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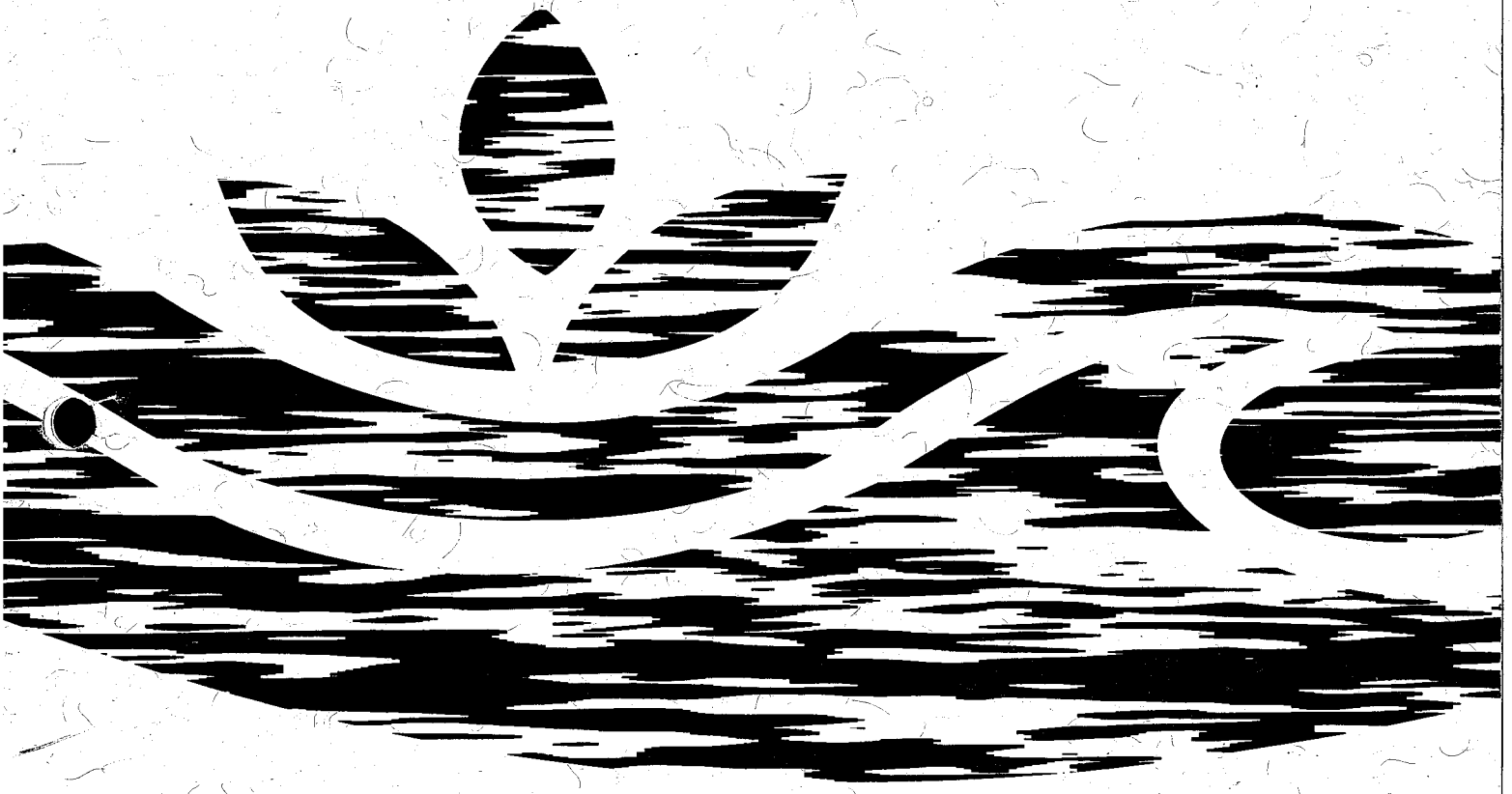
# Wave data recording program
# Brisbane
# 1976 - 1997



QUEENSLAND GOVERNMENT

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# Wave data recording program Brisbane Region 1976–1997


## Abstract

This report summarises primary analyses of wave data recorded in water depths of approximately 70 metres offshore from Point Lookout on North Stradbroke Island in southern Queensland. Data were recorded using a Datawell waverider buoy, and covers the period 30 October 1976 to 28 February 1997. The data were divided into seasonal groupings for analysis. No estimations of wave direction data have been provided.



This report has been prepared by the Coastal Management Branch, Division of Conservation, Department of Environment, on behalf of the Beach Protection Authority.


**Wave data recording program**
**Brisbane Region 1976–1997**

## Disclaimer

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# 1 Introduction

As part of its long-term data collection program, the Beach Protection Authority has maintained a network of wave recording stations along Queensland's coast since 1968. This report summarises the primary analyses of wave data collected at the Brisbane station. In addition, brief details of the recording equipment, the methods of handling raw data and the type of analyses employed are provided.

# 2 Recording equipment

The Beach Protection Authority's wave recording program uses one of two systems to measure wave data: the waverider buoy system or a wave pole.

## 2.1 Waverider system

The waverider system manufactured by Datawell bv of the Netherlands uses a waverider buoy to determine the sea surface fluctuations at an offshore location. Directional and non-directional buoys are in operation.

Directional and non-directional waverider buoys measure vertical acceleration by means of an accelerometer, mounted on a gravity-stabilised platform suspended in a fluid filled plastic sphere located at the bottom of the buoy. This data is then twice integrated to give displacement.

The directional buoy measures horizontal acceleration 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 instantaneous water level and directional data are then transmitted to the shore station as a frequency modulated high frequency radio signal.

## 2.2 Wave pole system

The wave pole system, manufactured by the Queensland Government Hydraulics Laboratory, consists of a single perforated metal pipe surrounding an inner metal pipe which acts as a co-axial transmission line to the water, with an enclosed circuit board housing containing an electronic oscillator mounted on the top. This system is mounted vertically on a suitable offshore structure.

Relative wave height measurements are taken based on the principle that a sharp change in the electrical impedance of the wave pole occurs at the fluctuating water surface and the period of oscillation is linearly proportional to the length of the wave pole that is not immersed in water.

Water surface elevations are recorded at the wave pole and are transferred via radio modem to a remote data recording computer.

## 2.3 Station configuration

In the original configuration of the Brisbane station, first installed on 30 October 1976, the shore station consisted of a WAREP mark II Waverider receiver coupled to an ANMA analogue recorder.

On 17 June 1982 the Brisbane station equipment was upgraded to a WAREP mark II Waverider receiver and a DIMA digitiser/recorder.

In both systems, the WAREP receiver controlled the timing of data recording and provided a paper chart of the water level signal. Wave data were recorded by the ANMA and DIMA units in 20 minute bursts and digitised at 0·5 second intervals (2.0Hz). The data were recorded on digital cassettes and, along with the paper charts, transferred to the Brisbane office for processing.

On 1 November 1991, the wave recording system was upgraded to a personal computer (PC) based system utilising the Datawell DIWAR Waverider receiver/digitiser. The water level data, digitised at 0·39 second intervals (2.56Hz), is recorded in bursts of 4096 points (approximately 26 minutes) 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 can 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 of this report.

## 2.4 Laboratory calibration checks

Waverider buoys used by the Authority are calibrated before deployment and also after recovery. Normally, a buoy is calibrated once every 12 months. Calibration is performed at the Queensland Government Hydraulics Laboratory using a buoy calibrator to simulate sinusoidal waves with amplitudes of either 2m or 2.8m depending on whether a 0·7m or 0·9m diameter buoy is involved. The calibrator is electrically controlled and the frequency can be varied from 0·016–0·25Hz. It is usual to check three frequencies during a calibration. During the calibration procedure, the following characteristics of the buoy are also checked:

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

The recorded wave data are not adjusted in light of the laboratory calibration results.

# 3 Wave recording and analysis procedures

Between 30 October 1976 to 16 June 1982, wave data were recorded twice daily, each of 20 minutes duration, with the timing of recordings set at 0300 hours and 1500 hours Australian Eastern Standard Time.

Over the period 17 June 1982 to 31 October 1991, wave data were generally recorded four times a day at 0300, 0900, 1500 and 2100 hours (Australian Eastern Standard Time). During storm events the recording frequency might have been switched manually by the operator to record eight times a day.

Since 1 November 1991, the PC based recording system generally recorded data at (nominally) hourly intervals. During periods when the recorded Hsig value reaches the storm threshold of 4 metres the recording frequency is increased to (nominally) 30 minute intervals.

Recorded non-directional wave data are analysed in the time domain by the zero upcrossing method and in the frequency domain by spectral analysis. Spectral analysis of the WAREP/DIMA data was performed by the autocorrelation method providing 50 lags at a spacing of 0·02Hz.

The PC based analysis uses Fast Fourier Transform 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 Fast Fourier Transform techniques. The output from this processing is then transmitted to the shore station where it undergoes further analysis using Fast Fourier Transform techniques to produce 128 spectral estimates in bands of 0.005Hz.

The zero upcrossing analysis is equivalent in all systems.

Wave parameters resulting from this processing include the following:

| | |
|---|---|
| S(f) | energy density spectrum |
| Hsig | significant wave height (time domain), the average of the highest one-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 one-third of waves in the record |
| Tz | average period of all zero upcrossing 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 in this report.

## 4 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 data recorded by the WAREP/DIMA and the PC based systems includes some data rejection checks. In the case of the WAREP/DIMA data, the length of the record can be shortened to exclude corrupt data points. In the PC based analysis, a small number of spurious data points can be corrected by an interpolation procedure. Otherwise the entire series is rejected.

Details of data losses for the Brisbane wave recording station are included in appendix 1.

## 5 Wave climate

The wave climate data presented in this report are based on statistical analyses of the parameters obtained from the recorded wave data.

Programs developed by the Authority provide statistical information on percentage of time occurrence and exceedance for wave heights and periods. The results of these analyses are presented in tables 1 to 6 and figs.2, 3 and 4. In addition, similar analyses are carried out on the relationships between the various wave parameters and these are presented in fig.5.

### 5.1 Methodology

As discussed above, the various sources of data losses can cause occasional gaps in the data record. Gaps can 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 duration on the side of records adjacent to gaps in the data is limited to a maximum value dependent on the nominal recording interval of that record.

During the period when two records a day were taken, the nominal recording interval was 12 hours. The maximum allowable total duration of a record is equal to the nominal recording interval of 12 hours. Each duration on either side of a record greater than nominal six hours (half the nominal recording interval) is set to the maximum allowable of exactly six hours, and a gap in the data is reported.

During the period when four records a day were taken, the nominal recording interval was six hours. The maximum allowable total duration of a record is equal to the nominal recording interval of six hours. Each duration on either side of a record greater than nominal three hours (half the nominal recording interval) is set to the maximum allowable of exactly three hours, and a gap in the data is reported.

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

## 6 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. This data is shown on appendix 1. The non-directional Waverider recording system used by the Authority 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.

Although a directional Waverider buoy was installed at Brisbane in November 1996, data presented does not include any analysis of wave directions as it is considered that the data sampling period is too short to provide any meaningful base data.

Appendix 2 provides a summary of meteorological events which occurred during the recording period of this report where the recorded Hsig value reached the storm threshold of 4 metres during the event. The wave parameters Hsig, Hmax, and Tp and other relevant information are listed for each event. Only cyclone events which contributed to Hsig reaching the storm threshold of 4 metres are listed in appendix 2 and plotted in fig.8.

Appendix 3 lists only the names and dates of cyclones which occurred along the eastern seaboard of Queensland during the recording period of this report.

For the purposes of analysis, Summer has been taken as the period from 1 November to 30 April of the following year. Winter covers the period 1 May to 31 October in any one year.

## 7 References

Permanent International Association of Navigation Congresses (1986), List of Sea State Parameters. Brussels, Belgium.

Datawell, Operation and Service Manual for the Waverider – series 6000

Datawell, Manual of Waverider Receiver type WAREP – mark II

Datawell, Manual of the Digital Waverider Receiver type DIWAR

Datawell, Manual of the Digital Magnetic Tape Recorder

type DIMA – mark II
Datawell, Operations and Service Manual for Directional Waverider from serial no. 30109
Lawson and Treloar Pty Ltd (1991), Real Time Wave Analysis Package. Sydney.
Bureau of Meteorology, Monthly Weather Reviews. Melbourne.

## 8 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, 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, 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, Weipa Region
(Report No. W07.1) 21 Dec 1978 to 7 Apr 1983
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, 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, 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

## Appendix 1

Details of wave recorder installations, Brisbane Region

**Buoy locations**

See fig.1 for the locations of the waverider buoys and receiving station for the period of this report.

Location: 153°37'00" east, 27°25'00" south
Description: 9.0 kilometres east of Point Lookout.
Water depth at buoy: 70 metres relative to Australian Height Datum.
Period: 30 October 1976 to 24 November 1988

Location: 153°37'00" east, 27°29'00" south
Description: 11.0 kilometres east-south-east of Point Lookout.
Water depth at buoy: 80 metres relative to Australian Height Datum.
Period: 25 November 1988 to 31 October 1991

These locations are calculated using radar ranging and compass bearings to prominent landmarks

Location: 153°37'00" east, 27°23'53" south
Description: 9.31 kilometres east-north-east of Point Lookout.
Water depth at buoy: 80 metres relative to Australian Height Datum.
Period: 31 October 1991 to 29 October 1994

Location: 153°37'26" east, 27°29'19" south
Description: 10 kilometres south-east of Point Lookout.
Water depth at buoy: 70 metres relative to Australian Height Datum.
Period: 30 October 1994 to 28 February 1997

On 16 November 1996 a directional Waverider buoy was installed at a distance of 200 metres, bearing 160° from the non-directional buoy. At the time of this report the systems are operating simultaneously. This location was measured using GPS fixing procedures.
All water depths are accurate to ±1 metre.

**Location of recording stations**

Department of Harbours and Marine, Pinkenba Depot
Location: 153°06'30" east, 27°26'15" south
Period: 30 October 1976 to 1 October 1987

Department of Harbours and Marine, Queensland Government Hydraulics Laboratory, Deagon
Location: 153°03'00" east, 27°19'53" south
Period: 31 October 1987 to 10 January 1989

Point Lookout Surf Lifesaving Clubhouse
Location: 153°32'27" east, 27°26'13" south
Period: 11 January 1989 to 23 October 1991

Point Lookout Hotel
Location: 153°31'46" east, 27°25'43" south
Period: 24 October 1991 to 1 September 1994

Point Lookout Surf Lifesaving Clubhouse
Location: 153°32'27" east, 27°26'13" south
Period: 2 September 1994 to 28 February 1997

**Recording intervals**

Two 20 minute records daily at 0300 hours and 1500 hours between 30 October 1976 and 16 June 1982.

Four 20 minute records daily at 0300 hours, 0900 hours, 1500 hours and 2100 hours between 17 June 1982 and 31 October 1991.

Commencing on 1 November 1991, one hourly records, each of approximately 26 minutes have been taken, giving 4096 water surface elevation measurements for that period, from which sea state parameters are calculated and recorded.

During periods when the recorded Hsig value reaches the storm threshold of 4 metres, the recording frequency is increased to (nominally) 30-minute intervals.

**Data collection and analysis**

| | |
|---|---|
| Number of records collected: | 55288 |
| Number of records used in analysis: | 55272 |
| Number of days in recording period: | 7424·71 |
| Number of days used in analysis: | 5898·82 |
| Number of days lost: | 1525·89 |

## Appendix 2
Major meteorological events

| 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) (secs) |
|---|---|---|---|---|---|---|
| Low pressure system offshore from Brisbane | 1004 | 19-5-77 | | 4·38 | 6·26 | 12·32 |
| Low pressure system offshore from Brisbane | 1008 | 30-7-79 | | 4·67 | 8·73 | 10·99 |
| Cyclone Paul | 992 | 8-1-80 | 530 ESE | 4·25 | 9·84 | 9·28 |
| Cyclone Ruth | 998 | 14-2-80 | 610 NE | 4·02 | 6·30 | 9·83 |
| Low pressure system offshore from Brisbane | 1008 | 8-5-80 | | 5·21 | 8·06 | 11·73 |
| Cyclone Cliff | 994 | 15-2-81 | 220 NNE | 4·37 | 7·16 | 9·64 |
| Cyclone Abigail | 984 | 27-1-82 | 790 E | 4·00 | 5·37 | 9·73 |
| High pressure system over Tasman Sea | 1040 | 4-6-83 | | 5·27 | 10·04 | 11·02 |
| Low pressure system offshore from Brisbane | 1008 | 22-6-83 | | 5·11 | 7·53 | 9·69 |
| High pressure system over Tasman Sea and low pressure system off southern Queensland coast | 1032<br>1000 | 8-4-84 | | 5·22 | 8·80 | 10·58 |
| High pressure system over Tasman Sea | 1036 | 20-5-84 | | 4·13 | 7·14 | 11·24 |
| Low pressure system off Queensland coast | 1012 | 5-3-87 | | 4·65 | 9·08 | 9·52 |
| Low pressure system off southeast Queensland coast | 1004 | 15-1-88 | | 4·29 | 6·81 | 10·36 |
| High pressure system over Great Australian Bight | 1028 | 6-3-88 | | 4·02 | 7·20 | 14·49 |
| Low pressure system over Brisbane | 1008 | 11-4-88 | | 4·10 | 6·28 | 11·29 |
| Low pressure system off Victorian coast | 1000 | 5-6-88 | | 4·48 | 7·19 | 9·71 |
| High pressure system over Victoria | 1032 | 12-7-88 | | 4·48 | 9·16 | 9·24 |
| Low pressure system off Brisbane | 1000 | 15-9-88 | | 4·62 | 7·05 | 9·43 |
| High pressure system over Tasman Sea and low pressure system in Coral Sea | 1024 | 6-11-88 | | 4·19 | 8·01 | 9·53 |
| Low pressure system north of Fraser Island | 996 | 18-12-88 | | 4·98 | 7·86 | 10·29 |
| High pressure system off southern New South Wales coast and low pressure system off southern Queensland coast | 1028<br>1000 | 25-4-89 | | 6·11 | 9·11 | 10·62 |
| Low pressure system off south Queensland coast | 1004 | 29-5-89 | | 4·76 | 10·25 | 10·33 |
| Low pressure system off south Queensland coast | 1004 | 19-8-89 | | 4·74 | 7·29 | 10·03 |
| High pressure system over Tasman Sea | 1024 | 7-9-89 | | 4·09 | 7·32 | 9·43 |
| High pressure system over Tasman Sea and low pressure system off central Queensland | 1032<br>1008 | 9-6-90 | | 4·49 | 7·57 | 10·32 |
| Cyclone Betsy | 978 | 13-1-92 | 650 NE | 4·39 | 8·45 | 9·45 |
| Cyclone Daman | 998 | 18-2-92 | 400 E | 4·30 | 8·08 | 13·05 |
| Cyclone Fran | 980 | 17-3-92 | 260 N | 5·08 | 9·31 | 9·66 |
| Low pressure system off southern Queensland coast | 996 | 1-12-92 | | 4·30 | 8·43 | 12·19 |
| Cyclone Roger | 992 | 17-3-93 | 420 NE | 7·36 | 13·09 | 12·32 |

| 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) (secs) |
|---|---|---|---|---|---|---|
| High pressure system over southern Australia | 1028 | 11-10-93 | | 4·18 | 7·90 | 10·38 |
| High pressure system over Tasman Sea | 1028 | 31-10-93 | | 4·43 | 7·62 | 8·80 |
| High pressure system over Tasman Sea | 1028 | 8-12-93 | | 4·39 | 7·63 | 9·37 |
| Low pressure system off Fraser Island | 1004 | 3-3-94 | | 4·61 | 8·96 | 10·44 |
| High pressure system over Tasman Sea | 1032 | 26-3-94 | | 4·01 | 7·46 | 10·54 |
| High pressure system over Victoria | 1024 | 15-4-94 | | 4·59 | 8·33 | 11·84 |
| High pressure system over South Australia | 1024 | 21-9-94 | | 5·06 | 9·21 | 11·47 |
| High pressure system over Tasman Sea | 1028 | 3-12-94 | | 4·35 | 9·09 | 10·14 |
| High pressure system over Tasmania | 1020 | 21-1-95 | | 4·50 | 8·58 | 9·37 |
| High pressure system over South Australia | 1028 | 7-2-95 | | 5·15 | 9·53 | 10·44 |
| High pressure system over Tasman Sea and low pressure system off Fraser Island | 1028<br>1004 | 15-2-95 | | 6·42 | 12·17 | 11·17 |
| Cyclone Violet | 975 | 6-3-95 | 610 ESE | 4·54 | 8·66 | 11·33 |
| High pressure system over South Australia | 1024 | 11-3-95 | | 4·38 | 8·53 | 10·04 |
| High pressure system over Victoria | 1036 | 22-6-95 | | 4·12 | 7·42 | 9·98 |
| High pressure system over southeastern Australia | 1024 | 27-9-95 | | 4·71 | 8·05 | 13·07 |
| High pressure system over southeastern Australia | 1024 | 9-10-95 | | 4·40 | 7·29 | 8·79 |
| Low pressure system off southern Queensland coast | 996 | 24-12-95 | | 4·62 | 8·73 | 9·64 |
| Low pressure system off southern Queensland coast | 1000 | 15-2-96 | | 6·19 | 12·09 | 12·94 |
| High pressure system over Tasman Sea | 1032 | 22-2-96 | | 4·37 | 8·59 | 9·49 |
| Low pressure system over Fraser Island | 1004 | 2-5-96 | | 6·90 | 12·83 | 11·93 |
| High pressure system over South Australia | 1028 | 17-5-96 | | 4·80 | 9·39 | 10·28 |

**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.
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.

The events listed in the above table includes all events during the recording period of this report with a recorded Hsig value which reached the storm threshold value of 4 metres.

Highest significant wave height (Hsig) recorded was 7·36 metres on 17 March 1993 during to the passage of Tropical Cyclone Roger off the southern Queensland coast.

Highest maximum wave height (Hmax) recorded was 12·83 metres on 2 May 1996 coincident with the presence of a 1004hPa low pressure system over Fraser Island.

Meteorological information obtained from the Monthly Weather Review, published by the Bureau of Meteorology.

## Appendix 3

Tropical cyclones of the east coast of Queensland
30 October 1976 to 28 February 1997:

| Cyclone name | Year | Month |
|---|---|---|
| June | 1977 | 1 |
| Keith | 1977 | 1 |
| Lily | 1977 | 2 |
| Miles | 1977 | 2 |
| Nancy-77 | 1977 | 2 |
| Otto | 1977 | 3 |
| Tom | 1977 | 11 |
| Gwen | 1978 | 2 |
| Hal | 1978 | 4 |
| Peter | 1978 | 1 |
| Greta | 1979 | 1 |
| Gordon | 1979 | 1 |
| Rosa | 1979 | 2 |
| Kerry | 1979 | 2 |
| Stan | 1979 | 4 |
| Paul | 1980 | 1 |
| Ruth | 1980 | 2 |
| Simon | 1980 | 2 |
| Sina | 1980 | 3 |
| Eddie | 1981 | 2 |
| Cliff | 1981 | 2 |
| Freda | 1981 | 2 |
| Abigail | 1982 | 1 |
| Bernie | 1982 | 4 |
| Dominic | 1982 | 4 |
| Claudia | 1982 | 5 |
| Des | 1983 | 1 |
| Elinor | 1983 | 2 |
| Fritz | 1983 | 12 |
| Grace | 1984 | 1 |
| Harvey | 1984 | 2 |
| Ingrid | 1984 | 2 |
| Jim | 1984 | 3 |
| Kathy | 1984 | 3 |
| Lance | 1984 | 4 |
| Monica | 1984 | 12 |
| Nigel | 1985 | 1 |
| Odette | 1985 | 1 |
| Pierre | 1985 | 2 |
| Rebecca | 1985 | 2 |
| Tanya | 1985 | 3 |
| Vernon | 1986 | 1 |
| Winifred | 1986 | 1 |
| Alfred | 1986 | 3 |
| Manu | 1986 | 4 |
| Namu | 1986 | 5 |
| Jason | 1987 | 2 |
| Blanch | 1987 | 5 |
| Agi | 1988 | 1 |
| Charlie | 1988 | 2 |
| Delilah | 1988 | 1 |
| Harry | 1989 | 2 |
| Aivu | 1989 | 4 |
| Meena | 1989 | 5 |
| Ernie | 1989 | 5 |
| Felicity | 1989 | 12 |
| Nancy-90 | 1990 | 1 |
| Hilda | 1990 | 3 |
| Ivor | 1990 | 3 |
| Joy | 1990 | 12 |
| Kelvin | 1991 | 2 |
| Lisa | 1991 | 5 |
| Mark | 1992 | 1 |
| Betsy | 1992 | 1 |
| Daman | 1992 | 2 |
| Esau | 1992 | 2 |
| Fran | 1992 | 3 |
| Nina | 1992 | 1 |
| Oliver | 1993 | 2 |
| Polly | 1993 | 2 |
| Roger | 1993 | 3 |
| Rewa | 1993 | 1 |
| Sadie | 1994 | 1 |
| Theodore | 1994 | 2 |
| Violet | 1995 | 3 |
| Agnes-95 | 1995 | 4 |
| Barry | 1996 | 1 |
| Celeste | 1996 | 1 |
| Dennis | 1996 | 2 |
| Ethel | 1996 | 3 |
| Fergus | 1996 | 12 |
| Gillian | 1997 | 2 |
| Harold | 1997 | 2 |
| Ita | 1997 | 2 |

**Table 1.**
*Wave statistics*
*Wave period/wave height occurrences*
*All data, all directions.*

| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·75 | * | * | * | * | * | * | * | 0·75 |
| 0·20–0·39 | 1·25 | * | * | * | * | * | 0·25 | * | 1·50 |
| 0·40–0·59 | 0·38 | 2·83 | 7·08 | 18·75 | 29·43 | 8·46 | 1·46 | 0·08 | 68·46 |
| 0·60–0·79 | 0·17 | 29·43 | 52·34 | 96·97 | 117·55 | 36·49 | 5·29 | 1·14 | 339·37 |
| 0·80–0·99 | 0·25 | 51·71 | 96·58 | 273·06 | 263·95 | 82·40 | 12·95 | 2·04 | 782·94 |
| 1·00–1·19 | * | 48·45 | 134·73 | 348·76 | 302·12 | 75·89 | 11·81 | 1·17 | 922·93 |
| 1·20–1·39 | * | 25·25 | 142·21 | 335·95 | 309·98 | 68·31 | 9·27 | 0·58 | 891·55 |
| 1·40–1·59 | * | 7·24 | 123·16 | 258·98 | 254·32 | 63·59 | 7·99 | 0·54 | 715·81 |
| 1·60–1·79 | * | 1·00 | 96·37 | 222·66 | 200·91 | 54·72 | 8·45 | 0·29 | 584·40 |
| 1·80–1·99 | * | 0·10 | 55·81 | 172·35 | 147·55 | 42·82 | 6·12 | 0·38 | 425·13 |
| 2·00–2·19 | * | * | 32·27 | 137·64 | 116·79 | 36·25 | 3·81 | 0·21 | 326·98 |
| 2·20–2·39 | * | * | 15·14 | 122·38 | 78·14 | 27·49 | 5·46 | 0·08 | 248·70 |
| 2·40–2·59 | * | * | 7·04 | 94·56 | 71·13 | 20·02 | 2·16 | 0·21 | 195·12 |
| 2·60–2·79 | * | * | 1·27 | 53·16 | 45·46 | 16·09 | 3·35 | 0·10 | 119·43 |
| 2·80–2·99 | * | * | 0·21 | 33·67 | 37·39 | 15·29 | 1·59 | 0·04 | 88·19 |
| 3·00–3·19 | * | * | 0·04 | 19·76 | 24·19 | 10·07 | 0·99 | 0·04 | 55·10 |
| 3·20–3·39 | * | * | 0·03 | 9·84 | 20·13 | 8·00 | 0·89 | * | 38·89 |
| 3·40–3·59 | * | * | 0·04 | 5·35 | 16·10 | 4·53 | 0·84 | * | 26·86 |
| 3·60–3·79 | * | * | * | 5·06 | 11·06 | 2·60 | 0·18 | * | 18·89 |
| 3·80–3·99 | * | * | * | 1·76 | 7·37 | 2·76 | 0·19 | * | 12·08 |
| 4·00–4·19 | * | * | * | 1·18 | 6·93 | 2·34 | 0·34 | * | 10·79 |
| 4·20–4·39 | * | * | * | 0·38 | 5·33 | 1·67 | 0·12 | * | 7·50 |
| 4·40–4·59 | * | * | * | 0·09 | 4·91 | 0·78 | 0·02 | * | 5·81 |
| 4·60–4·79 | * | * | * | * | 3·15 | 0·07 | 0·04 | * | 3·26 |
| 4·80–4·99 | * | * | * | * | 0·72 | 0·12 | 0·06 | * | 0·91 |
| 5·00–5·19 | * | * | * | * | 1·26 | 0·42 | * | * | 1·68 |
| 5·20–5·39 | * | * | * | * | 0·33 | 1·36 | 0·06 | * | 1·76 |
| 5·40–5·59 | * | * | * | * | 0·19 | 0·60 | 0·10 | * | 0·89 |
| 5·60–5·79 | * | * | * | * | 0·10 | 0·27 | 0·15 | * | 0·52 |
| 5·80–5·99 | * | * | * | * | 0·08 | 0·36 | 0·10 | * | 0·55 |
| 6·00–6·19 | * | * | * | * | 0·33 | 0·44 | 0·13 | * | 0·90 |
| 6·20–6·39 | * | * | * | * | * | 0·29 | 0·02 | * | 0·31 |
| 6·40–6·59 | * | * | * | * | 0·04 | 0·16 | 0·02 | * | 0·22 |
| 6·60–6·79 | * | * | * | * | * | 0·39 | * | * | 0·39 |
| 6·80–6·99 | * | * | * | * | * | 0·11 | * | * | 0·11 |
| 7·00–7·19 | * | * | * | * | * | 0·05 | 0·02 | * | 0·07 |
| 7·20–7·39 | * | * | * | * | * | 0·05 | 0·02 | * | 0·07 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 2·80 | 166·01 | 764·32 | 2212·29 | 2076·95 | 585·26 | 84·27 | 6·91 | 5898·82 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)

**Table 2.**
*Wave statistics*
*Wave period/wave height occurrences*
*Summer data, all directions.*

| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·50 | * | * | * | * | * | * | * | 0·50 |
| 0·20–0·39 | * | * | * | * | * | * | * | * | 0·00 |
| 0·40–0·59 | 0·04 | 1·46 | 2·25 | 8·49 | 8·57 | 0·29 | * | * | 21·10 |
| 0·60–0·79 | 0·08 | 10·77 | 27·43 | 42·80 | 38·24 | 7·10 | 0·88 | 0·51 | 127·81 |
| 0·80–0·99 | * | 25·98 | 54·27 | 151·74 | 110·45 | 27·84 | 2·52 | 0·54 | 373·35 |
| 1·00–1·19 | * | 25·09 | 67·24 | 192·04 | 133·08 | 25·98 | 2·31 | 0·08 | 445·82 |
| 1·20–1·39 | * | 12·54 | 75·00 | 198·62 | 131·28 | 22·02 | 2·73 | 0·08 | 442·28 |
| 1·40–1·59 | * | 3·54 | 59·78 | 158·55 | 118·72 | 19·51 | 3·31 | 0·21 | 363·61 |
| 1·60–1·79 | * | 0·58 | 47·91 | 128·56 | 97·19 | 21·73 | 4·19 | 0·25 | 300·42 |
| 1·80–1·99 | * | 0·06 | 22·53 | 106·72 | 71·05 | 17·14 | 2·46 | 0·33 | 220·29 |
| 2·00–2·19 | * | * | 15·42 | 83·86 | 65·07 | 12·88 | 1·46 | 0·12 | 178·81 |
| 2·20–2·39 | * | * | 8·30 | 77·44 | 43·37 | 11·76 | 2·42 | 0·04 | 143·33 |
| 2·40–2·59 | * | * | 3·21 | 57·65 | 36·26 | 8·33 | 1·20 | 0·08 | 106·73 |
| 2·60–2·79 | * | * | 1·19 | 31·93 | 28·88 | 6·26 | 1·94 | * | 70·19 |
| 2·80–2·99 | * | * | 0·12 | 22·27 | 22·26 | 8·18 | 0·76 | * | 53·60 |
| 3·00–3·19 | * | * | 0·04 | 12·70 | 18·11 | 4·99 | 0·49 | * | 36·34 |
| 3·20–3·39 | * | * | 0·03 | 6·46 | 12·34 | 2·79 | 0·40 | * | 22·02 |
| 3·40–3·59 | * | * | 0·04 | 4·41 | 9·76 | 2·21 | 0·46 | * | 16·88 |
| 3·60–3·79 | * | * | * | 2·58 | 6·96 | 1·82 | 0·03 | * | 11·40 |
| 3·80–3·99 | * | * | * | 0·99 | 4·26 | 1·58 | * | * | 6·83 |
| 4·00–4·19 | * | * | * | 0·50 | 4·91 | 1·47 | 0·28 | * | 7·16 |
| 4·20–4·39 | * | * | * | 0·22 | 3·03 | 0·57 | 0·08 | * | 3·90 |
| 4·40–4·59 | * | * | * | 0·04 | 2·44 | 0·13 | * | * | 2·61 |
| 4·60–4·79 | * | * | * | * | 1·77 | 0·05 | * | * | 1·82 |
| 4·80–4·99 | * | * | * | * | 0·66 | 0·08 | 0·04 | * | 0·78 |
| 5·00–5·19 | * | * | * | * | 0·70 | 0·21 | * | * | 0·91 |
| 5·20–5·39 | * | * | * | * | 0·29 | 0·22 | * | * | 0·51 |
| 5·40–5·59 | * | * | * | * | 0·15 | 0·47 | 0·02 | * | 0·64 |
| 5·60–5·79 | * | * | * | * | 0·08 | 0·23 | 0·04 | * | 0·35 |
| 5·80–5·99 | * | * | * | * | 0·08 | 0·18 | 0·02 | * | 0·28 |
| 6·00–6·19 | * | * | * | * | 0·31 | 0·25 | 0·04 | * | 0·60 |
| 6·20–6·39 | * | * | * | * | * | 0·17 | * | * | 0·17 |
| 6·40–6·59 | * | * | * | * | 0·04 | 0·11 | * | * | 0·16 |
| 6·60–6·79 | * | * | * | * | * | 0·28 | * | * | 0·28 |
| 6·80–6·99 | * | * | * | * | * | 0·07 | * | * | 0·07 |
| 7·00–7·19 | * | * | * | * | * | 0·05 | 0·02 | * | 0·07 |
| 7·20–7·39 | * | * | * | * | * | 0·05 | 0·02 | * | 0·07 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 0·63 | 80·01 | 384·78 | 1288·58 | 970·30 | 207·03 | 28·11 | 2·26 | 2961·70 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)

**Table 3.**
*Wave statistics*
*Wave period/wave height occurrences*
*Winter data, all directions.*

| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·25 | * | * | * | * | * | * | * | 0·25 |
| 0·20–0·39 | 1·25 | * | * | * | * | * | 0·25 | * | 1·50 |
| 0·40–0·59 | 0·33 | 1·37 | 4·83 | 10·25 | 20·86 | 8·17 | 1·46 | 0·08 | 47·36 |
| 0·60–0·79 | 0·08 | 18·66 | 24·91 | 54·17 | 79·31 | 29·39 | 4·42 | 0·62 | 211·56 |
| 0·80–0·99 | 0·25 | 25·73 | 42·31 | 121·32 | 153·49 | 54·56 | 10·43 | 1·50 | 409·59 |
| 1·00–1·19 | * | 23·36 | 67·49 | 156·72 | 169·04 | 49·91 | 9·49 | 1·08 | 477·11 |
| 1·20–1·39 | * | 12·71 | 67·21 | 137·33 | 178·70 | 46·29 | 6·54 | 0·50 | 449·27 |
| 1·40–1·59 | * | 3·71 | 63·38 | 100·43 | 135·60 | 44·08 | 4·68 | 0·33 | 352·21 |
| 1·60–1·79 | * | 0·42 | 48·46 | 94·10 | 103·71 | 32·99 | 4·27 | 0·04 | 283·98 |
| 1·80–1·99 | * | 0·04 | 33·27 | 65·63 | 76·50 | 25·68 | 3·67 | 0·04 | 204·84 |
| 2·00–2·19 | * | * | 16·85 | 53·78 | 51·72 | 23·37 | 2·36 | 0·08 | 148·17 |
| 2·20–2·39 | * | * | 6·84 | 44·94 | 34·77 | 15·73 | 3·04 | 0·04 | 105·36 |
| 2·40–2·59 | * | * | 3·83 | 36·92 | 34·87 | 11·69 | 0·96 | 0·12 | 88·39 |
| 2·60–2·79 | * | * | 0·08 | 21·23 | 16·58 | 9·83 | 1·42 | 0·10 | 49·24 |
| 2·80–2·99 | * | * | 0·08 | 11·40 | 15·13 | 7·10 | 0·83 | 0·04 | 34·59 |
| 3·00–3·19 | * | * | * | 7·06 | 6·08 | 5·08 | 0·50 | 0·04 | 18·76 |
| 3·20–3·39 | * | * | * | 3·38 | 7·79 | 5·21 | 0·49 | * | 16·87 |
| 3·40–3·59 | * | * | * | 0·94 | 6·34 | 2·32 | 0·39 | * | 9·99 |
| 3·60–3·79 | * | * | * | 2·47 | 4·09 | 0·77 | 0·15 | * | 7·48 |
| 3·80–3·99 | * | * | * | 0·77 | 3·12 | 1·18 | 0·19 | * | 5·25 |
| 4·00–4·19 | * | * | * | 0·68 | 2·01 | 0·88 | 0·06 | * | 3·63 |
| 4·20–4·39 | * | * | * | 0·16 | 2·30 | 1·10 | 0·04 | * | 3·60 |
| 4·40–4·59 | * | * | * | 0·05 | 2·48 | 0·65 | 0·02 | * | 3·20 |
| 4·60–4·79 | * | * | * | * | 1·38 | 0·02 | 0·04 | * | 1·44 |
| 4·80–4·99 | * | * | * | * | 0·06 | 0·04 | 0·02 | * | 0·13 |
| 5·00–5·19 | * | * | * | * | 0·56 | 0·21 | * | * | 0·77 |
| 5·20–5·39 | * | * | * | * | 0·04 | 1·15 | 0·06 | * | 1·25 |
| 5·40–5·59 | * | * | * | * | 0·04 | 0·12 | 0·08 | * | 0·25 |
| 5·60–5·79 | * | * | * | * | 0·02 | 0·04 | 0·10 | * | 0·17 |
| 5·80–5·99 | * | * | * | * | * | 0·19 | 0·08 | * | 0·27 |
| 6·00–6·19 | * | * | * | * | 0·02 | 0·19 | 0·08 | * | 0·29 |
| 6·20–6·39 | * | * | * | * | * | 0·12 | 0·02 | * | 0·15 |
| 6·40–6·59 | * | * | * | * | * | 0·04 | 0·02 | * | 0·06 |
| 6·60–6·79 | * | * | * | * | * | 0·10 | * | * | 0·10 |
| 6·80–6·99 | * | * | * | * | * | 0·04 | * | * | 0·04 |
| 7·00–7·19 | * | * | * | * | * | * | * | * | 0·00 |
| 7·20–7·39 | * | * | * | * | * | * | * | * | 0·00 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 2·17 | 86·00 | 379·55 | 923·71 | 1106·64 | 378·24 | 56·16 | 4·65 | 2937·12 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)


*Wave data recording program, Brisbane region — 1987-1997 • October 1997 • ISSN 0158-7757*

**Table 4.**
*Wave statistics*
*Wave period/wave height occurrences*
*All data, all directions.*

| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·01 | * | * | * | * | * | * | * | 0·01 |
| 0·20–0·39 | 0·02 | * | * | * | * | * | * | * | 0·03 |
| 0·40–0·59 | 0·01 | 0·05 | 0·12 | 0·32 | 0·50 | 0·14 | 0·02 | * | 1·16 |
| 0·60–0·79 | * | 0·50 | 0·89 | 1·64 | 1·99 | 0·62 | 0·09 | 0·02 | 5·75 |
| 0·80–0·99 | * | 0·88 | 1·64 | 4·63 | 4·47 | 1·40 | 0·22 | 0·03 | 13·27 |
| 1·00–1·19 | * | 0·82 | 2·28 | 5·91 | 5·12 | 1·29 | 0·20 | 0·02 | 15·65 |
| 1·20–1·39 | * | 0·43 | 2·41 | 5·70 | 5·25 | 1·16 | 0·16 | 0·01 | 15·11 |
| 1·40–1·59 | * | 0·12 | 2·09 | 4·39 | 4·31 | 1·08 | 0·14 | 0·01 | 12·13 |
| 1·60–1·79 | * | 0·02 | 1·63 | 3·77 | 3·41 | 0·93 | 0·14 | * | 9·91 |
| 1·80–1·99 | * | * | 0·95 | 2·92 | 2·50 | 0·73 | 0·10 | 0·01 | 7·21 |
| 2·00–2·19 | * | * | 0·55 | 2·33 | 1·98 | 0·61 | 0·06 | * | 5·54 |
| 2·20–2·39 | * | * | 0·26 | 2·07 | 1·32 | 0·47 | 0·09 | * | 4·22 |
| 2·40–2·59 | * | * | 0·12 | 1·60 | 1·21 | 0·34 | 0·04 | * | 3·31 |
| 2·60–2·79 | * | * | 0·02 | 0·90 | 0·77 | 0·27 | 0·06 | * | 2·02 |
| 2·80–2·99 | * | * | * | 0·57 | 0·63 | 0·26 | 0·03 | * | 1·49 |
| 3·00–3·19 | * | * | * | 0·34 | 0·41 | 0·17 | 0·02 | * | 0·93 |
| 3·20–3·39 | * | * | * | 0·17 | 0·34 | 0·14 | 0·02 | * | 0·66 |
| 3·40–3·59 | * | * | * | 0·09 | 0·27 | 0·08 | 0·01 | * | 0·46 |
| 3·60–3·79 | * | * | * | 0·09 | 0·19 | 0·04 | * | * | 0·32 |
| 3·80–3·99 | * | * | * | 0·03 | 0·12 | 0·05 | * | * | 0·20 |
| 4·00–4·19 | * | * | * | 0·02 | 0·12 | 0·04 | 0·01 | * | 0·18 |
| 4·20–4·39 | * | * | * | 0·01 | 0·09 | 0·03 | * | * | 0·13 |
| 4·40–4·59 | * | * | * | * | 0·08 | 0·01 | * | * | 0·10 |
| 4·60–4·79 | * | * | * | * | 0·05 | * | * | * | 0·06 |
| 4·80–4·99 | * | * | * | * | 0·01 | * | * | * | 0·02 |
| 5·00–5·19 | * | * | * | * | 0·02 | 0·01 | * | * | 0·03 |
| 5·20–5·39 | * | * | * | * | 0·01 | 0·02 | * | * | 0·03 |
| 5·40–5·59 | * | * | * | * | * | 0·01 | * | * | 0·02 |
| 5·60–5·79 | * | * | * | * | * | * | * | * | 0·01 |
| 5·80–5·99 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·00–6·19 | * | * | * | * | 0·01 | 0·01 | * | * | 0·02 |
| 6·20–6·39 | * | * | * | * | * | * | * | * | 0·01 |
| 6·40–6·59 | * | * | * | * | * | * | * | * | 0·00 |
| 6·60–6·79 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·80–6·99 | * | * | * | * | * | * | * | * | 0·00 |
| 7·00–7·19 | * | * | * | * | * | * | * | * | 0·00 |
| 7·20–7·39 | * | * | * | * | * | * | * | * | 0·00 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 0·05 | 2·81 | 12·96 | 37·50 | 35·21 | 9·92 | 1·43 | 0·12 | 100·00 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)

**Table 5.**
*Wave statistics*
*Wave period/wave height occurrences*
*Summer data, all directions.*

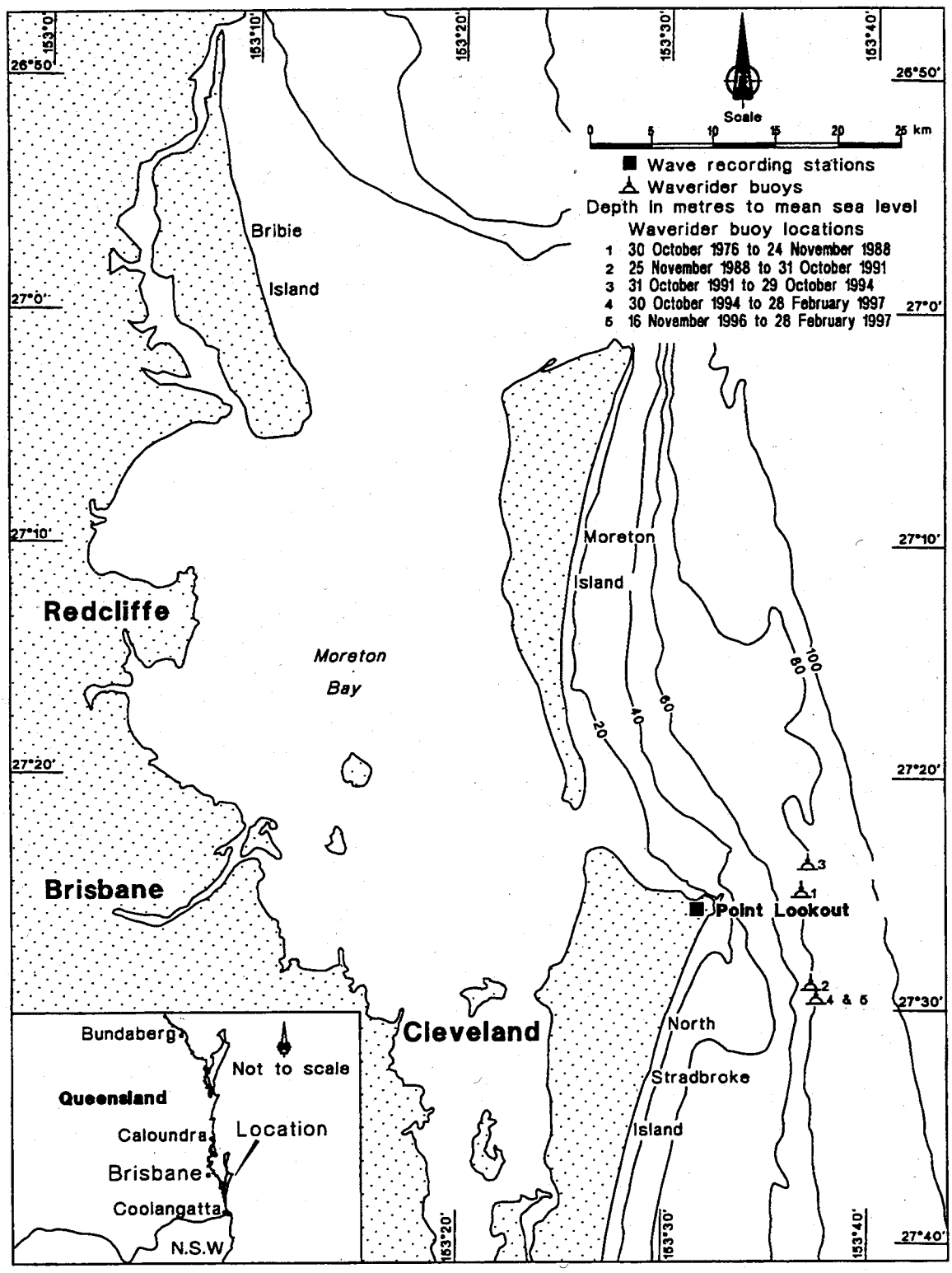
| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·02 | * | * | * | * | * | * | * | 0·02 |
| 0·20–0·39 | * | * | * | * | * | * | * | * | 0·00 |
| 0·40–0·59 | * | 0·05 | 0·08 | 0·29 | 0·29 | 0·01 | * | * | 0·71 |
| 0·60–0·79 | * | 0·36 | 0·93 | 1·45 | 1·29 | 0·24 | 0·03 | 0·02 | 4·32 |
| 0·80–0·99 | * | 0·88 | 1·83 | 5·12 | 3·73 | 0·94 | 0·09 | 0·02 | 12·61 |
| 1·00–1·19 | * | 0·85 | 2·27 | 6·48 | 4·49 | 0·88 | 0·08 | * | 15·05 |
| 1·20–1·39 | * | 0·42 | 2·53 | 6·71 | 4·43 | 0·74 | 0·09 | * | 14·93 |
| 1·40–1·59 | * | 0·12 | 2·02 | 5·35 | 4·01 | 0·66 | 0·11 | 0·01 | 12·28 |
| 1·60–1·79 | * | 0·02 | 1·62 | 4·34 | 3·28 | 0·73 | 0·14 | 0·01 | 10·14 |
| 1·80–1·99 | * | * | 0·76 | 3·60 | 2·40 | 0·58 | 0·08 | 0·01 | 7·44 |
| 2·00–2·19 | * | * | 0·52 | 2·83 | 2·20 | 0·43 | 0·05 | * | 6·04 |
| 2·20–2·39 | * | * | 0·28 | 2·61 | 1·46 | 0·40 | 0·08 | * | 4·84 |
| 2·40–2·59 | * | * | 0·11 | 1·95 | 1·22 | 0·28 | 0·04 | * | 3·60 |
| 2·60–2·79 | * | * | 0·04 | 1·08 | 0·97 | 0·21 | 0·07 | * | 2·37 |
| 2·80–2·99 | * | * | * | 0·75 | 0·75 | 0·28 | 0·03 | * | 1·81 |
| 3·00–3·19 | * | * | * | 0·43 | 0·61 | 0·17 | 0·02 | * | 1·23 |
| 3·20–3·39 | * | * | * | 0·22 | 0·42 | 0·09 | 0·01 | * | 0·74 |
| 3·40–3·59 | * | * | * | 0·15 | 0·33 | 0·07 | 0·02 | * | 0·57 |
| 3·60–3·79 | * | * | * | 0·09 | 0·24 | 0·06 | * | * | 0·39 |
| 3·80–3·99 | * | * | * | 0·03 | 0·14 | 0·05 | * | * | 0·23 |
| 4·00–4·19 | * | * | * | 0·02 | 0·17 | 0·05 | 0·01 | * | 0·24 |
| 4·20–4·39 | * | * | * | 0·01 | 0·10 | 0·02 | * | * | 0·13 |
| 4·40–4·59 | * | * | * | * | 0·08 | * | * | * | 0·09 |
| 4·60–4·79 | * | * | * | * | 0·06 | * | * | * | 0·06 |
| 4·80–4·99 | * | * | * | * | 0·02 | * | * | * | 0·03 |
| 5·00–5·19 | * | * | * | * | 0·02 | 0·01 | * | * | 0·03 |
| 5·20–5·39 | * | * | * | * | 0·01 | 0·01 | * | * | 0·02 |
| 5·40–5·59 | * | * | * | * | * | 0·02 | * | * | 0·02 |
| 5·60–5·79 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 5·80–5·99 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·00–6·19 | * | * | * | * | 0·01 | 0·01 | * | * | 0·02 |
| 6·20–6·39 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·40–6·59 | * | * | * | * | * | * | * | * | 0·01 |
| 6·60–6·79 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·80–6·99 | * | * | * | * | * | * | * | * | 0·00 |
| 7·00–7·19 | * | * | * | * | * | * | * | * | 0·00 |
| 7·20–7·39 | * | * | * | * | * | * | * | * | 0·00 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 0·02 | 2·70 | 12·99 | 43·51 | 32·76 | 6·99 | 0·95 | 0·08 | 100·00 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)

**Table 6.**
*Wave statistics*
*Wave period/wave height occurrences*
*Winter data, all directions.*

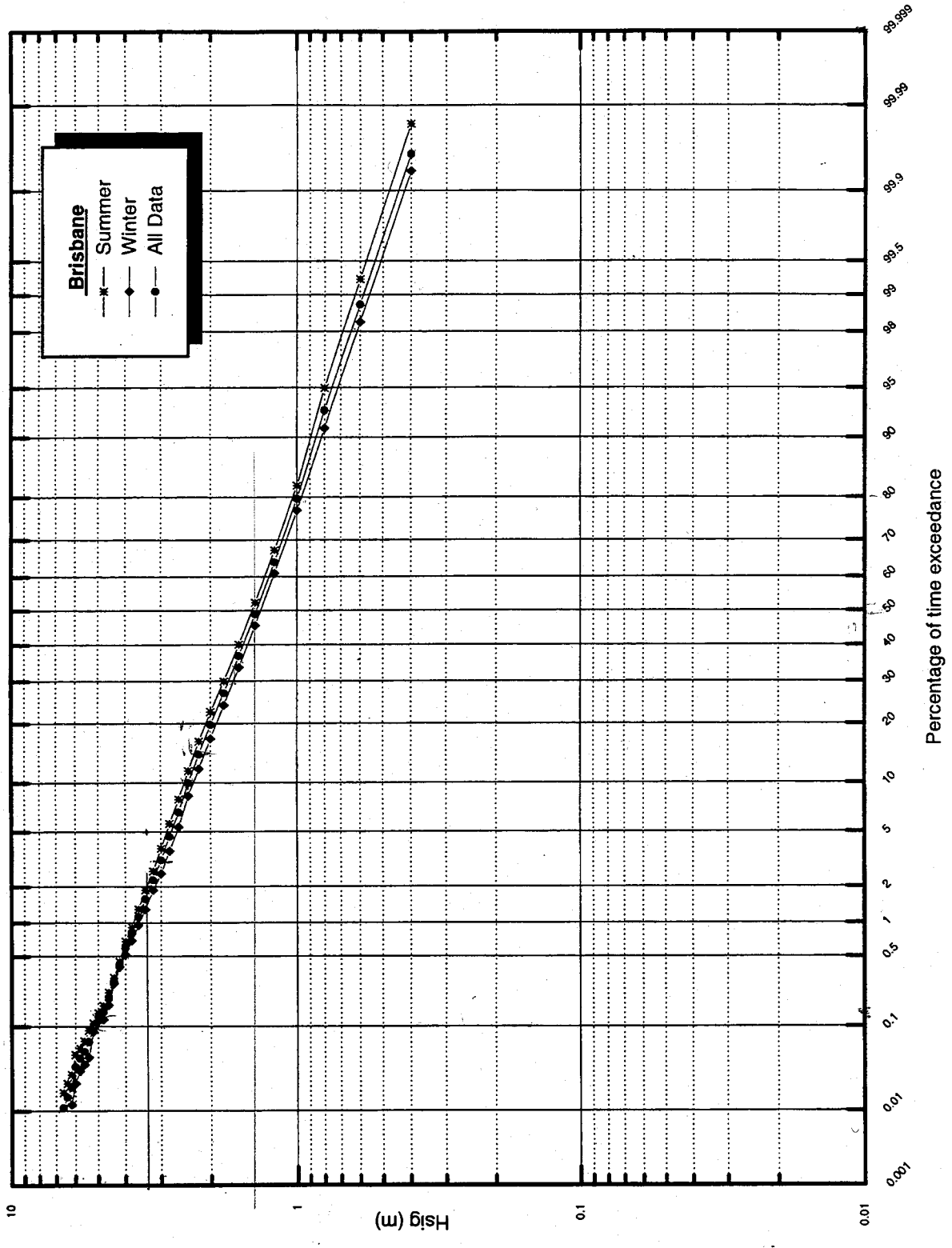
| Significant wave height (Hsig) (metres) | Peak energy wave period (Tp) (seconds) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–2·99 | 3–4·99 | 5–6·99 | 7–8·99 | 9–10·99 | 11–12·99 | 13–14·99 | >14·99 | Totals |
| 0·00–0·19 | 0·01 | * | * | * | * | * | * | * | 0·01 |
| 0·20–0·39 | 0·04 | * | * | * | * | * | 0·01 | * | 0·05 |
| 0·40–0·59 | 0·01 | 0·05 | 0·16 | 0·35 | 0·71 | 0·28 | 0·05 | * | 1·61 |
| 0·60–0·79 | * | 0·64 | 0·85 | 1·84 | 2·70 | 1·00 | 0·15 | 0·02 | 7·20 |
| 0·80–0·99 | 0·01 | 0·88 | 1·44 | 4·13 | 5·23 | 1·86 | 0·36 | 0·05 | 13·95 |
| 1·00–1·19 | * | 0·80 | 2·30 | 5·34 | 5·76 | 1·70 | 0·32 | 0·04 | 16·24 |
| 1·20–1·39 | * | 0·43 | 2·29 | 4·68 | 6·08 | 1·58 | 0·22 | 0·02 | 15·30 |
| 1·40–1·59 | * | 0·13 | 2·16 | 3·42 | 4·62 | 1·50 | 0·16 | 0·01 | 11·99 |
| 1·60–1·79 | * | 0·01 | 1·65 | 3·20 | 3·53 | 1·12 | 0·15 | * | 9·67 |
| 1·80–1·99 | * | * | 1·13 | 2·23 | 2·60 | 0·87 | 0·12 | * | 6·97 |
| 2·00–2·19 | * | * | 0·57 | 1·83 | 1·76 | 0·80 | 0·08 | * | 5·04 |
| 2·20–2·39 | * | * | 0·23 | 1·53 | 1·18 | 0·54 | 0·10 | * | 3·59 |
| 2·40–2·59 | * | * | 0·13 | 1·26 | 1·19 | 0·40 | 0·03 | * | 3·01 |
| 2·60–2·79 | * | * | * | 0·72 | 0·56 | 0·33 | 0·05 | * | 1·68 |
| 2·80–2·99 | * | * | * | 0·39 | 0·52 | 0·24 | 0·03 | * | 1·18 |
| 3·00–3·19 | * | * | * | 0·24 | 0·21 | 0·17 | 0·02 | * | 0·64 |
| 3·20–3·39 | * | * | * | 0·12 | 0·27 | 0·18 | 0·02 | * | 0·57 |
| 3·40–3·59 | * | * | * | 0·03 | 0·22 | 0·08 | 0·01 | * | 0·34 |
| 3·60–3·79 | * | * | * | 0·08 | 0·14 | 0·03 | * | * | 0·25 |
| 3·80–3·99 | * | * | * | 0·03 | 0·11 | 0·04 | 0·01 | * | 0·18 |
| 4·00–4·19 | * | * | * | 0·02 | 0·07 | 0·03 | * | * | 0·12 |
| 4·20–4·39 | * | * | * | 0·01 | 0·08 | 0·04 | * | * | 0·12 |
| 4·40–4·59 | * | * | * | * | 0·08 | 0·02 | * | * | 0·11 |
| 4·60–4·79 | * | * | * | * | 0·05 | * | * | * | 0·05 |
| 4·80–4·99 | * | * | * | * | * | * | * | * | 0·00 |
| 5·00–5·19 | * | * | * | * | 0·02 | 0·01 | * | * | 0·03 |
| 5·20–5·39 | * | * | * | * | * | 0·04 | * | * | 0·04 |
| 5·40–5·59 | * | * | * | * | * | * | * | * | 0·01 |
| 5·60–5·79 | * | * | * | * | * | * | * | * | 0·01 |
| 5·80–5·99 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·00–6·19 | * | * | * | * | * | 0·01 | * | * | 0·01 |
| 6·20–6·39 | * | * | * | * | * | * | * | * | 0·00 |
| 6·40–6·59 | * | * | * | * | * | * | * | * | 0·00 |
| 6·60–6·79 | * | * | * | * | * | * | * | * | 0·00 |
| 6·80–6·99 | * | * | * | * | * | * | * | * | 0·00 |
| 7·00–7·19 | * | * | * | * | * | * | * | * | 0·00 |
| 7·20–7·39 | * | * | * | * | * | * | * | * | 0·00 |
| 7·40–7·59 | * | * | * | * | * | * | * | * | 0·00 |
| Totals | 0·07 | 2·93 | 12·92 | 31·45 | 37·68 | 12·88 | 1·91 | 0·16 | 100·00 |

* = 0.00
(Table values are numbers of days for the recording period, rounded to the second decimal place.)



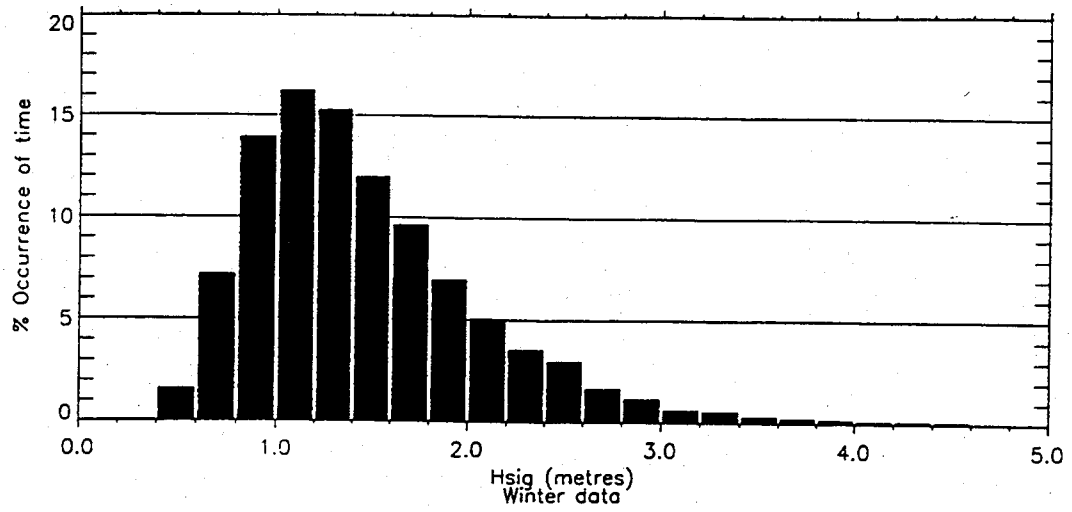

# Locality plan

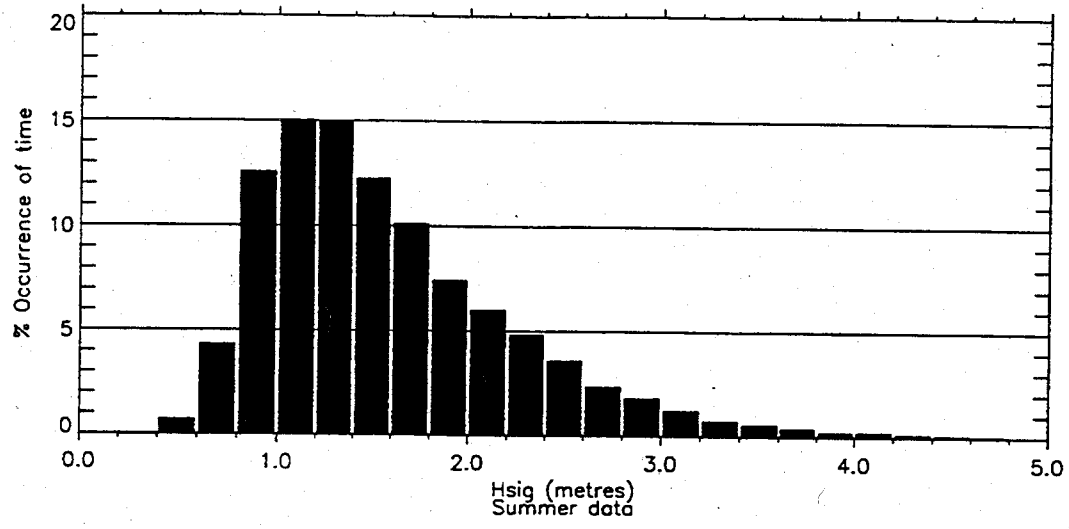
| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 1** |

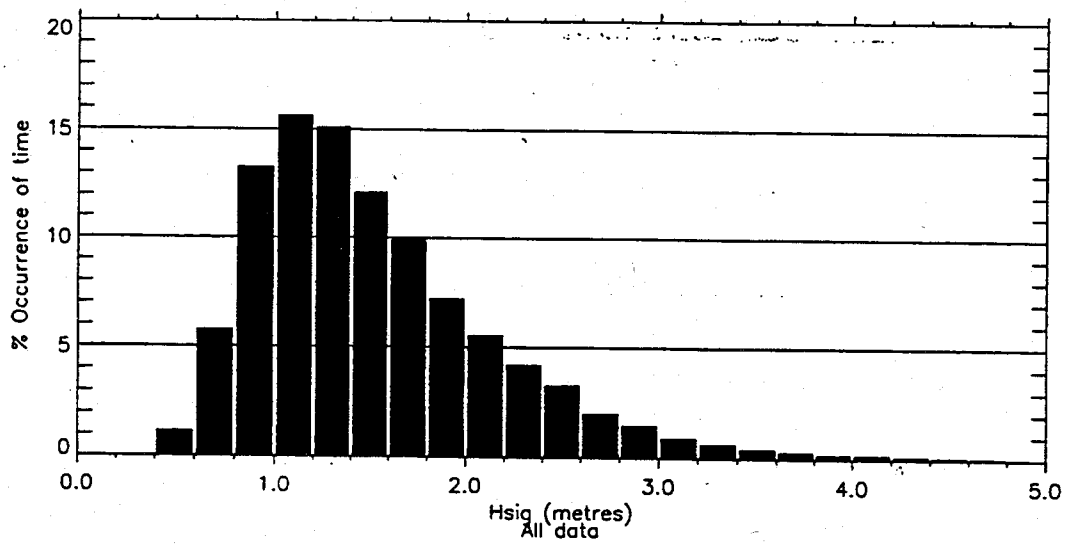



**Percentage (of time) exceedance of wave heights (Hsig) for all wave periods 30 October 1976 to 28 February 1997**

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 2** |

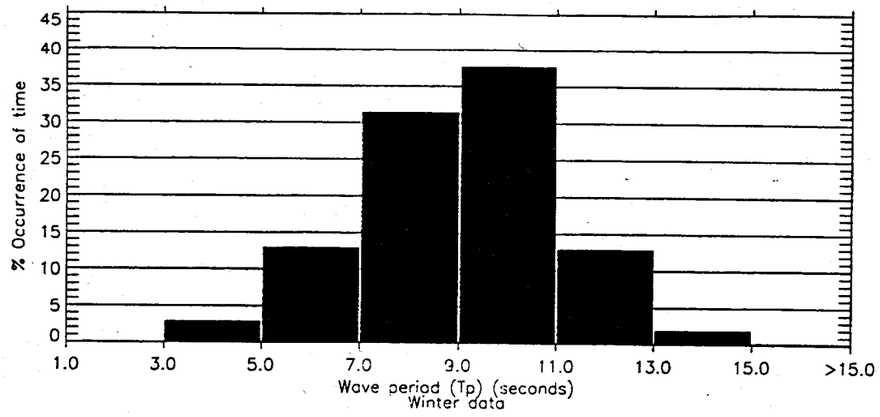


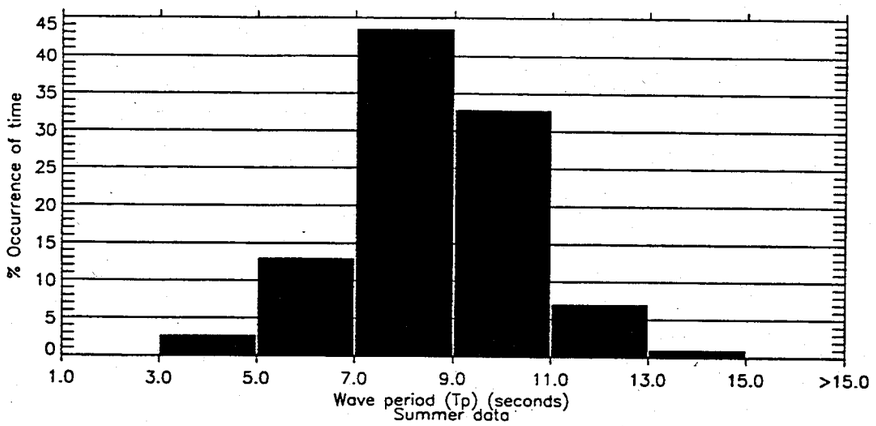



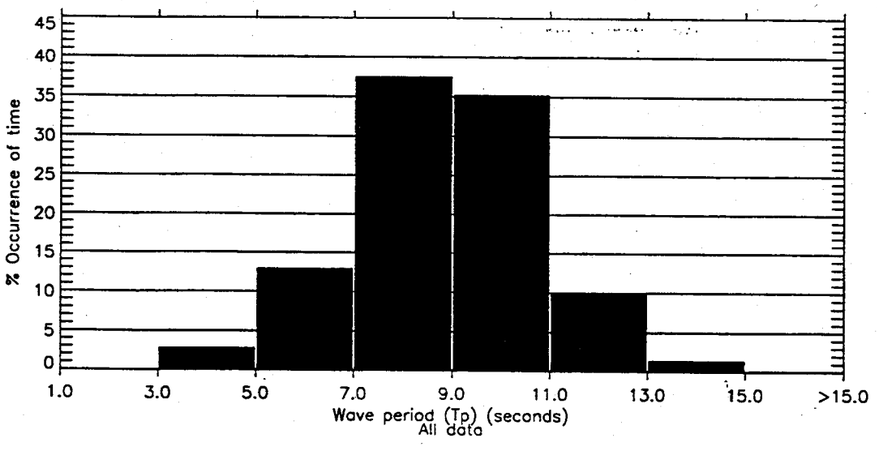




**Histogram percentage (of time) occurrence of wave heights (Hsig) for all wave periods (Tp)**

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 3** |

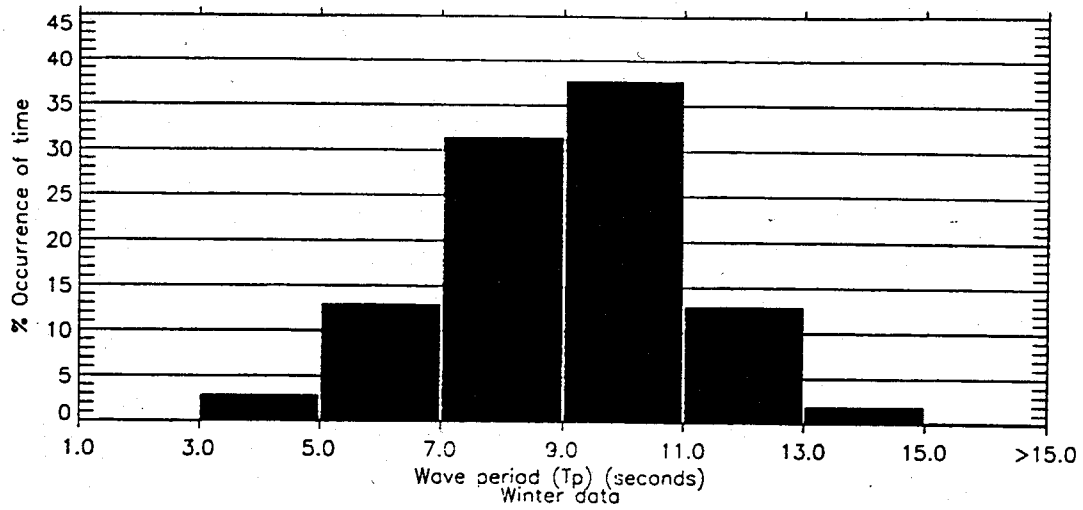


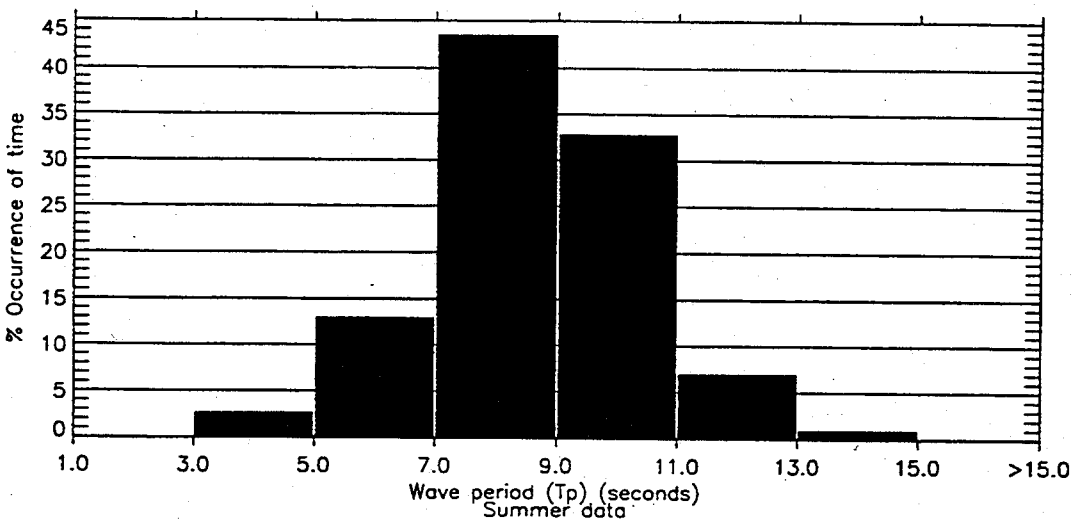



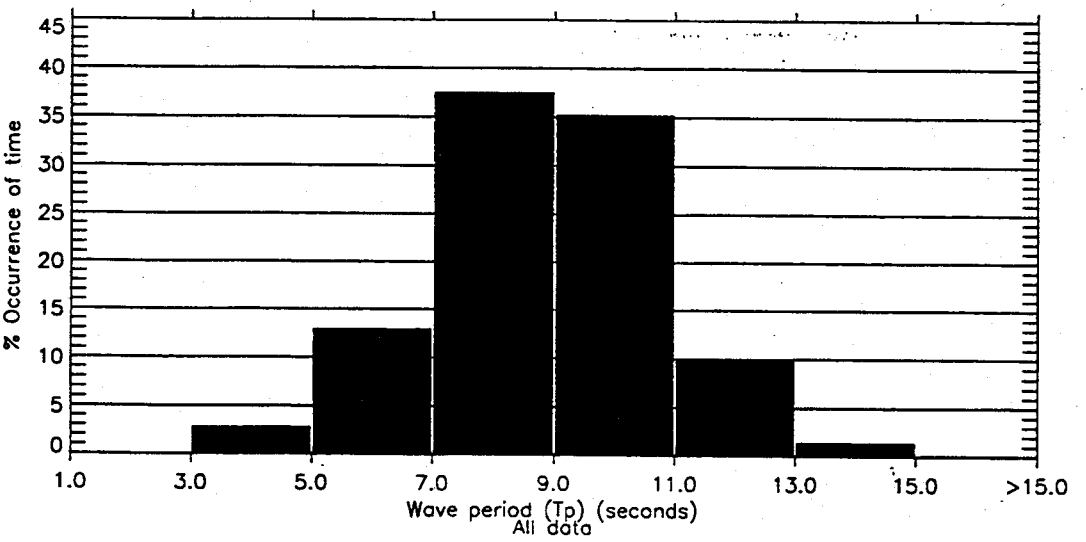




**Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)**

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 4** |

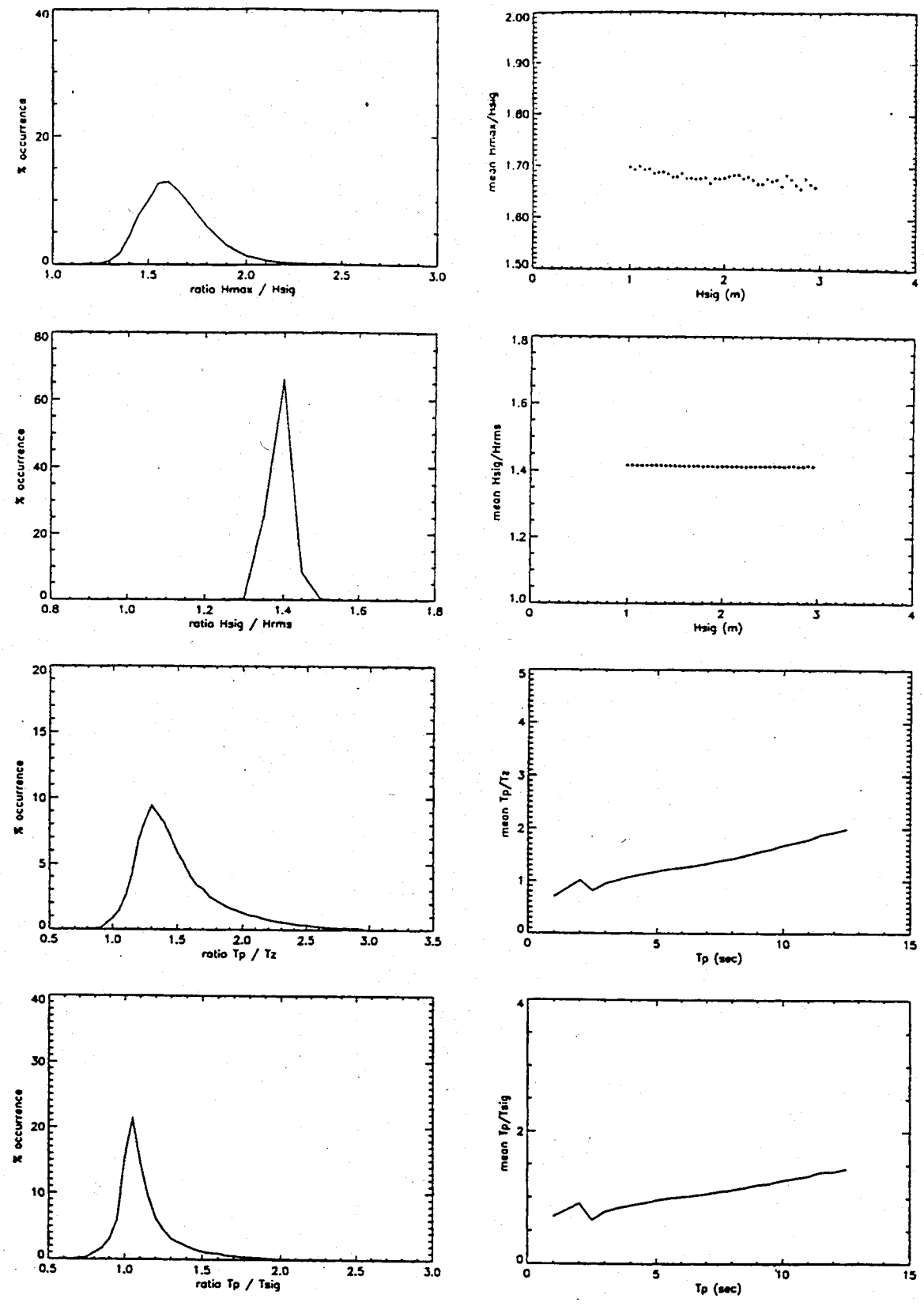



**Histogram percentage (of time) occurrence of wave periods (Tp) for all wave heights (Hsig)**

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 4** |

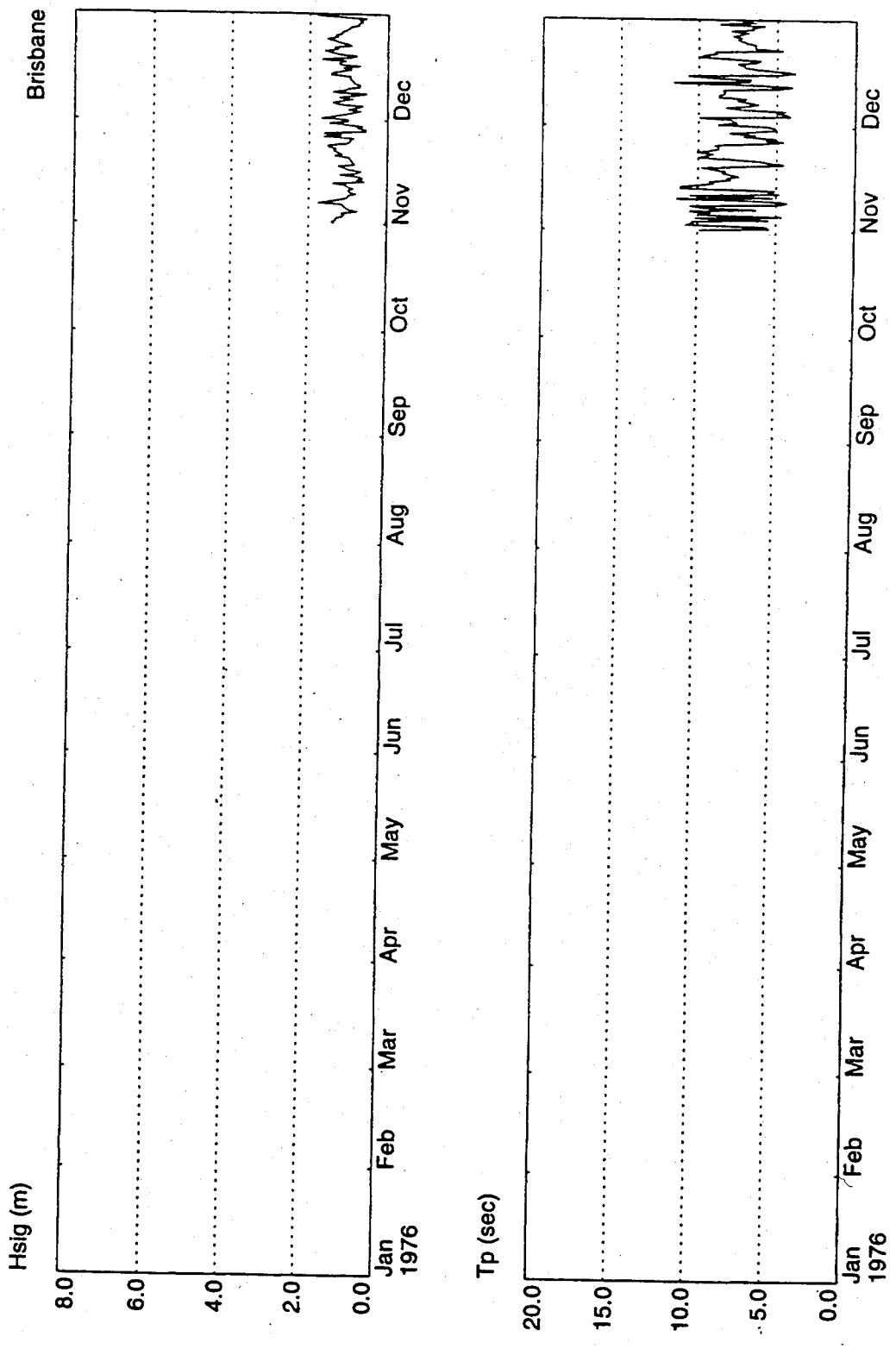



**Wave parameter relationships**
30 October 1976 to 28 February 1997

**Beach Protection Authority Queensland**
Department of Environment

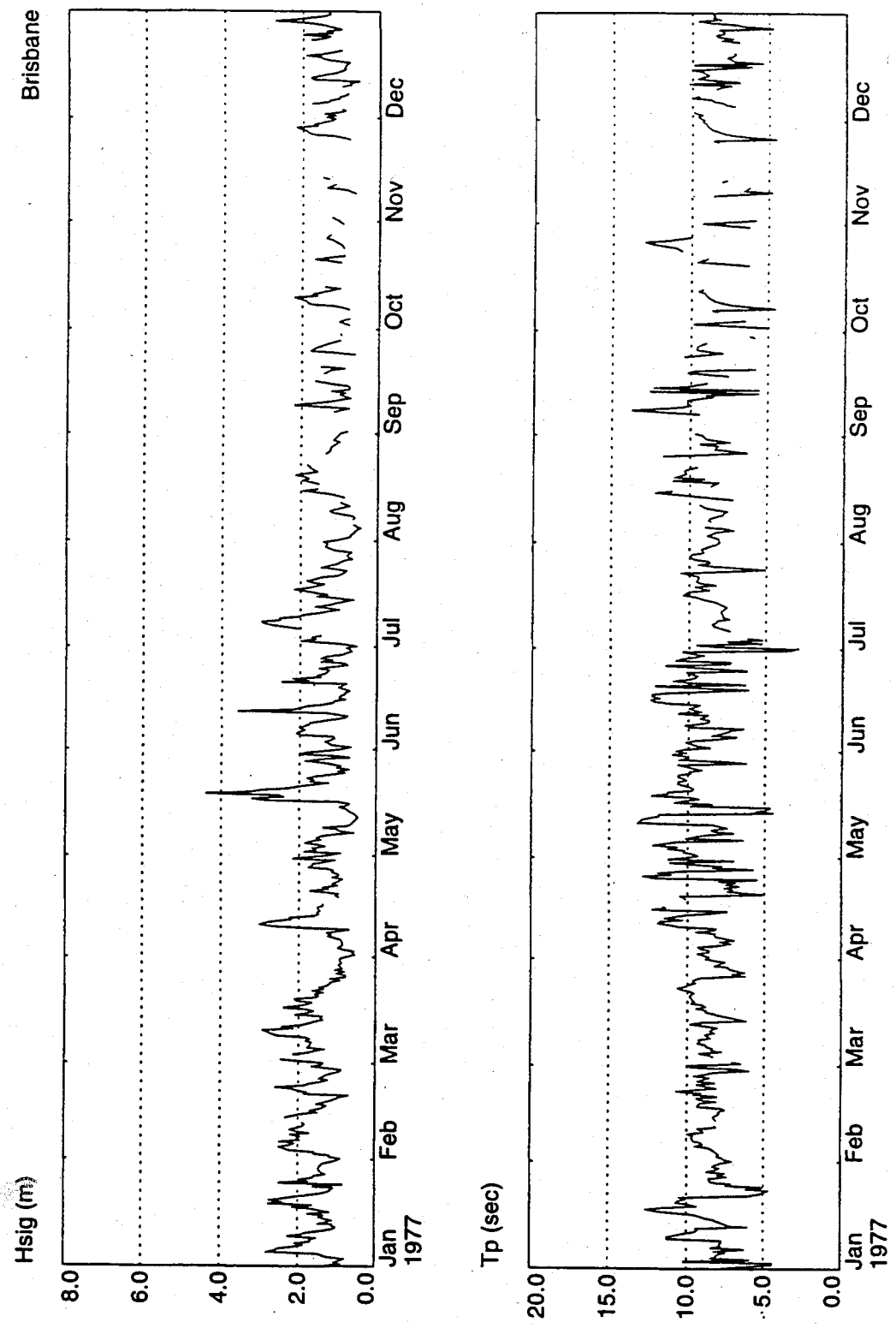
Wave data recording program
Brisbane Region

**Figure 5**




**Daily wave recordings**
30 October 1976 to 31 December 1976

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.01** |

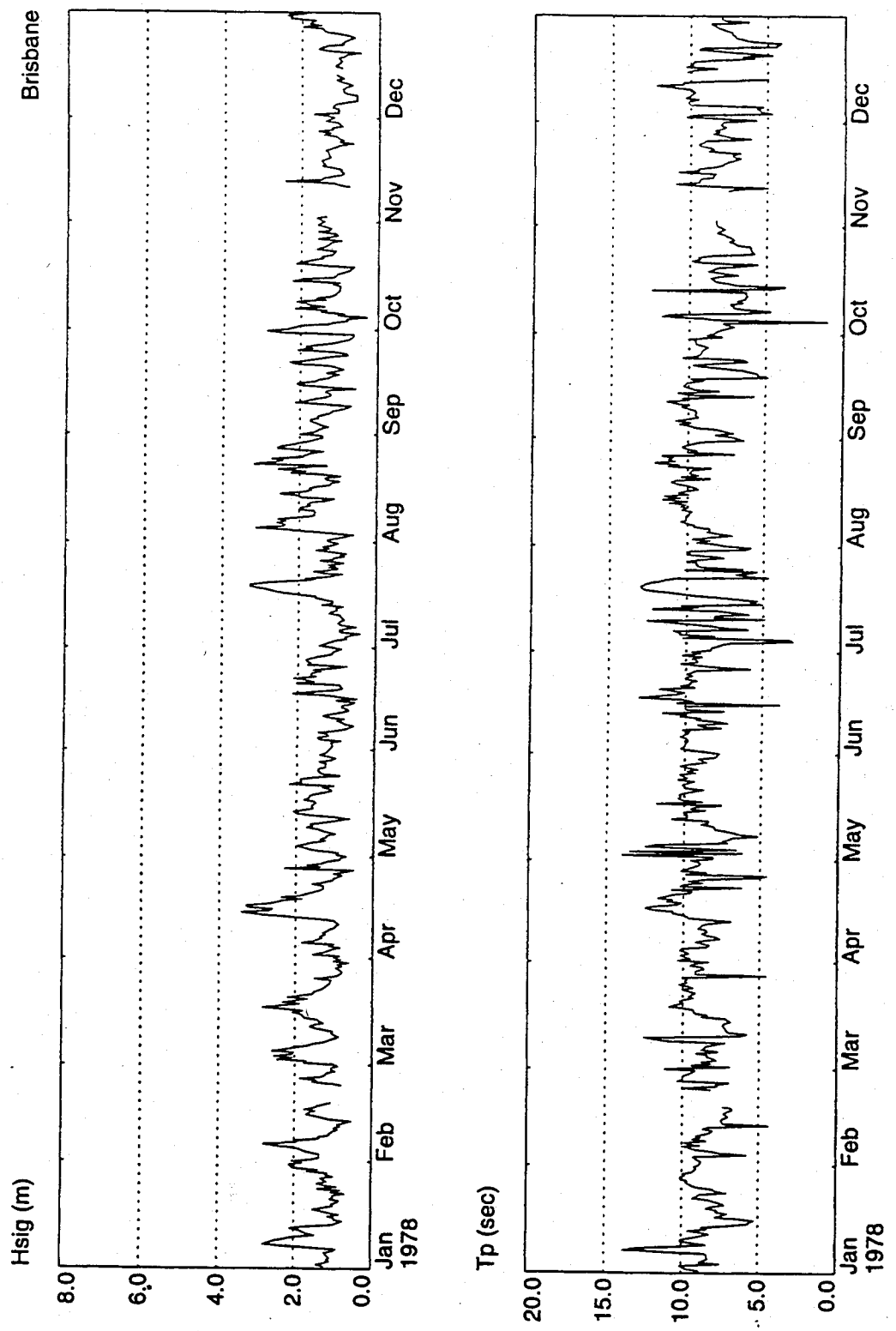



**Daily wave recordings**
1 January 1977 to 31 December 1977

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.02**

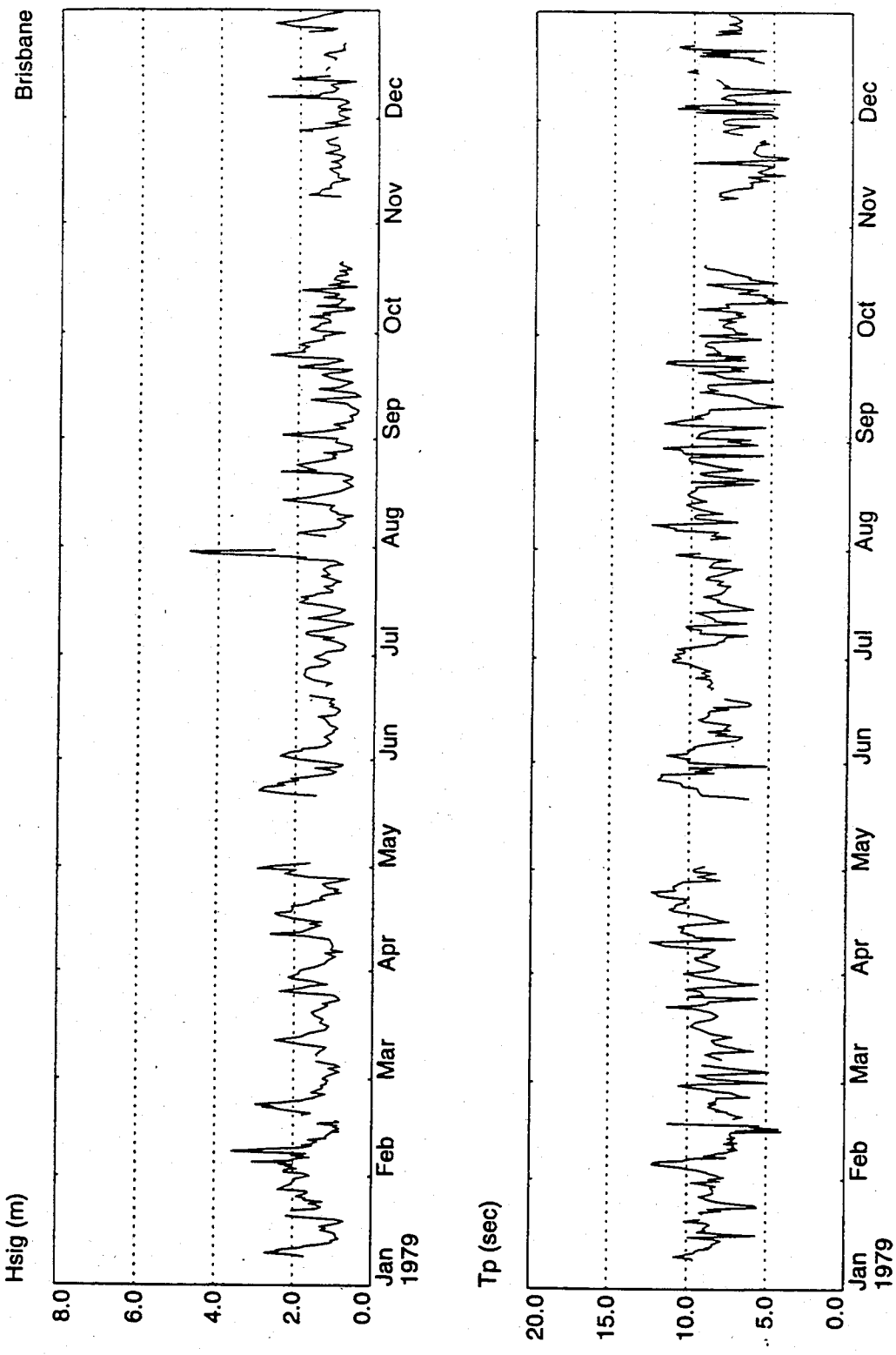



**Daily wave recordings**
1 January 1978 to 31 December 1978

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.03**

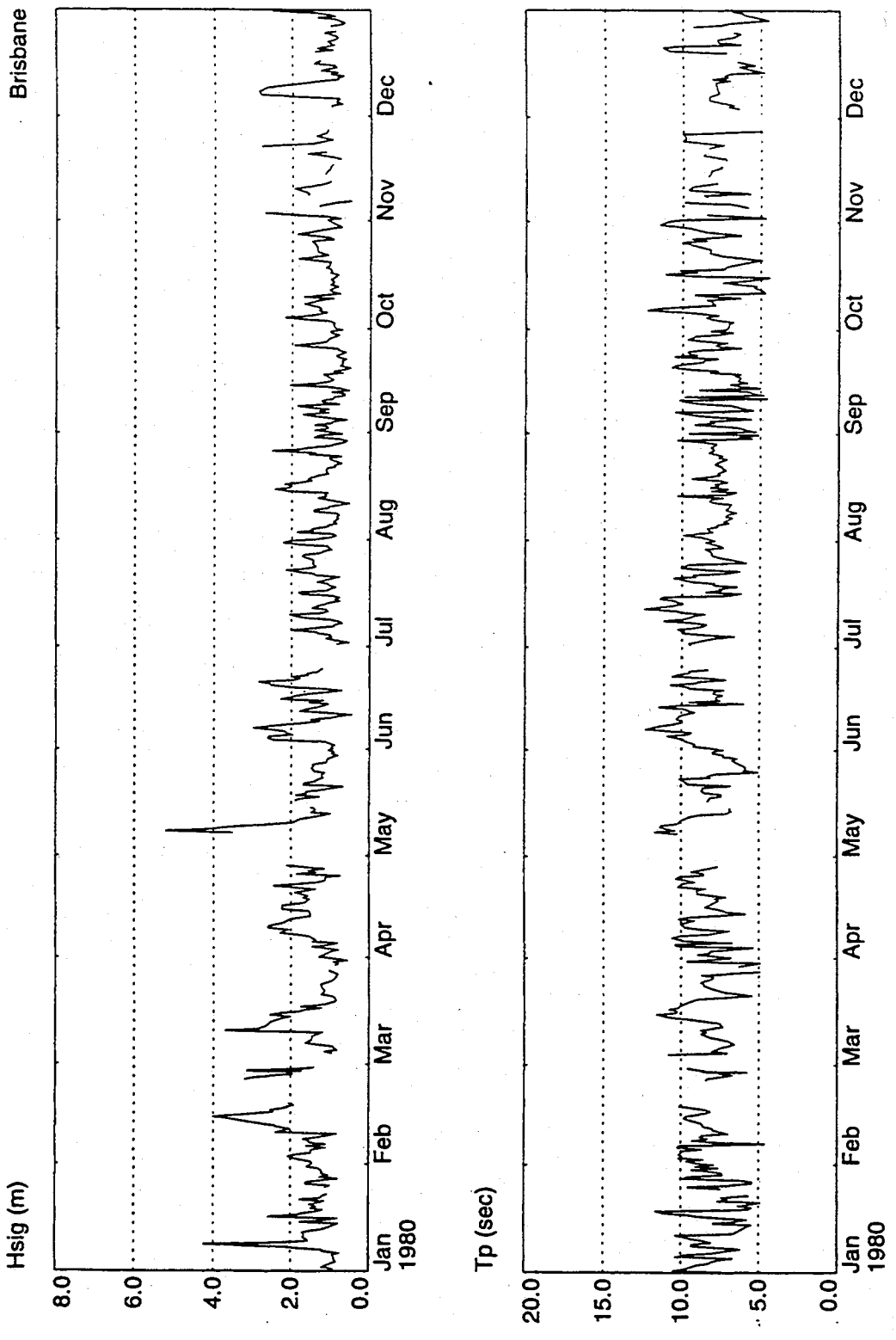



**Daily wave recordings**
1 January 1979 to 31 December 1979

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.04**

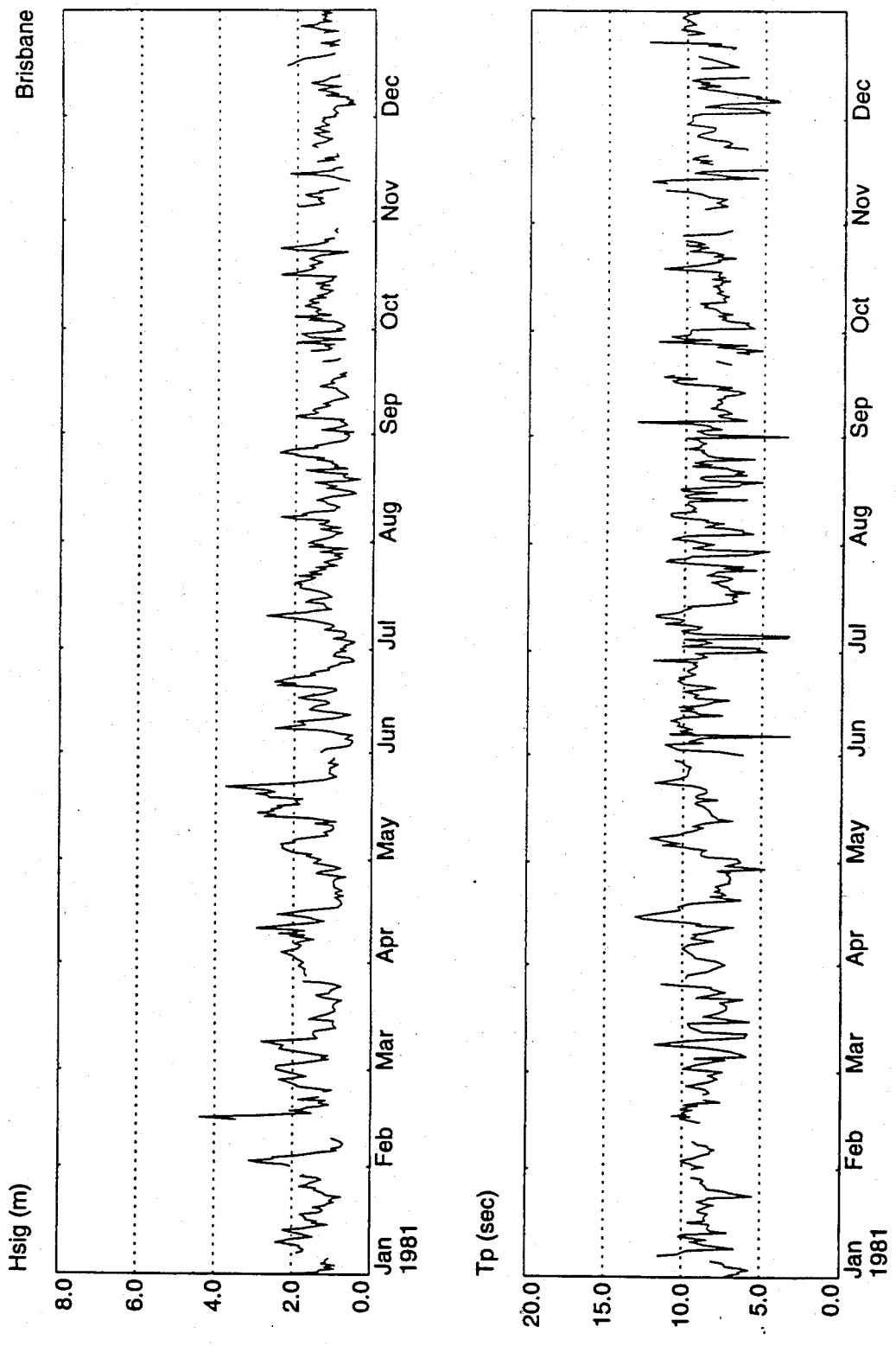



**Daily wave recordings**
1 January 1980 to 31 December 1980

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.05**

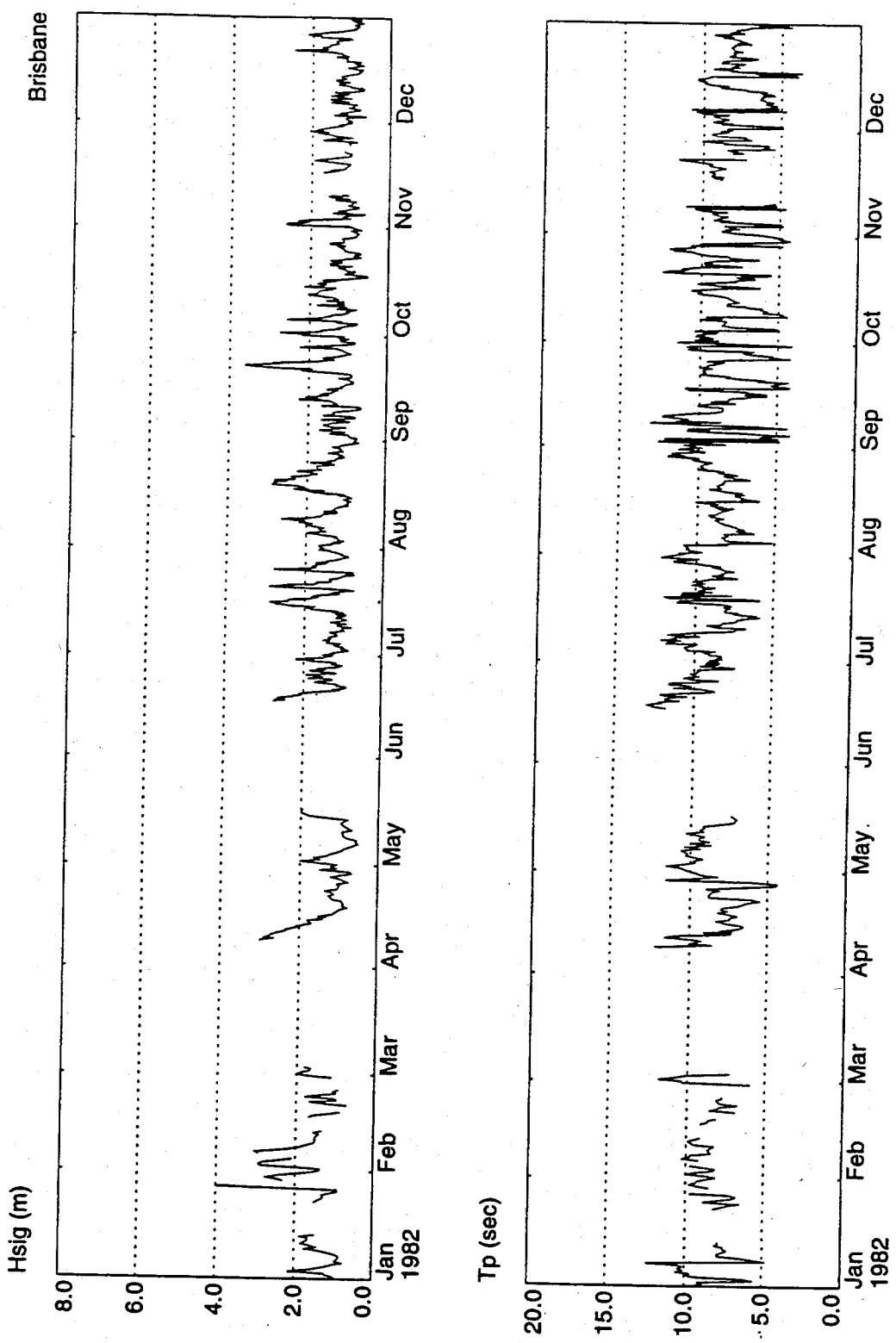



**Daily wave recordings**
1 January 1981 to 31 December 1981

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.06**

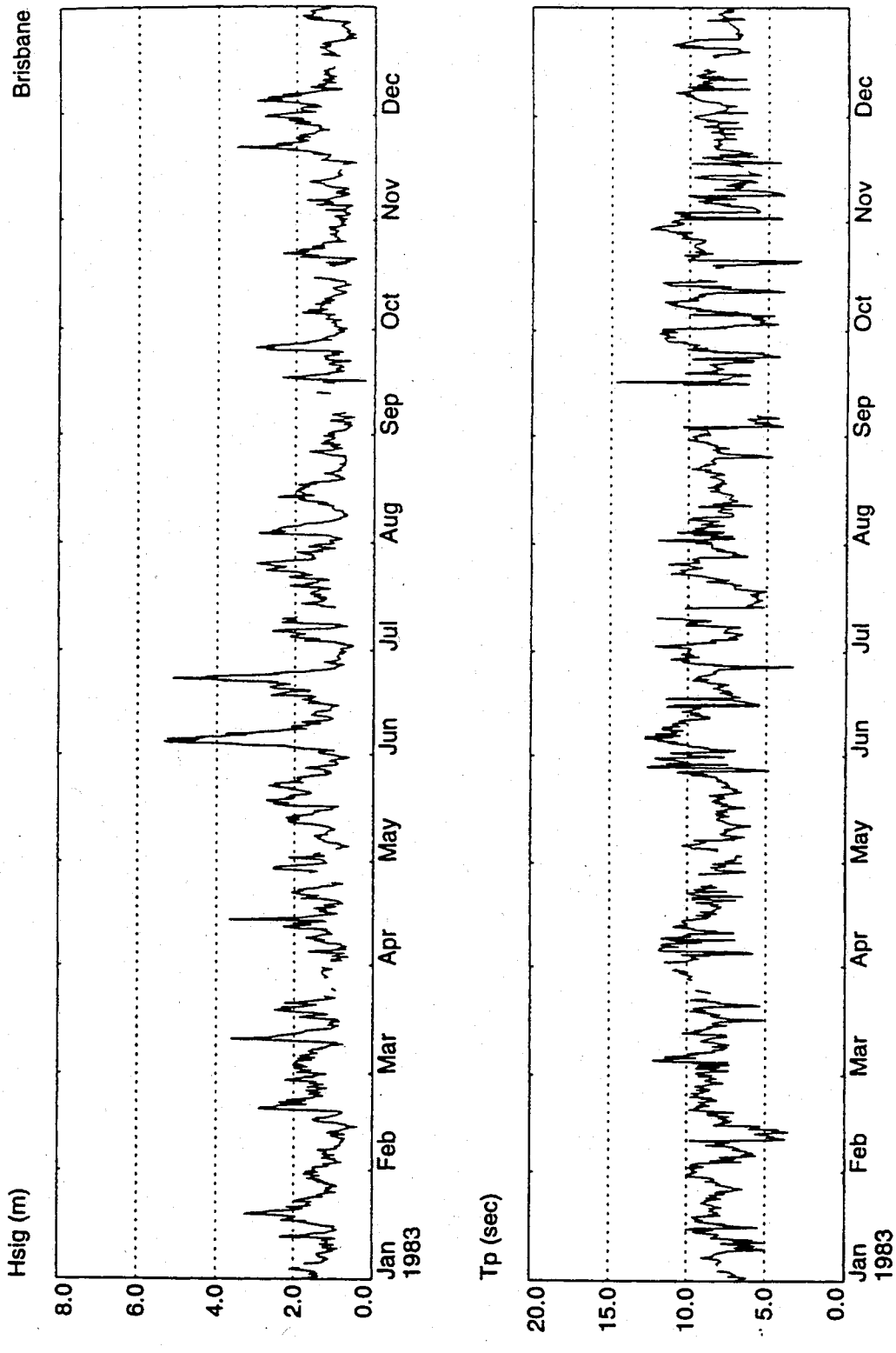



**Daily wave recordings**
1 January 1982 to 31 December 1982

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.07**




**Daily wave recordings**
1 January 1983 to 31 December 1983

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.08** |



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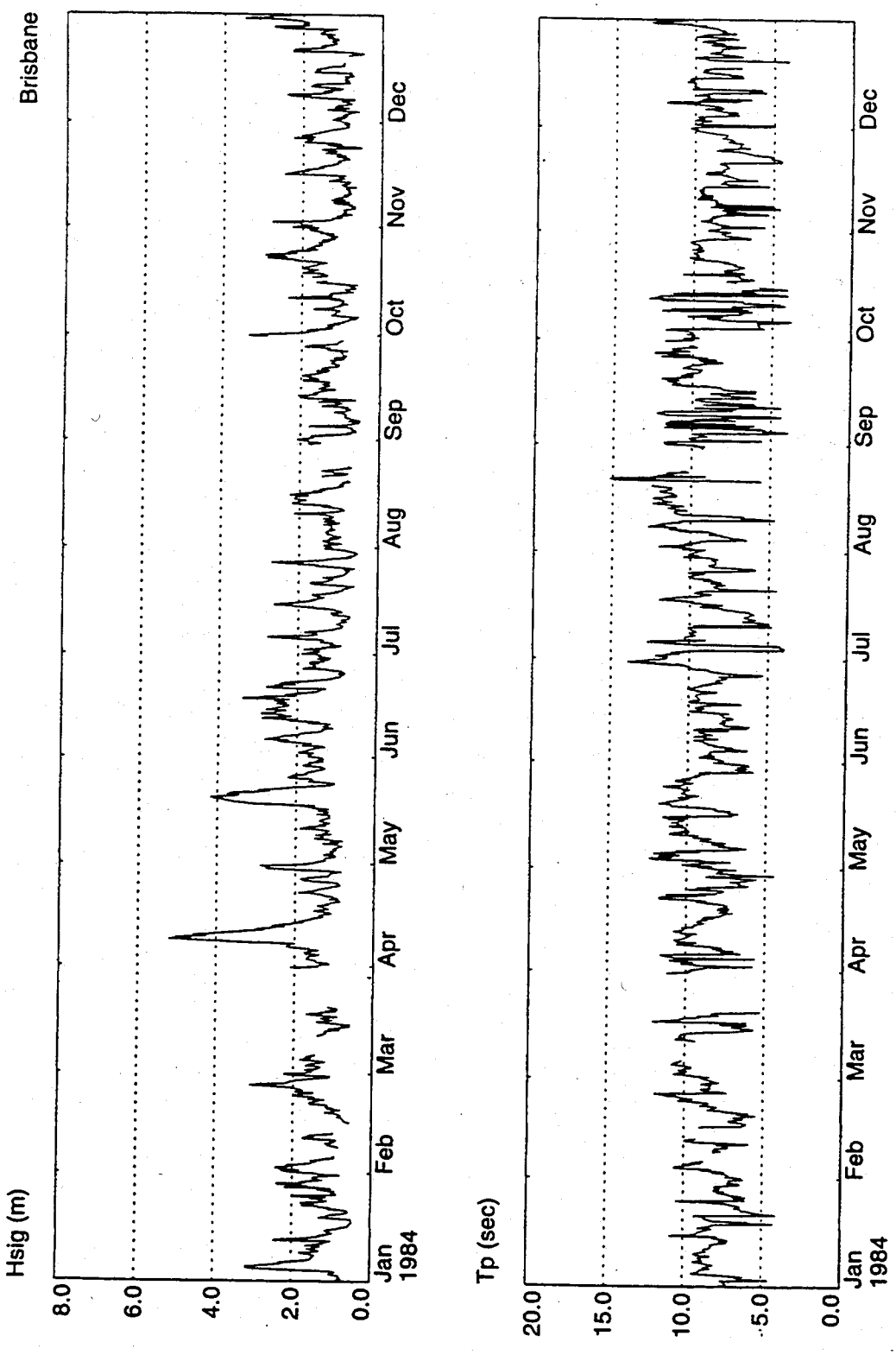
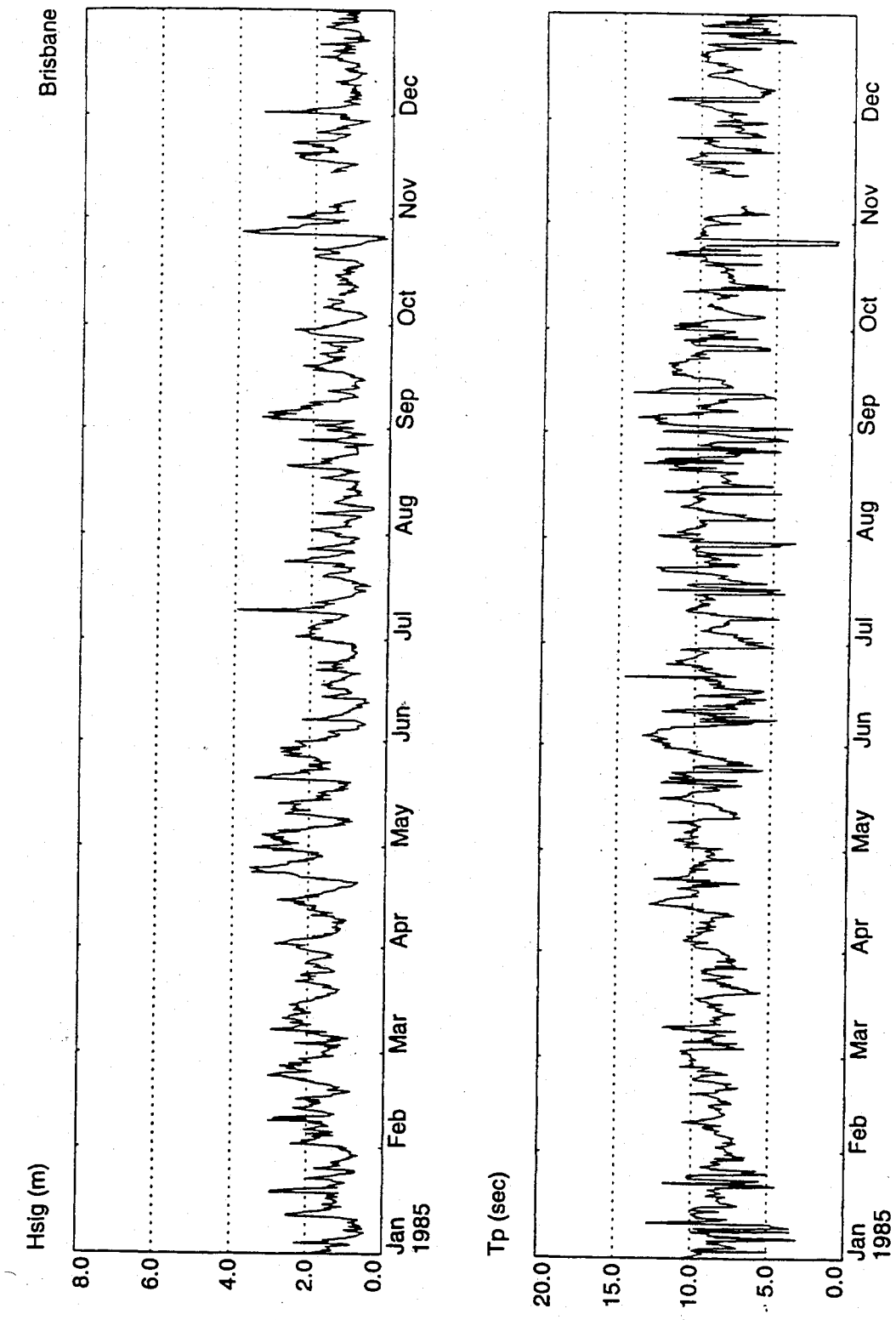



**Daily wave recordings**
1 January 1984 to 31 December 1984

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.09**




**Daily wave recordings**
1 January 1985 to 31 December 1985

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.10**



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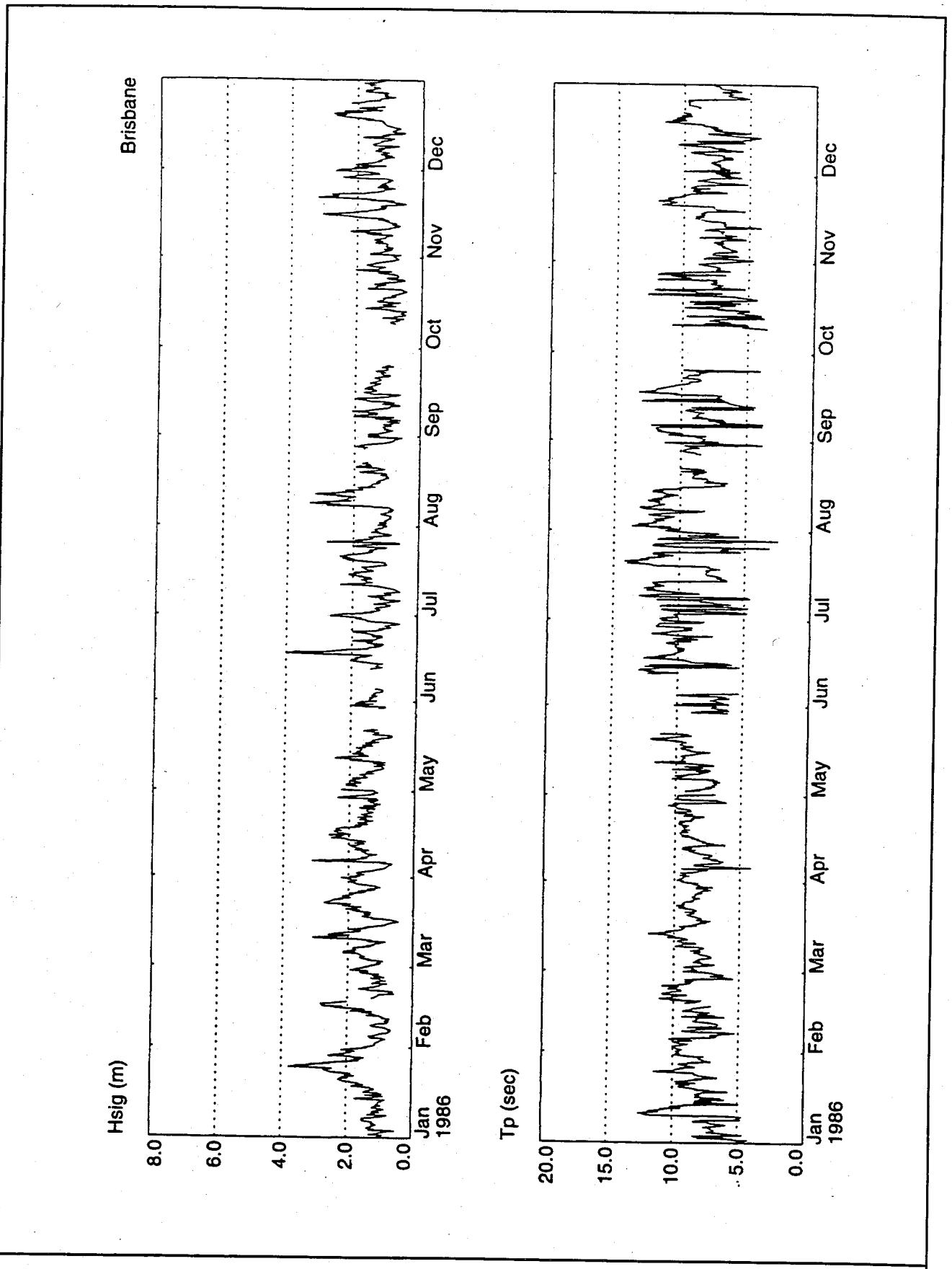
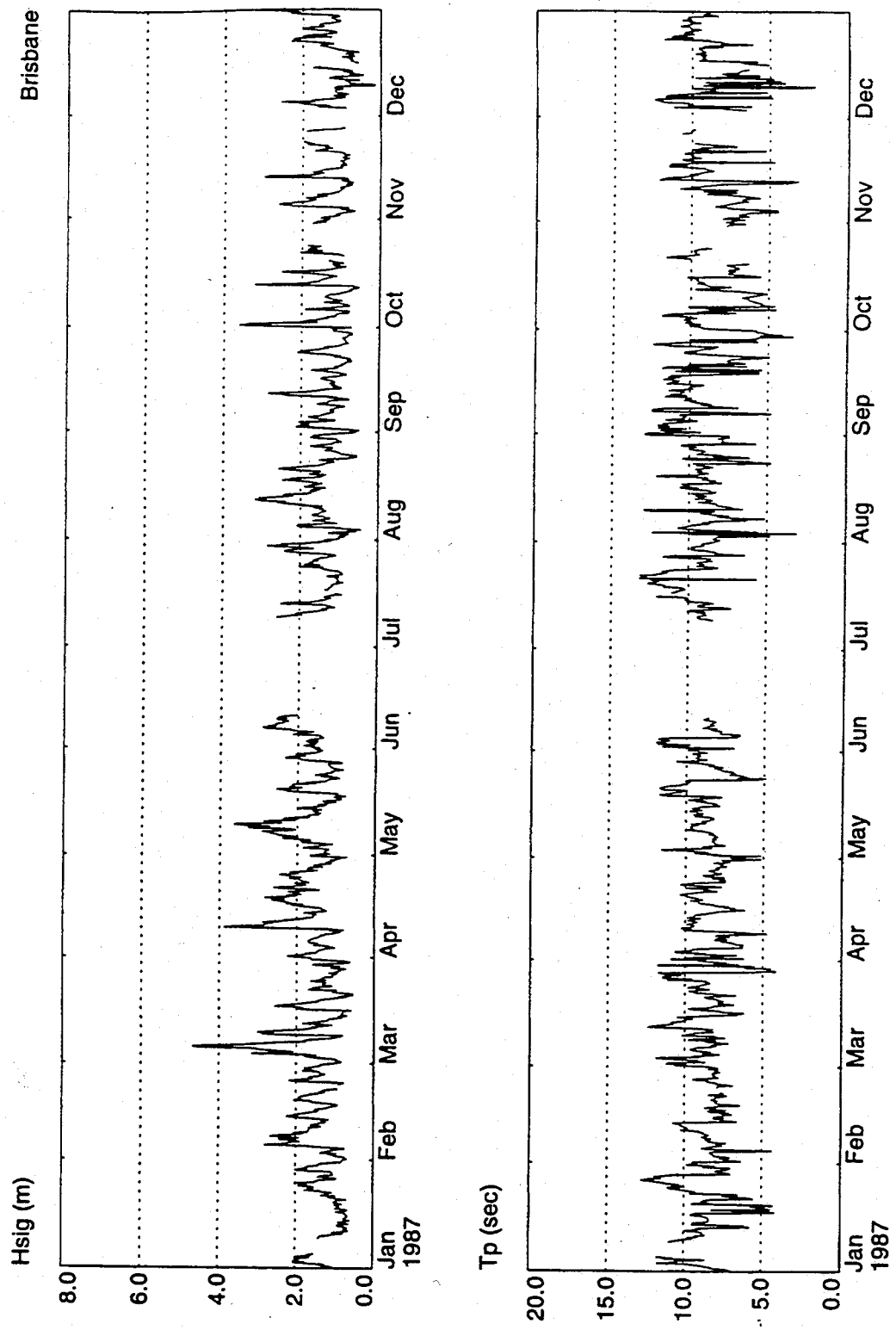



**Daily wave recordings**
1 January 1986 to 31 December 1986

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.11** |




**Daily wave recordings**
1 January 1987 to 31 February 1987

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.12**



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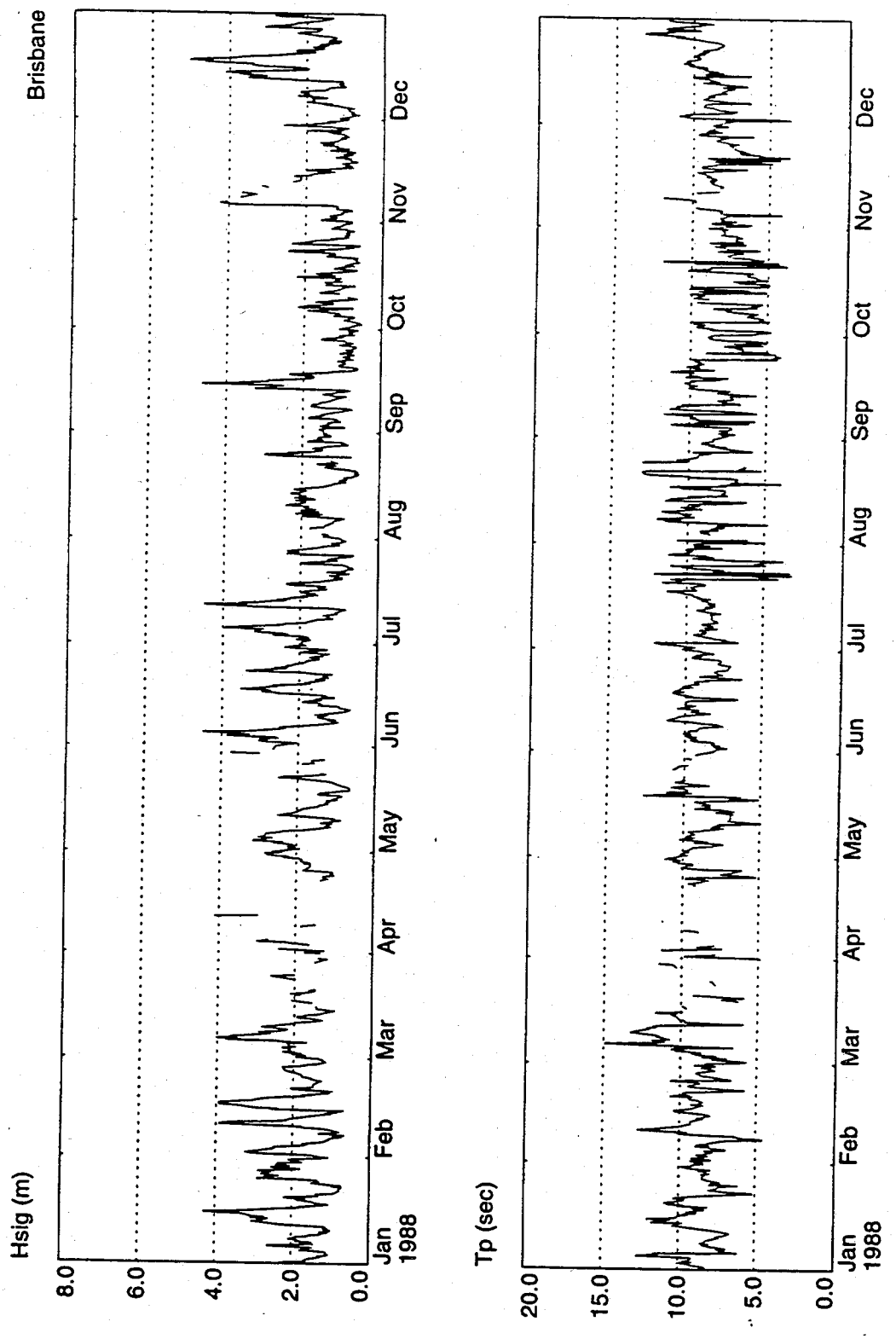
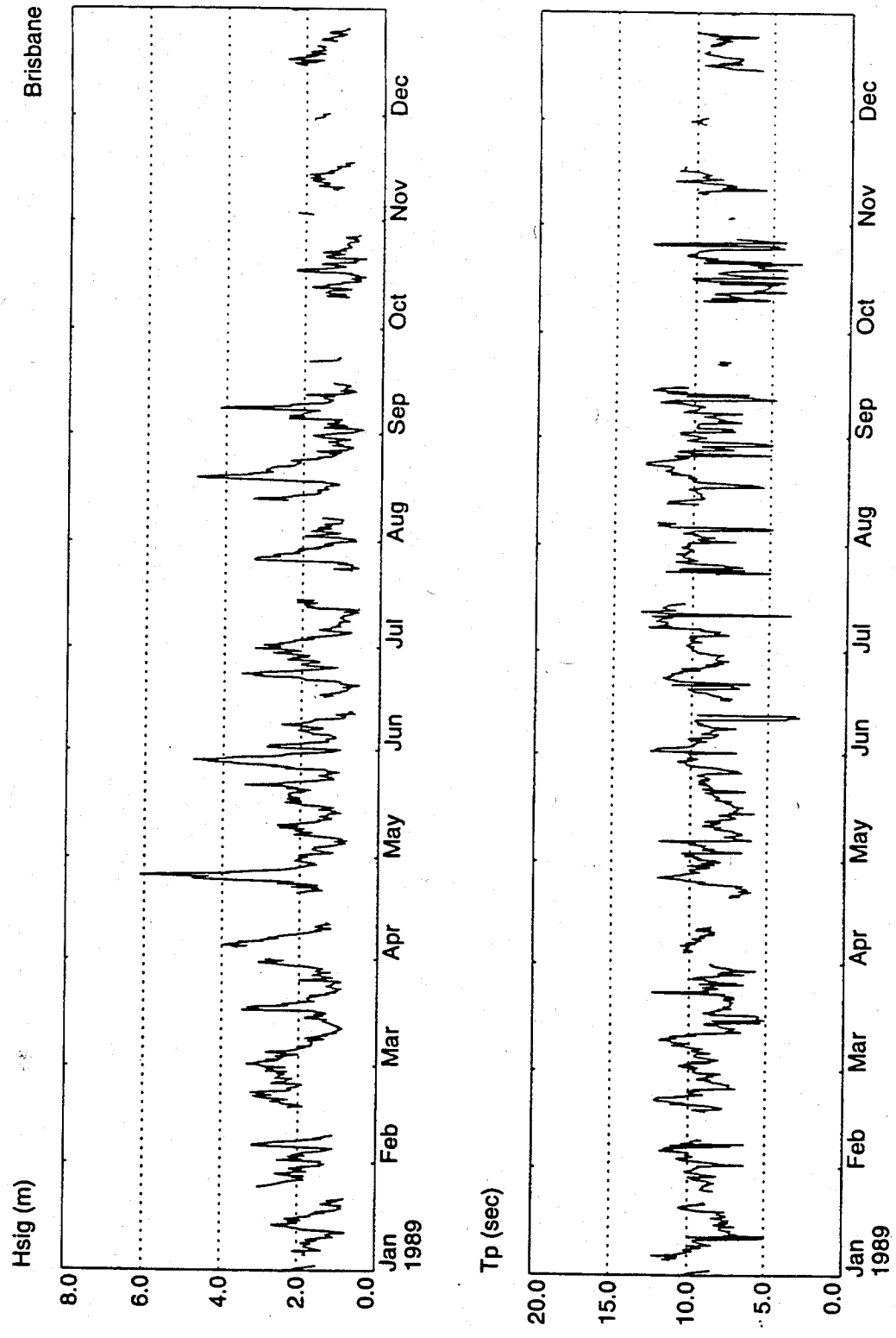


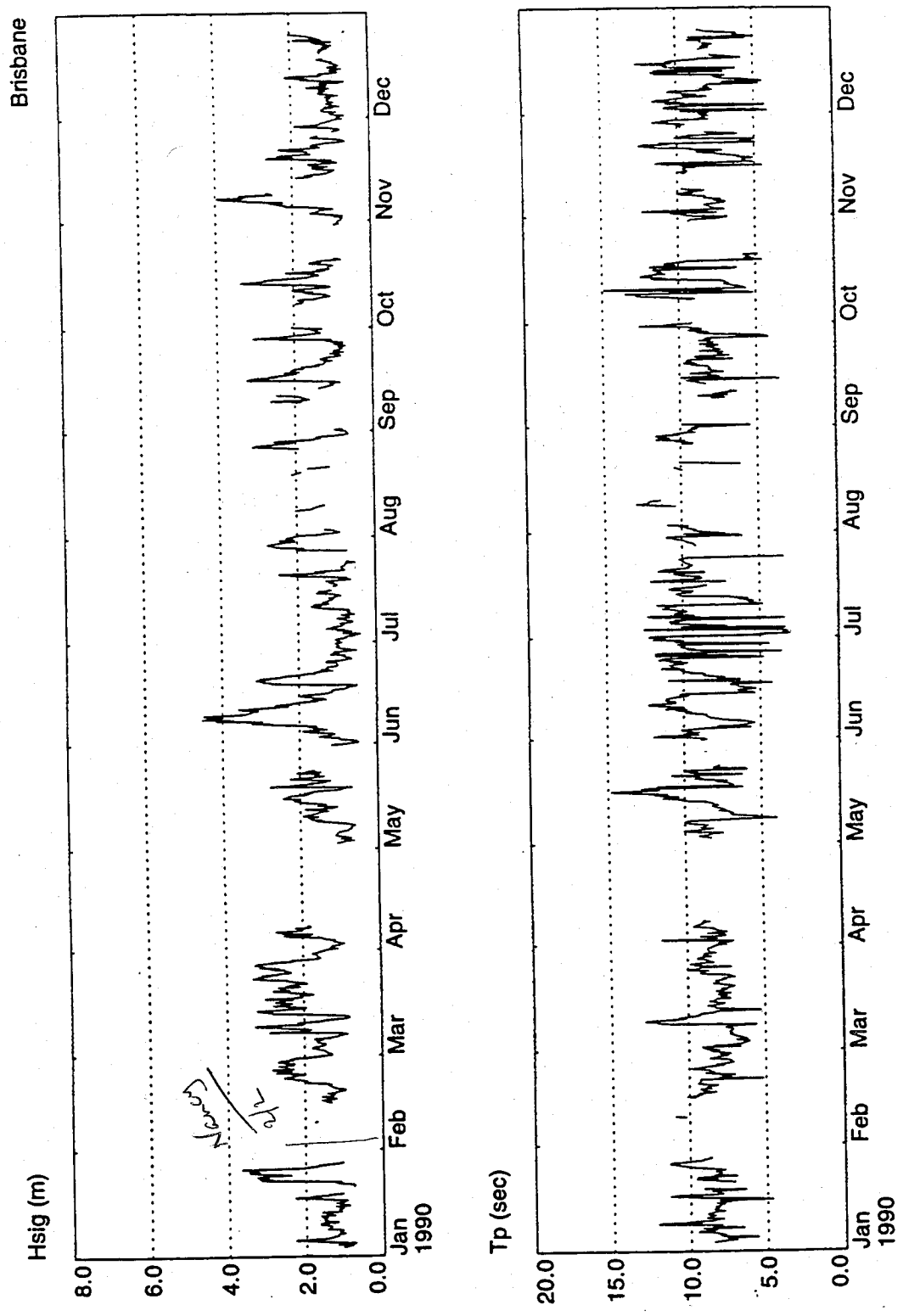

**Daily wave recordings**
1 January 1986 to 31 February 1988

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.13** |



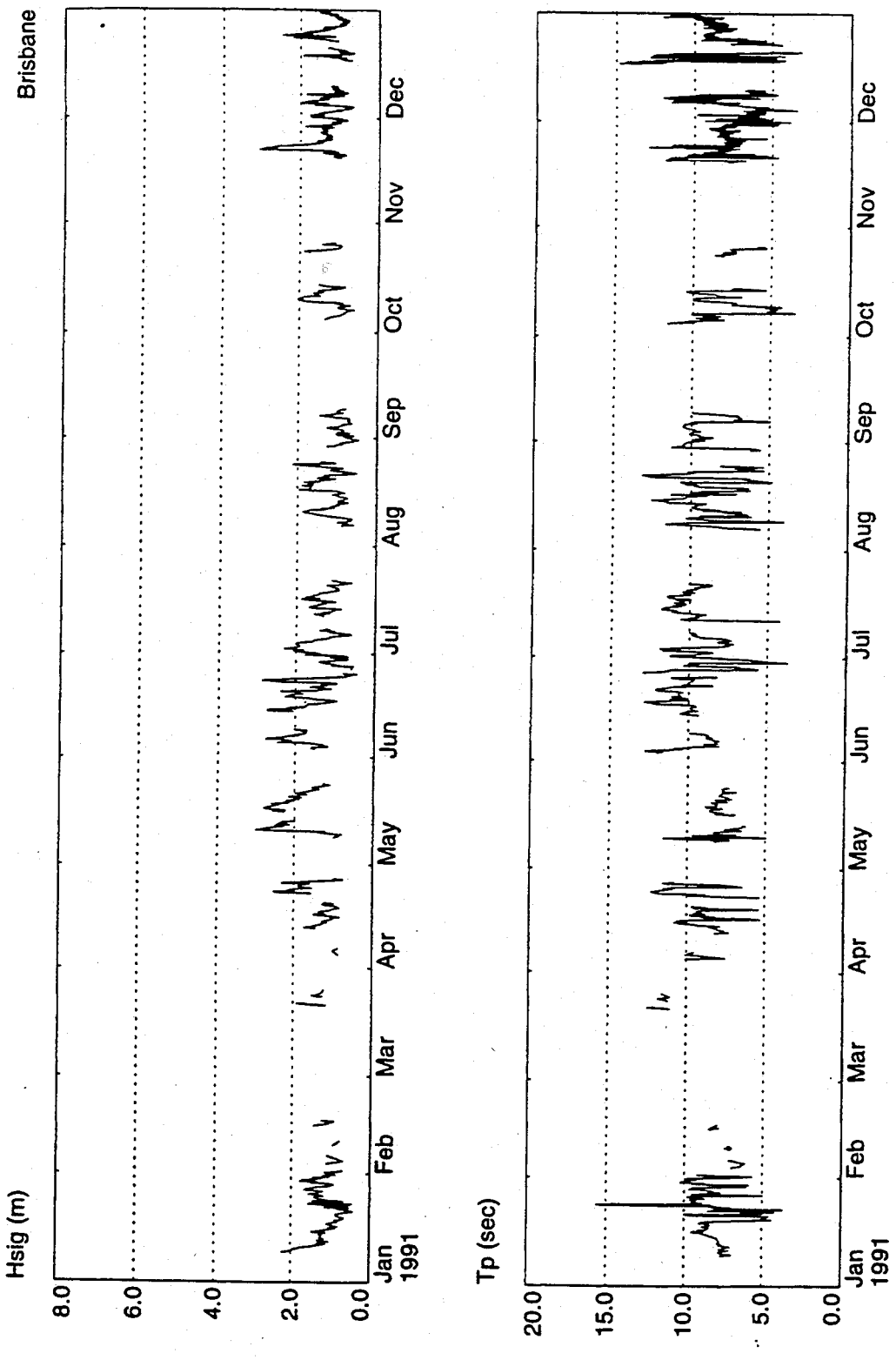

**Daily wave recordings**
1 January 1989 to 31 December 1989

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.14** |




**Daily wave recordings**
1 January 1990 to 31 December 1990

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.15** |




**Daily wave recordings**
1 January 1991 to 31 December 1991

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.16** |



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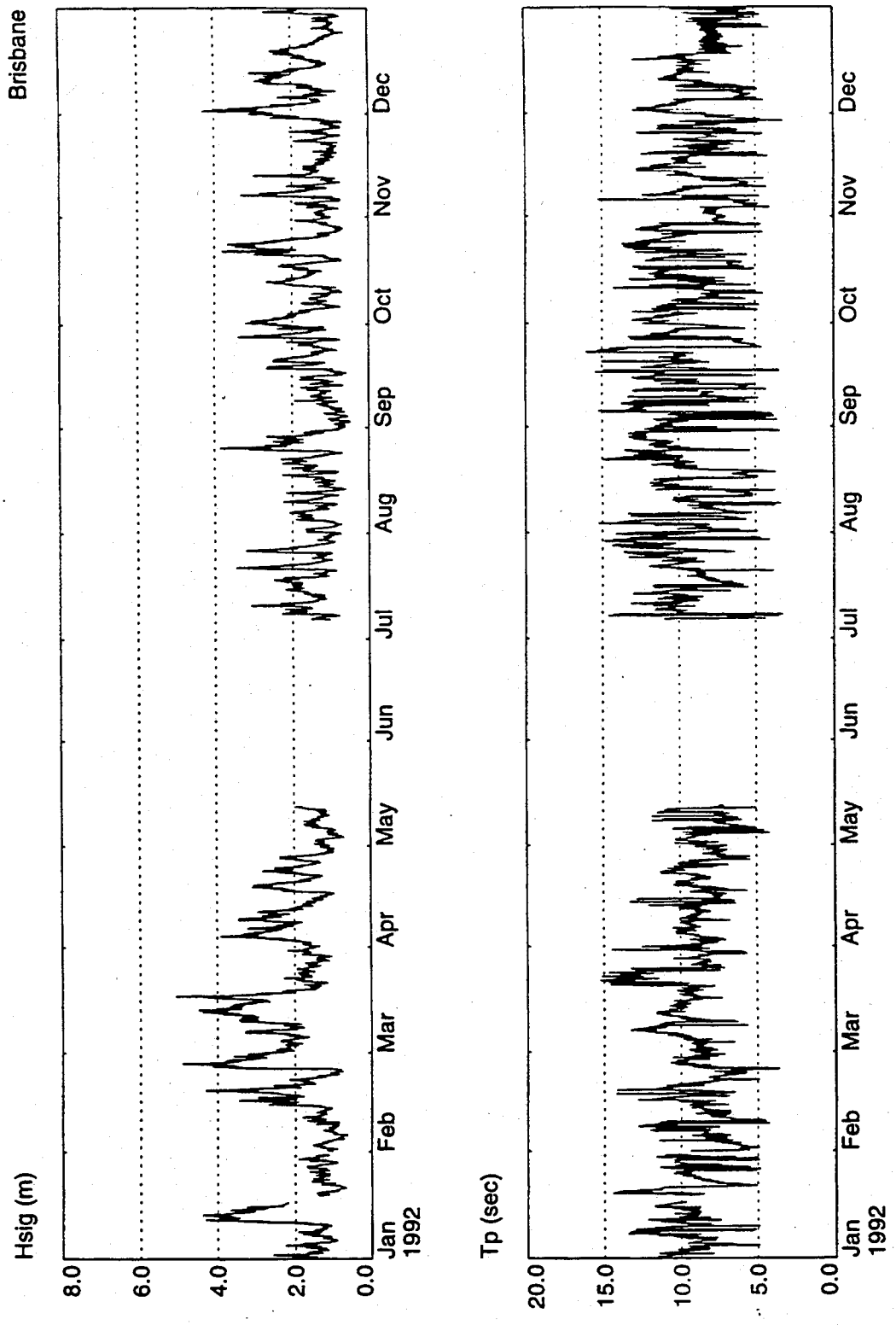
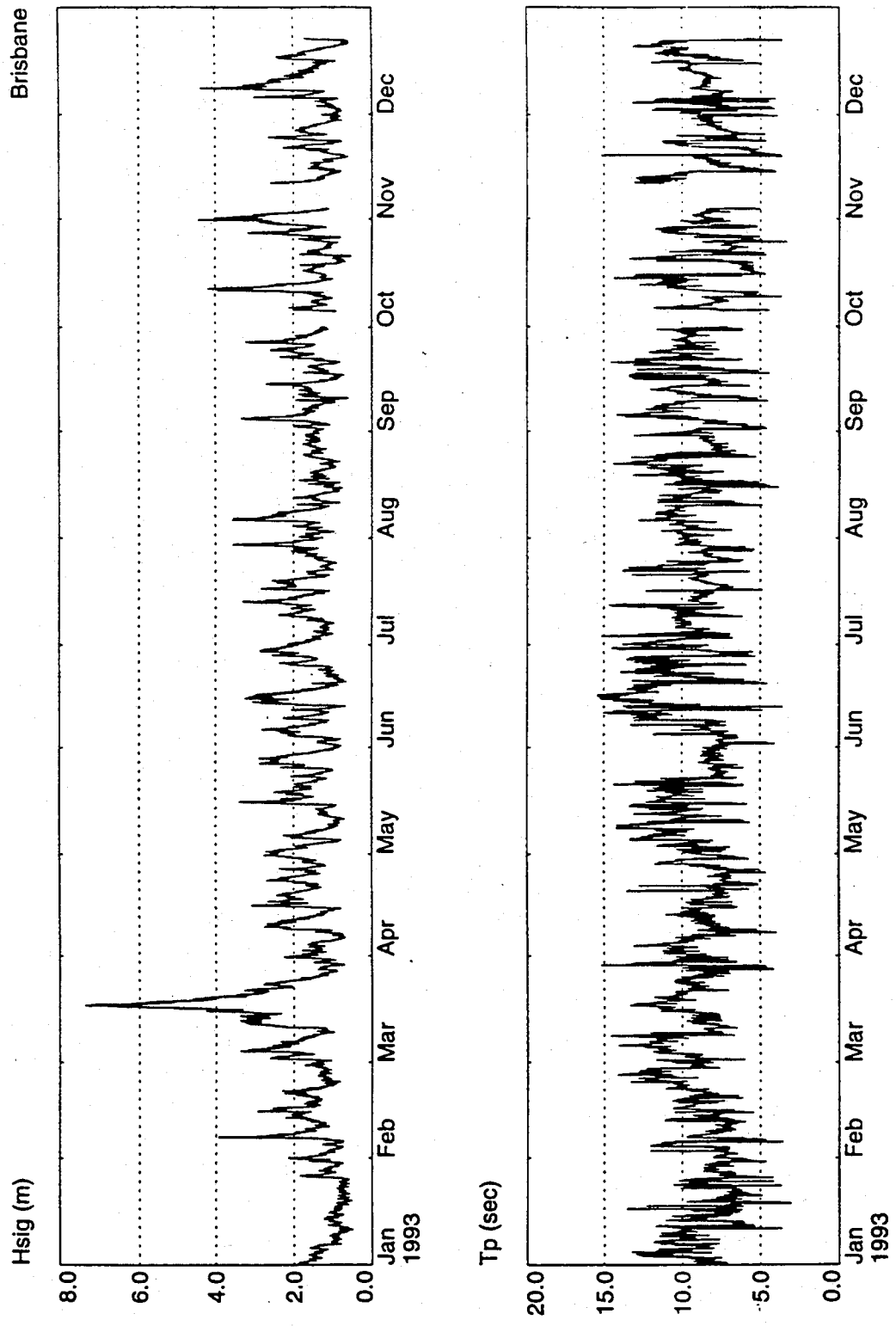



**Daily wave recordings**
1 January 1992 to 31 December 1992

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.17**

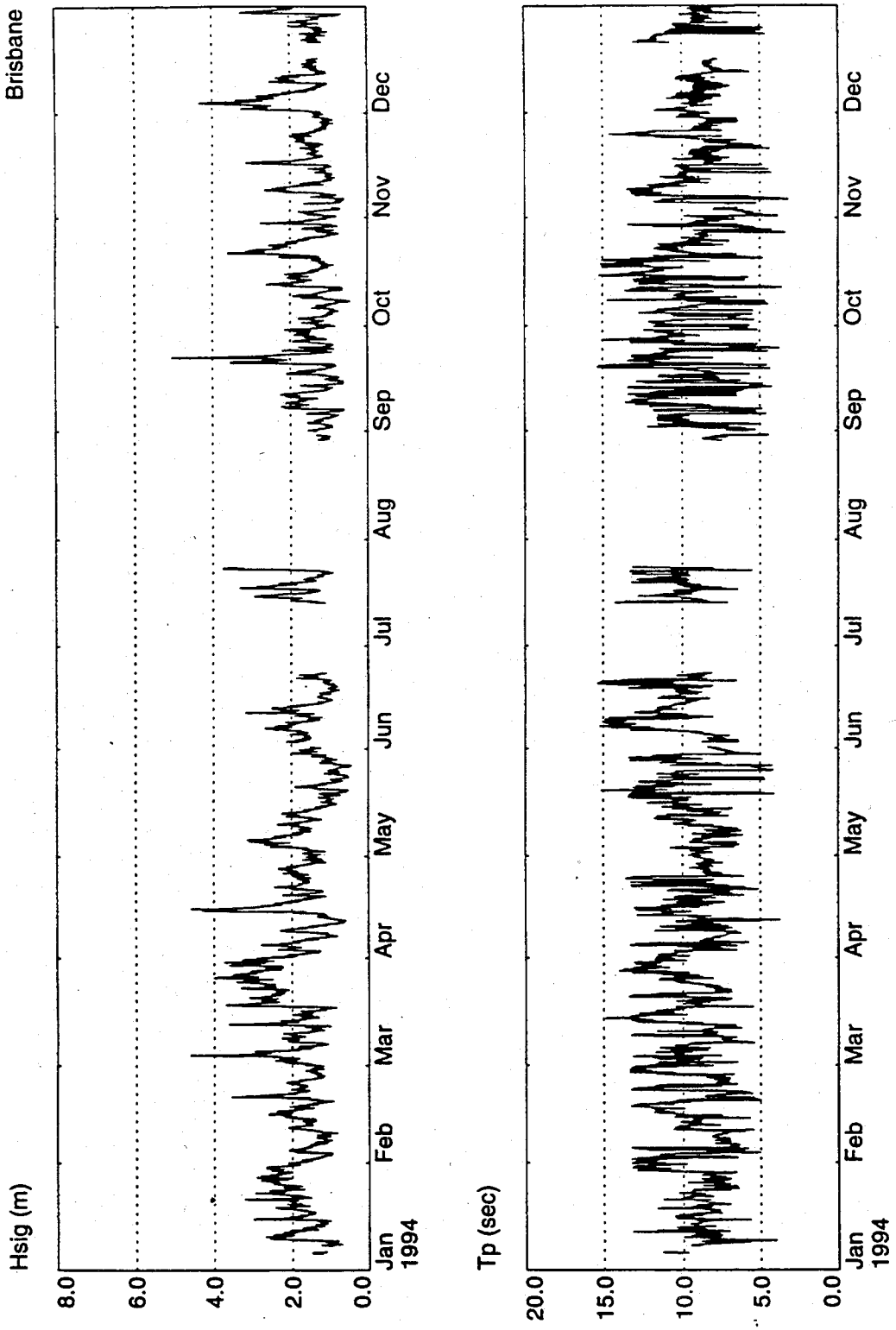



**Daily wave recordings**
1 January 1993 to 31 December 1993

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 6.18**

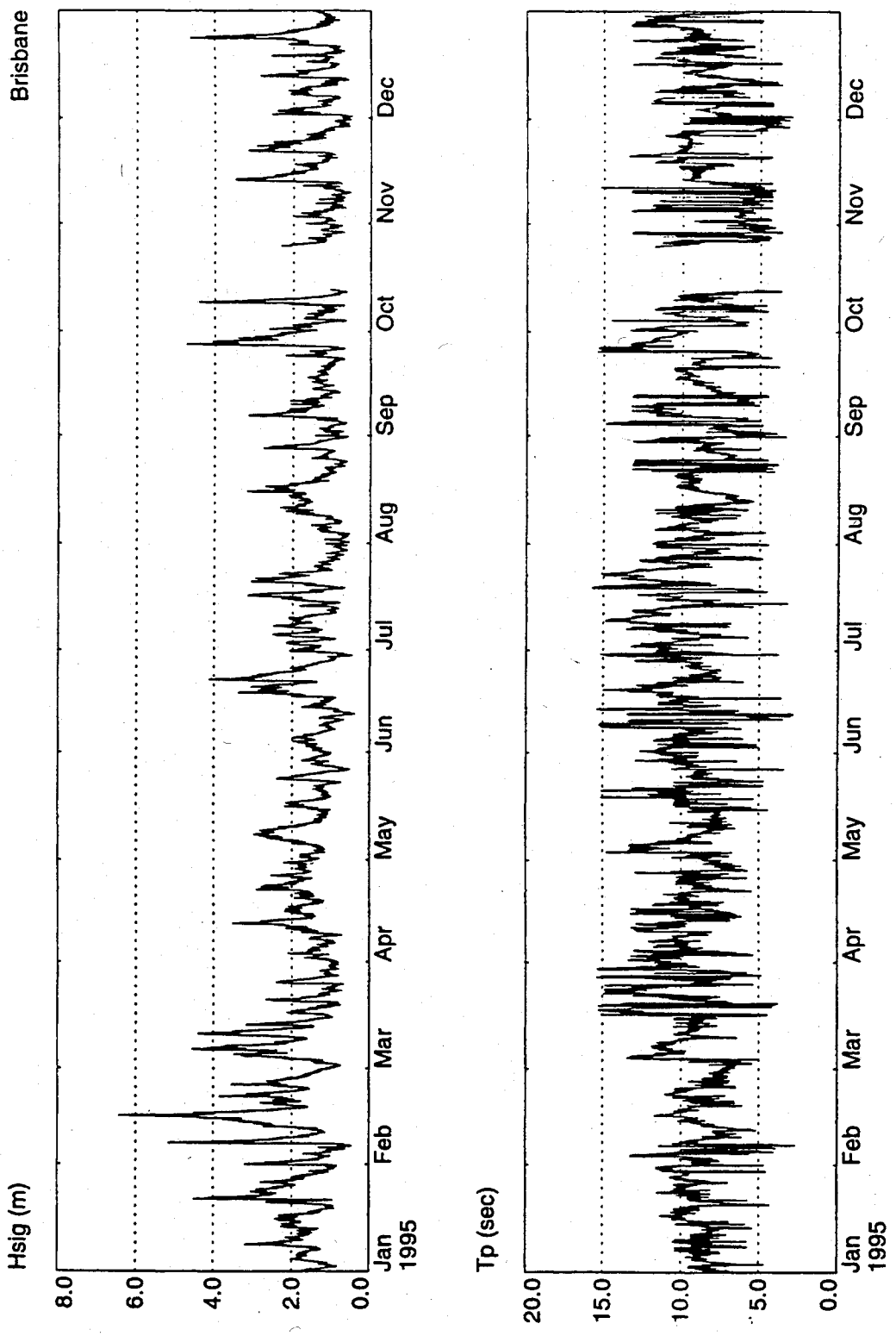



**Daily wave recordings**
1 January 1994 to 31 December 1994

**Beach Protection Authority Queensland**
Department of Environment

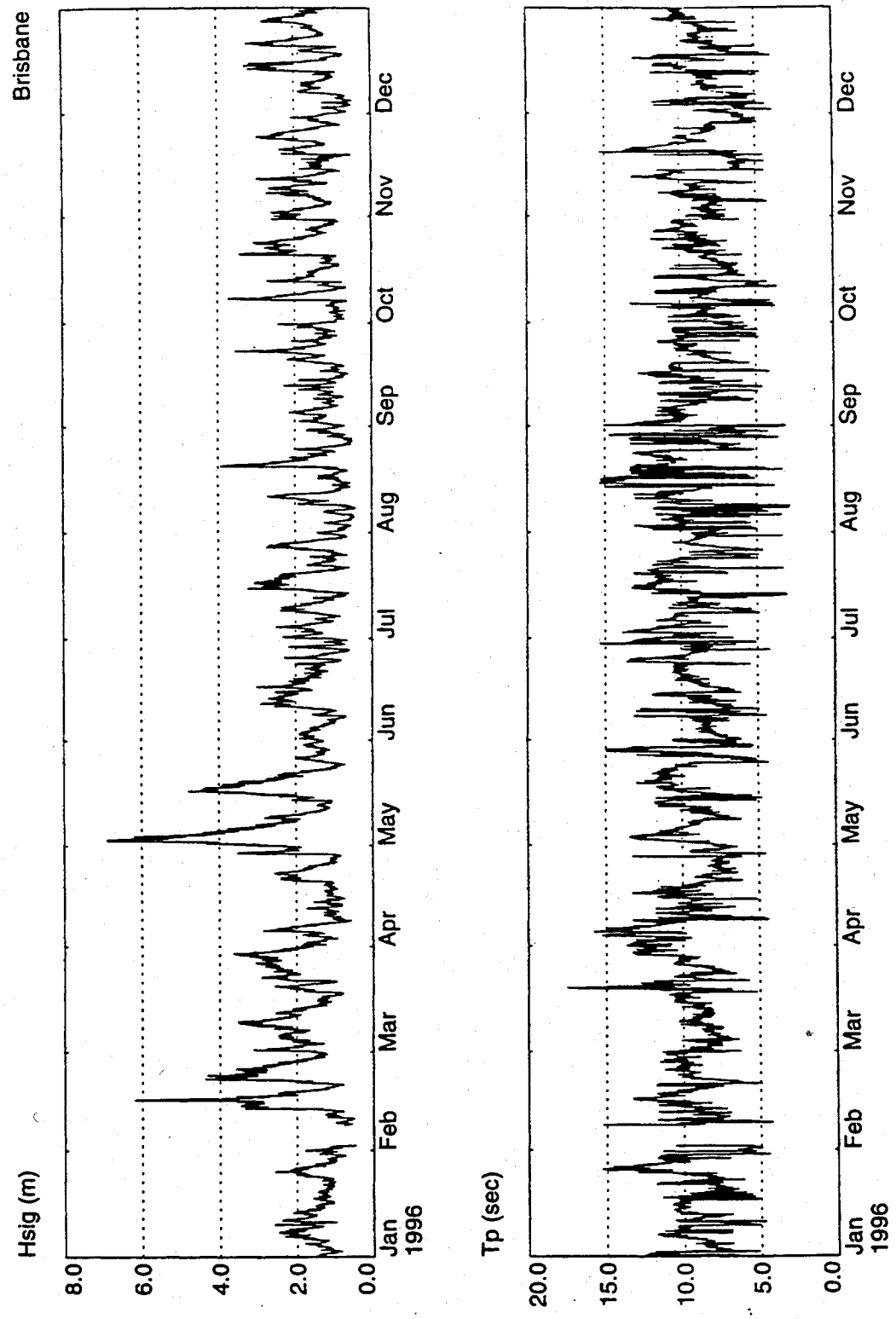
Wave data recording program
Brisbane Region

**Figure 6.19**




**Daily wave recordings**
1 January 1995 to 31 December 1995

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.20** |

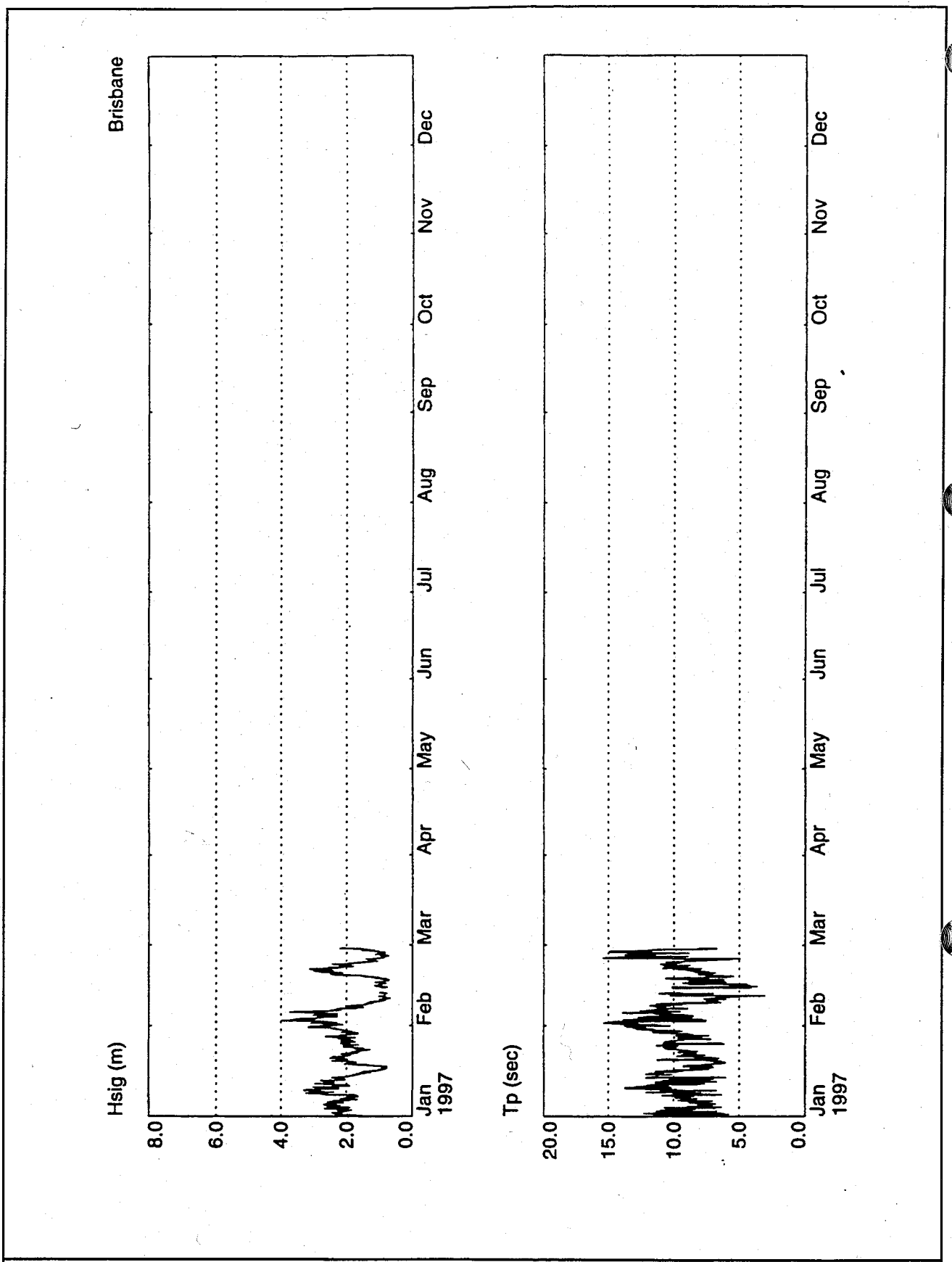



**Daily wave recordings**
1 January 1996 to 31 December 1996

**Beach Protection Authority Queensland**
Department of Environment

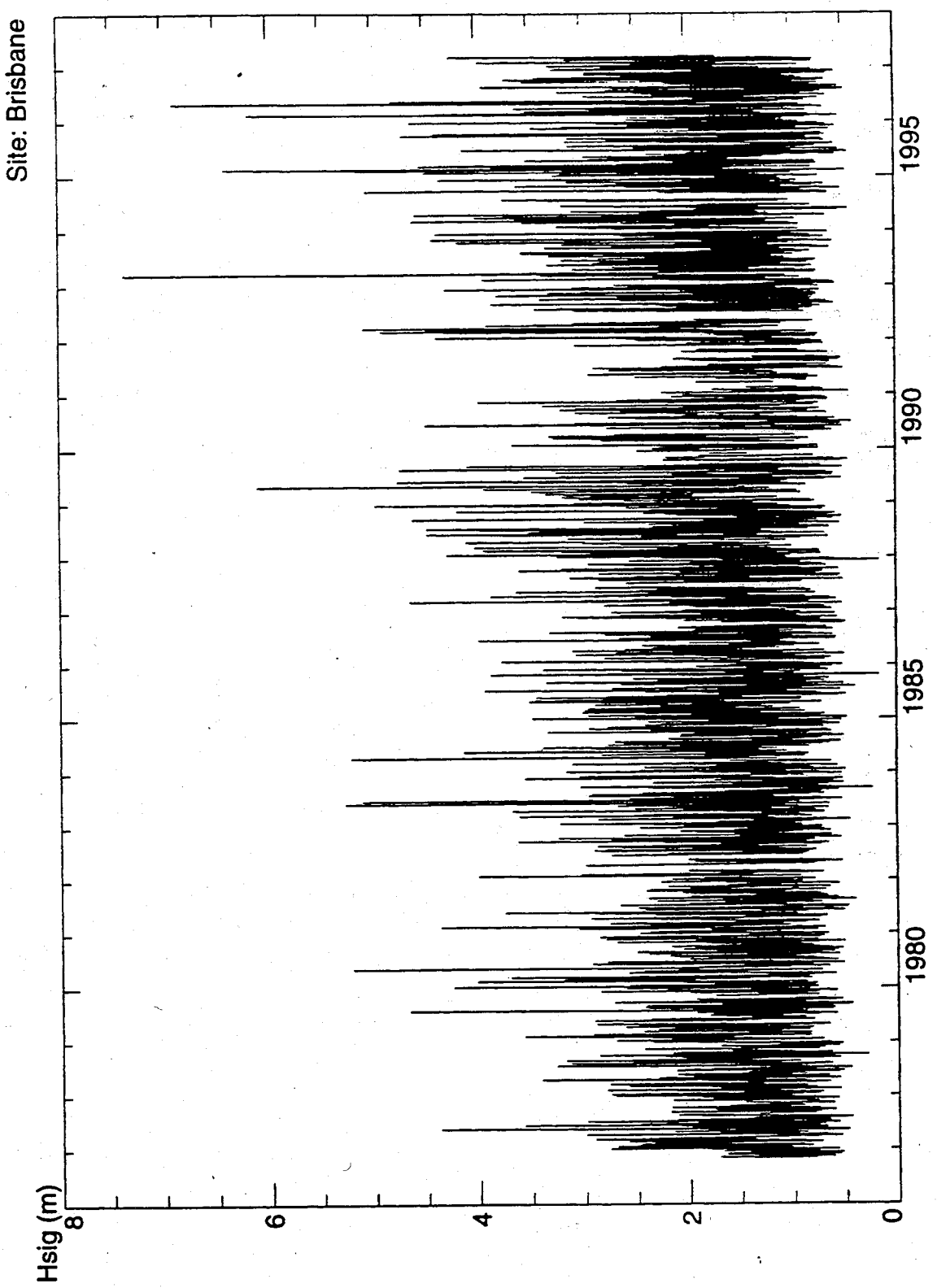
Wave data recording program
Brisbane Region

**Figure 6.21**




**Daily wave recordings**
1 January 1997 to 31 December 1997

| | | |
|---|---|---|
| **Beach Protection Authority Queensland**<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 6.22** |




**Whole recording period single plot of wave heights (Hsig)**

| | | |
|---|---|---|
| Beach Protection Authority Queensland<br>Department of Environment | Wave data recording program<br>Brisbane Region | **Figure 7** |



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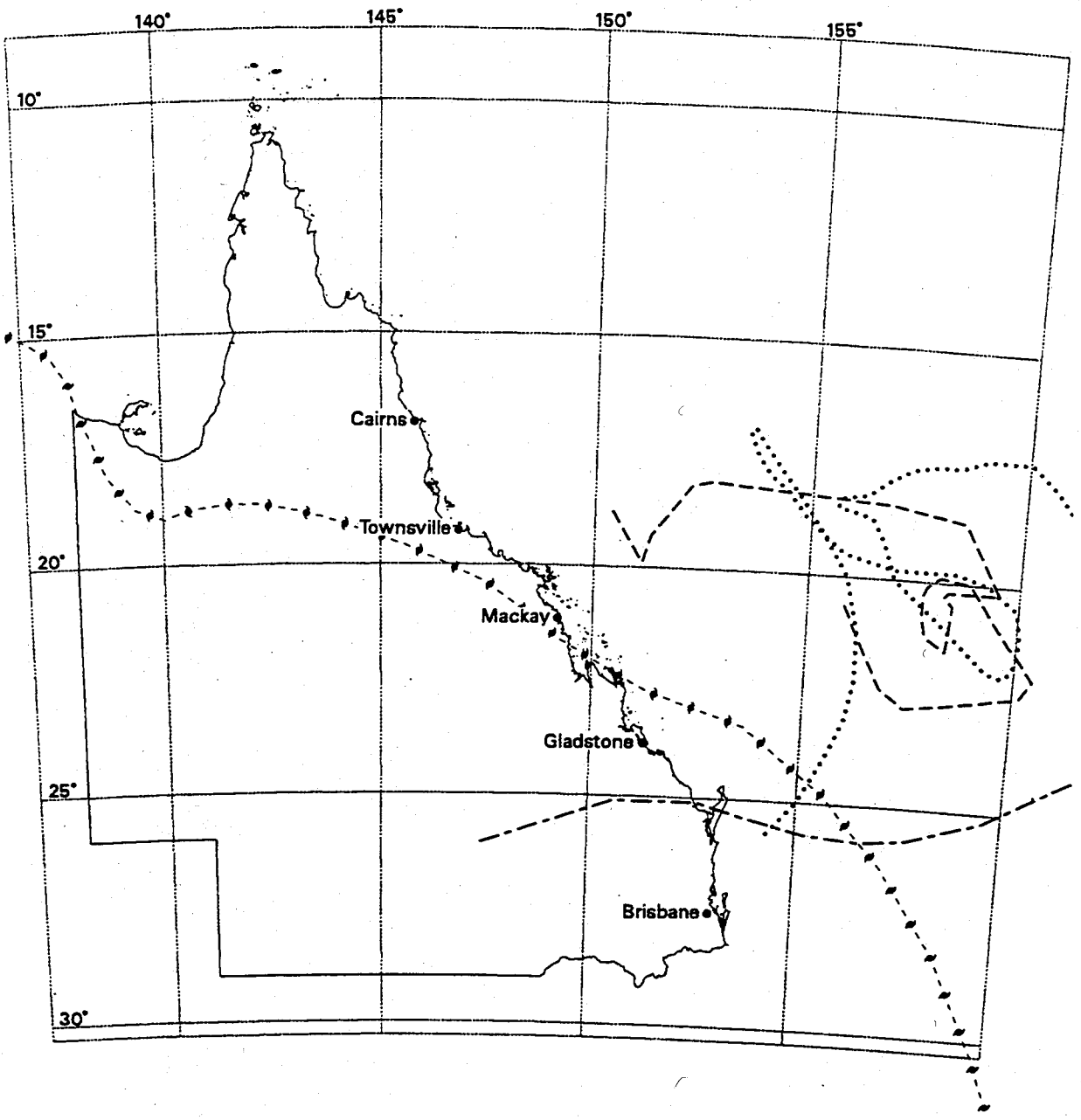



Key to cyclones

Paul — Ruth

Cliff — Abigail

1:16000000

0 160 320 480 640 800

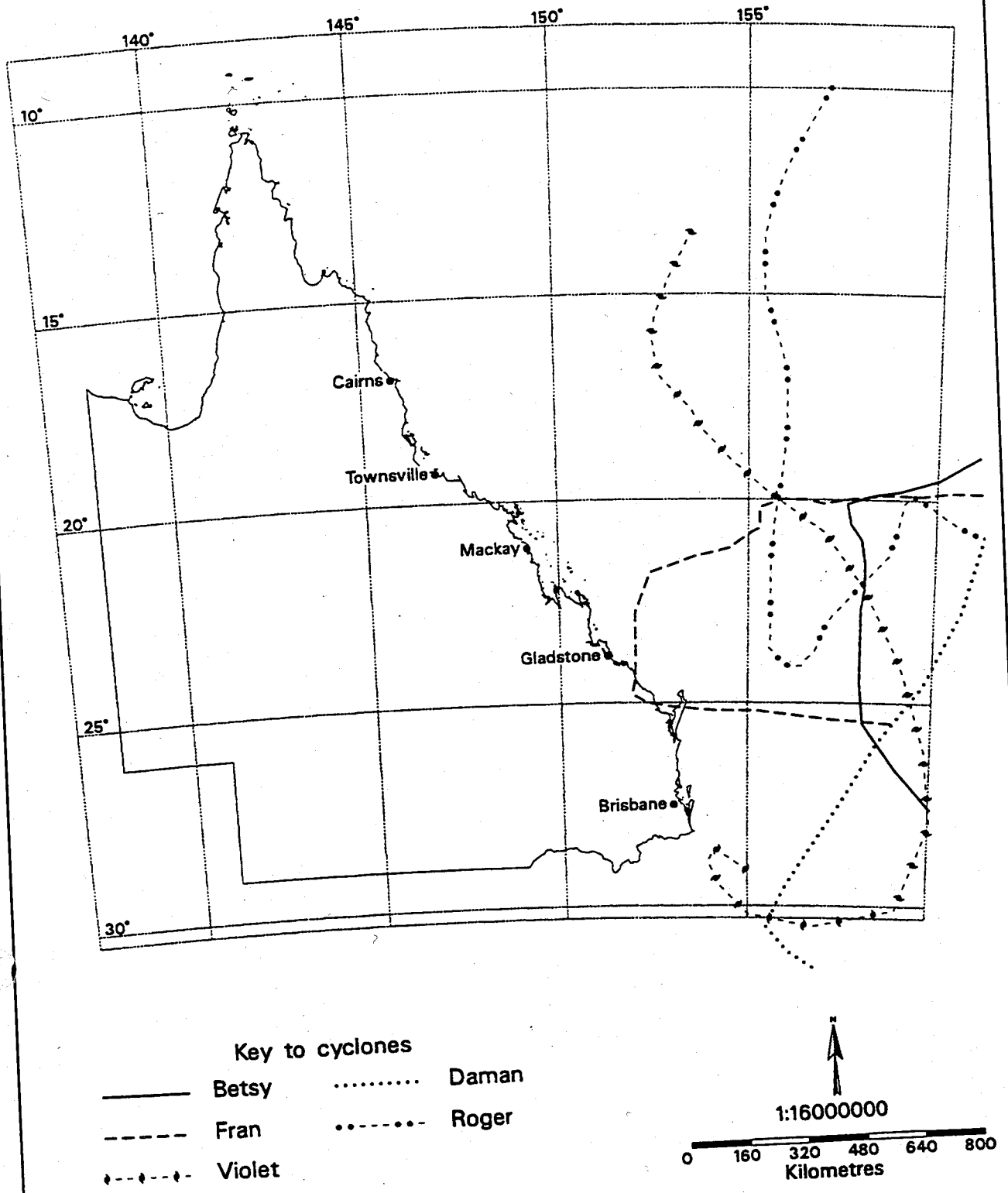
Kilometres

## Cyclone tracks
1980 to 1991

Beach Protection Authority Queensland
Department of Environment

Wave data recording program
Brisbane Region

**Figure 8.1**




## Cyclone tracks
1992 to 1997

**Beach Protection Authority Queensland**
Department of Environment

Wave data recording program
Brisbane Region

**Figure 8.2**

*Wave data recording program, Brisbane region — 1987-1997 • October 1997 • ISSN 0158-7757*