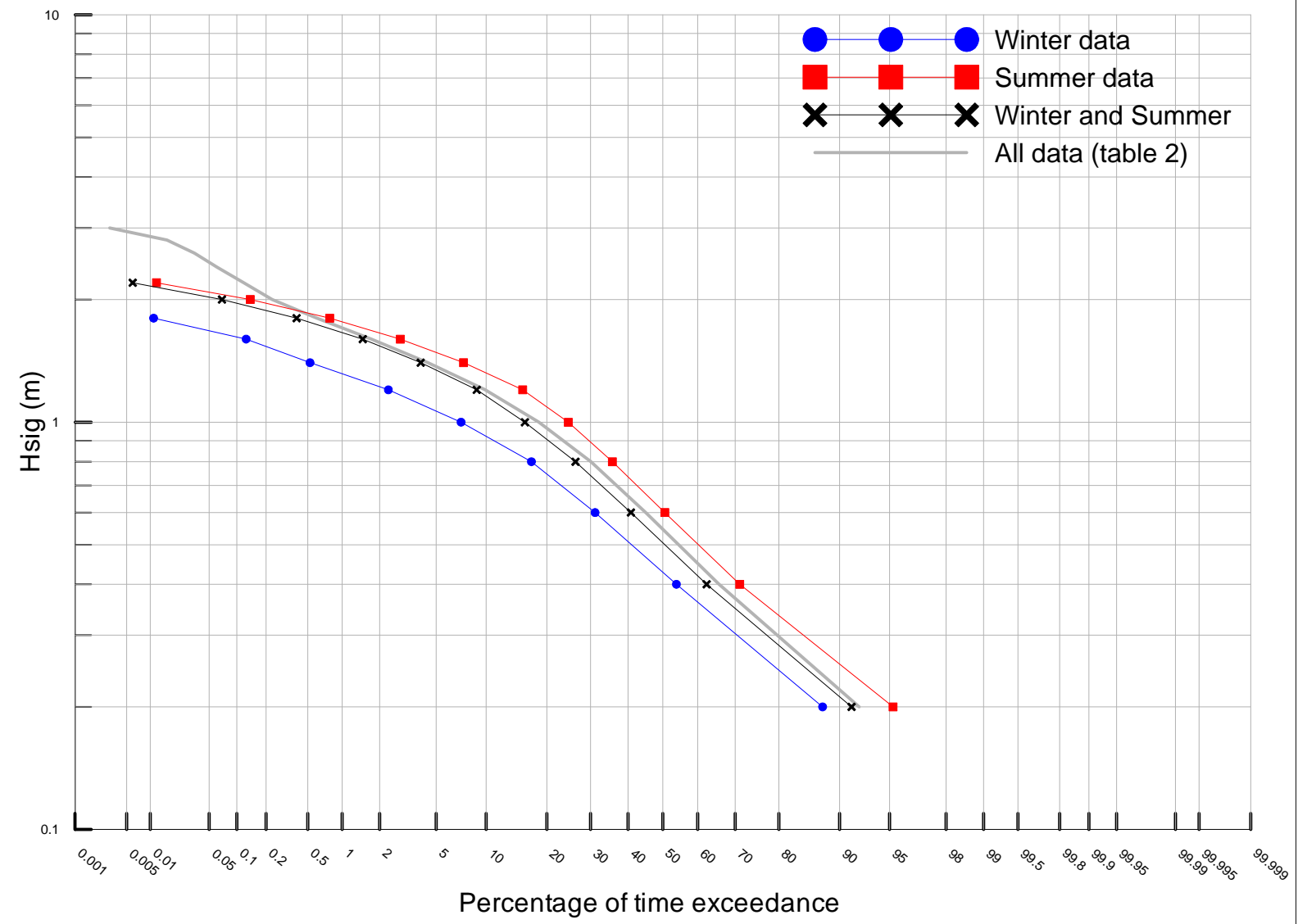
Hay Point region—Locality plan

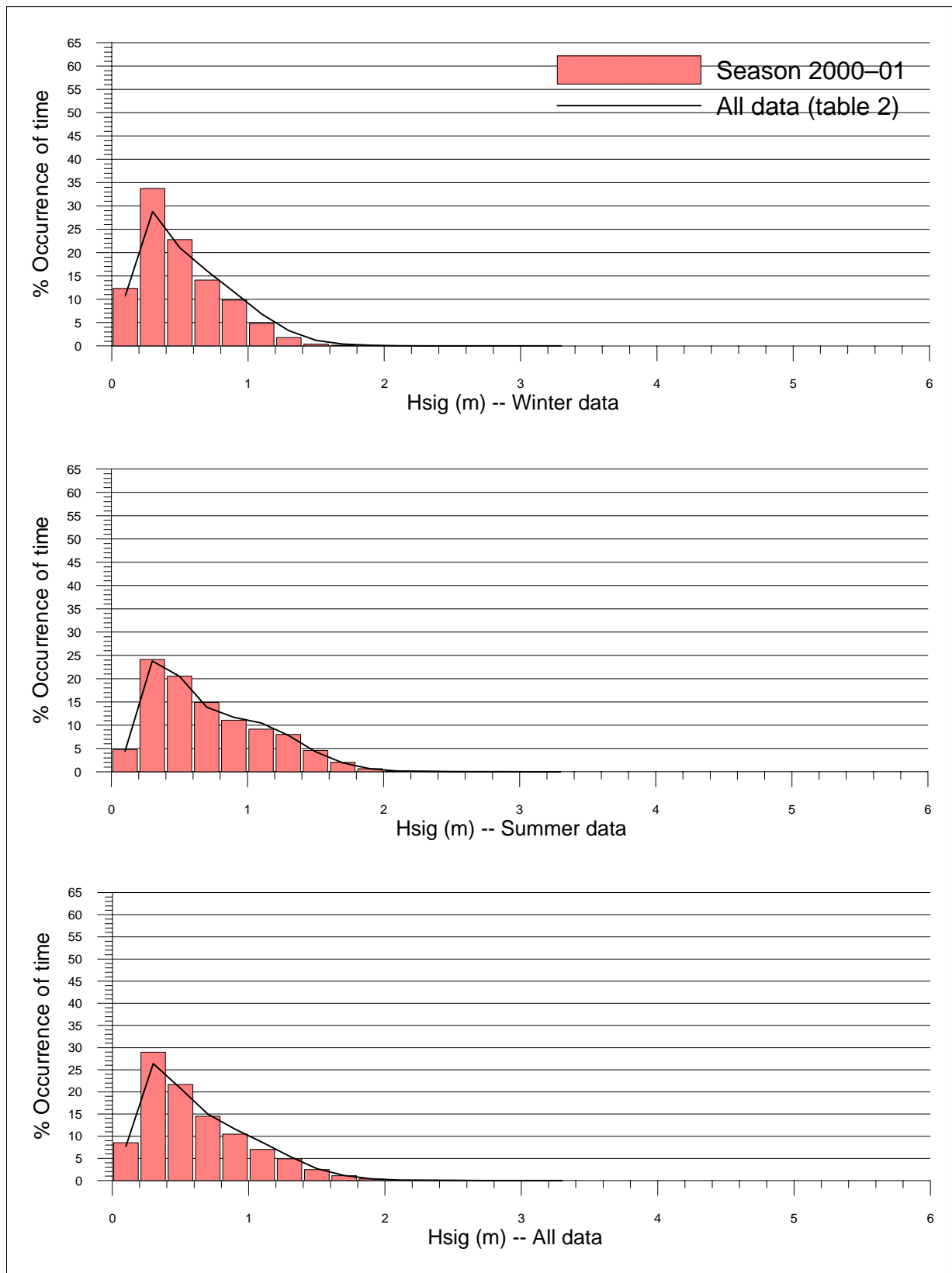


Wave data recording program
Annual summary for season 2000-01

Figure 7.1

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



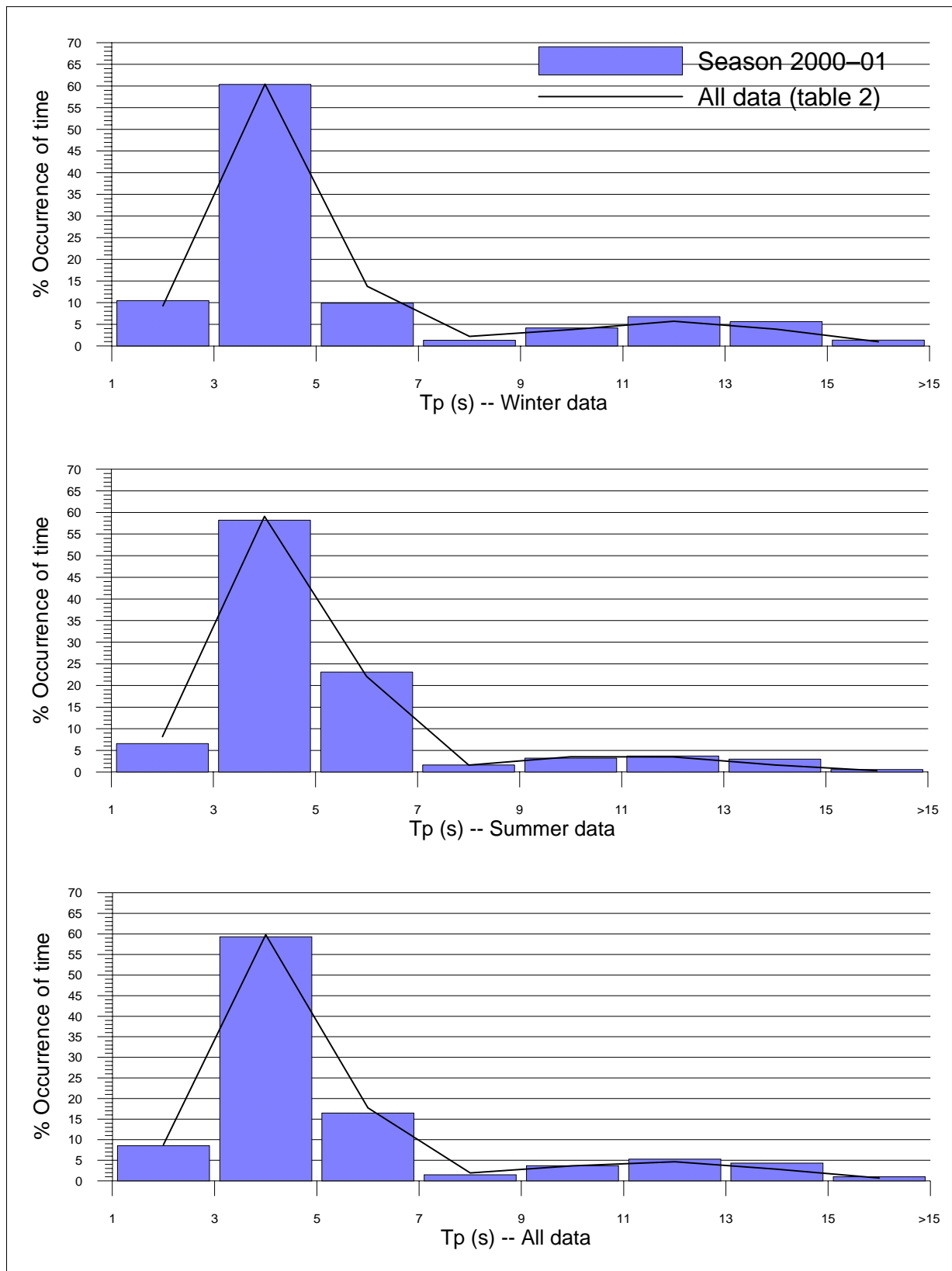


Hay Point region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 7.3



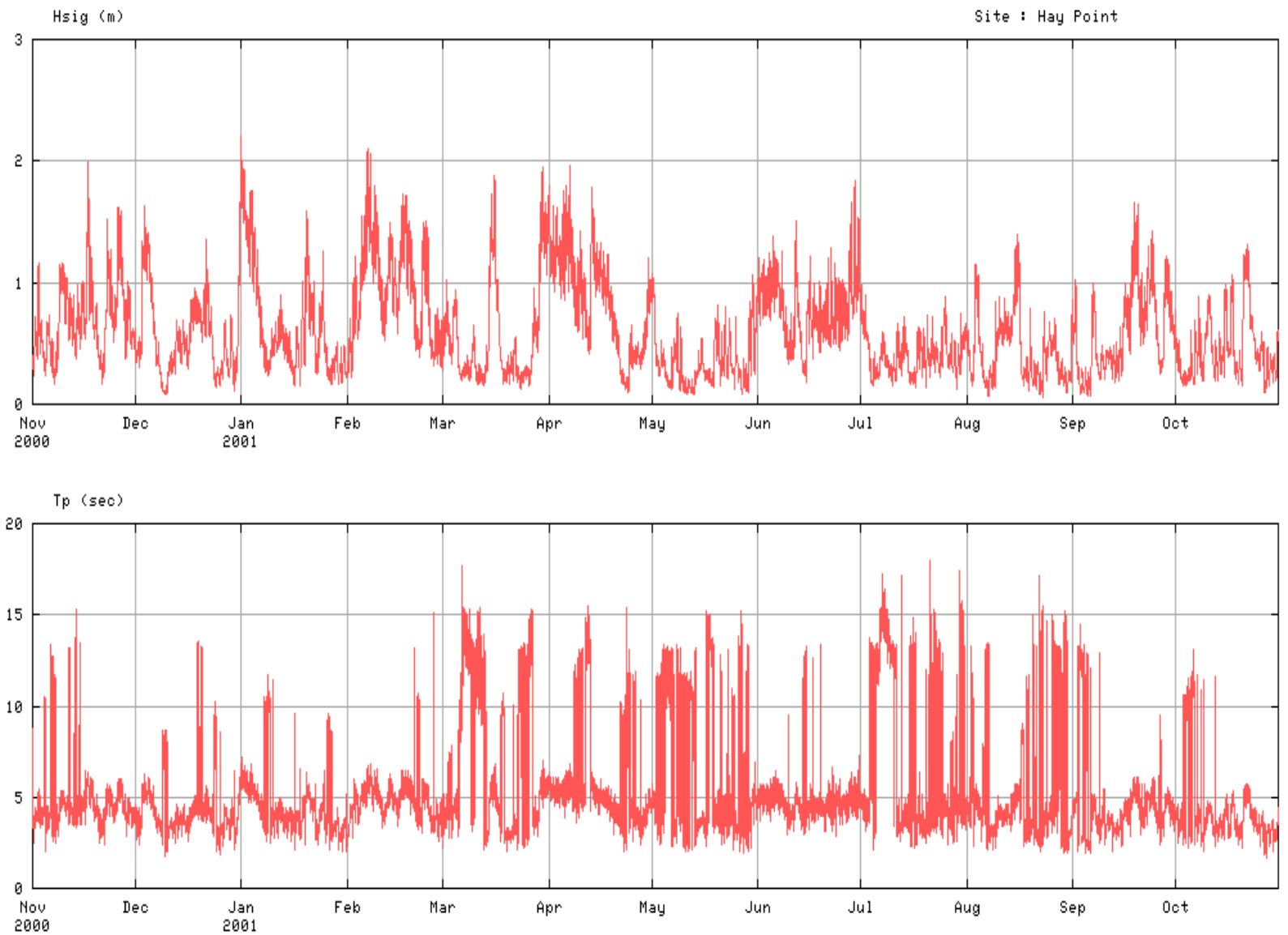
Hay Point region—Histogram percentage (of time) occurrence of wave periods (T_p) for all wave heights (H_{sig})



Wave data recording program
Annual summary for season 2000-01

Figure 7.4

Hay Point region—Daily wave recordings



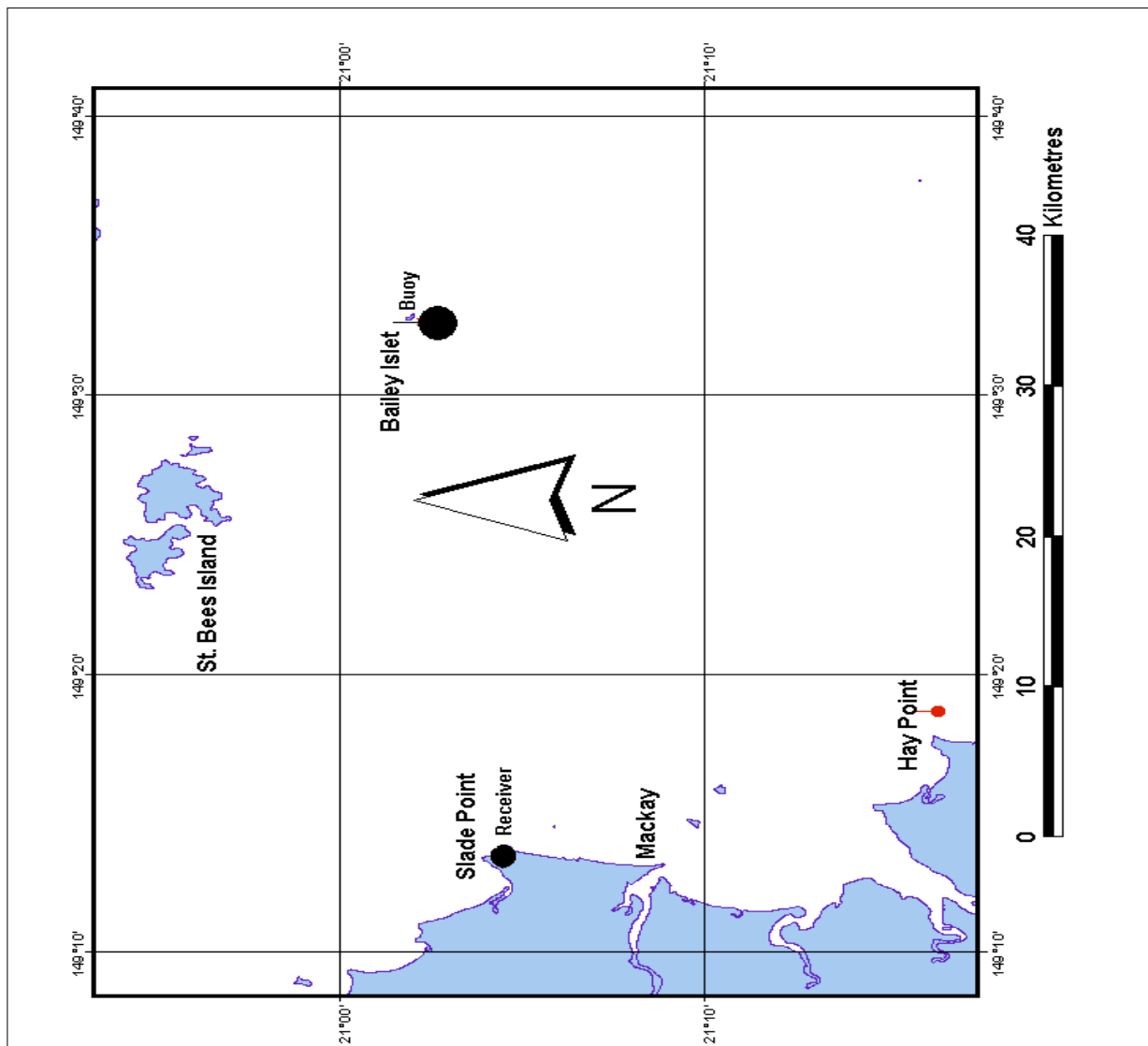
Mackay

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 328.272
Gaps in data from selected dates (days)	= 36.728
Gaps in data from duration analysis (days)	= 36.728
Number of records used in analysis	= 6,946

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



Location	Latitude	Longitude	Depth (m)	LAT	Deployment date	Removal date
1	21° 06.83'	149° 31.83'	22.0		19/09/1975	05/11/1976
2	21° 03.90'	149° 31.80'	25.0		24/11/1977	23/08/1985
3	21° 02.83'	149° 32.58'	22.0		24/08/1985	22/05/1988
4	21° 02.57'	149° 32.42'	22.0		23/05/1988	23/06/1991
5	21° 01.83'	149° 32.17'	22.0		01/09/1991	26/02/1992
6	21° 02.80'	149° 32.02'	25.0		04/08/1992	08/06/1993
7	21° 02.80'	149° 32.25'	22.0		09/06/1993	23/11/1993
8	21° 02.80'	149° 32.02'	25.0		23/11/1993	07/04/1995
9	21° 02.62'	149° 32.07'	29.5		07/04/1995	19/03/1996
10	21° 02.62'	149° 32.22'	27.0		19/03/1996	08/08/1997
11	21° 02.73'	149° 32.27'	28.5		08/08/1997	06/08/1998
12	21° 03.45'	149° 32.12'	28.0		06/08/1998	08/10/1998
13	Details Unavailable				08/10/1998	06/10/1999
14	21° 02.78'	149° 32.23'	29.5		06/10/1999	-
15	21° 02.63'	149° 32.21'	28.3		22/06/2000	21/11/2000
16	21° 02.52'	149° 32.78'	29.0		21/11/2000	current

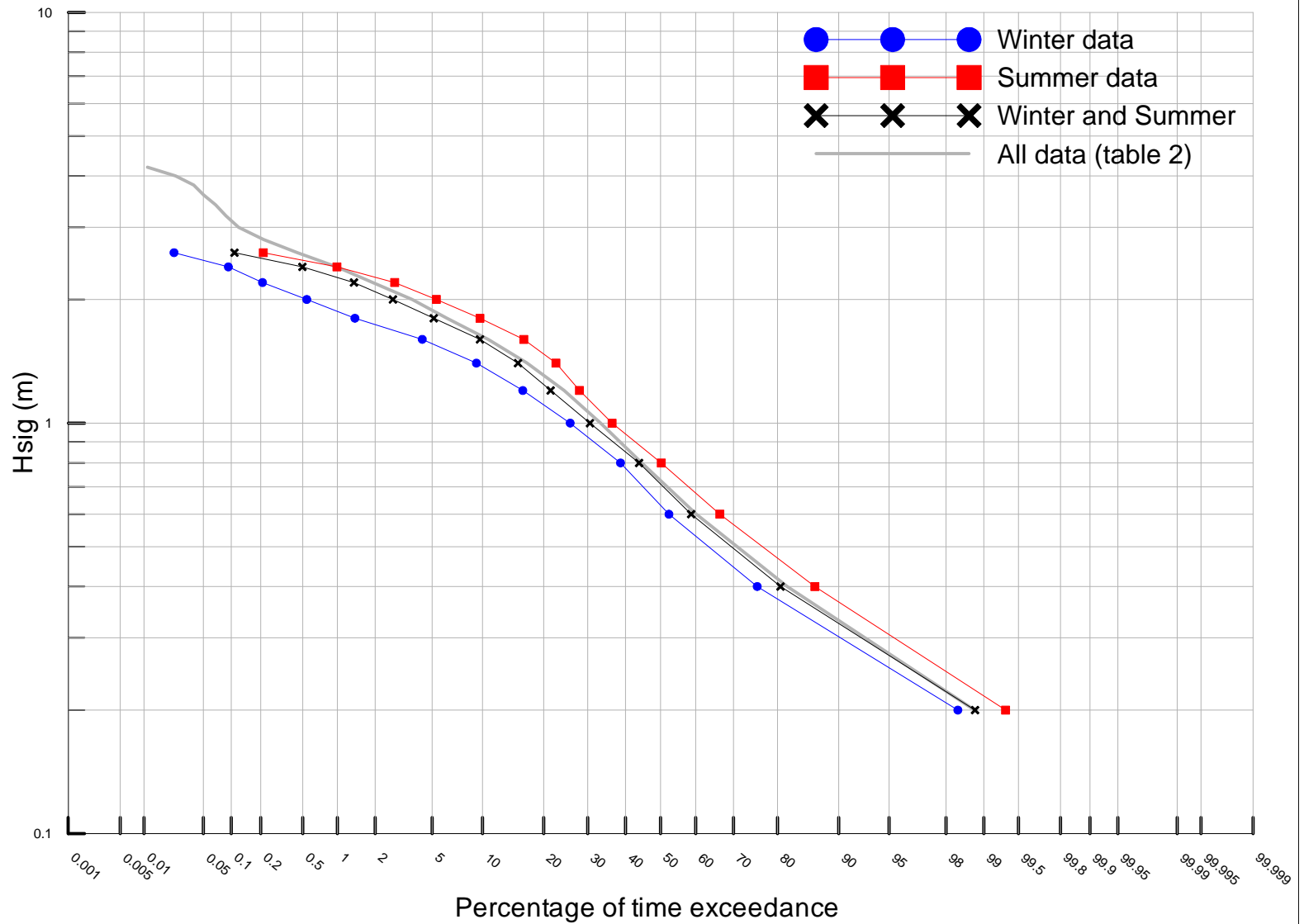
Mackay region—Locality plan

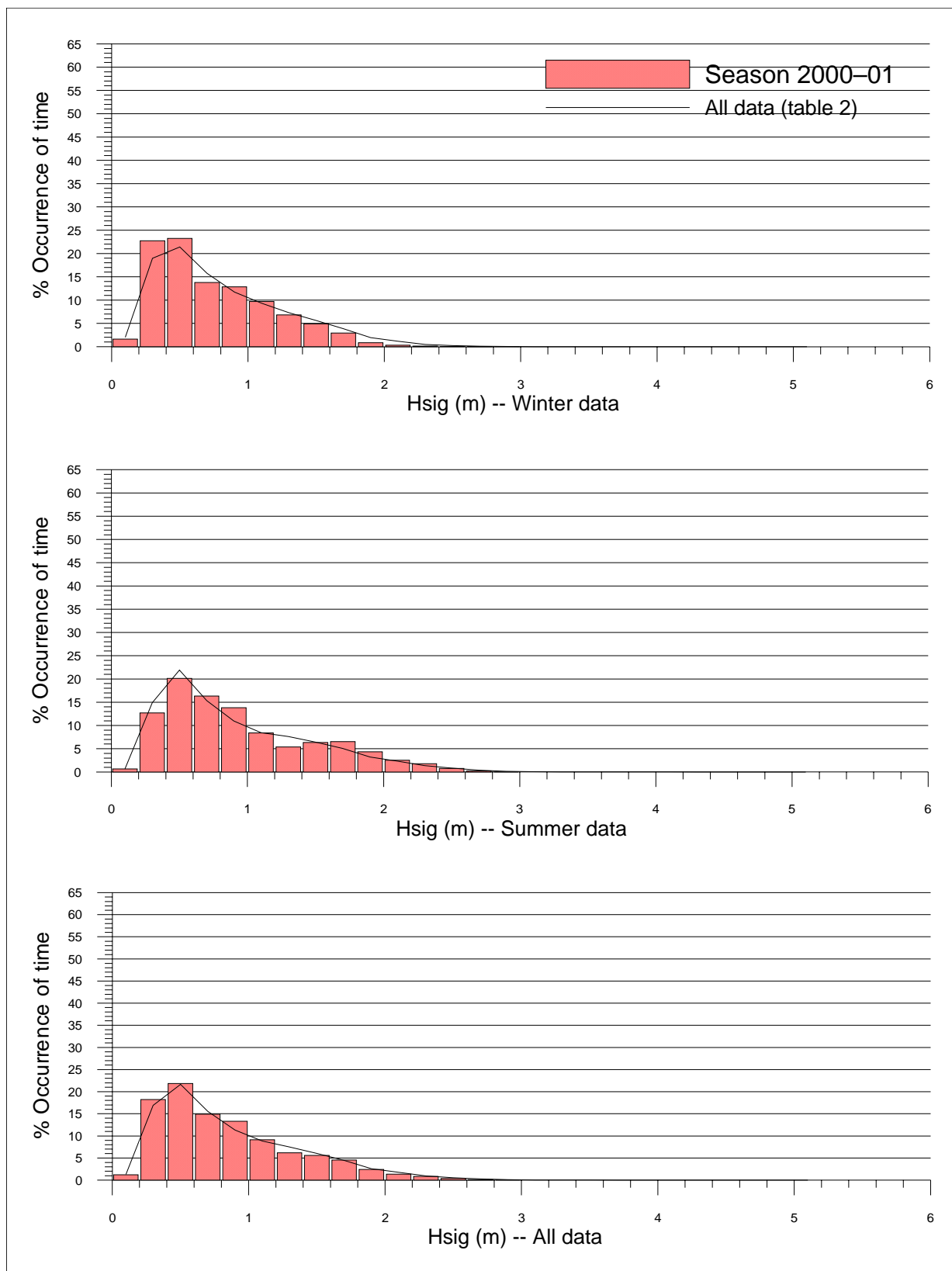


Wave data recording program
Annual summary for season 2000–01

Figure 8.1

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



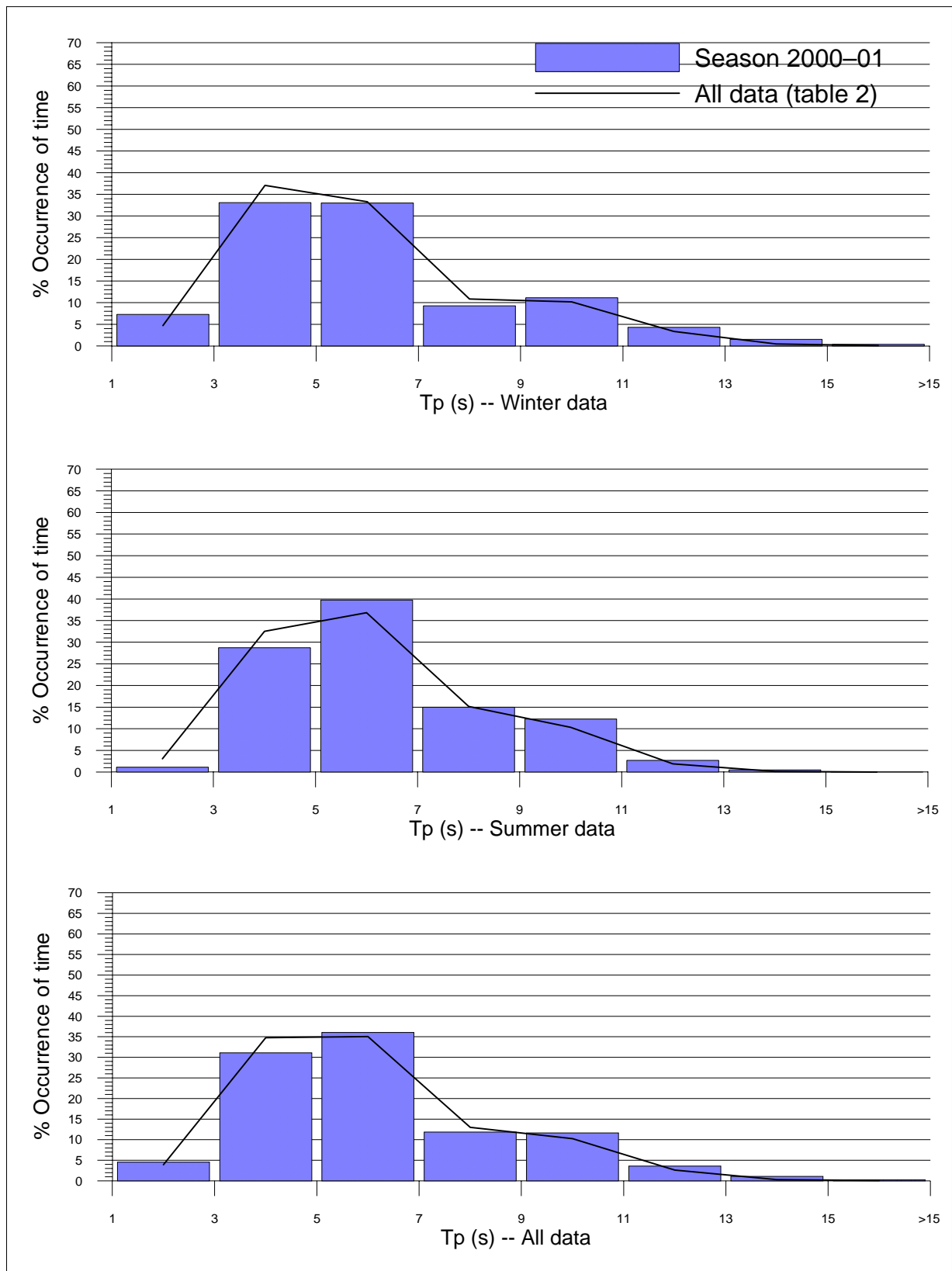


Mackay region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000-01

Figure 8.3



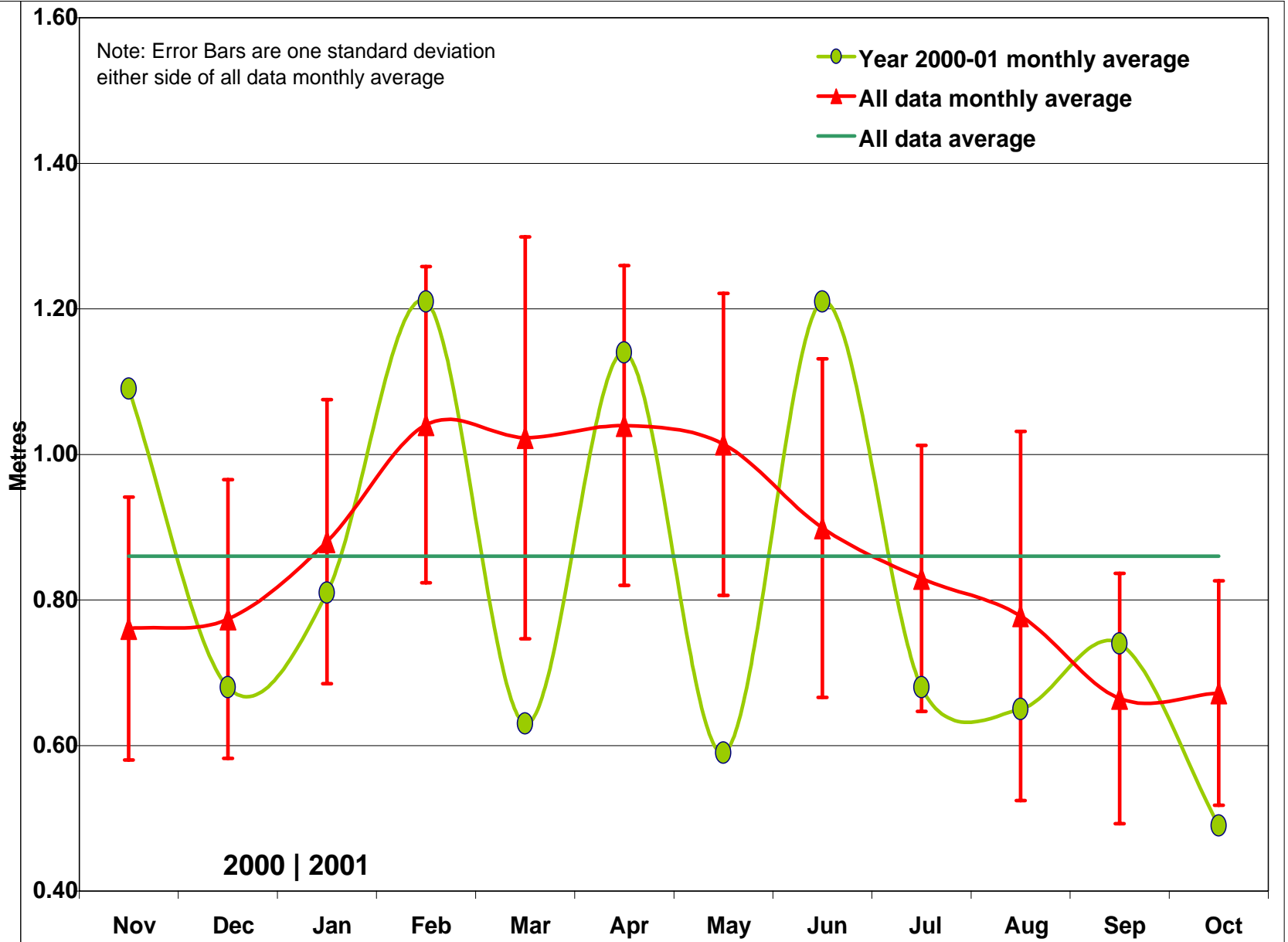
Mackay region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



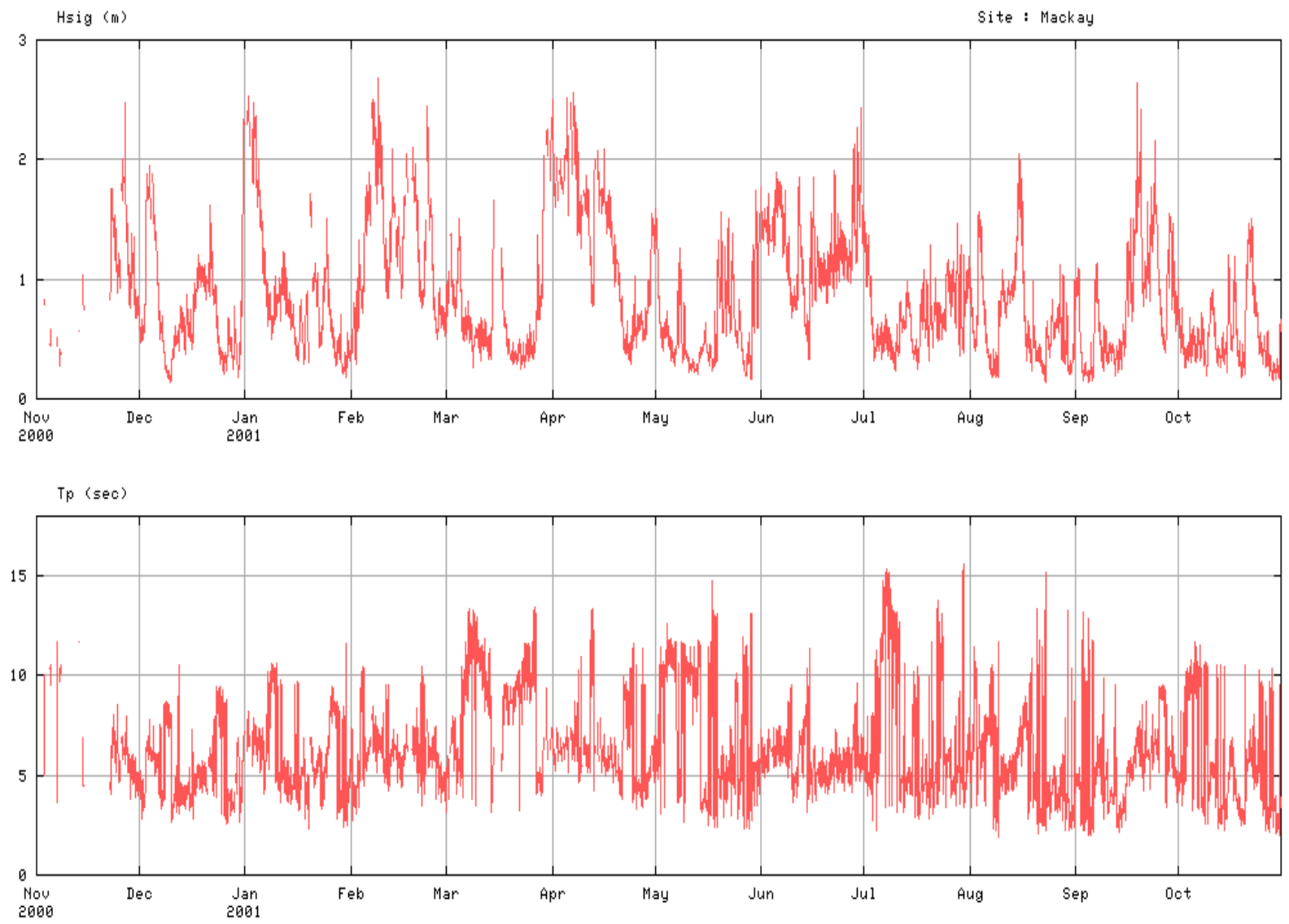
Wave data recording program
Annual summary for season 2000-01

Figure 8.4

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



Mackay region—Daily wave recordings



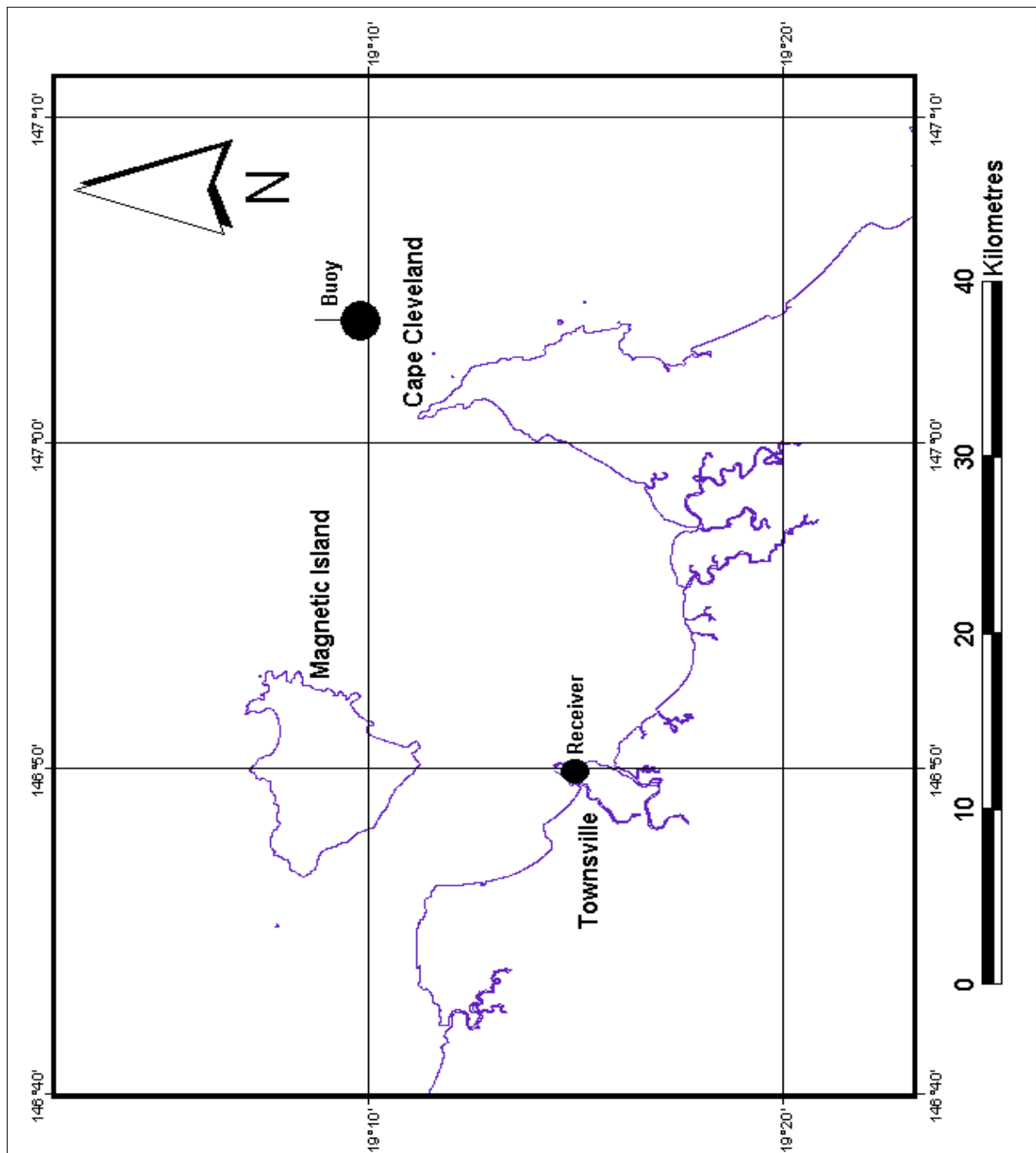
Townsville

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 331.893
Gaps in data from selected dates (days)	= 33.107
Gaps in data from duration analysis (days)	= 33.107
Number of records used in analysis	= 13,301

HAT at nearest standard port: Cape Ferguson, 3.73m



Location	Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
1	19° 09.10'	147° 03.15'	18.0	20/11/1975	08/10/1991
2	19° 09.50'	147° 03.10'	18.0	08/10/1991	12/07/1994
3	19° 09.26'	147° 03.47'	18.0	12/07/1994	19/05/1995
4	19° 09.47'	147° 03.08'	18.0	19/05/1995	05/06/1996
5	19° 09.47'	147° 03.77'	22.0	05/06/1996	03/06/1997
6	19° 09.42'	147° 03.11'	16.2	03/06/1997	09/07/1998
7	19° 09.44'	147° 03.24'	15.1	09/07/1998	02/09/1999
8	19° 09.47'	147° 03.75'	14.4	02/09/1999	current

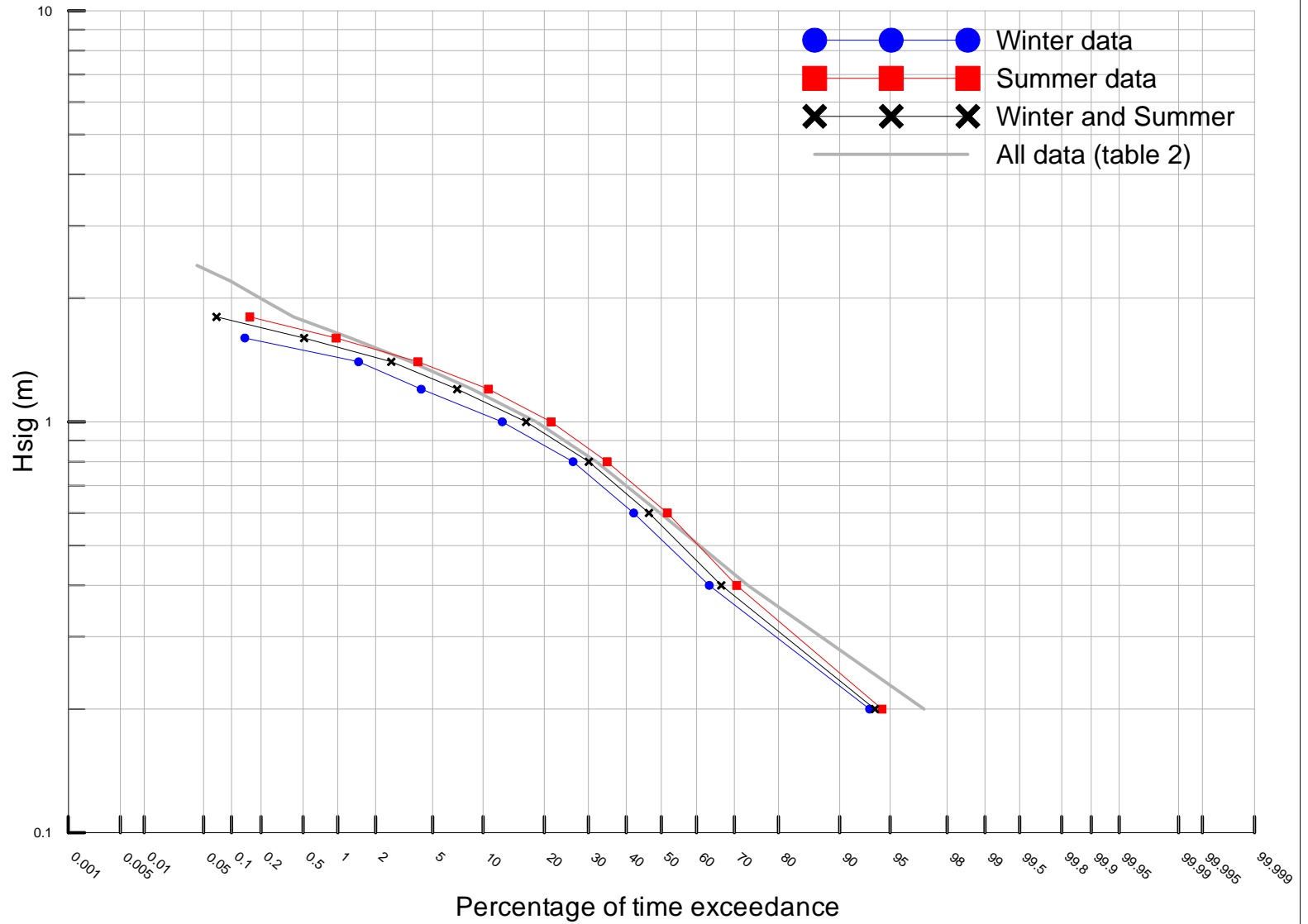
Townsville region—Locality plan

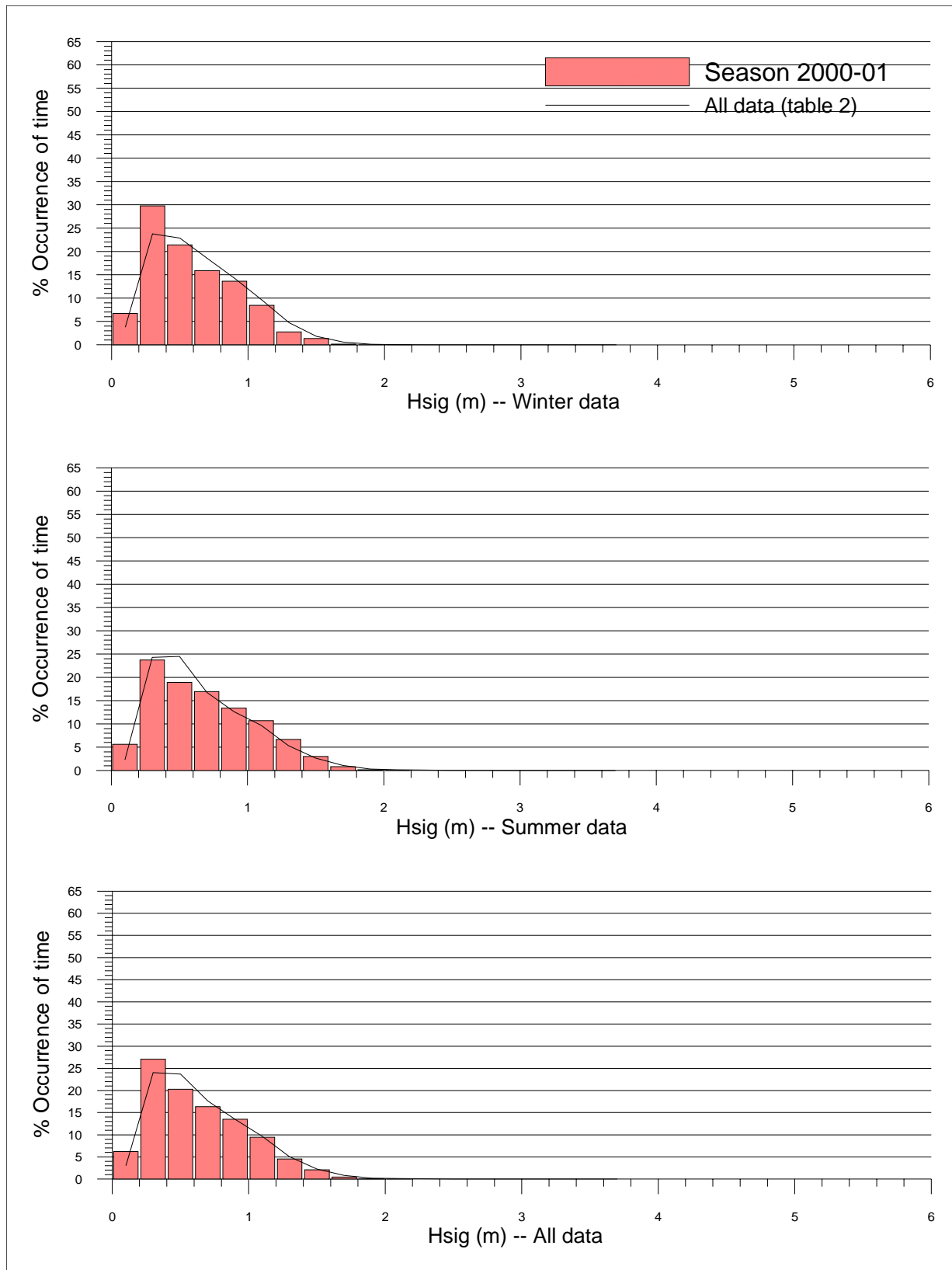


Wave data recording program
Annual summary for season 2000–01

Figure 9.1

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



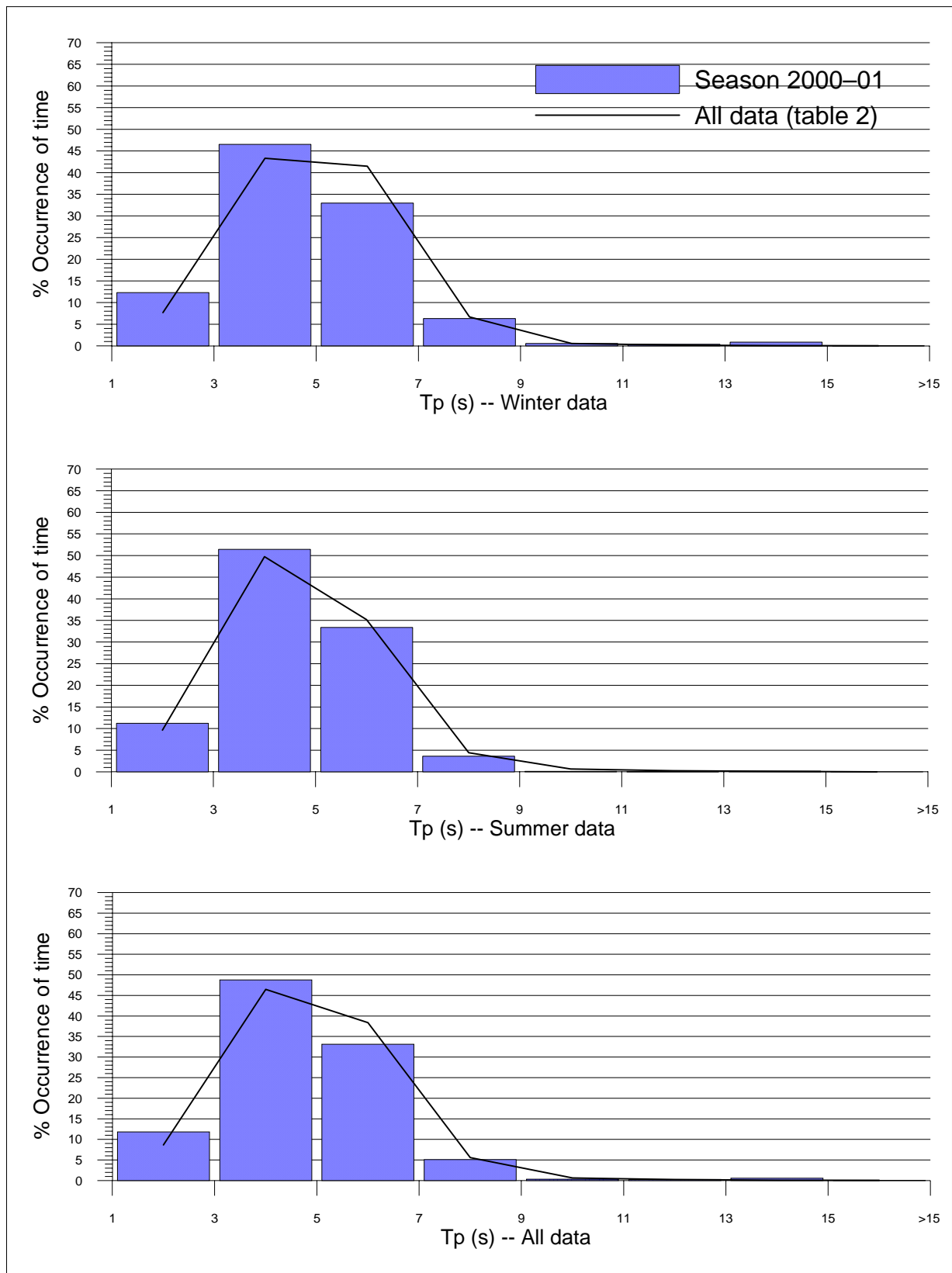


Townsville region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000–01

Figure 9.3



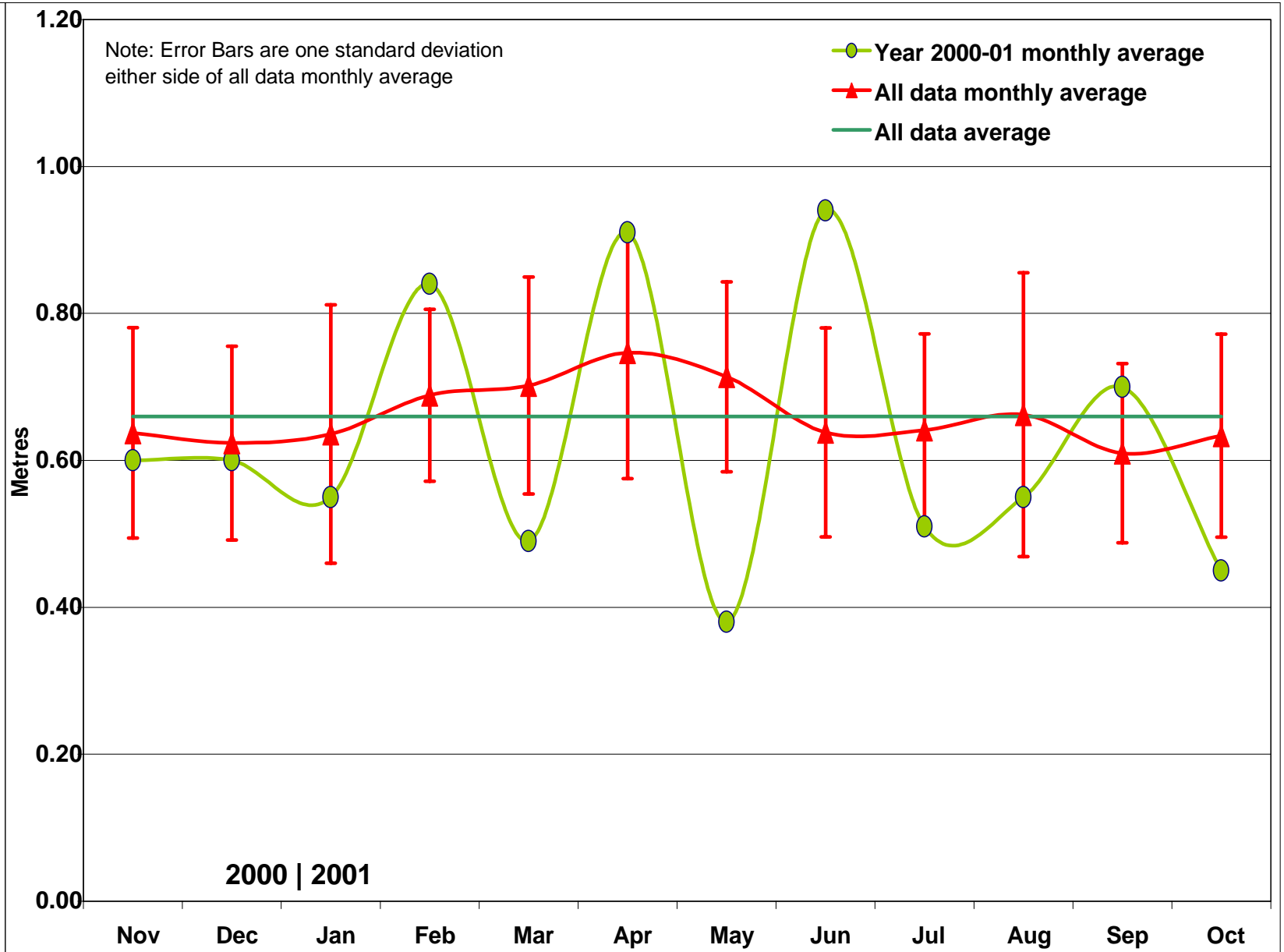
Townsville region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



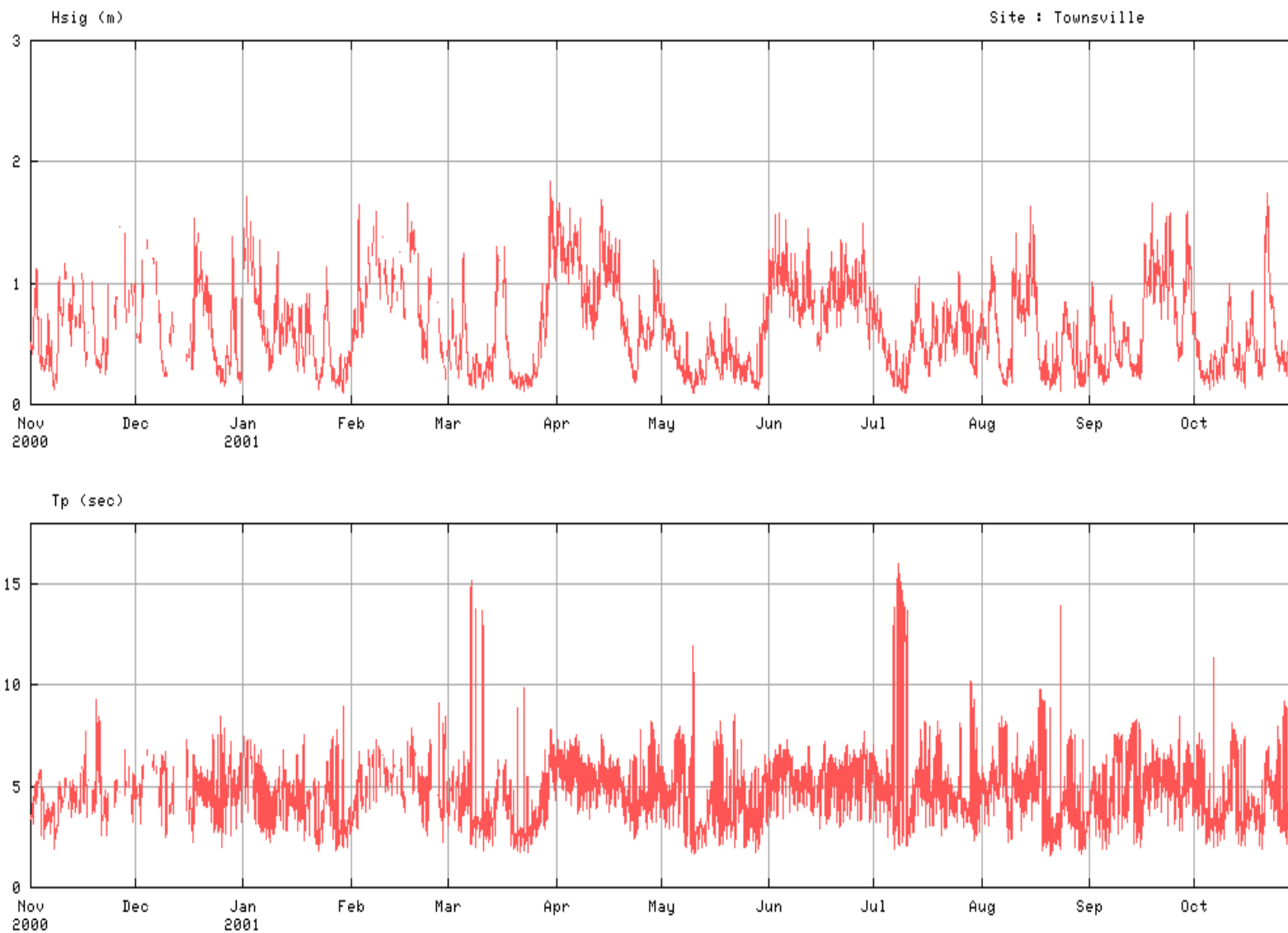
Wave data recording program
Annual summary for season 2000-01

Figure 9.4

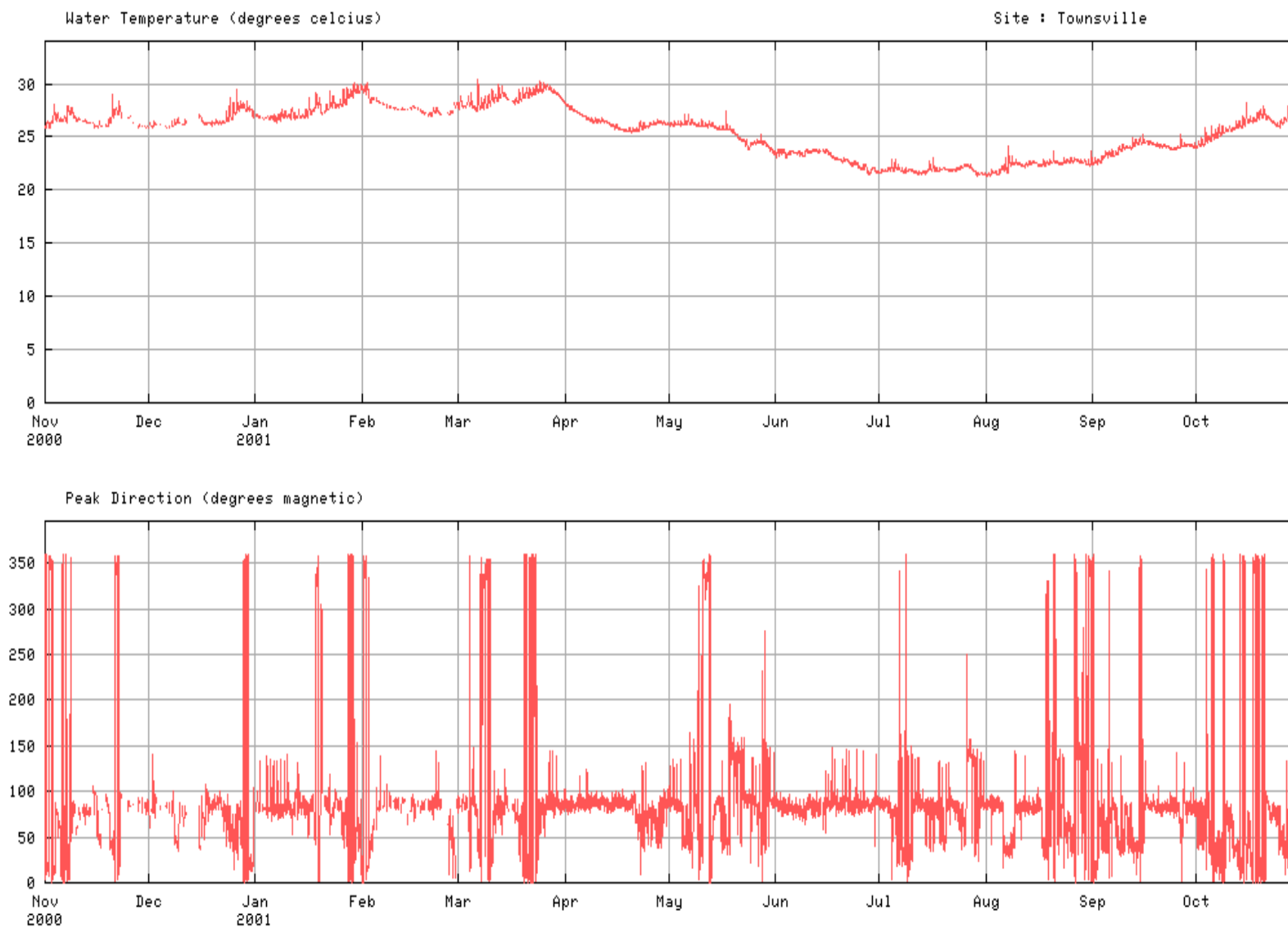
Townsville region—Plot of monthly averages for seasonal year and for all data, for wave height (Hsig)

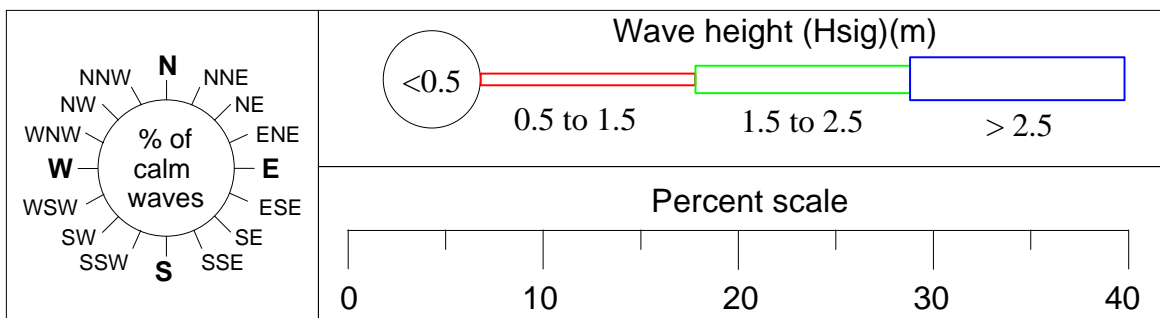
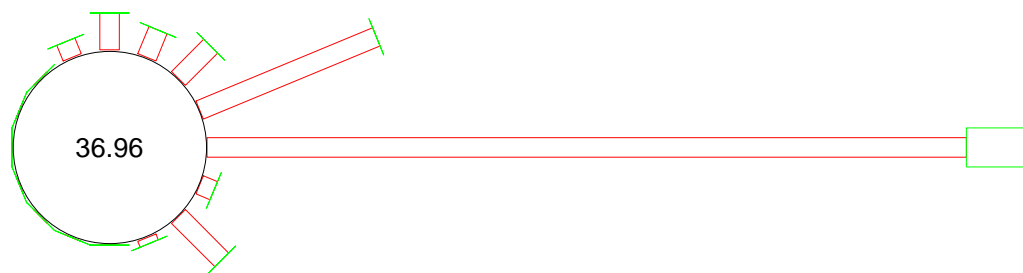


Townsville region—Daily wave recordings



**Townsville region—Water temperature
and peak direction recordings**





Townsville region—Directional wave rose



Wave data recording program
Annual summary for season 2000–01

Figure 9.8

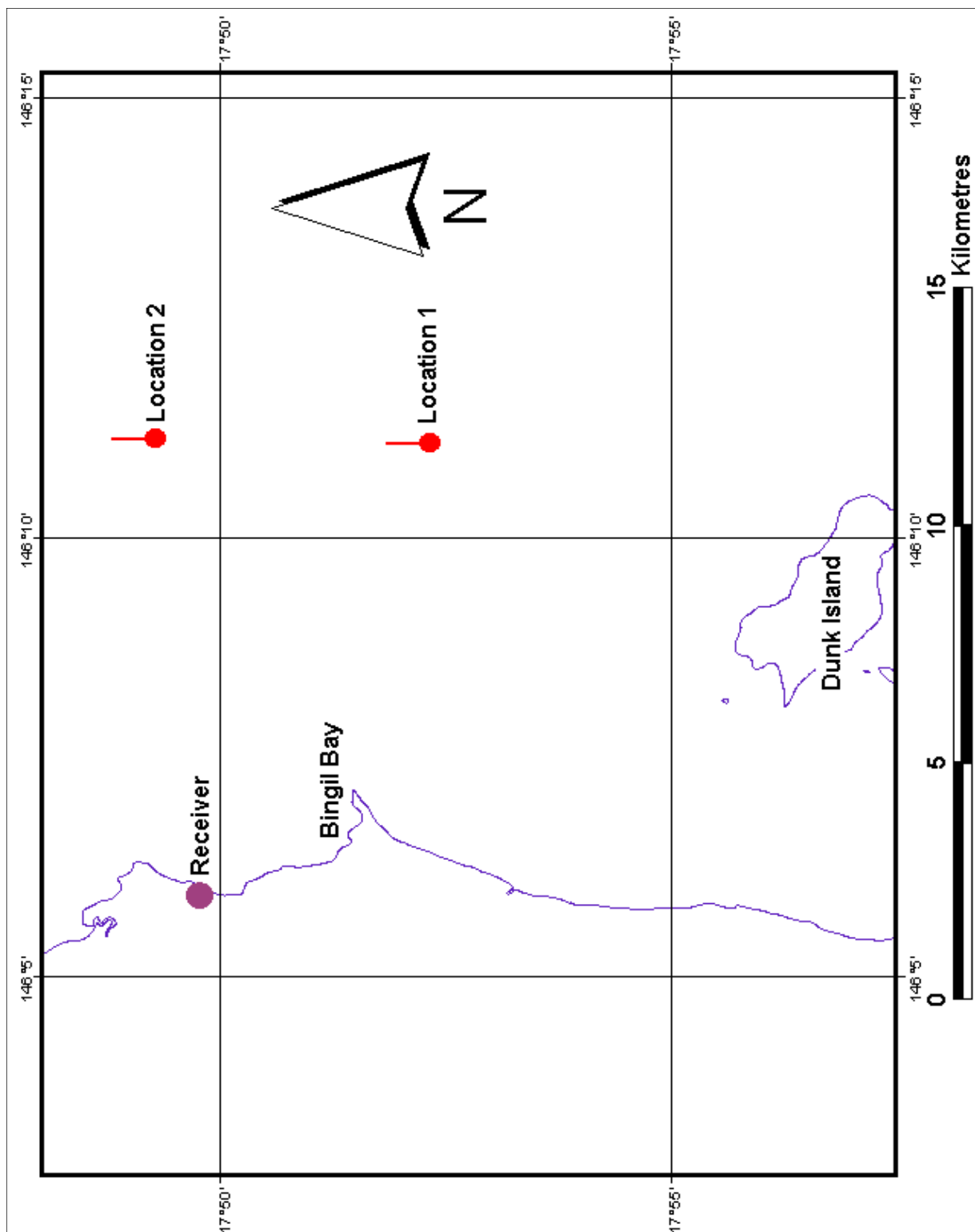
Dunk Island

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 306.457
Gaps in data from selected dates (days)	= 58.543
Gaps in data from duration analysis (days)	= 44.918
Number of records used in analysis	= 14,009

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



Location	Latitude	Longitude	Depth (m)	LAT	Deployment date	Removal date
1	17° 52.21'	146° 11.06'	20.0		18/12/1998	18/09/2000
2	17° 49.09'	146° 11.13'	20.0		14/11/2000	current

Dunk Island region—Locality plan

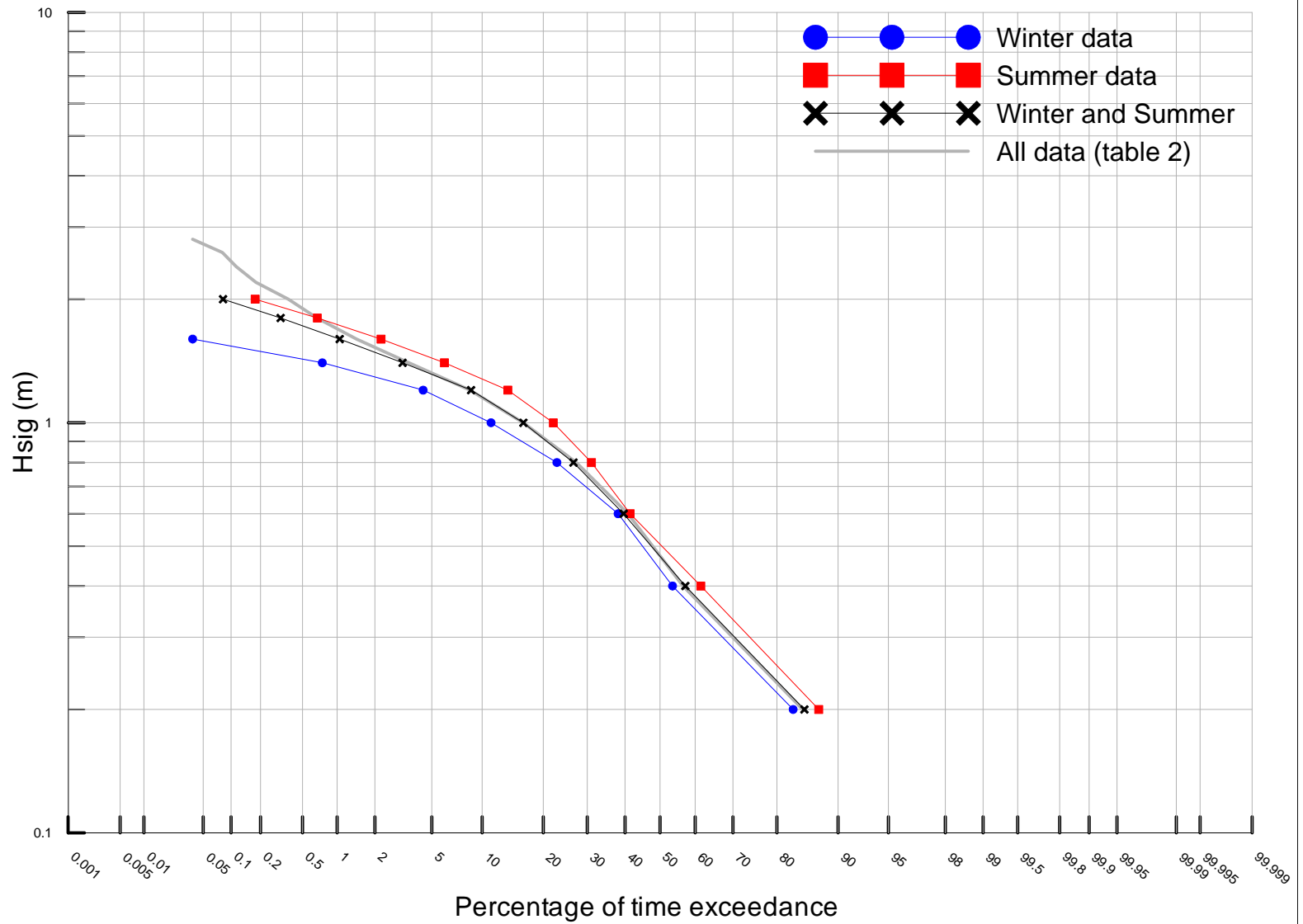


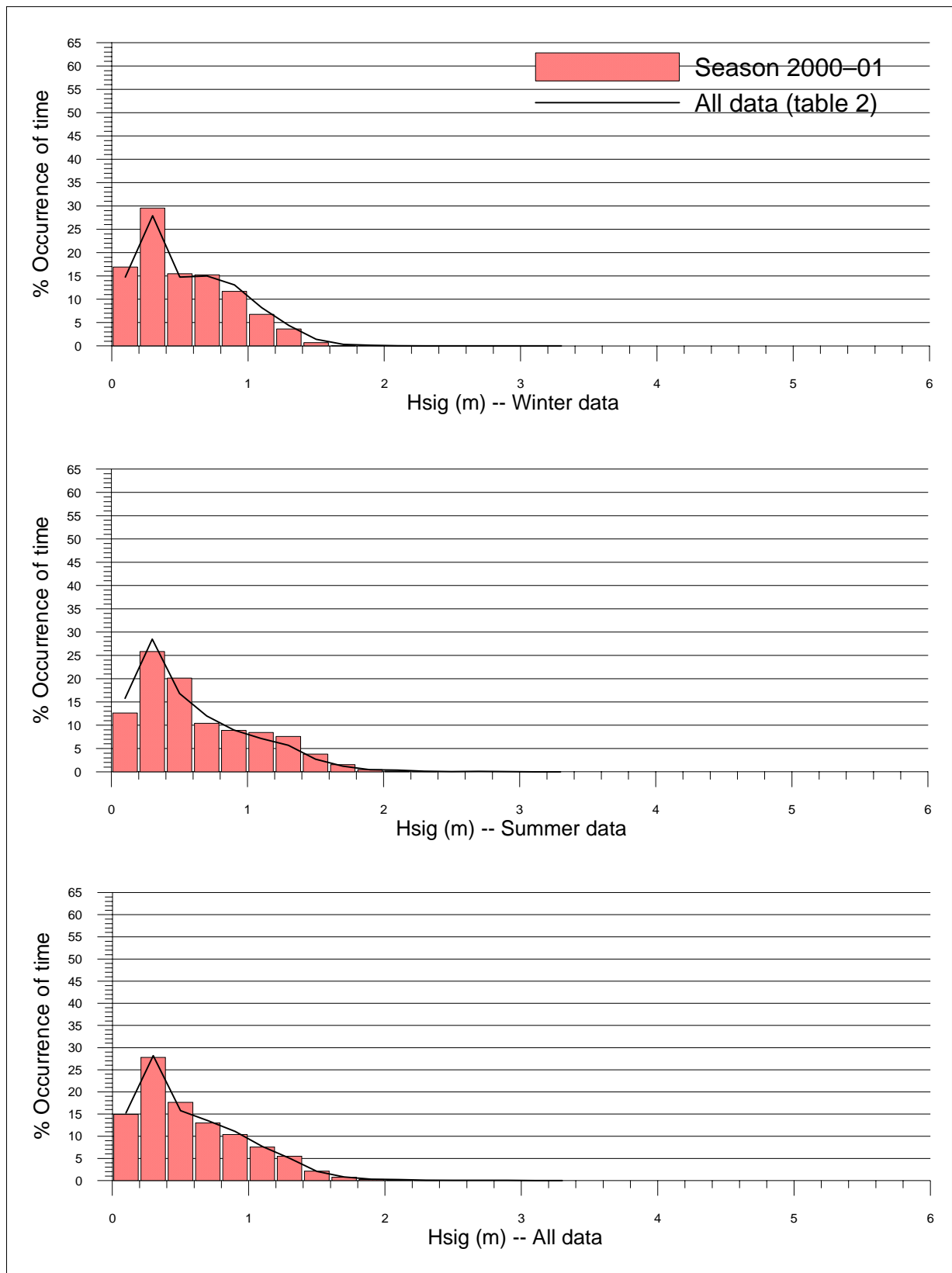
Wave data recording program
Annual summary for season 2000–01

Figure 10.1


Dunk Island region—Percentage (of time) exceedance

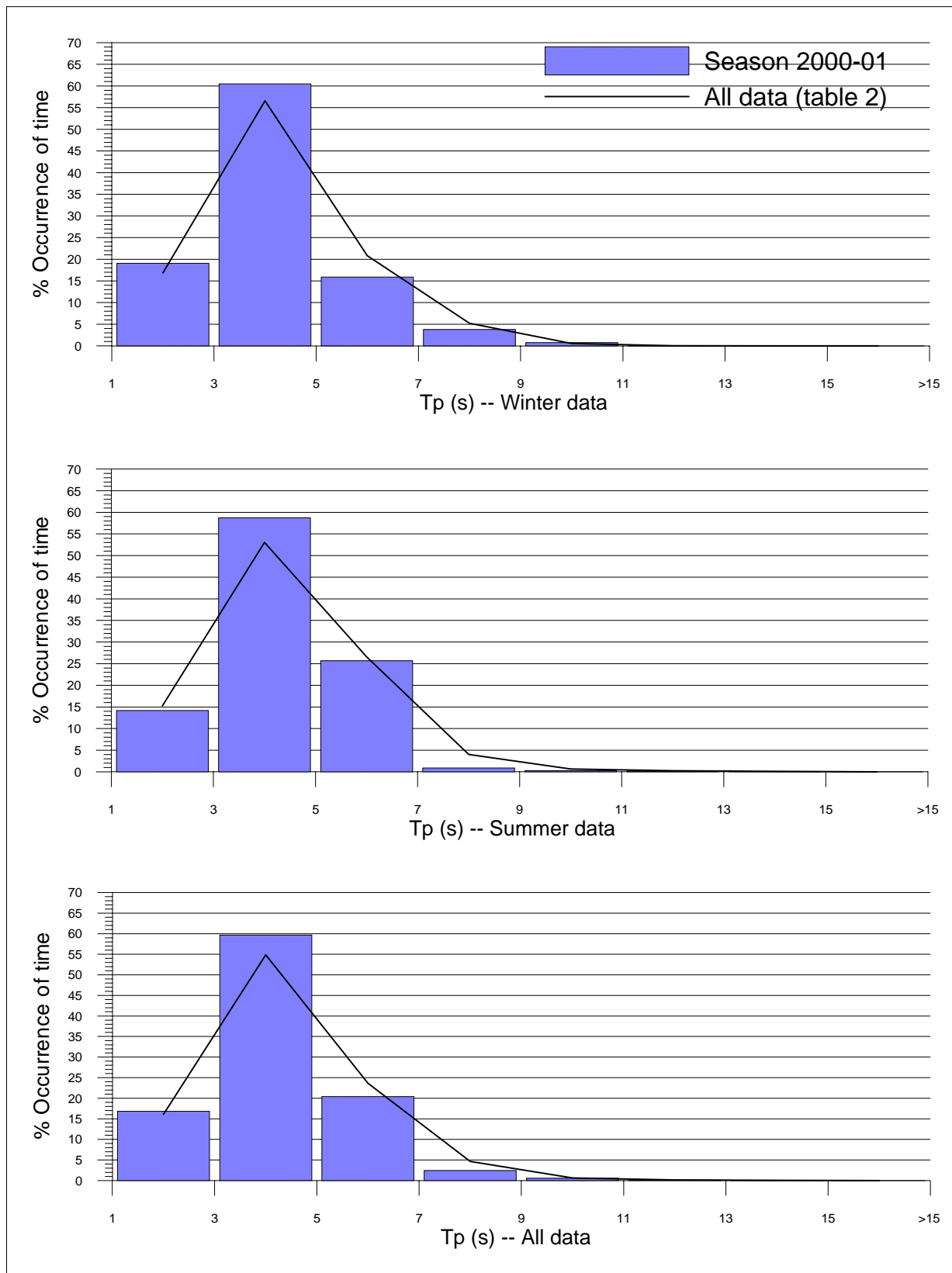
 of wave heights (Hsig) for all wave periods (Tp)





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

 <p>Queensland Government Environmental Protection Agency</p>	<p>Wave data recording program Annual summary for season 2000-01</p>	<p>Figure 10.3</p>
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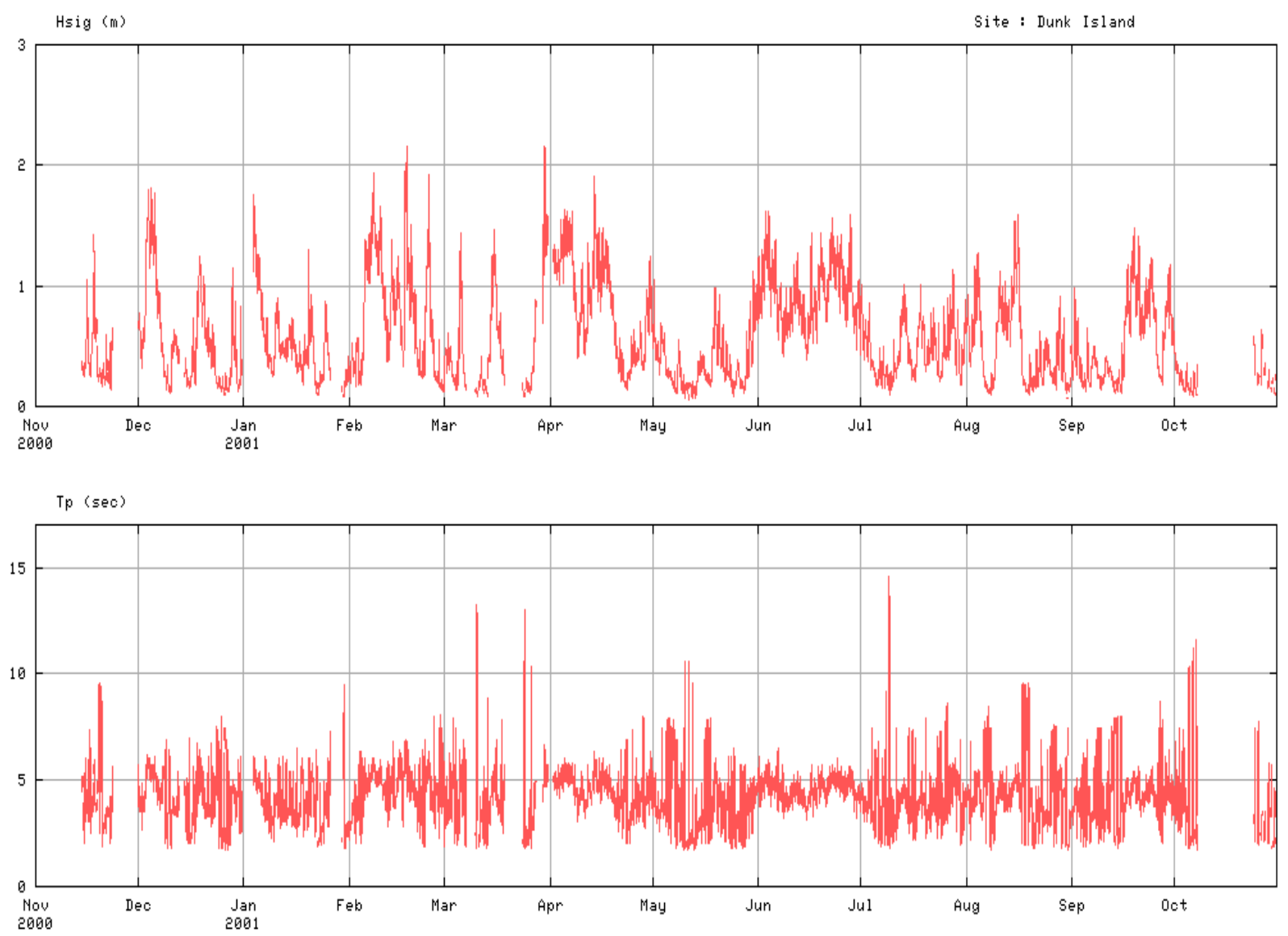
Dunk Island region—Histogram percentage (of time) occurrence of wave periods (T_p) for all wave heights (H_{sig})



Wave data recording program
Annual summary for season 2000–01

Figure 10.4

Dunk Island region—Daily wave recordings



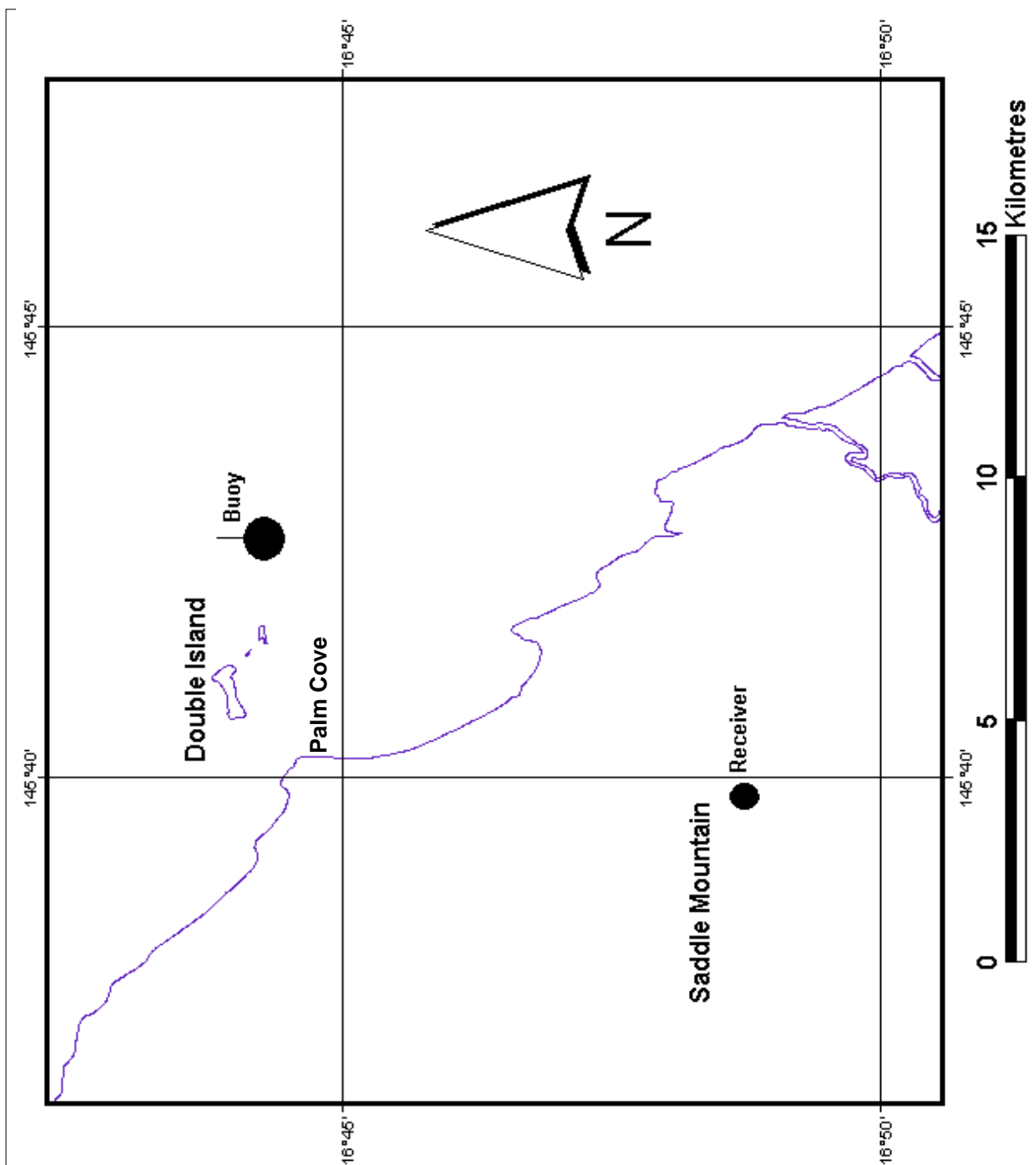
Cairns

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 349.416
Gaps in data from selected dates (days)	= 15.584
Gaps in data from duration analysis (days)	= 15.584
Number of records used in analysis	= 13,878

HAT at nearest standard port: Palm Cove, 3.1m



Location	Latitude	Longitude	Depth (m)	LAT	Deployment date	Removal date
1	16° 42.42'	145° 44.5'	16.4		04/05/1975	27/10/1985
2	16° 42.55'	145° 42.05'	16.5		27/10/1985	13/11/1987
3	16° 43.07'	145° 42.05'	13.5		14/11/1987	18/08/1988
4	16° 43.07'	145° 42.20'	13.5		19/08/1988	19/07/1991
5	16° 43.54'	145° 42.35'	13.5		20/07/1991	31/01/1995
6	16° 43.95'	145° 42.68'	14.0		31/01/1995	28/10/1998
7	16° 44.02'	145° 42.57'	12.5		29/10/1998	current

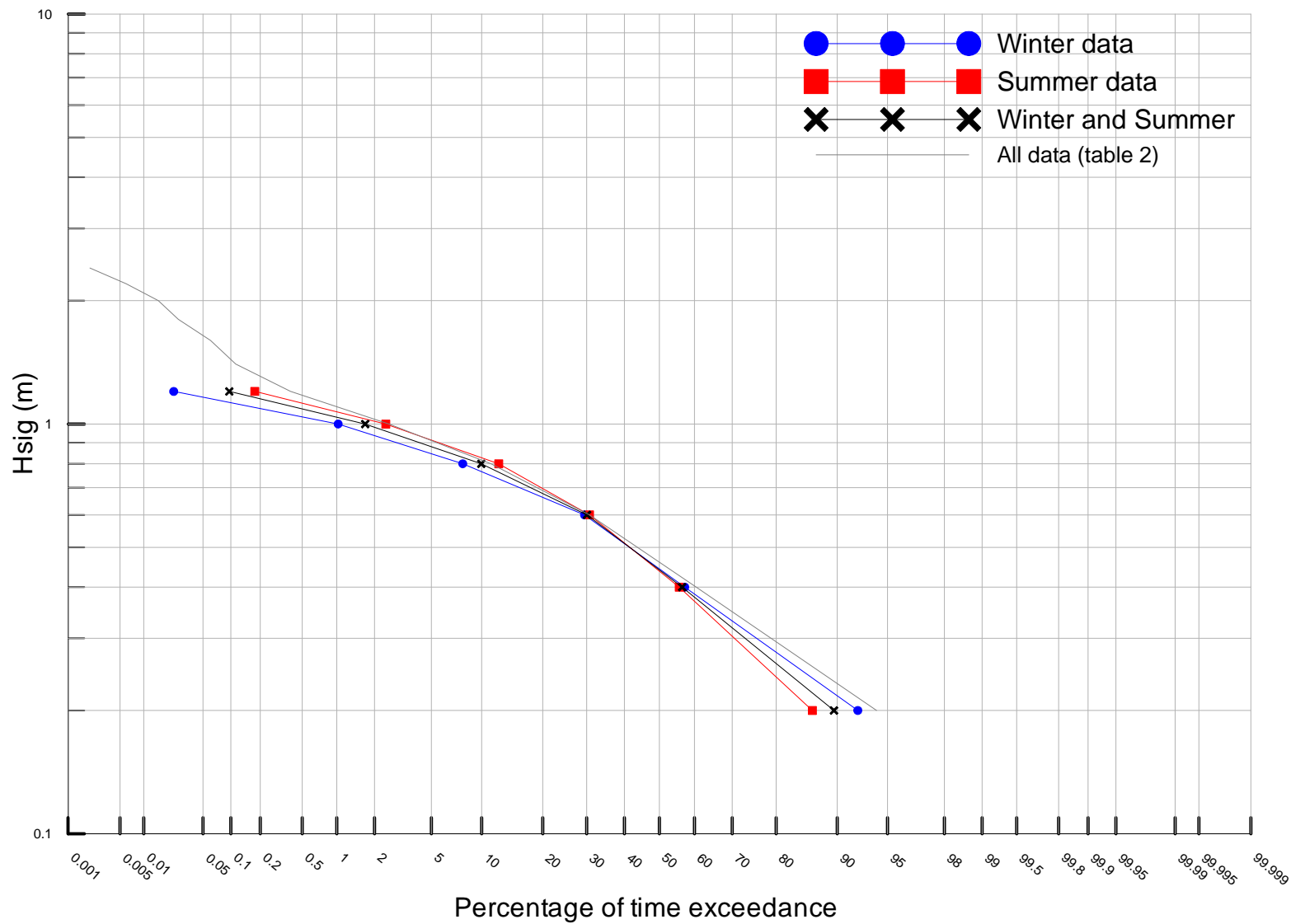
Cairns region—Locality plan

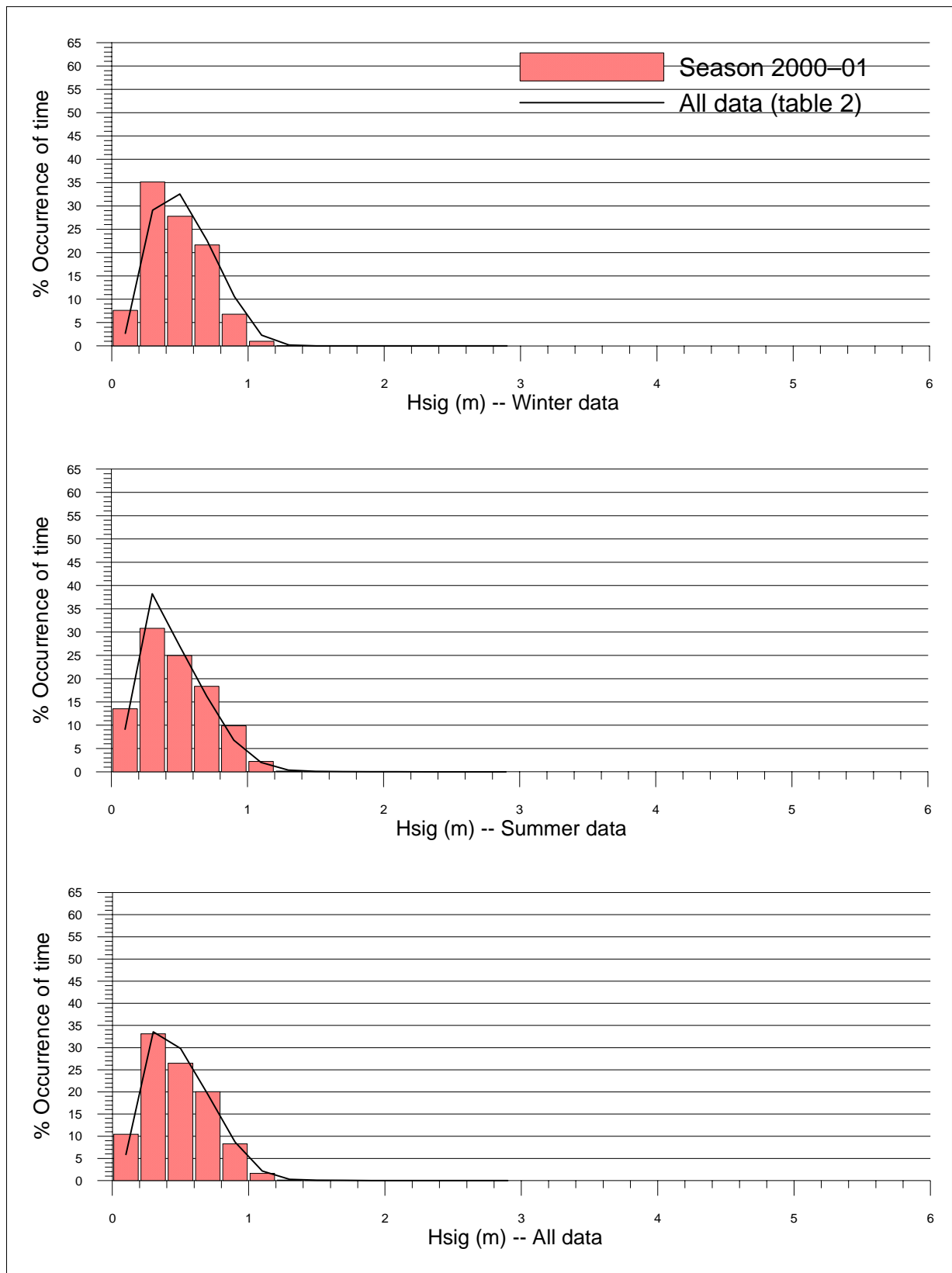


Wave data recording program
Annual summary for season 2000–01


Figure 11.1

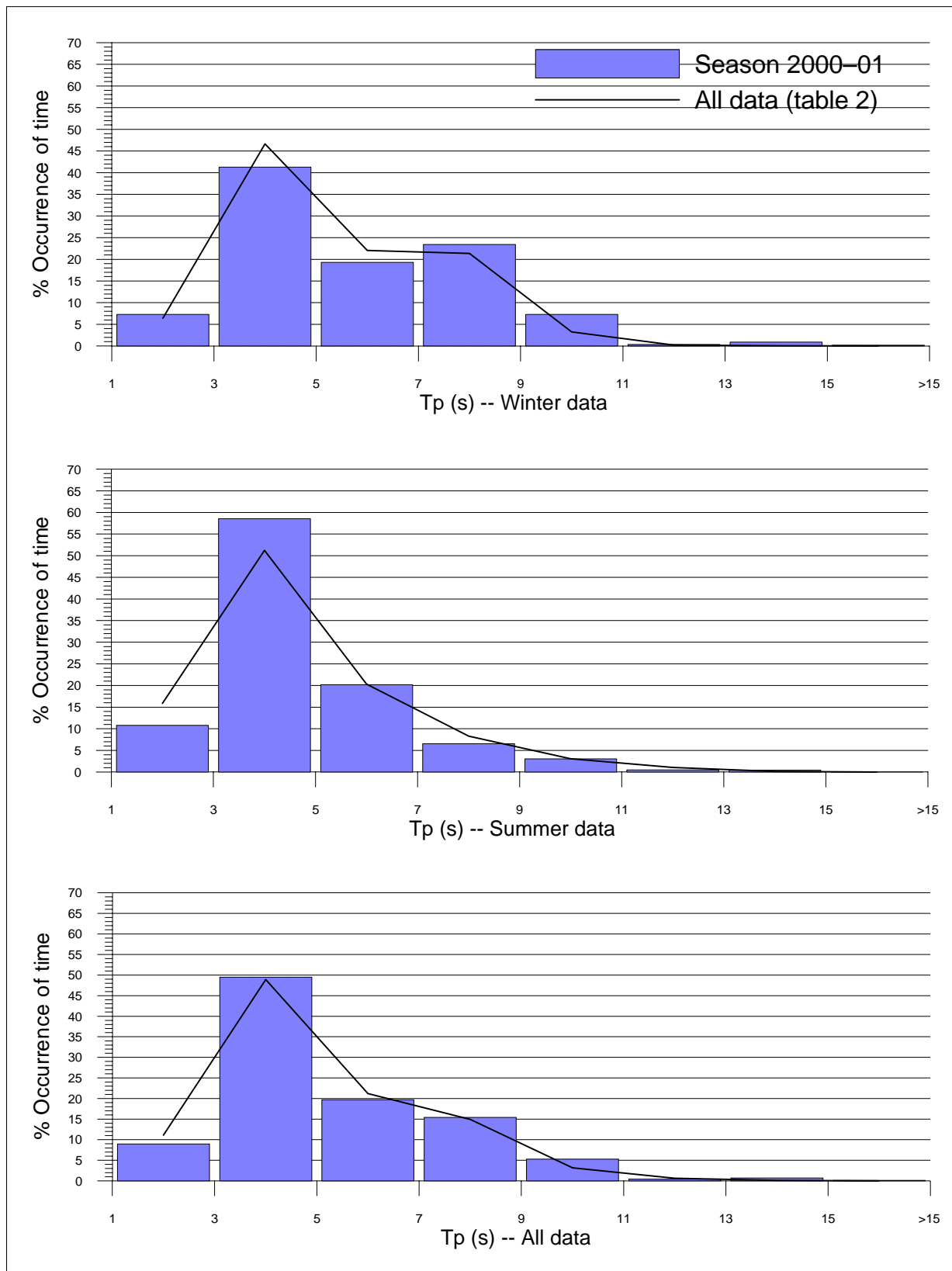
Cairns region—Percentage (of time) exceedance of wave heights (Hsig) for all wave periods (Tp)





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

	<p>Wave data recording program Annual summary for season 2000-01</p>	<p>Figure 11.3</p>
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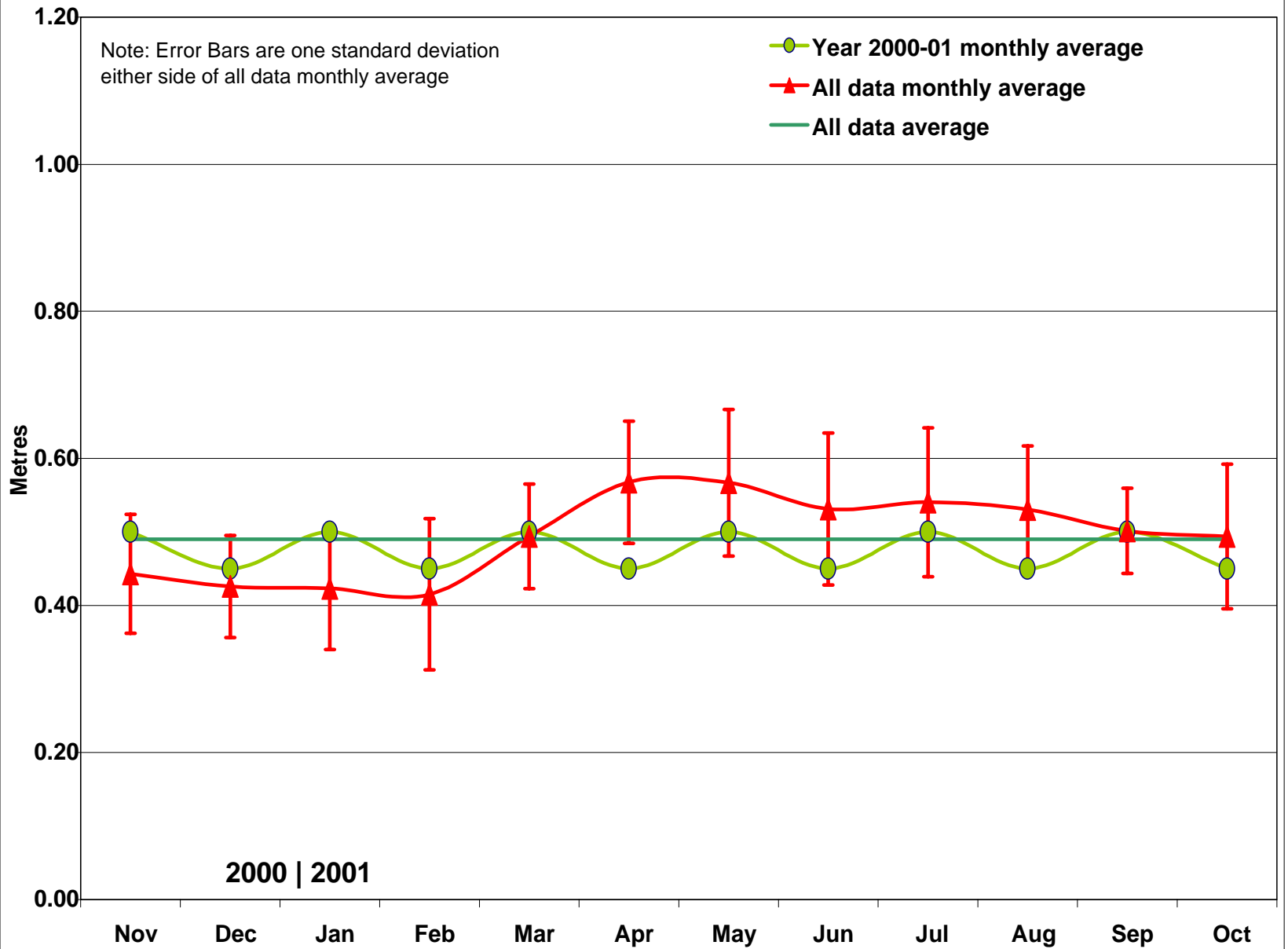
Cairns region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)



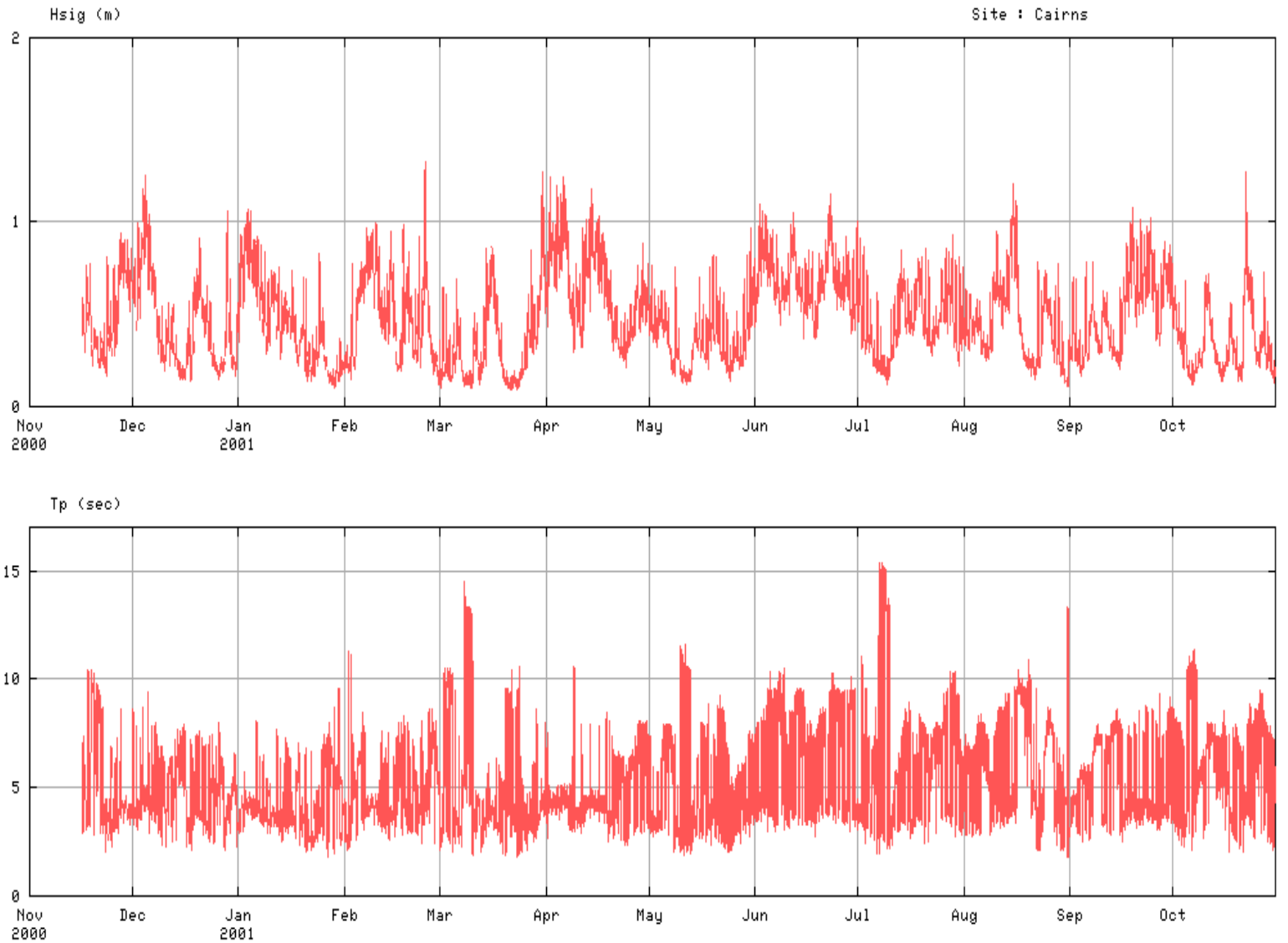
Wave data recording program
Annual summary for season 2000-01

Figure 11.4

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



Cairns region—Daily wave recordings



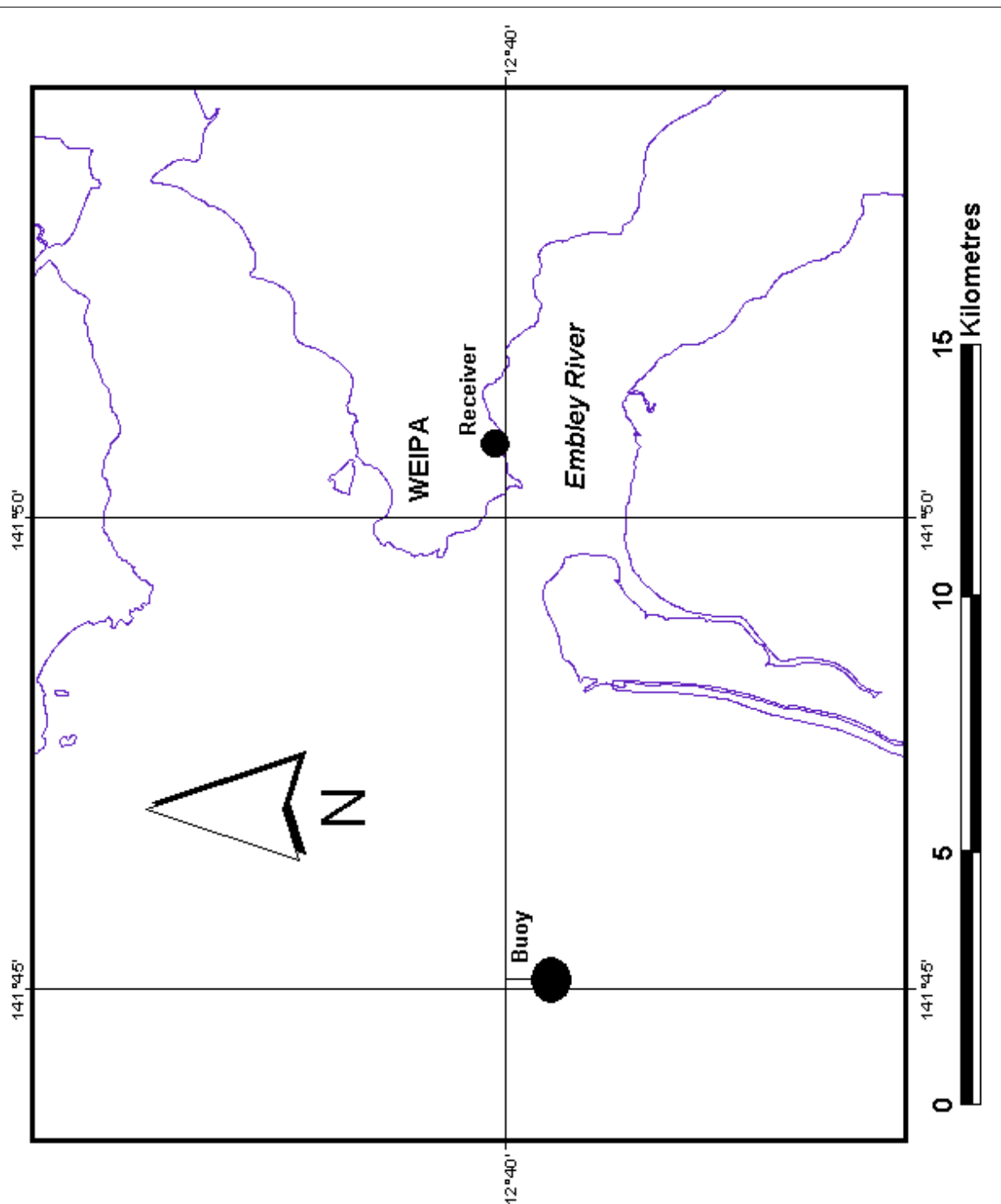
Weipa

Wave recording station

Details of wave recorder station

Maximum possible analysis days (last record–first record)	= 365.0
Total days used in analysis	= 335.448
Gaps in data from selected dates (days)	= 29.551
Gaps in data from duration analysis (days)	= 29.968
Number of records used in analysis	= 13,796

HAT at nearest standard port: Weipa, 3.38m



Location	Latitude	Longitude	Depth (m) LAT	Deployment date	Removal date
1	12° 40.83'	141° 45.20'	5.3	22/12/1978	25/07/1990
2	12° 40.05'	141° 45.02'	5.3	26/07/1990	11/02/1992
3	12° 40.42'	141° 45.03'	5.4	11/02/1992	02/08/1995
4	12° 40.60'	141° 45.10'	4.1	04/08/1995	10/09/1998
5	12° 40.52'	141° 45.15'	4.1	10/09/1998	current

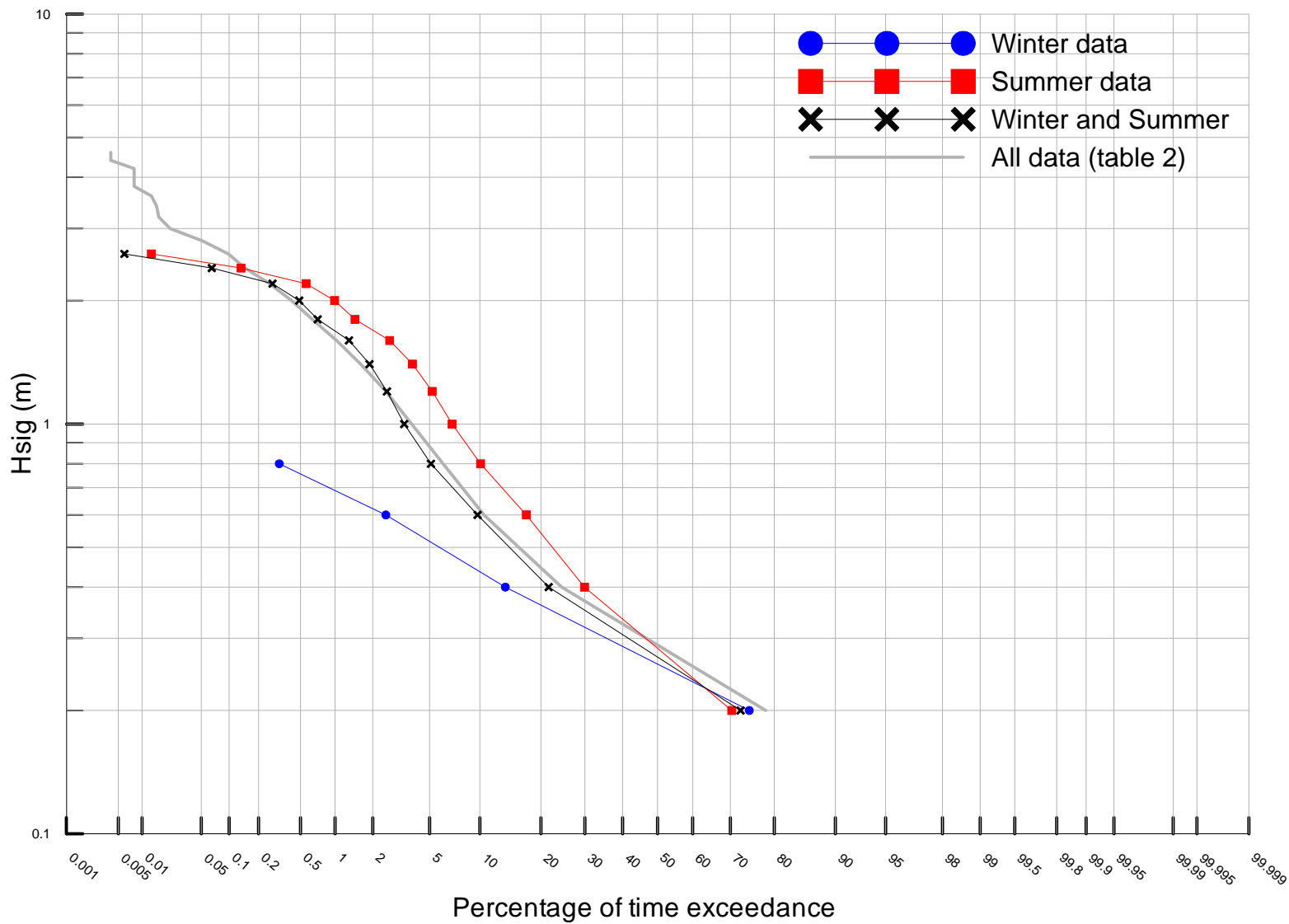
Weipa region—Locality plan

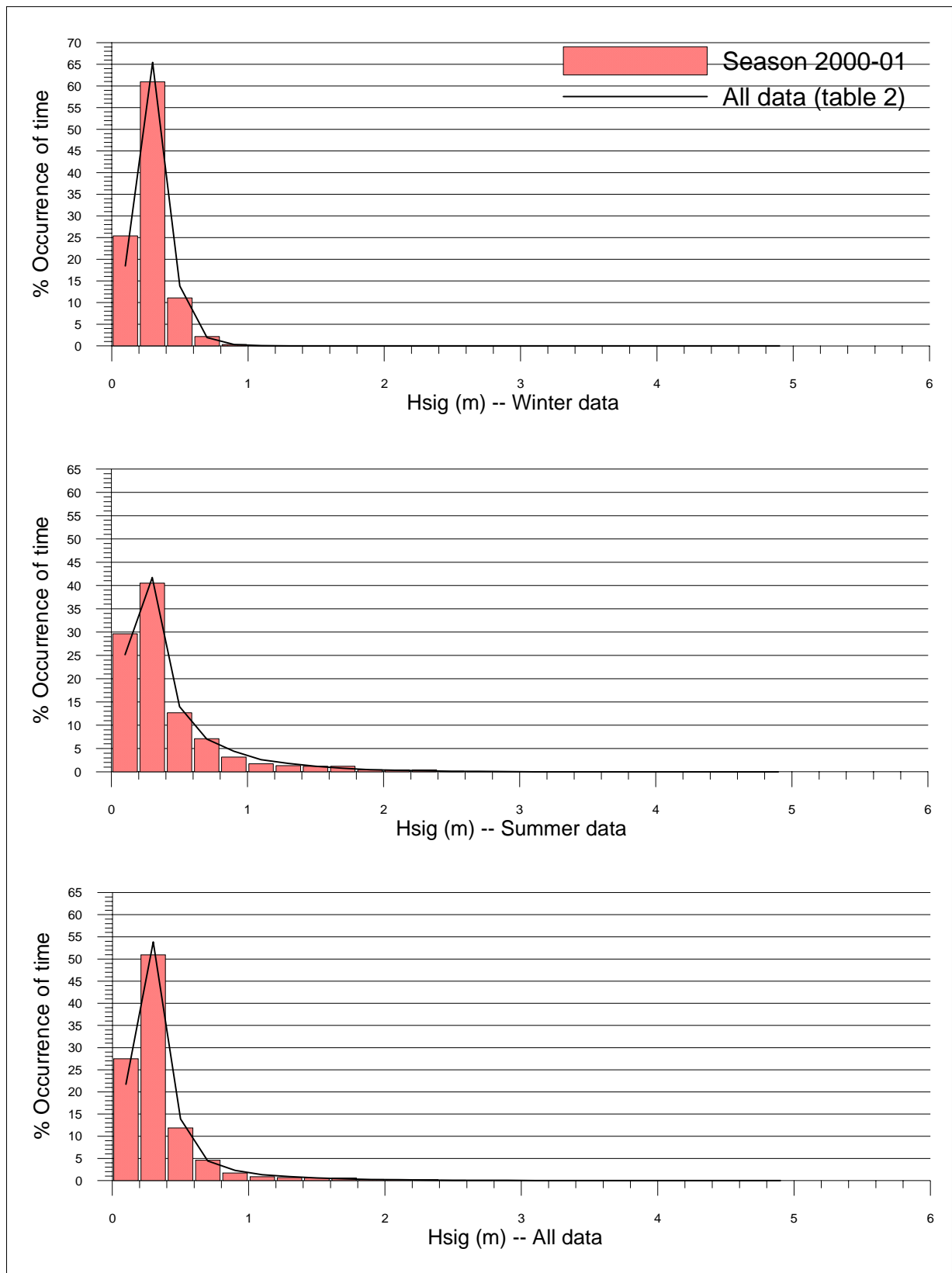


Wave data recording program
Annual summary for season 2000–01

Figure 12.1

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



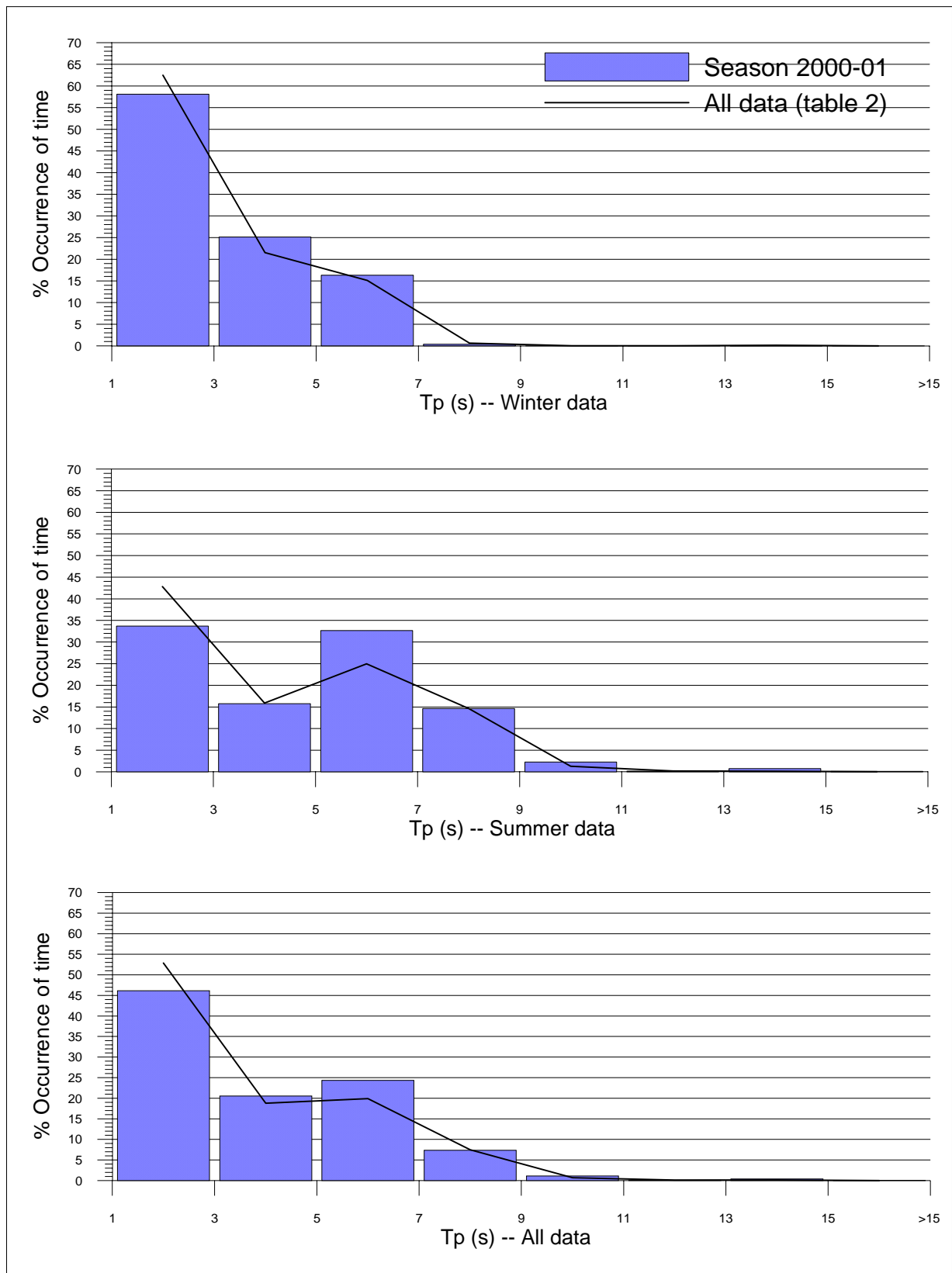


Weipa region—Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)



Wave data recording program
Annual summary for season 2000–01

Figure 12.3



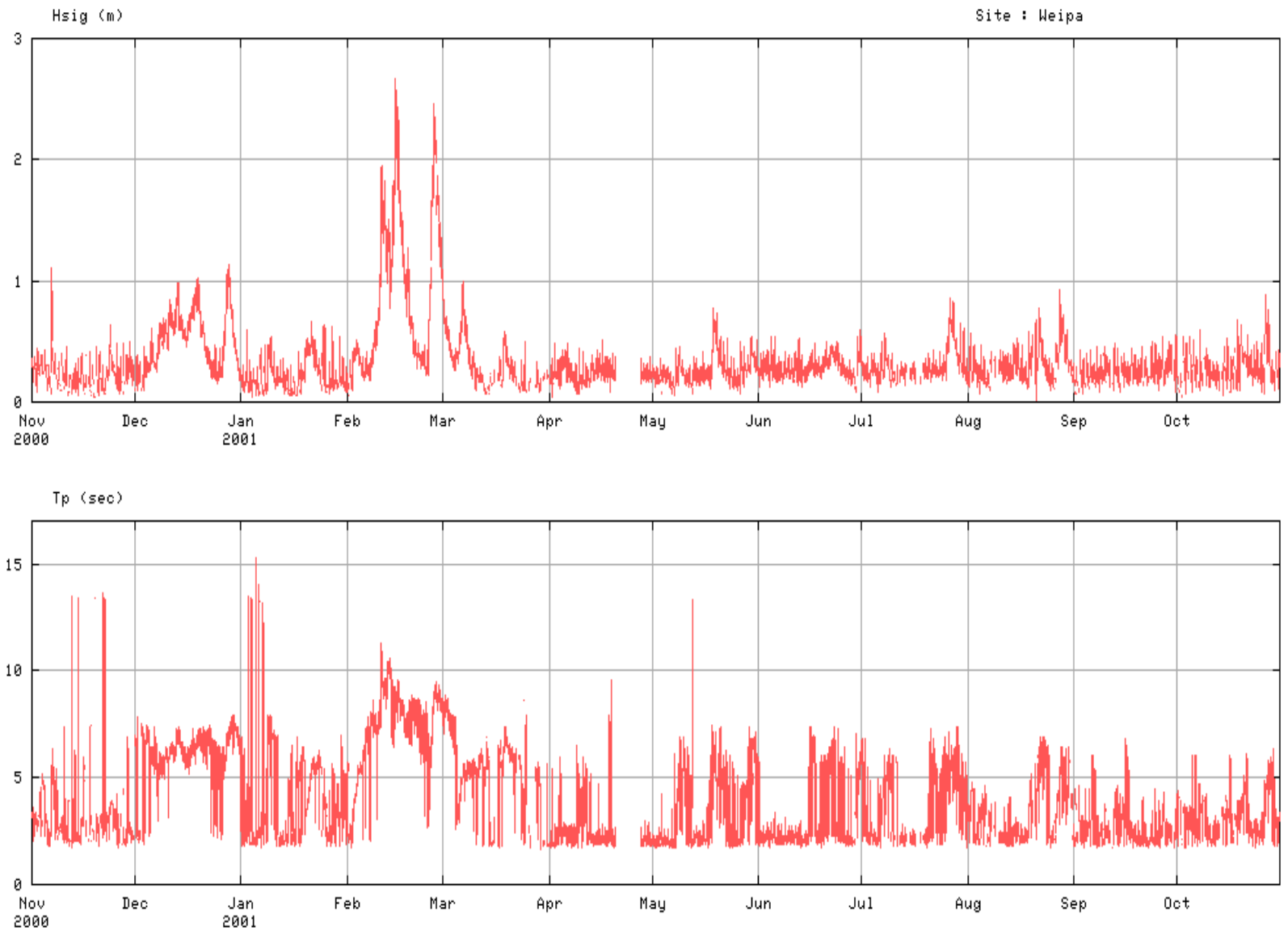
Weipa region—Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)

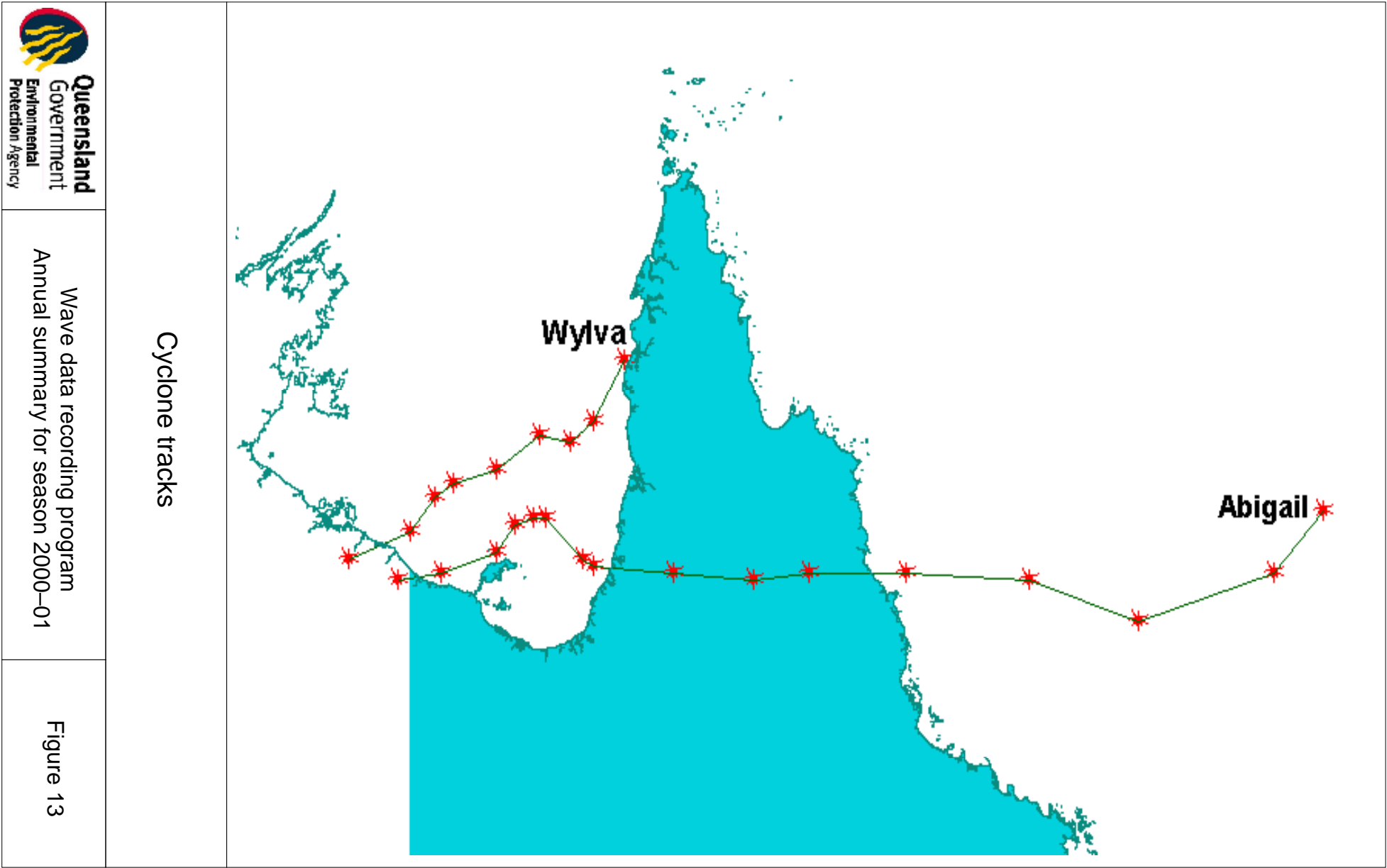


Wave data recording program
Annual summary for season 2000—01

Figure 12.4

Weipa region—Daily wave recordings

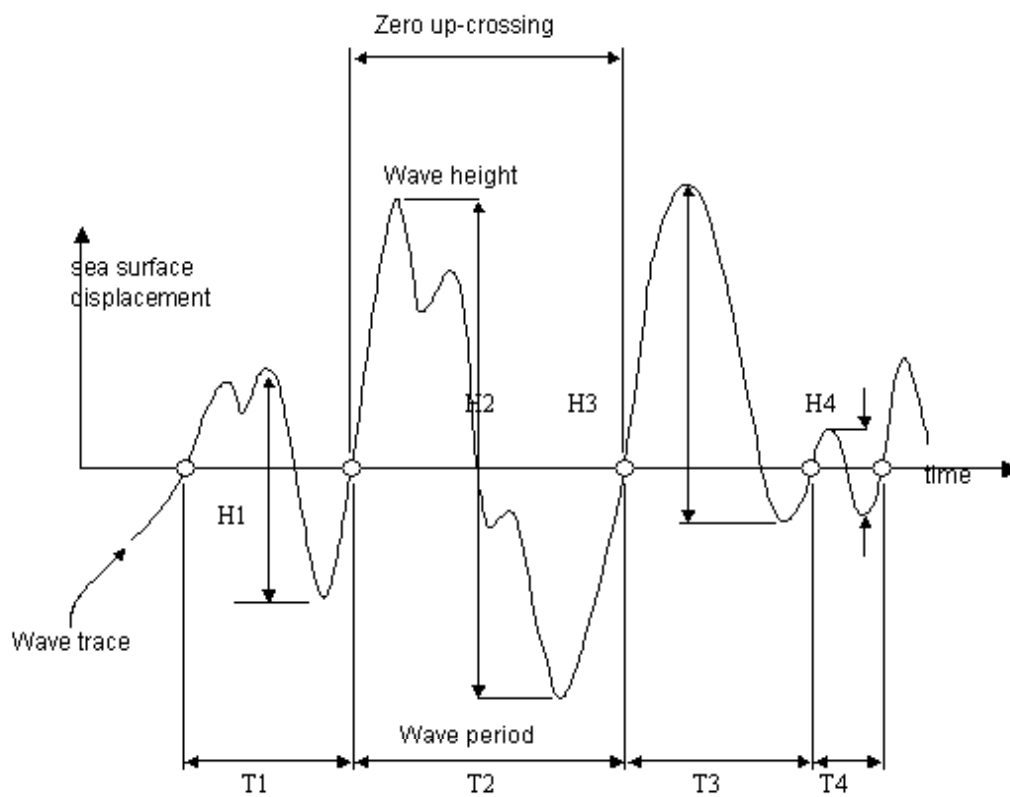




Zero crossing analysis

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 up-crossing method, the method employed by the Agency, a wave is defined as the portion of the record between two successive zero up-crossings. 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

Appendix A

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 zero and two, 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)