

COASTAL OBSERVATION PROGRAMME - ENGINEERING (COPE)

SHELLY BEACH - LANDSBOROUGH SHIRE

For the Years 1975 to 1978

Beach Protection Authority

March 1984

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SHELLY BEACH, LANDSBOROUGH SHIRE

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ABSTRACT:

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Shelly Beach near Caloundra in the Landsborough Shire in southern Queensland. The data were recorded by volunteer observers Mr. and Mrs. A. Donaldson, assisted by Mr. and Mrs. F. Schulte during the period March 1975 to the end of December 1978. The recordings were made daily during the four year period and the information published is considered representative and reliable.

OTHERS AVAILABLE IN THIS SERIES:

Coastal Observation Program - Engineering (COPE), Machans Beach - Mulgrave Shire, August 1979 (Report C 01.1).

Coastal Observation Program - Engineering (COPE), Baffle Creek - Miriam Vale Shire, October 1980 (Report C 02.1).

Coastal Observation Program - Engineering (COPE), Flying Fish Point - Johnstone Shire, November 1980 (Report C 03.1).

Coastal Observation Program - Engineering (COPE), Woodgate - Isis Shire, November 1980 (Report C04.1).

REFERENCES:

1. ROBINSON D.A. and JONES C.M.

Queensland Volunteer Coastal Observation Program - Engineering (COPE). 3rd Australian Conference on Coastal and Ocean Engineering, Melbourne, April 1979.

CONTENTS	PAGE
1.0 INTRODUCTION	
1.1 The Programme	1
1.2 Site Selection	1
1.3 Instrumentation	1
1.4 Observers	1
1.5 Accuracy	1
1.6 Presentation of Data	2
2.0 STATION PARTICULARS	
2.1 Location	2
2.2 Observers	2
2.3 Observed Parameters	3
2.4 Tidal Information	3
2.5 Description of Beach	3
2.6 Supervision of Station	4
3.0 DATA	
3.1 General	4
3.2 Wind	4
3.3 Waves	4
3.4 Longshore Current	5
3.5 Beach Profile Parameters	5
4.0 ATTACHMENTS	
Tables (see over for List of Tables)	
Figures (see over for List of Figures)	

LIST OF TABLES

Table No.	Title	
1	Monthly and Annual Wave Parameters Summary	1975
2	Monthly and Annual Wave Parameters Summary	1976
3	Monthly and Annual Wave Parameters Summary	1977
4	Monthly and Annual Wave Parameters Summary	1978

LIST OF FIGURES

Figure No.	Title	
1	Locality Plan	
2	Wind Data	
3	Wave Height % Exceedance	
4	Wave Height and Period % Occurrence	
5	Wave Direction Analysis	
6	Surf Zone Width – Morning	1975
7	Surf Zone Width – Afternoon	1975
8	Surf Zone Width – Afternoon	1976
9	Surf Zone Width – Afternoon	1977
10	Surf Zone Width – Morning	1978
11	Surf Zone Width – Afternoon	1978
12	Littoral Currents – Morning	1975
13	Littoral Currents – Afternoon	1975
14	Littoral Currents – Afternoon	1976
15	Littoral Currents – Afternoon	1977
16	Littoral Currents – Morning	1978
17	Littoral Currents – Afternoon	1978
18	Berm Crest Elevation	1975
19	Berm Crest Elevation	1976
20	Berm Crest Elevation	1977
21	Berm Crest Elevation	1978
22	Beach Profile Parameters	1975
23	Beach Profile Parameters	1976
24	Beach Profile Parameters	1977
25	Beach Profile Parameters	1978

1.0 INTRODUCTION

1.1 The Programme

The Beach Protection Authority requires basic data on the behaviour of Queensland's beaches in order to provide well founded advice on coastal management to local Authorities. The COPE project aims to collect information on wind, waves and beach behaviour in areas where extensive investigations are not practical and where otherwise little or no data exist.

The project is based on the recruitment of volunteer observers who are prepared to record a series of basic parameters once or twice daily for at least a three year period.

1.2 Site Selection

In selecting a site for a COPE station, consideration is given to:-

- (a) the general shoreline configuration and the possibility of extrapolation of data to other adjacent beaches;
- (b) the distribution of stations along Queensland's coastline;
- (c) the need to correlate the COPE data with planned or existing data collection programmes.

1.3 Instrumentation

Each COPE observer is supplied with a basic kit of recording instruments including:-

- 30 metre Tape
- Wind Meter
- Abney Level
- 1.5 metre Sighting Support
- Recording Forms
- Fluorescent Dye.

A graduated reference pole is installed on the beach to serve as the base point for all plan measurements and the control for vertical levelling.

1.4. Observers

The majority of COPE observers are volunteers who may be local business people, local residents or school children. Some stations are manned by Government employees who carry out the observations as part of their official duties.

1.5 Accuracy

Individual observers differ in their subjective assessment of the various parameters recorded as part of the COPE programme. Wave parameters such as type, height, and angle of approach together with surf zone width and the location of the vegetation line all require visual assessment, the accuracy of which will vary from observer to observer and from recording to recording.

Although the Authority is confident that all observers make their observations to the best of their ability and accepts these observations without adjustment, the existence of random and non - random errors in the recorded data is to be expected.

Problems associated with the use of data containing these errors are minimised in two ways. Firstly, regular visits are made to the COPE stations by the Authority's COPE Field Officer to provide a check on any bias introduced into the recordings by incorrect observation procedures. Secondly, it has been found that, with a large number of observations taken on a regular basis, a reasonable assessment can be made of the average climatologies of the observed parameters provided the observation errors are random. A minimum recording period of three years has been adopted for the analysis and publication of the data. Five day moving averages are applied to observations of the various beach width and foreshore slope parameters to smooth out random errors.

For these reasons, the Authority is of the opinion that published COPE data can be used with confidence provided the above inherent limitations are recognised.

1.6 Presentation of Data

The purpose of this report is to present COPE data for the four year period 1975 to 1978 in a useful statistical form. No attempt has been made to interpret the observed data.

If this four year period is representative of the long term average meteorological conditions, the wind, wave and beach movement climatologies presented can be regarded as typical. However, this recording period is too short to be representative in terms of the average occurrence of extreme events such as cyclones and floods, and this should be taken into account when consideration is being given to the influence of such events on trends of long term beach behaviour.

2.0 STATION PARTICULARS

2.1 Location

Shelly Beach is located at Caloundra within the Landsborough Shire in southern Queensland. It is the eastern beach at Caloundra, extending 1.5 kilometres between Moffat Head and Caloundra Head and lies about 2 kilometres north of the mouth of Pumicestone Passage. The location of the Shelly Beach COPE station is shown in Figure 1.

2.2 Observers

This station has been manned by Mr. and Mrs. A. Donaldson, who were assisted by Mr. and Mrs. E. Schulte during the period March 1975 to December 1978. The Donaldson and Schulte families are local residents of Caloundra, who live near the COPE station.

2.3 Observed Parameters

The observer at this station usually recorded at 3.00 p.m. daily during the four year period 1975 to 1978.

This station has recorded:

- Wave Period
- Wave Height
- Wave Angle
- Wave Type
- Surf Zone Width
- Presence of Offshore Bar
- Wind Speed
- Wind Direction
- State of Tide
- Distance to Berm
- Berm Elevation
- Distance to Vegetation
- Foreshore Slope
- Longshore Current Speed
- Longshore Current Direction

In addition, a sand sample was collected at the station each month and a profile of the beach recorded monthly also.

2.4 Tidal Information

Tidal information for this station as presented below is taken as essentially the same as that for Caloundra Head. Datum is Low Water Datum.

M.H.W.S.	:	1.6 metres
M.H.W.N.	:	1.3 metres
M.S.L.	:	0.89 metres
M.L.W.S.	:	0.2 metres
M.L.W.N.	:	0.5 metres.

2.5 Description of the Beach

The beach of the Shelly Beach station is a clean sandy beach with a well formed dune system which has been developed on the hind dune area for residential purposes. It exhibits the following characteristics:-

- Beach slope : typical foreshore slope 1 in 10.
- Beach width: typically 15 metres from dune.
- D50 sand size: 0.49 mm averaged over several years.
- Dunal system: main dune 5 to 6 metres above mean sea level, typically with a steep front face as evidence of recurrent erosion. The hind dune area is relatively flat at about 4 metres above mean sea level, with some residential development present.
- Vegetation: well established Spinifex grass with Casuarina trees and other foredune vegetation.

2.6 Supervision of Station

The observer was instructed in the recording program by the COPE Field Officer and the initial instruction period was followed up with visits to the station during the period of recordings presented in this report.

Installation and maintenance of the reference pole for this station has been carried out by the Landsborough Shire Council and the Authority wishes to thank the Council for its assistance in all matters associated with the COPE Project.

3.0 DATA

3.1 General

COPE data for this station for the four year period March 1975 to December 1978 are presented on the attached figures. The data have been analysed statistically and/or smoothed to reveal long term averages or trends. A brief description of each of the observed parameters is given below with the relevant figure references.

3.2 Wind

The observer recorded the wind speed at the beach using a hand held wind meter at 1.5 metres above beach level. Wind direction is estimated to the nearest compass sector.

A summary of annual wind speed and direction percentage occurrences are shown as a wind rose in Figure 2. Where applicable, morning and afternoon readings as well as the overall average are shown.

3.3 Waves

The average breaker height (trough to crest) is usually estimated to the nearest 0.1 metre. From experience this estimate has been found to be comparable with the equivalent deep water significant wave height.

The observer estimates the wave period by recording the time taken for eleven wave crests (the duration of 10 waves) to pass a point.

The wave direction is estimated as one of five direction sectors indicating the angle to the shoreline alignment from which the waves are approaching the beach. These sectors have been selected as:-

Sector 1 - 0° to 60°
 Sector 2 - 60° to 85°
 Sector 3 - 85° to 95°
 Sector 4 - 95° to 120°
 Sector 5 - 120° to 180°

Note: 0° is the beach alignment to the left of the observer when facing seaward.

Statistical representations of the observed wave data include:-

- (a) the percentage of wave height recordings which exceed any given wave height for all directions combined (Figure 3).

- (b) the percentage occurrence of various combinations of wave heights and periods and directions (Figure 4 and Figure 5).
- (c) surf zone width with an indication of the existence or otherwise of an offshore bar in Figures 6 to 11.
- (d) tabulation of the occurrence of various wave heights, periods, types and directions (Tables 1 to 4).

3.4 Longshore Currents

The observer measured the distance parallel to the shoreline that a dye patch in the surf zone moved in one minute. Current direction is either upcoast or downcoast, upcoast being to the left when facing the sea from the beach.

The readings are converted to a velocity which is plotted on a daily basis (Figure 12 to Figure 17). Mean upcoast and downcoast components and the overall annual means are also presented.

3.5 Beach Profile Parameters

Beach profile parameters were measured using an Abney level, tape measure and reference pole. These include:-

- distance from reference pole to the crest of the most seaward berm at the station.
- elevation of berm crest relative to A.H.D.
- distance from reference pole to the vegetation line (usually front face of fore-dune).
- foreshore slope.

Changes in these parameters with time indicate how the beach moves in response to wave attack. Plots of these parameters are shown in Figures 18 to 25 which provide a visual representation of the data.

TABLE 1.

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT / MEAN WAVE PERIOD AND WAVE TYPE / WAVE DIRECTION OCCURRENCES

YEAR 1975.

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type / Wave Direction											
			Wave Type					Wave Direction						
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm	
JANUARY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEBRUARY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MARCH	7.0	1.31	-	57.1	14.3	28.6	-	-	-	100.0	-	-	-	-
APRIL	7.8	1.16	3.6	35.7	3.6	57.1	-	-	14.3	85.7	-	-	-	-
MAY	8.4	1.03	7.1	28.6	10.7	53.6	-	-	21.4	75.0	3.6	-	-	-
JUNE	8.4	1.02	10.3	51.7	3.4	34.5	-	-	3.4	96.6	-	-	-	-
JULY	9.4	0.77	8.3	33.3	-	58.3	-	-	-	95.8	4.2	-	-	-
AUGUST	9.3	0.81	7.7	50.0	-	38.5	3.8	-	11.5	84.7	-	-	-	3.8
SEPTEMBER	8.7	1.19	-	73.3	-	26.7	-	-	13.3	86.7	-	-	-	-
OCTOBER	8.7	0.76	4.8	42.9	-	52.4	-	-	9.5	90.5	-	-	-	-
NOVEMBER	8.6	0.80	4.0	24.0	4.0	68.0	-	-	20.0	80.0	-	-	-	-
DECEMBER	8.4	0.93	-	26.9	-	73.1	-	-	8.0	92.0	-	-	-	-
WHOLE YEAR	8.6	0.95	5.2	39.7	3.1	51.5	0.4	-	10.1	88.7	0.8	-	-	0.4

SP - Spilling

PL - Plunging

SP/PL - Combined Spilling and Plunging

TABLE 2.

MONTHLY AND ANNUAL
MEAN WAVE HEIGHT /MEAN WAVE PERIOD AND WAVE TYPE / WAVE DIRECTION
OCCURRENCES

YEAR 1976.

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type /Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SF/PL	Calm	1	2	3	4	5	Calm
JANUARY	8.0	0.98	8.3	33.3	-	58.3	-	-	8.3	91.7	-	-	-
FEBRUARY	8.5	0.89	27.8	22.2	-	50.0	-	-	5.6	94.4	-	-	-
MARCH	10.0	1.02	3.7	40.7	-	55.6	-	-	-	100.0	-	-	-
APRIL	9.2	0.97	14.8	33.3	-	51.9	-	-	-	96.3	3.7	-	-
MAY	8.4	1.06	16.0	44.0	-	40.0	-	-	-	100.0	-	-	-
JUNE	8.8	0.86	-	25.0	-	75.0	-	-	-	100.0	-	-	-
JULY	9.3	0.60	15.4	11.5	34.6	38.5	-	-	7.7	69.2	23.1	-	-
AUGUST	8.8	0.75	7.1	-	7.1	57.1	28.6	-	14.2	28.6	28.6	-	28.6
SEPTEMBER	8.1	0.99	12.5	12.5	6.3	68.8	-	-	29.4	64.7	5.9	-	-
OCTOBER	8.7	0.89	23.5	5.9	17.6	47.1	5.9	-	29.4	58.8	5.9	-	5.9
NOVEMBER	9.4	0.74	43.3	30.0	-	26.7	-	-	27.6	72.4	-	-	-
DECEMBER	8.4	0.79	19.4	22.6	-	58.1	-	-	19.4	67.7	9.7	3.2	-
WHOLE YEAR	8.8	0.87	16.5	24.4	5.0	51.3	2.8	-	11.8	78.7	6.4	0.3	2.8

SP - Spilling

PL - Plunging

SP/PL - Combined Spilling and Plunging

TABLE 3.

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT /MEAN WAVE PERIOD AND WAVE TYPE / WAVE DIRECTION
OCCURRENCES

YEAR 1977.

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type /Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	9.0	1.04	20.0	10.0	-	70.0	-	3.3	23.3	63.3	10.0	-	-
FEBRUARY	9.2	1.06	3.7	18.5	-	77.8	-	-	3.7	92.6	3.7	-	-
MARCH	9.1	1.07	3.2	9.7	-	87.1	-	-	9.7	90.3	-	-	-
APRIL	8.8	0.83	-	13.3	-	86.7	-	-	-	93.3	6.7	-	-
MAY	9.1	0.87	3.3	33.3	-	63.3	-	-	23.3	76.7	-	-	-
JUNE	11.8	0.54	25.0	-	-	66.7	8.3	-	8.3	79.2	4.2	-	8.3
JULY	10.2	0.88	6.7	6.7	-	86.7	-	-	-	100.0	-	-	-
AUGUST	9.5	0.93	6.5	12.9	-	80.6	-	-	16.1	83.9	-	-	-
SEPTEMBER	9.7	0.69	3.4	10.3	-	86.2	-	-	27.6	69.0	3.4	-	-
OCTOBER	8.0	0.69	3.3	10.0	-	86.7	-	-	33.3	56.7	10.0	-	-
NOVEMBER	7.4	0.98	3.3	20.0	-	76.7	-	-	20.0	73.3	6.7	-	-
DECEMBER	7.3	0.74	10.7	-	-	89.3	-	3.6	10.7	82.1	3.6	-	-
WHOLE YEAR	9.0	0.87	7.1	12.3	-	80.0	0.6	0.6	14.9	79.9	4.0	-	0.6

SP - Spilling

PL - Plunging

SP/PL - Combined Spilling and Plunging

TABLE 4.

MONTHLY AND ANNUAL

MEAN WAVE HEIGHT /MEAN WAVE PERIOD AND WAVE TYPE / WAVE DIRECTION
OCCURRENCES

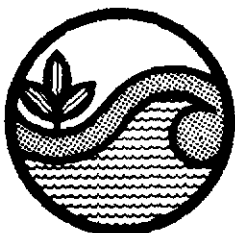
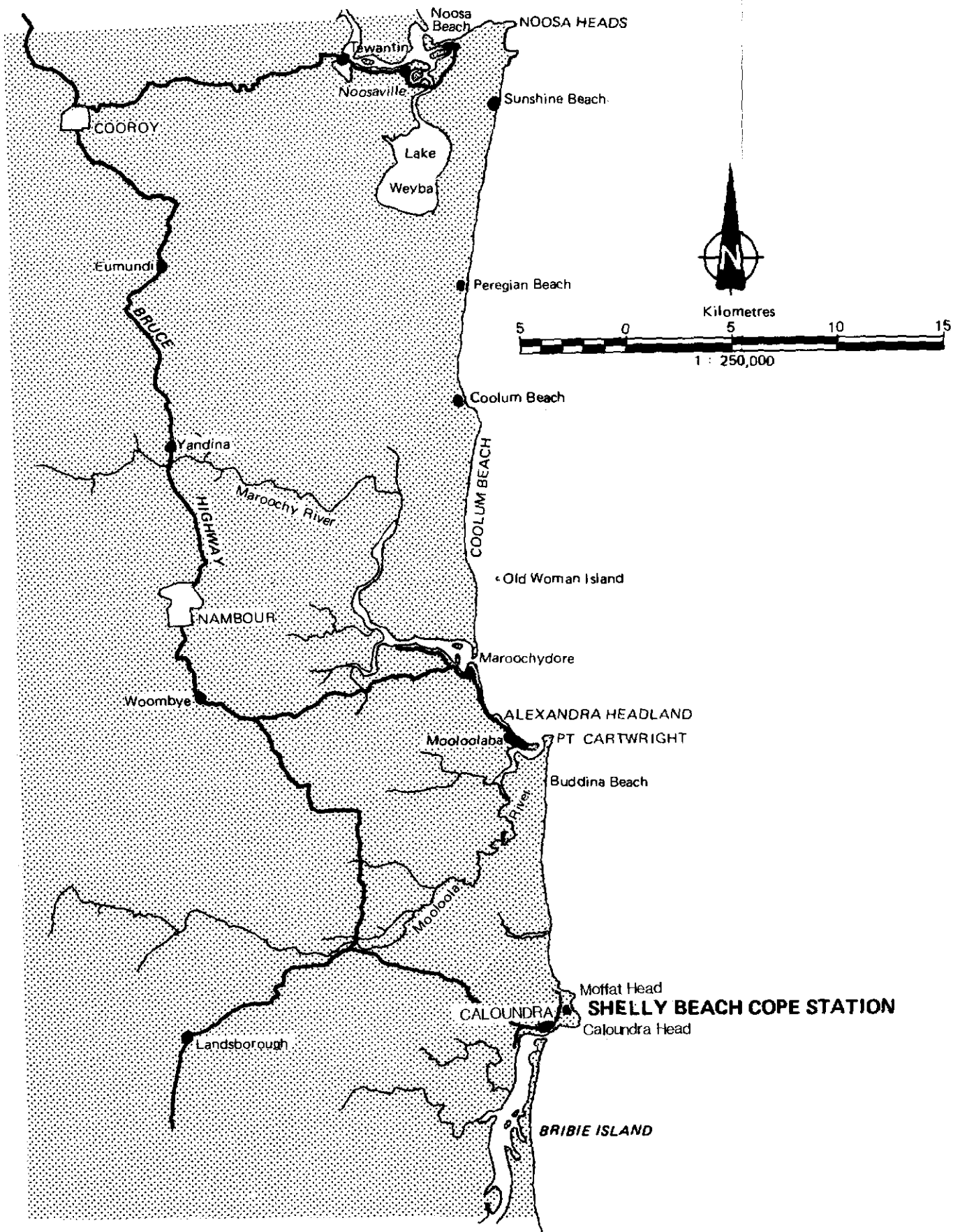
YEAR 1978.

MONTH	MEAN WAVE PERIOD (Secs)	MEAN WAVE HEIGHT (Metres)	Percentage Occurrences - Wave Type /Wave Direction										
			Wave Type					Wave Direction					
			SP	PL	Surge	SP/PL	Calm	1	2	3	4	5	Calm
JANUARY	8.7	0.83	9.7	6.5	-	83.9	-	-	3.2	96.8	-	-	-
FEBRUARY	8.6	0.79	7.4	-	-	92.6	-	-	-	88.9	11.1	-	-
MARCH	8.7	0.94	3.6	-	-	96.4	-	-	-	100.0	-	-	-
APRIL	9.2	0.84	8.0	-	-	92.0	-	-	8.0	92.0	-	-	-
MAY	8.9	0.68	13.3	-	-	86.7	-	-	-	100.0	-	-	-
JUNE	10.5	0.77	10.0	3.3	3.3	83.3	-	-	-	100.0	-	-	-
JULY	9.6	0.77	30.0	3.3	-	66.7	-	-	10.0	90.0	-	-	-
AUGUST	10.6	0.96	32.1	-	-	67.9	-	-	-	100.0	-	-	-
SEPTEMBER	9.3	0.85	3.6	-	-	96.4	-	-	14.3	85.7	-	-	-
OCTOBER	7.8	0.95	-	-	-	100.0	-	-	6.7	93.3	-	-	-
NOVEMBER	8.4	0.85	-	-	-	100.0	-	-	12.5	87.5	-	-	-
DECEMBER	8.1	0.87	-	-	-	100.0	-	-	7.4	92.6	-	-	-
WHOLE YEAR	9.0	0.84	10.1	1.2	0.3	88.4	-	-	5.0	94.1	0.9	-	-

SP — Spilling

PL — Plunging

SP/PL — Combined Spilling and Plunging



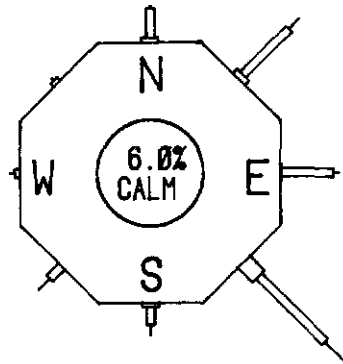
Beach Protection Authority

LOCALITY PLAN

COPE
Shelly Beach

Figure 1
C 05.1

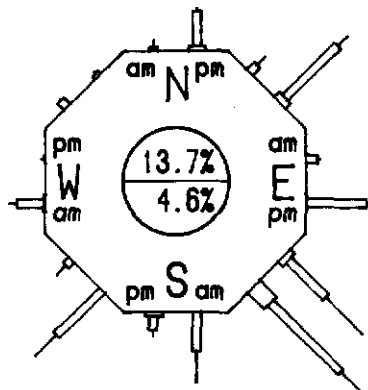
ALL OBSERVATIONS



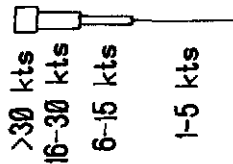
Total No. of Observations : 1195

MORNING - AFTERNOON OBSERVATIONS

NOTES :
 Figures in Central Circle
 Represent Percentage
 of CALM Observations.
 Upper Figure for AM
 Lower Figure for PM

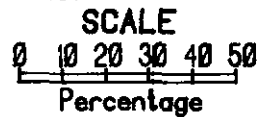


LEGEND

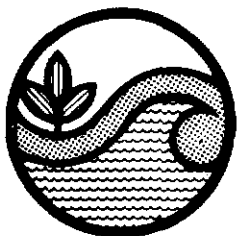


No. of Morning Observations : 190
 No. of Afternoon Observations : 1005

Mean Time :- Morning Obs : 0834 hrs
 Mean Time :- Afternoon Obs : 1633 hrs



WIND DATA - MAR 1975 to DEC 1978



Beach Protection Authority

WIND DATA

COPE
 Shelly Beach

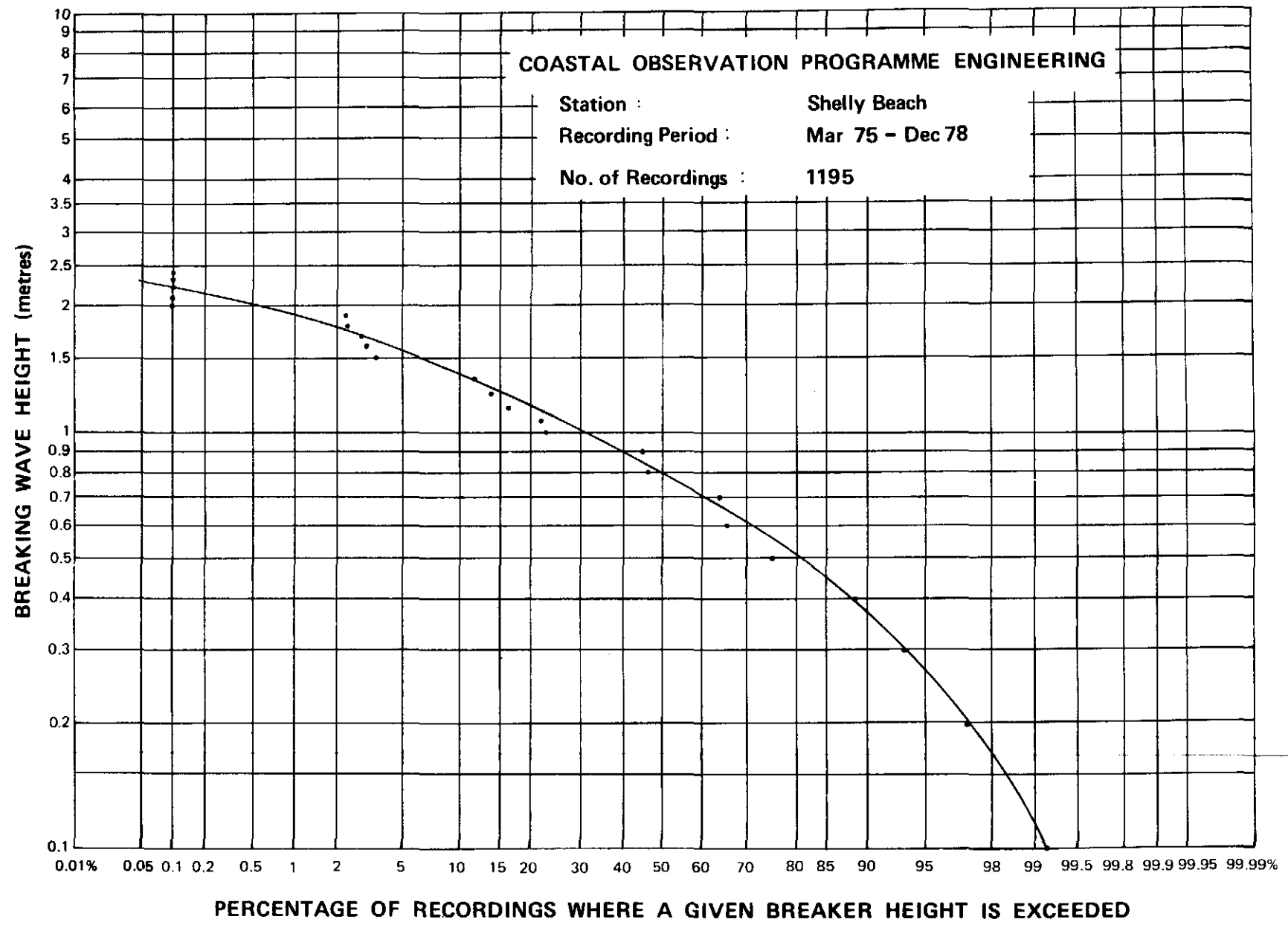
Figure 2
 C 05.1

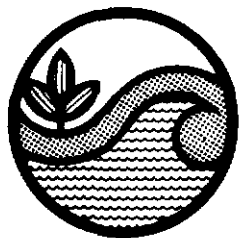
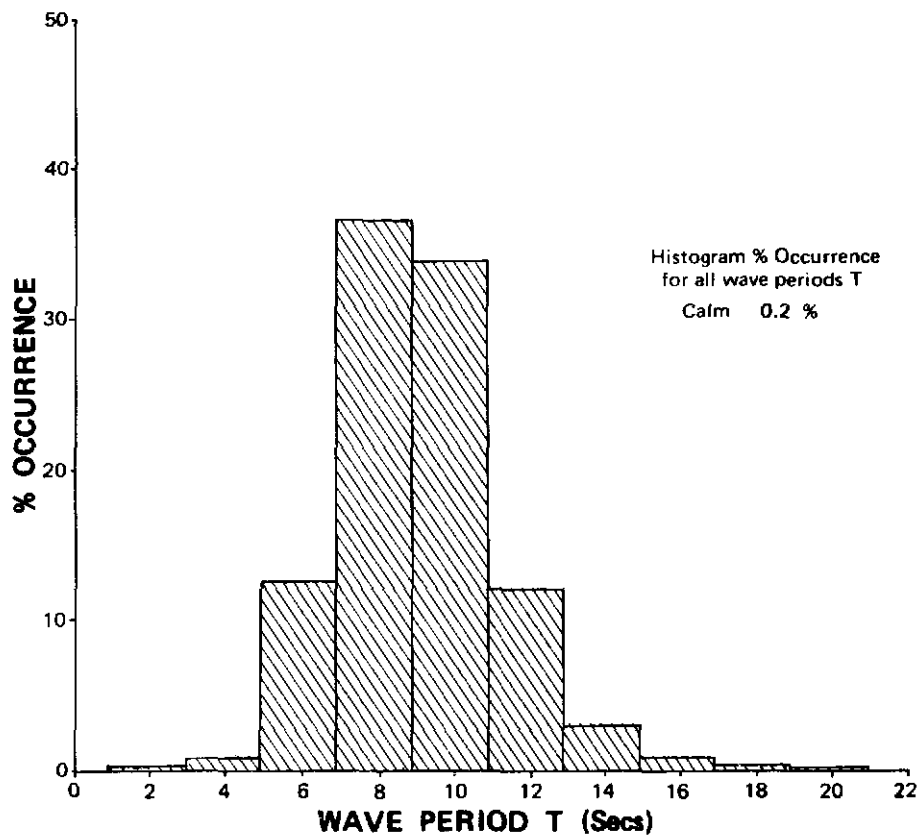
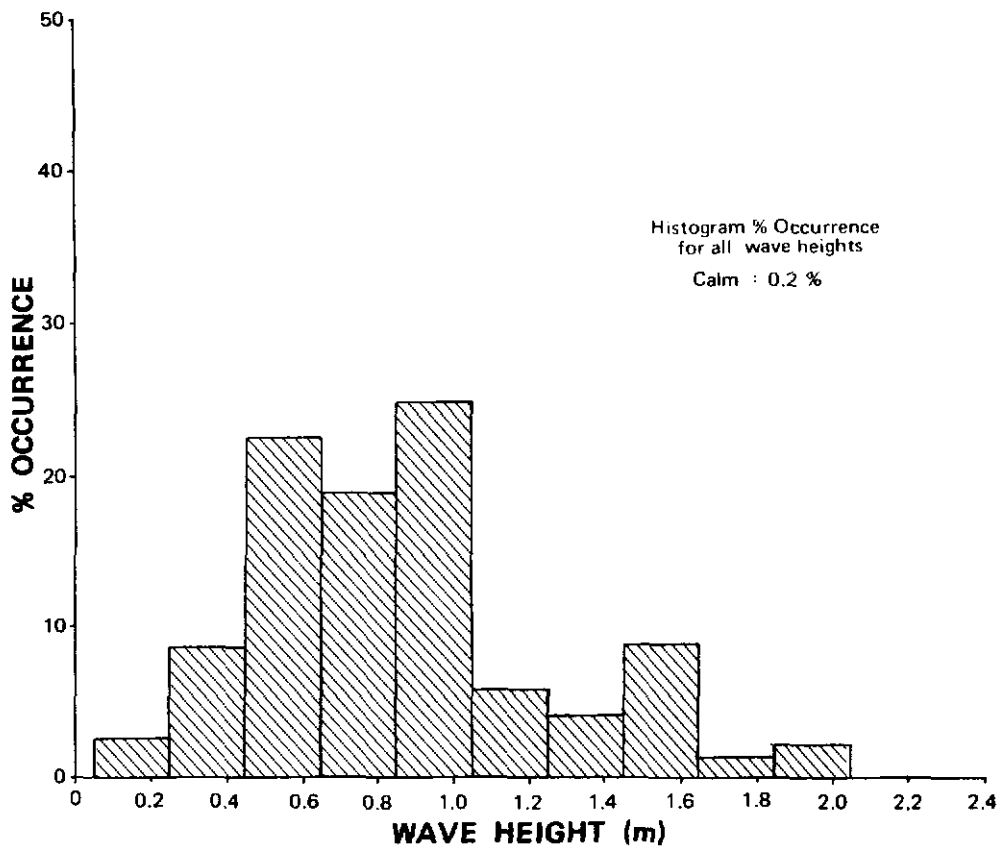


**WAVE HEIGHT % EXCEEDANCE
ALL DATA**

**Figure 3
C 05.1**

**COPE
Shelly Beach**



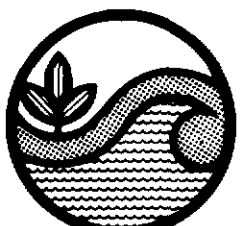
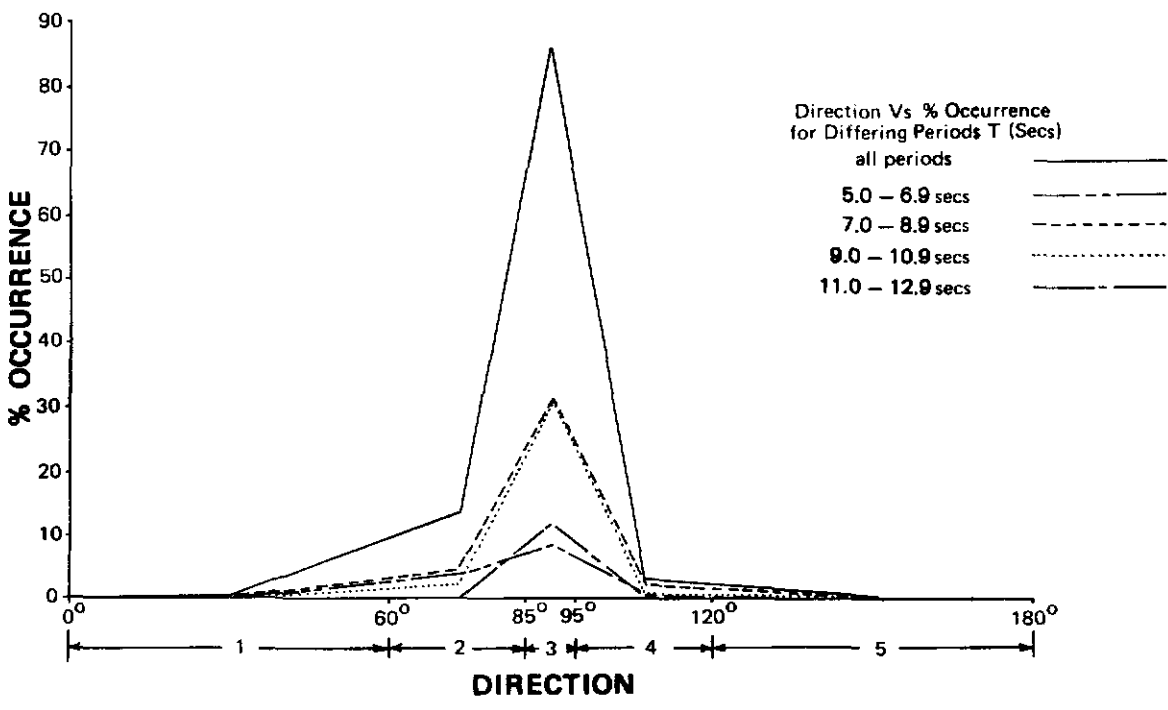
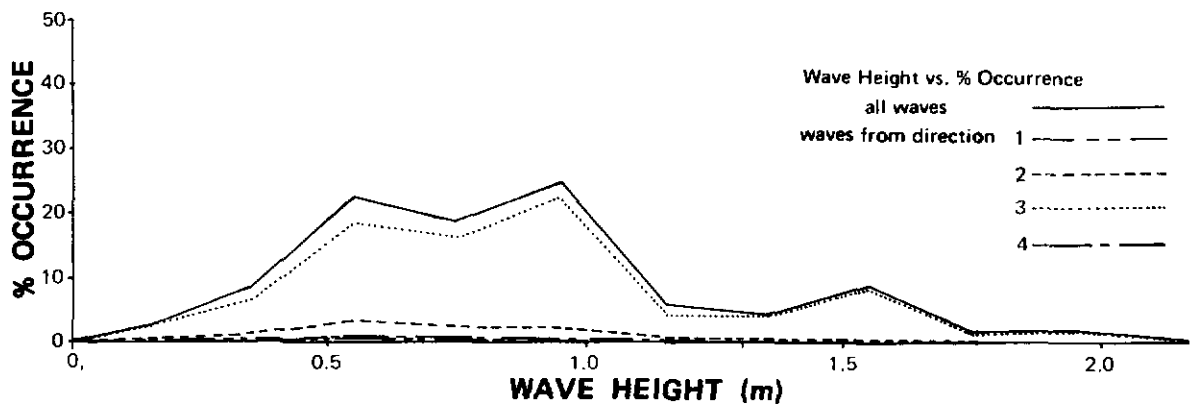
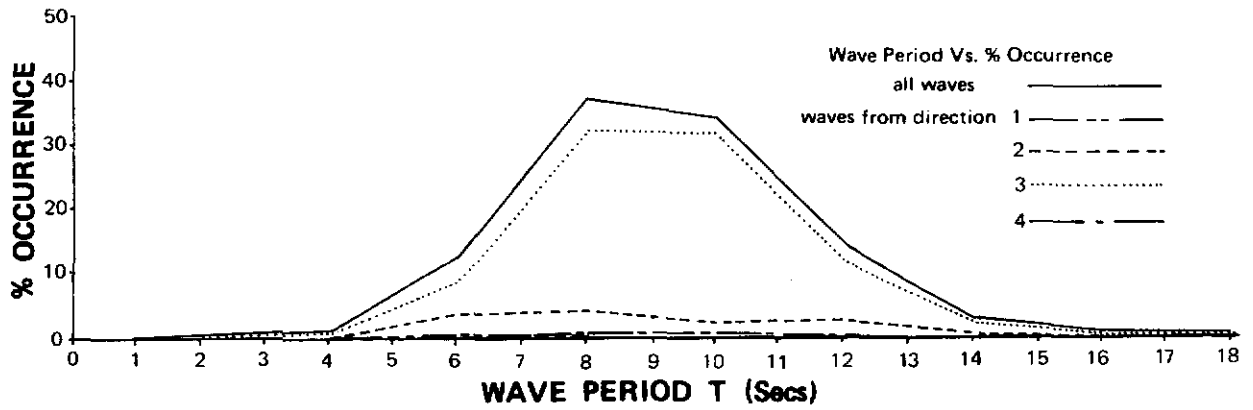


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**WAVE HEIGHT AND PERIOD % OCCURRENCE
ALL DATA**

COPE
Shelly Beach

Figure 4
C 05.1

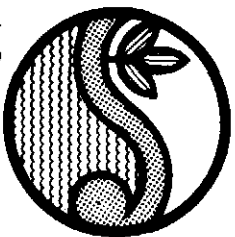


Beach Protection Authority

**WAVE DIRECTION ANALYSIS
ALL DATA**

COPE
Shelly Beach

Figure 5
C 05.1



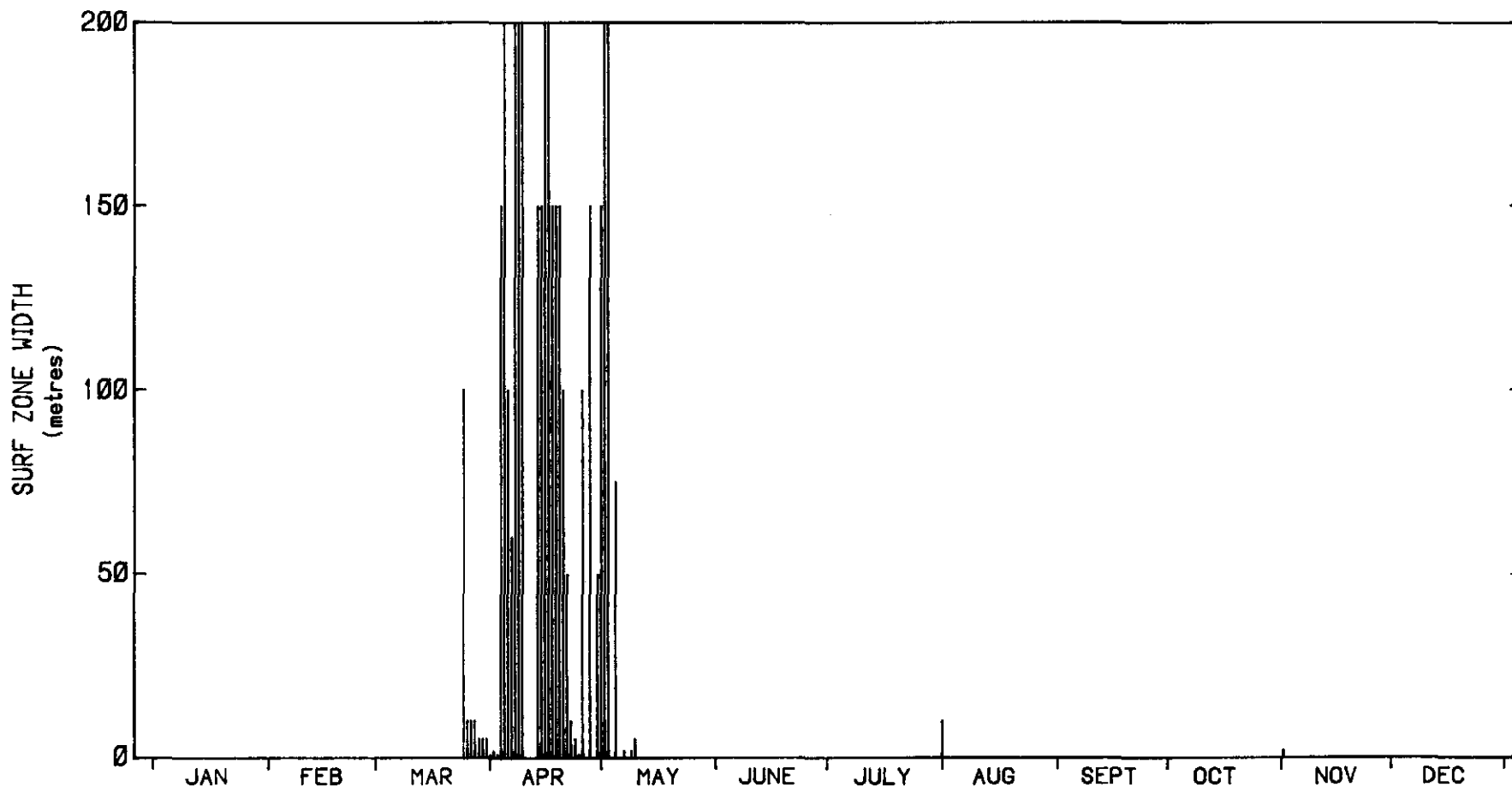
SURF ZONE WIDTH - MORNING 1975

COPE - Coastal Observation Programme Engineering

SHELLY BEACH

LANDSBOROUGH SHIRE

0602



SURF ZONE WIDTH SUMMARY - 1975

No. of Observations : 44

MORNING OBSERVATIONS

Mean Surf Zone Width = 80.0 m

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Figure 6

C 05.1



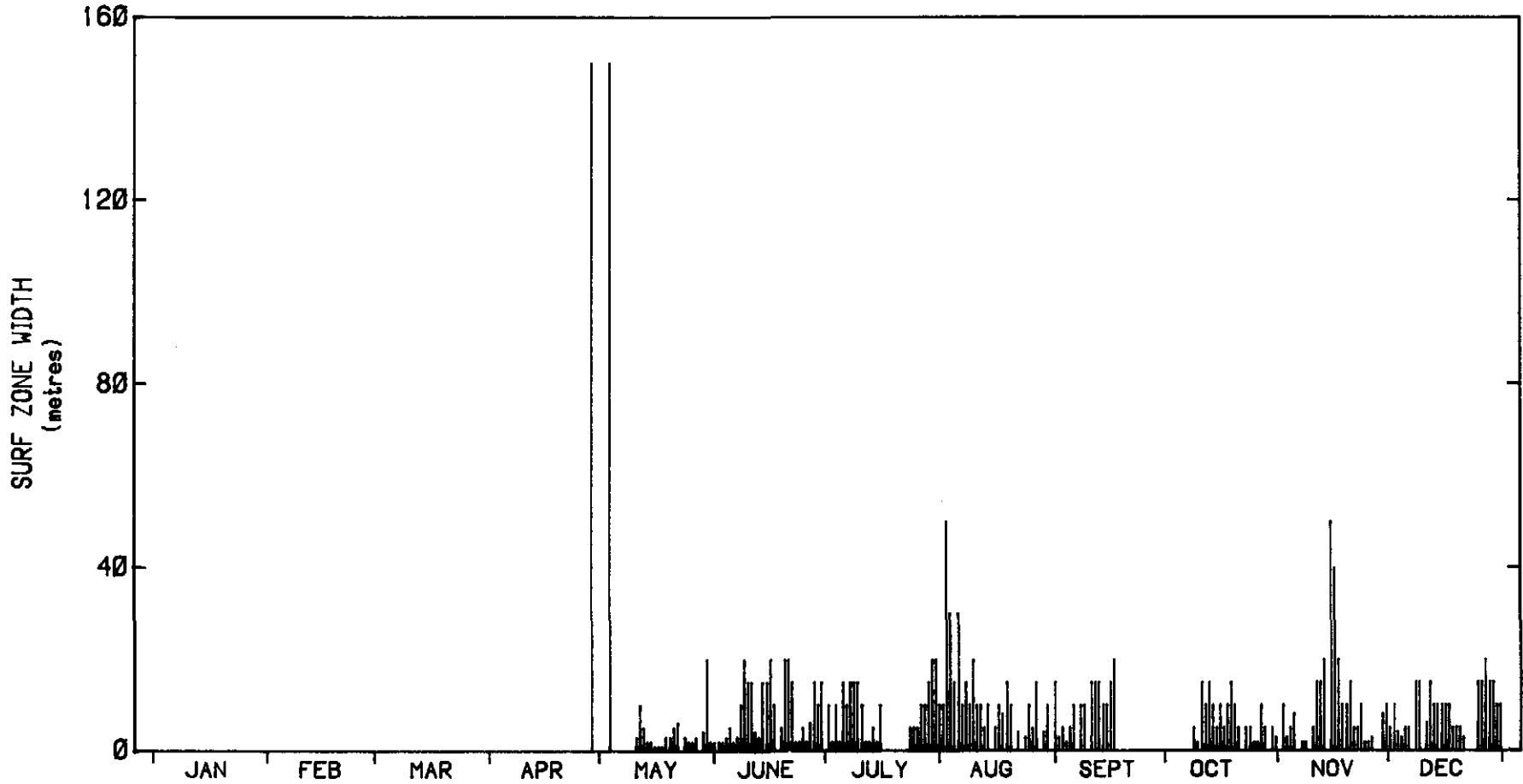
SURF ZONE WIDTH - AFTERNOON 1975

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SURF ZONE WIDTH SUMMARY - 1975

No. of Observations : 185

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 11.0 m

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Figure 7

C 05.1



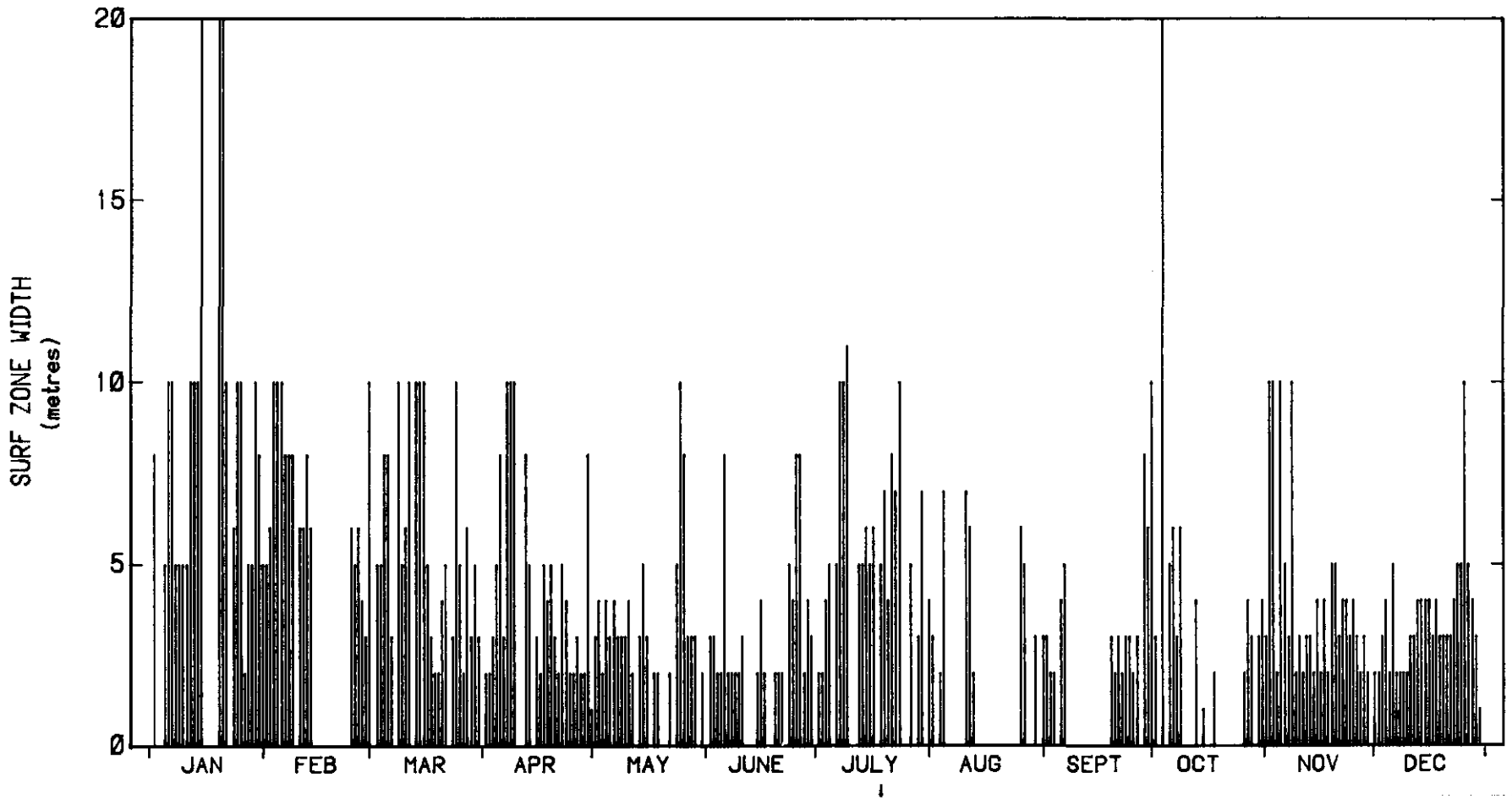
SURF ZONE WIDTH - AFTERNOON 1976

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SURF ZONE WIDTH SUMMARY - 1976

No. of Observations : 265

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 4.9 m

■ Indicates Offshore Bar Present

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Figure 8

C 05.1



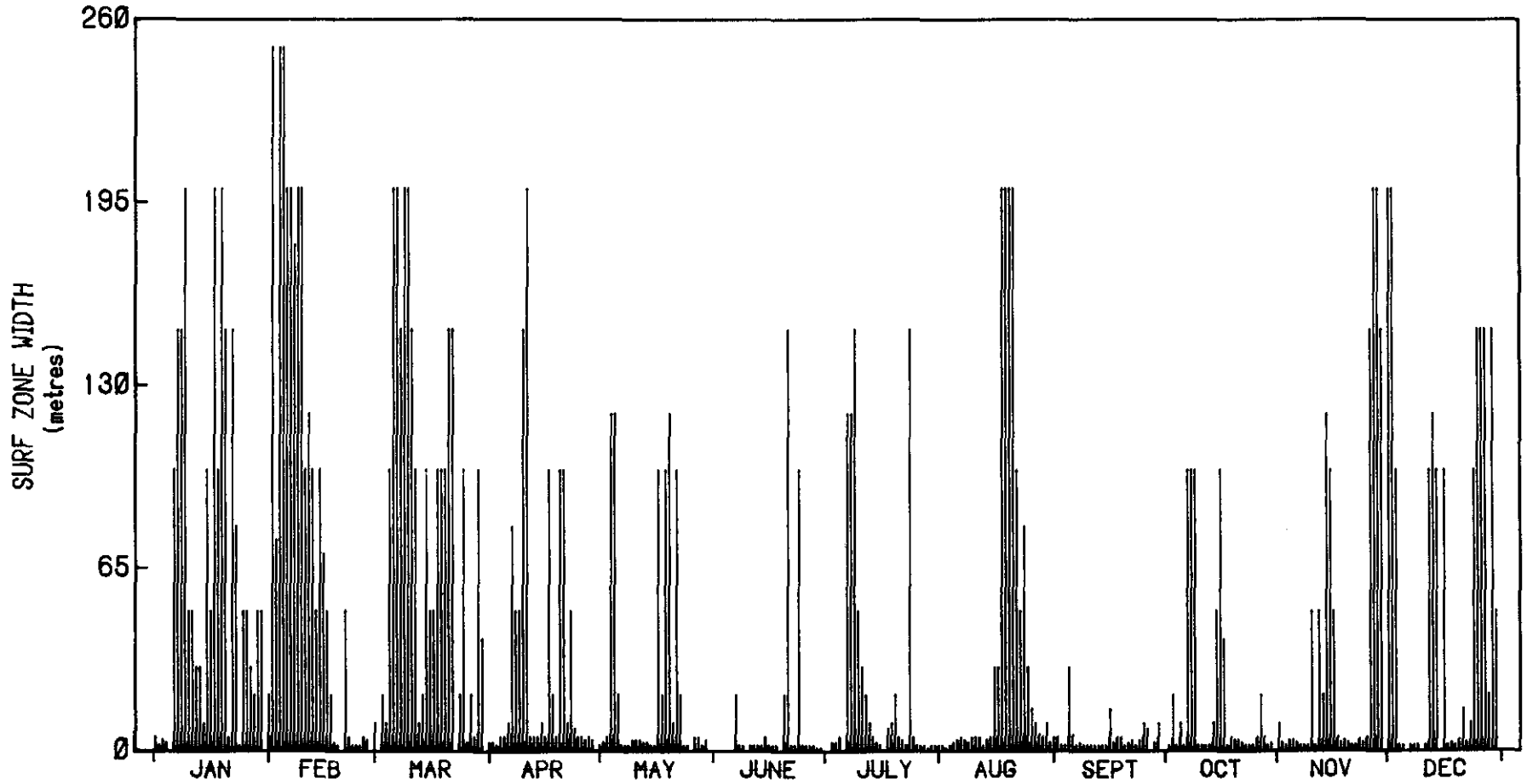
SURF ZONE WIDTH - AFTERNOON 1977

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SURF ZONE WIDTH SUMMARY - 1977

No. of Observations : 338

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 43.7 m

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Figure 9

C 05.1



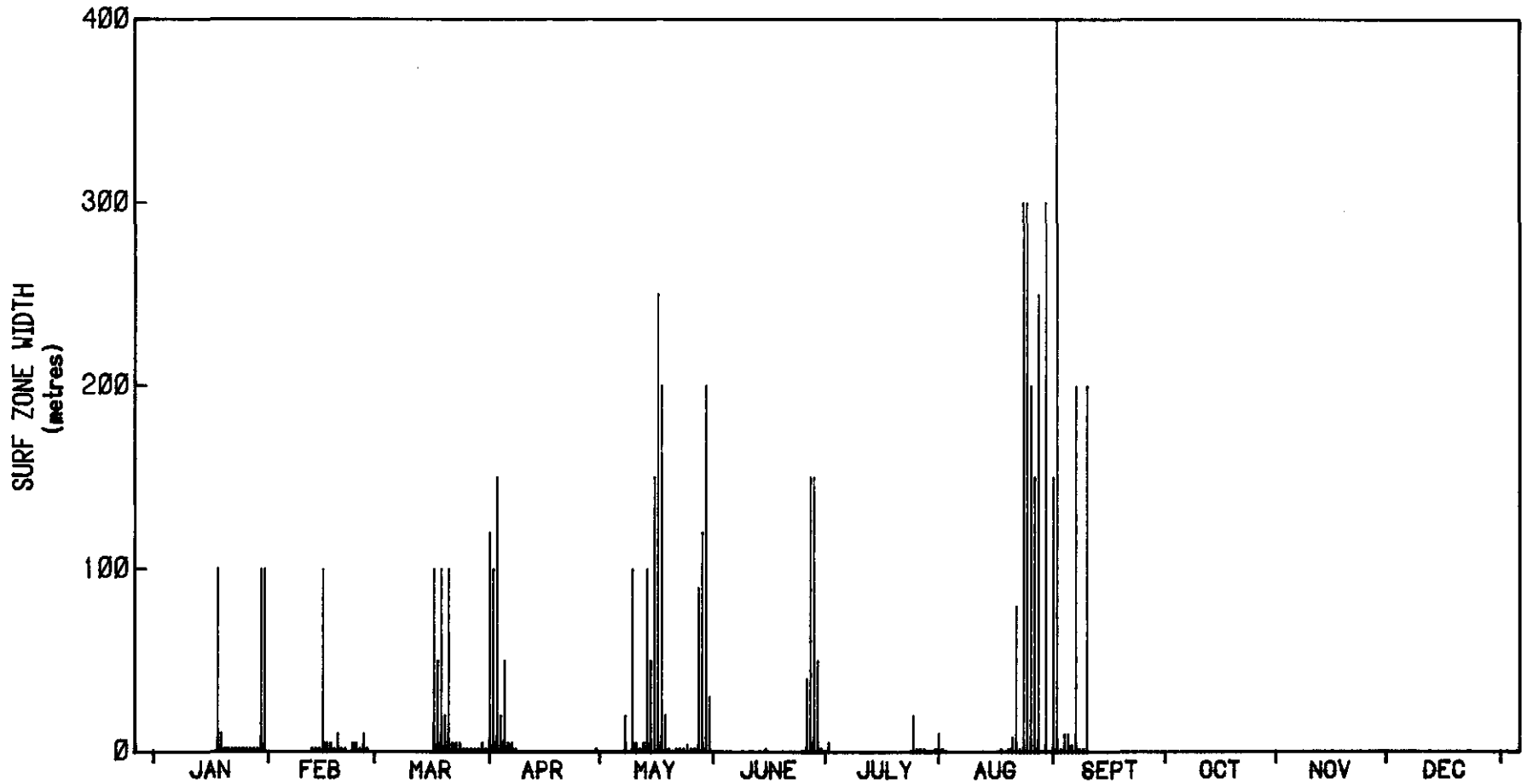
SURF ZONE WIDTH - MORNING 1978

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SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 116

MORNING OBSERVATIONS

Mean Surf Zone Width = 49.3 m

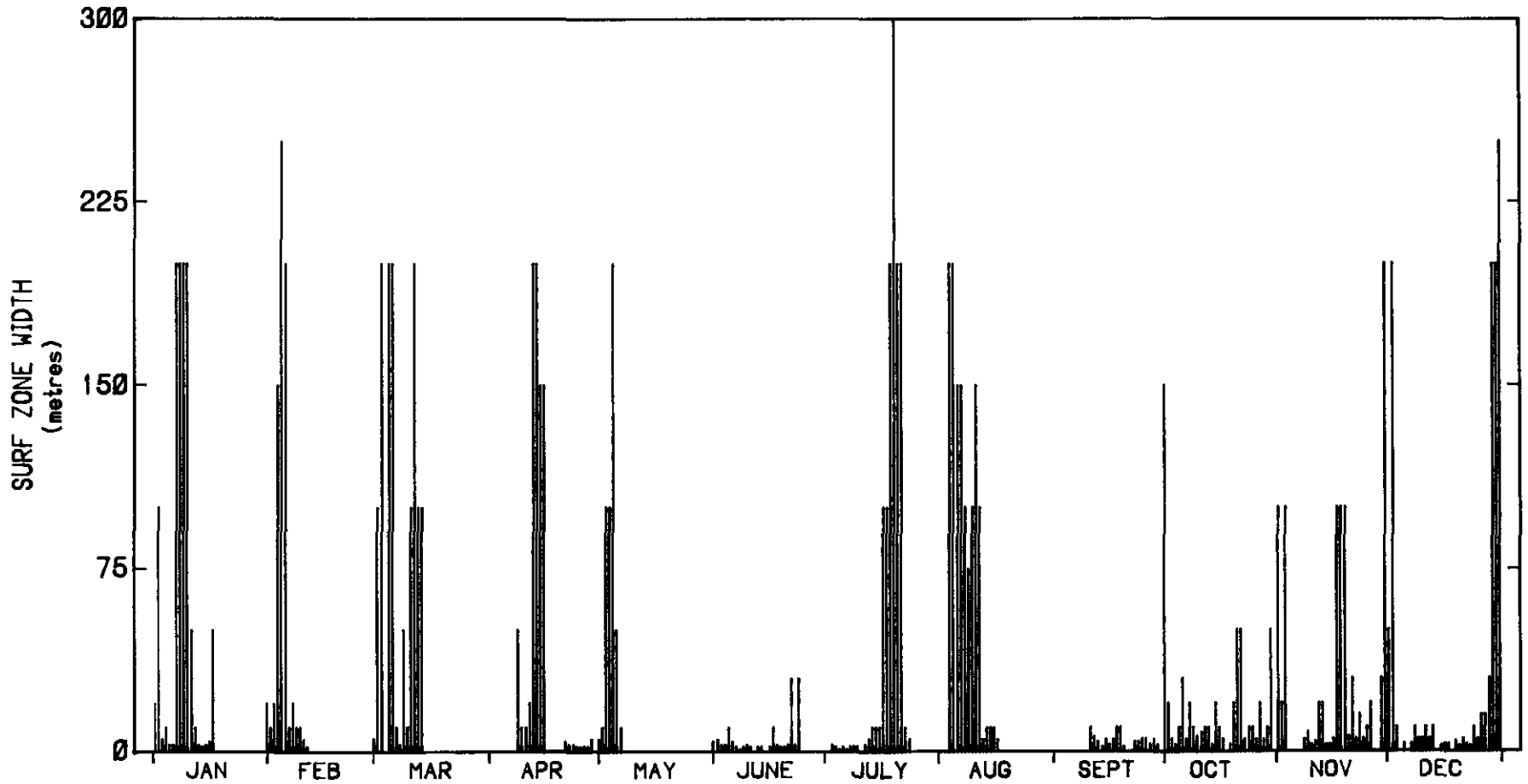
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Figure 10

C 05.1



SURF ZONE WIDTH - AFTERNOON 1978



SURF ZONE WIDTH SUMMARY - 1978

No. of Observations : 220

AFTERNOON OBSERVATIONS

Mean Surf Zone Width = 43.3 m

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Figure 11

C 05.1



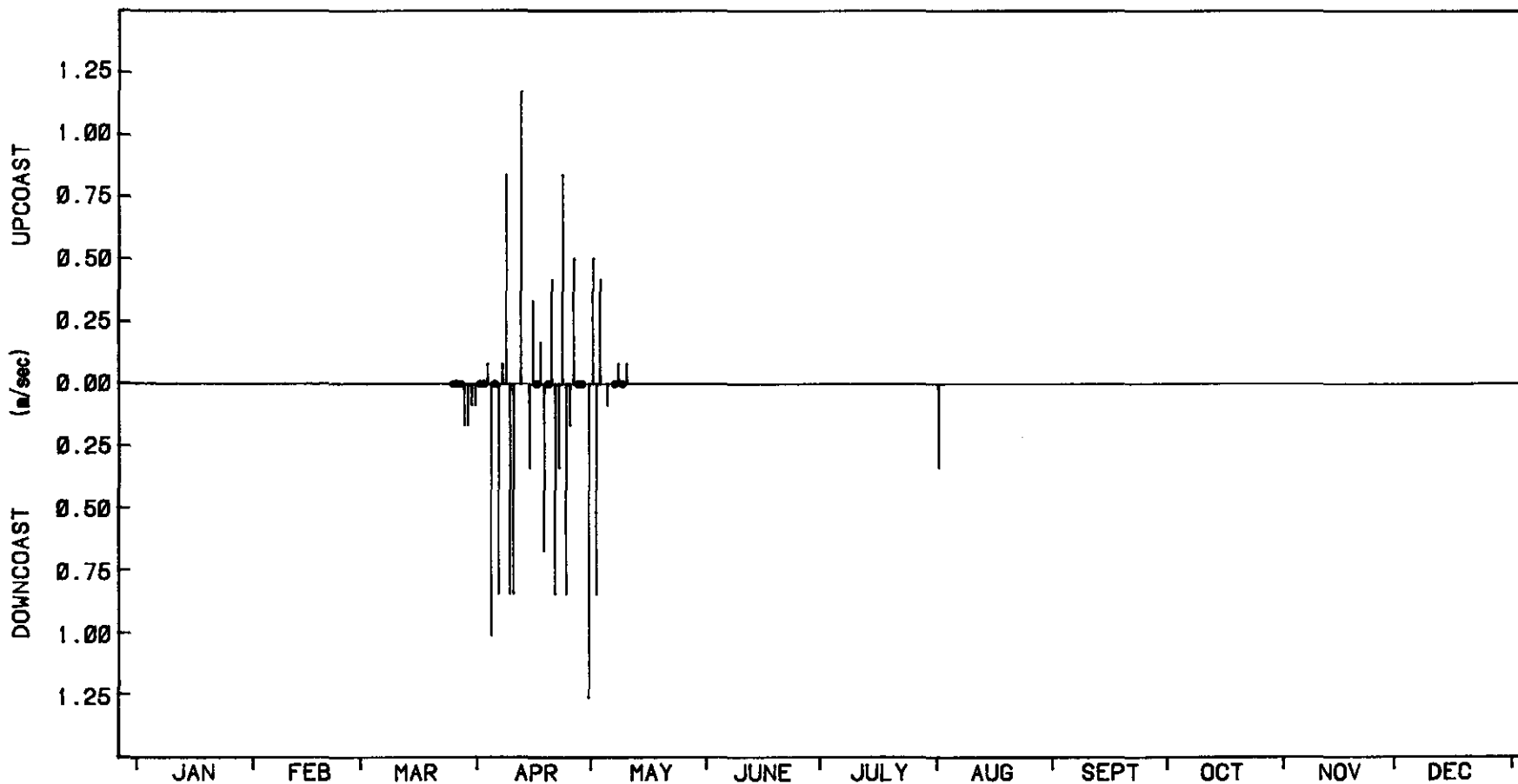
LITTORAL CURRENTS - MORNING 1975

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SHELLY BEACH

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LITTORAL CURRENT SUMMARY - 1975

Mean Vel = -.097 m/sec (down)

Mean Upcoast Vel = 0.423 m/sec

Mean Downcoast Vel = 0.537 m/sec

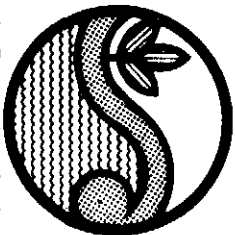
MORNING OBSERVATIONS - (43 recordings)

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Figure 12

C 05.1



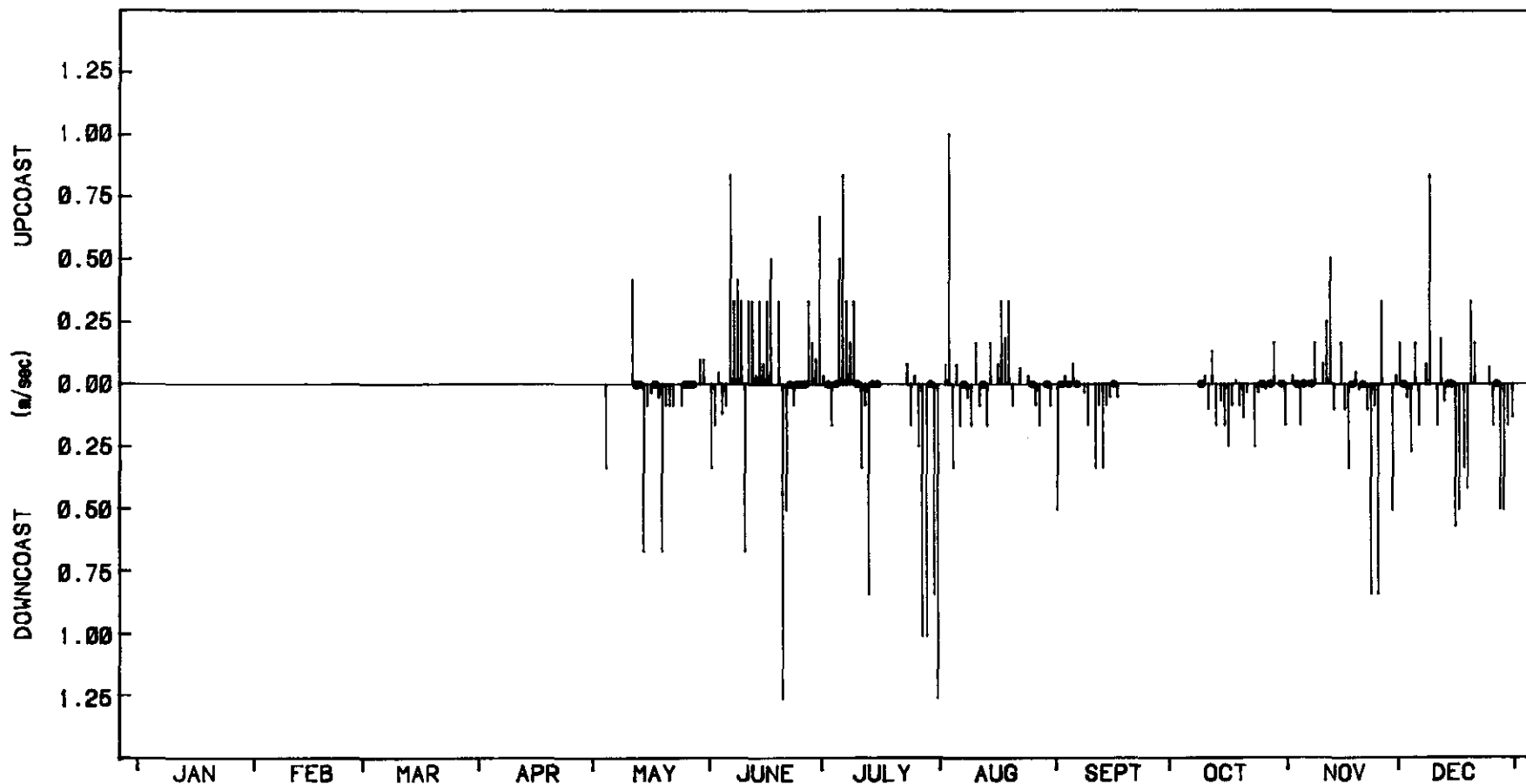
LITTORAL CURRENTS - AFTERNOON 1975

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LITTORAL CURRENT SUMMARY - 1975

Mean Vel = -.043 m/sec (down)

Mean Upcoast Vel = 0.243 m/sec

Mean Downcoast Vel = 0.273 m/sec

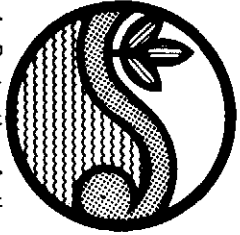
AFTERNOON OBSERVATIONS - (183 recordings)

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Figure 13

C 05.1



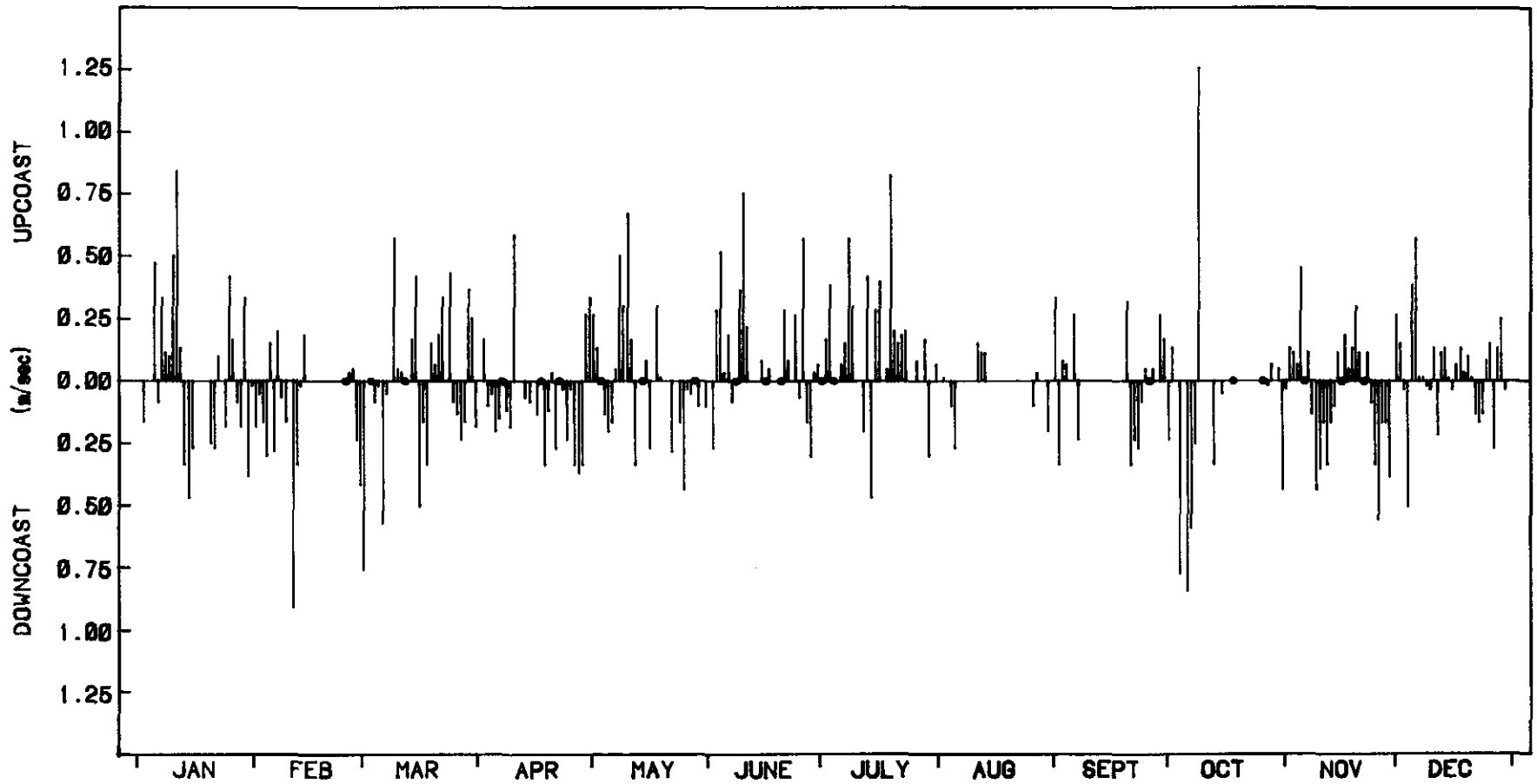
LITTORAL CURRENTS - AFTERNOON 1976

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LITTORAL CURRENT SUMMARY - 1976

Mean Vel = 0.003 m/sec (up)

Mean Upcoast Vel = 0.221 m/sec

Mean Downcoast Vel = 0.226 m/sec

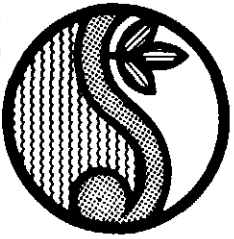
AFTERNOON OBSERVATIONS - (264 recordings)

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Figure 14

C 05.1



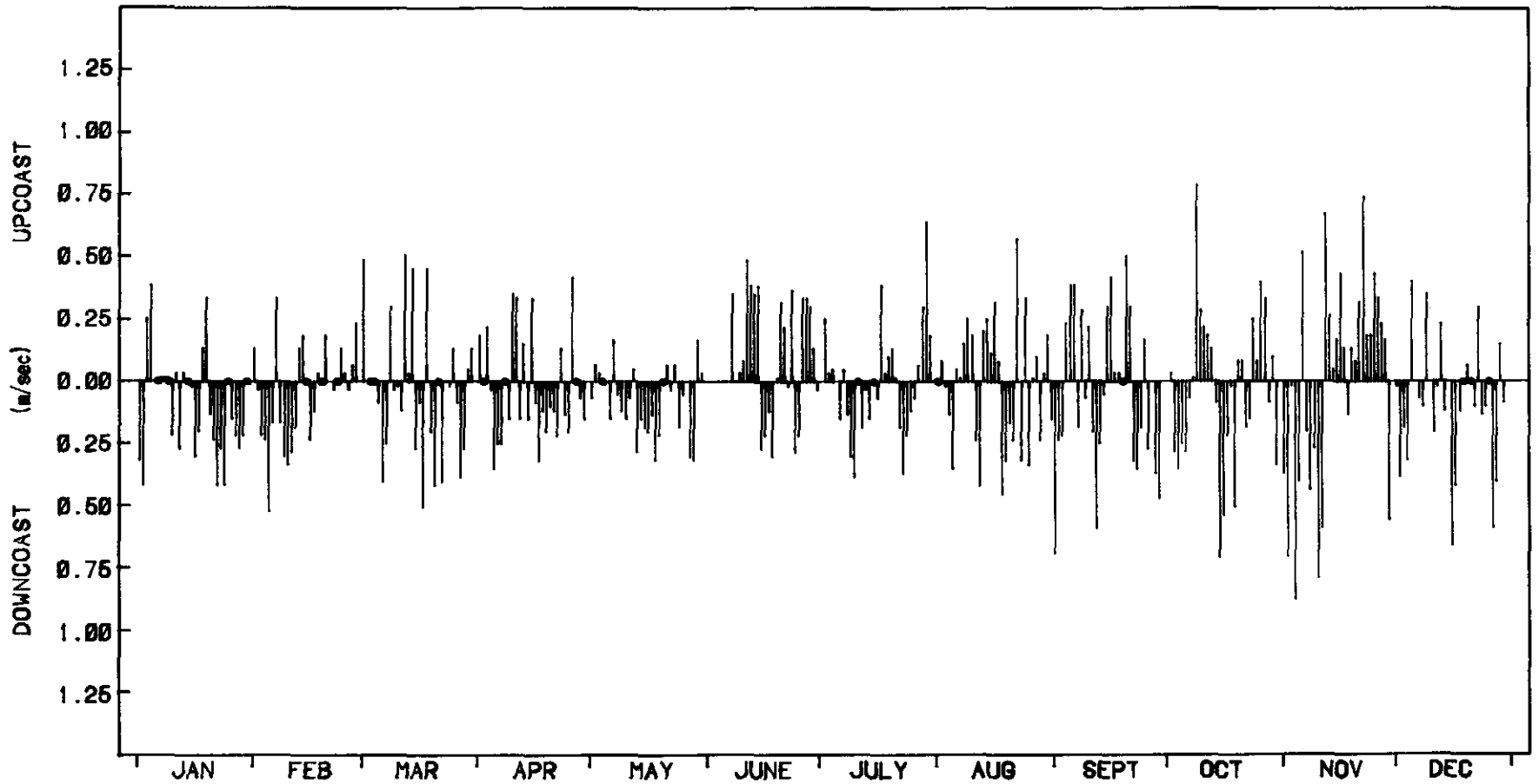
LITTORAL CURRENTS - AFTERNOON 1977

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LITTORAL CURRENT SUMMARY - 1977

Mean Vel = -0.034 m/sec (down)

Mean Upcoast Vel = 0.219 m/sec

Mean Downcoast Vel = 0.235 m/sec

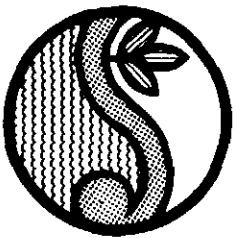
AFTERNOON OBSERVATIONS - (336 recordings)

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Figure 15

C 05.1



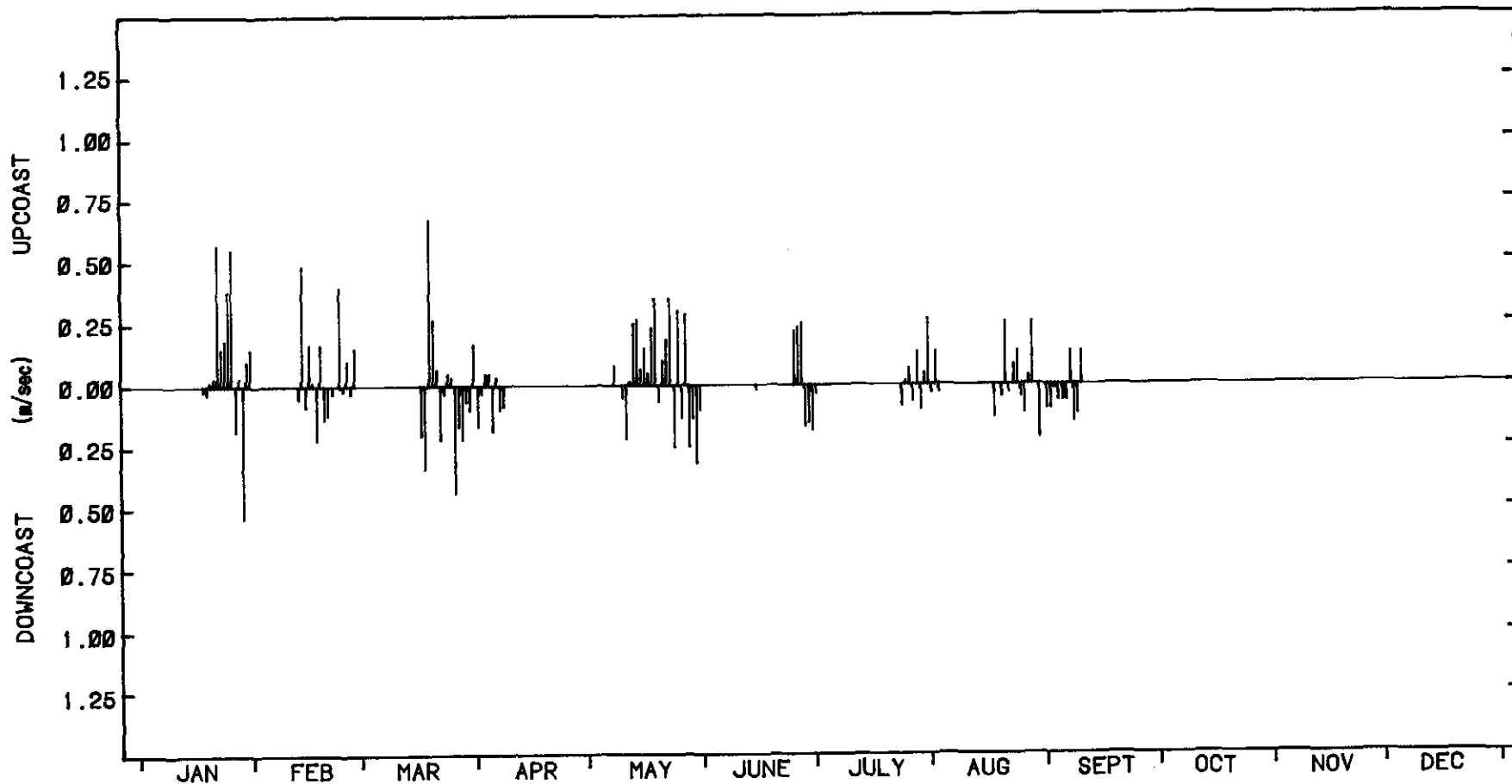
LITTORAL CURRENTS - MORNING 1978

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LITTORAL CURRENT SUMMARY - 1978

Mean Vel = 0.023 m/sec (up)

Mean Upcoast Vel = 0.180 m/sec

Mean Downcoast Vel = 0.126 m/sec

MORNING OBSERVATIONS - (115 recordings)

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Figure 16

C 5.1



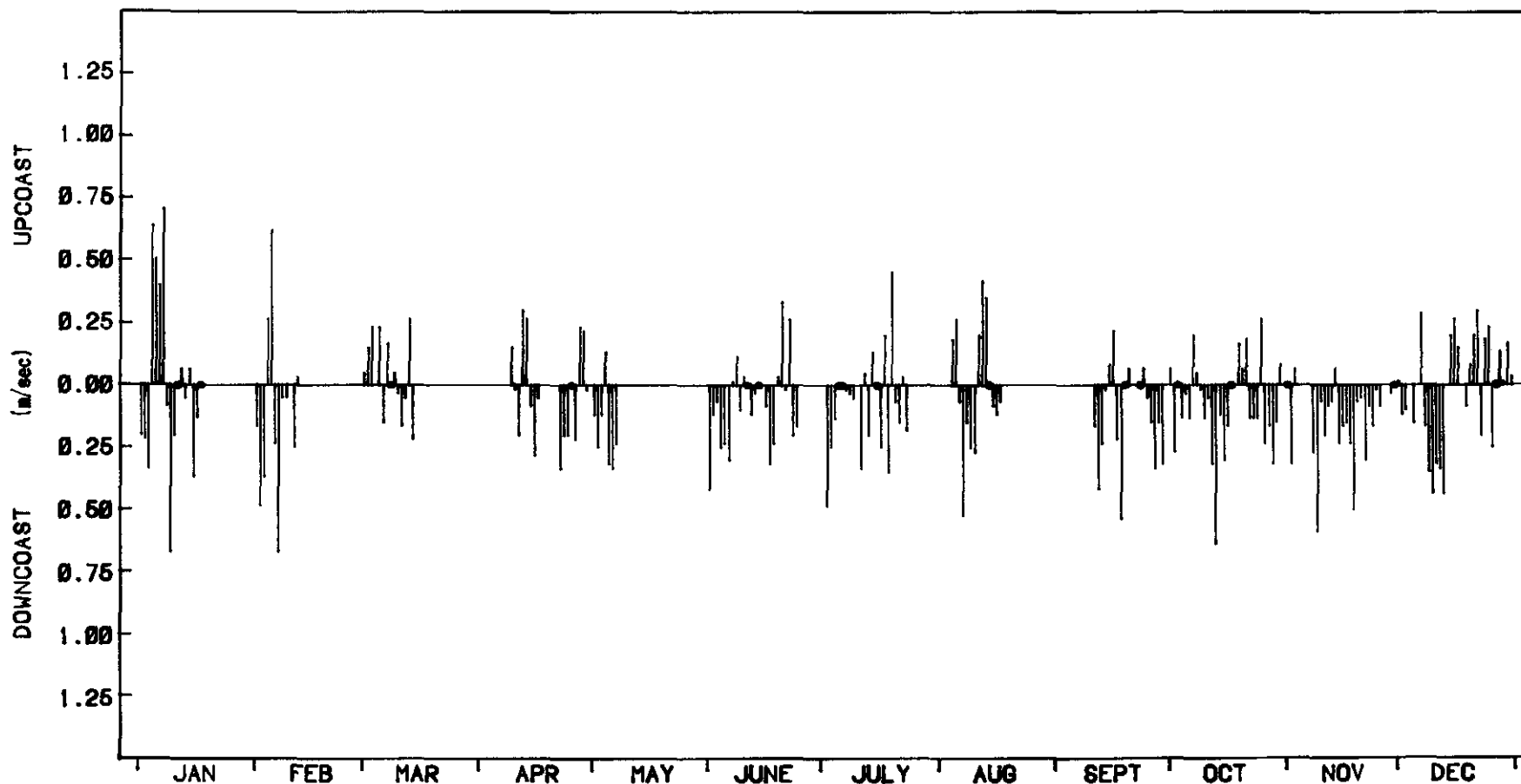
LITTORAL CURRENTS - AFTERNOON 1978

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LITTORAL CURRENT SUMMARY - 1978

Mean Vel = -0.068 m/sec (down)

Mean Upcoast Vel = 0.193 m/sec

Mean Downcoast Vel = 0.202 m/sec

AFTERNOON OBSERVATIONS - (219 recordings)

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Figure 17

C 05.1

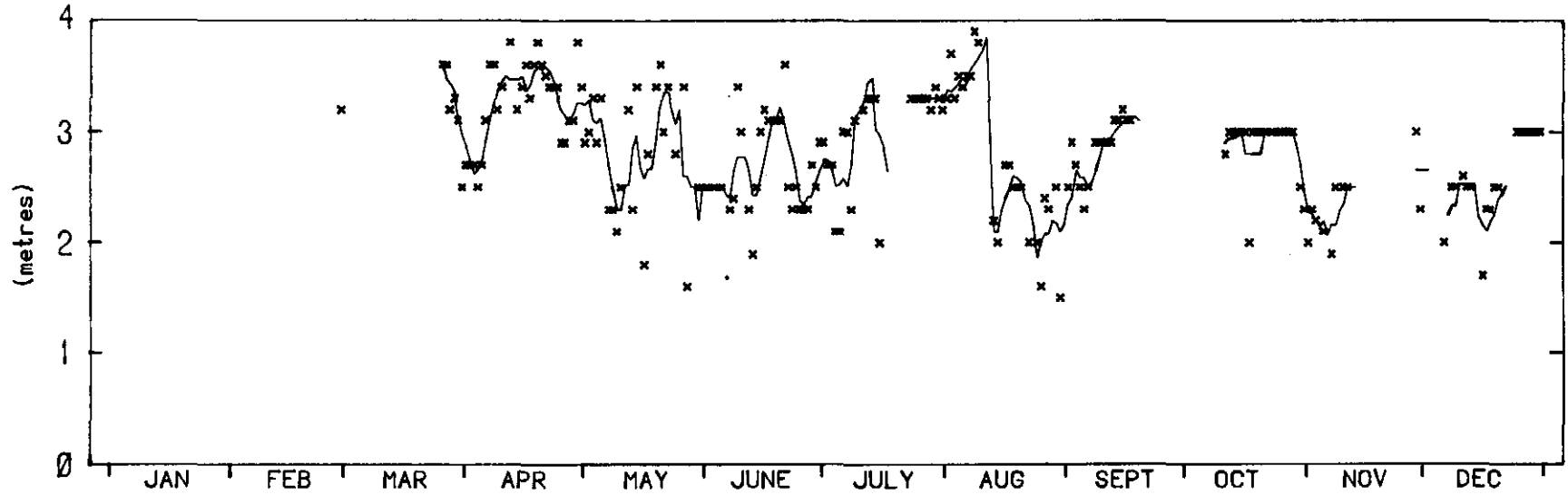


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BERM CREST ELEVATION - 1975

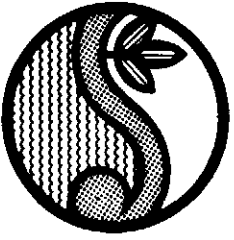
BERM CREST ELEVATION - 1975

No. of Observations : 192

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Shelly Beach

Figure 18

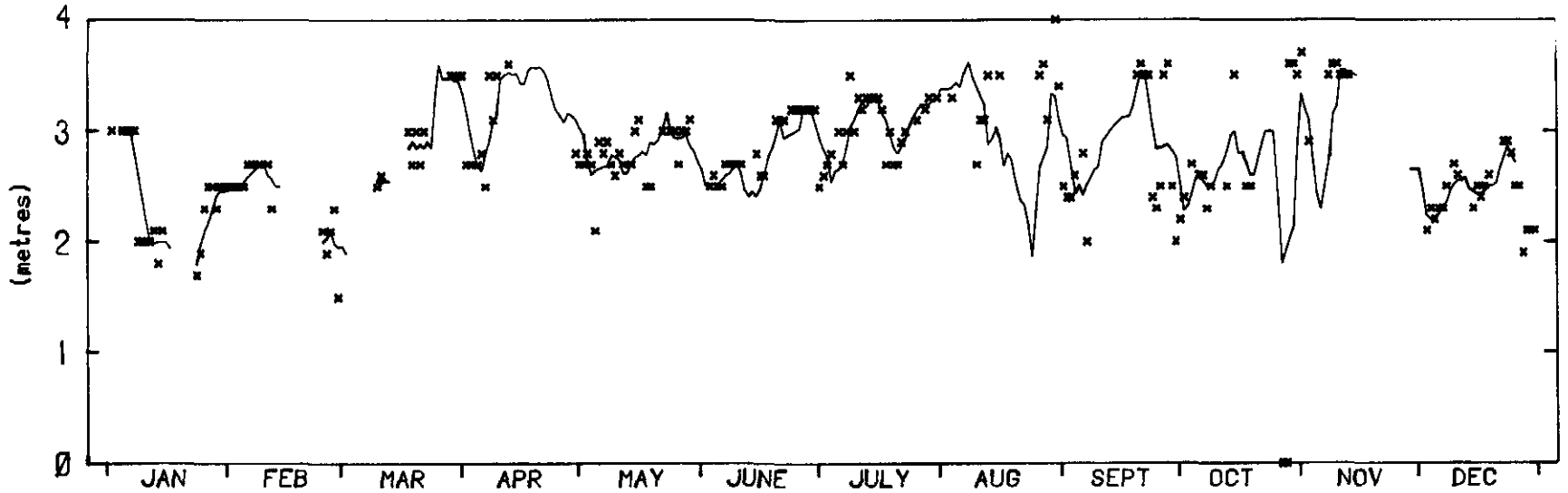
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BERM CREST ELEVATION - 1976

BERM CREST ELEVATION - 1976

No. of Observations : 203

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Figure 19
C 05.1

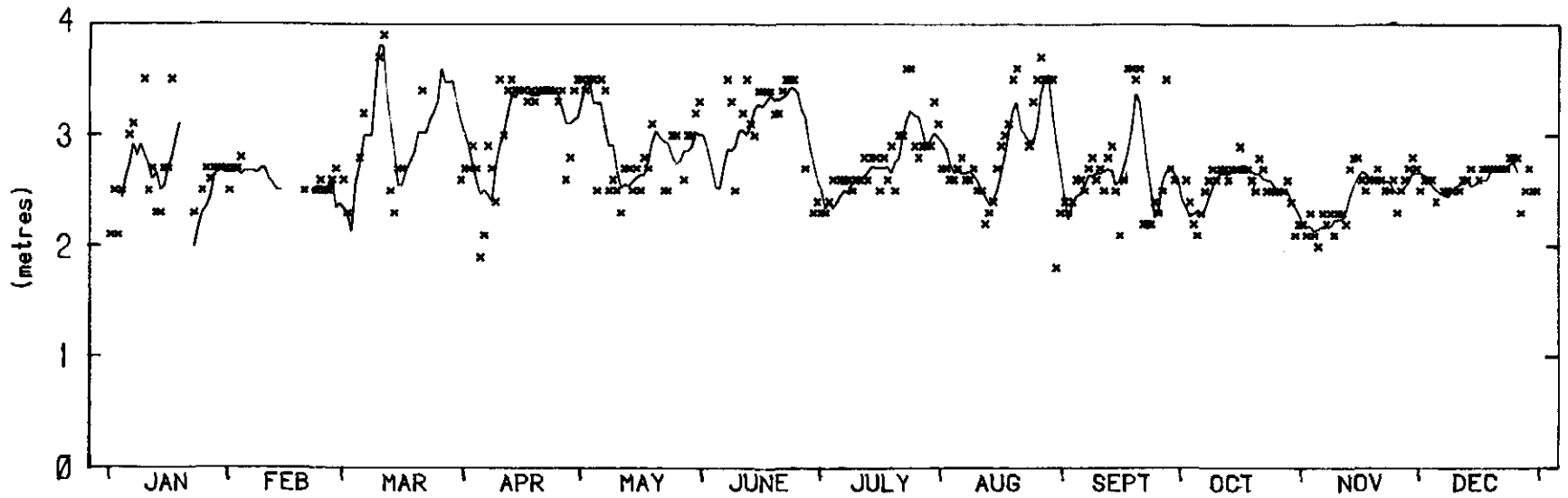


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BERM CREST ELEVATION - 1977

BERM CREST ELEVATION - 1977

No. of Observations : 299

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Figure 20

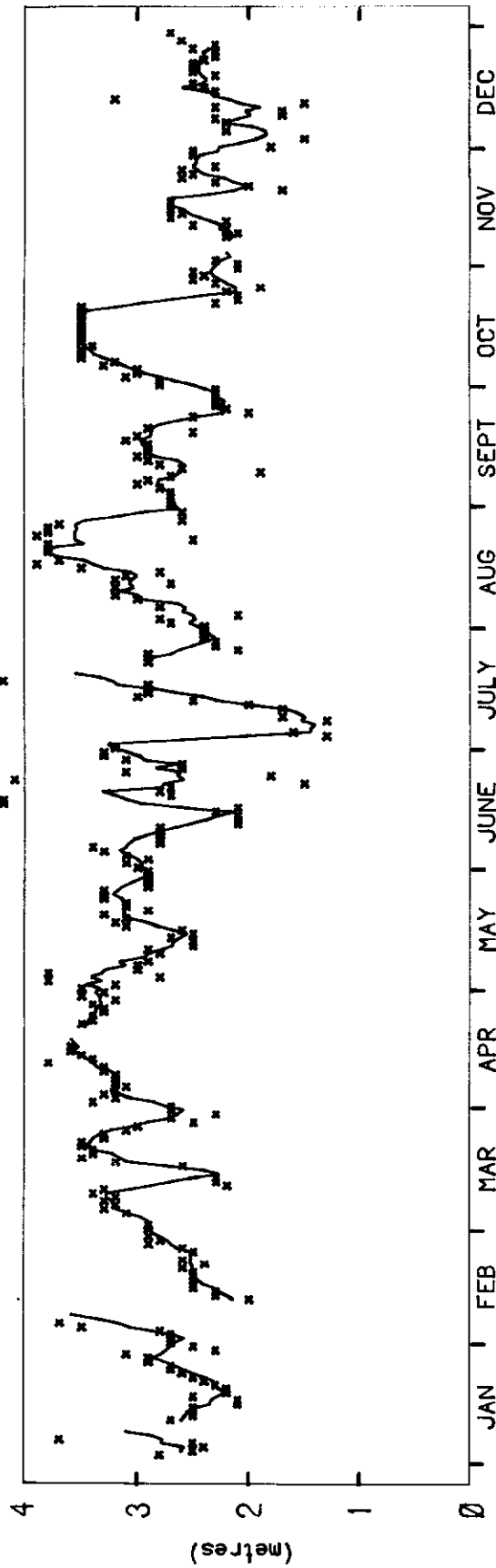
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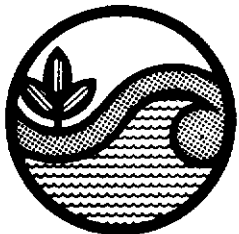
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BERM CREST ELEVATION - 1978

No. of Observations : 311



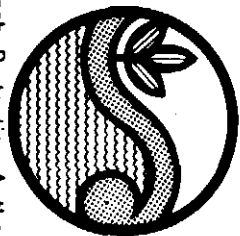
Beach Protection Authority

BERM CREST ELEVATION - 1978

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Shelly Beach

Figure 21

C 05.1



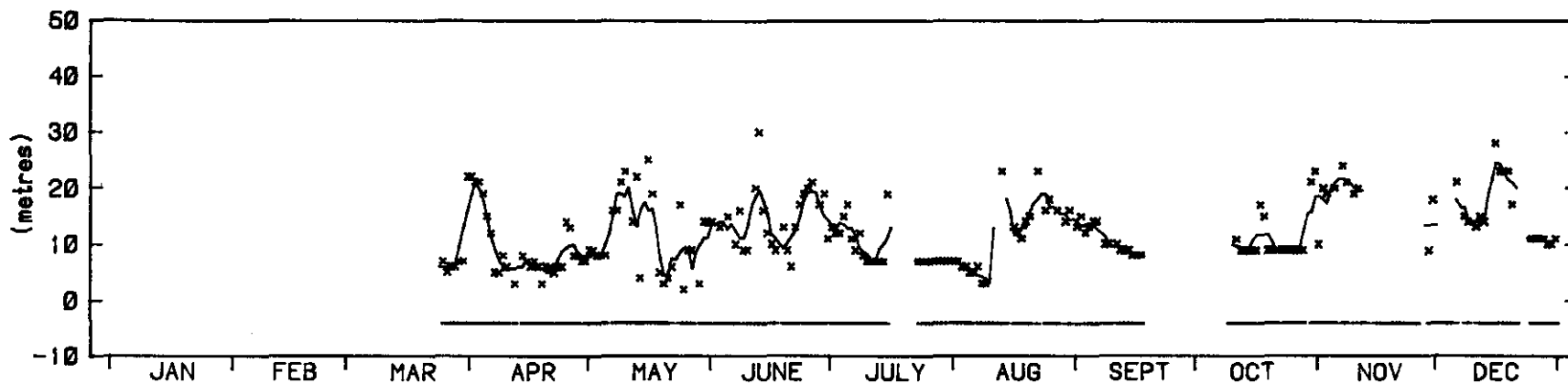
BEACH PROFILE PARAMETERS - 1975

COPE - Coastal Observation Programme Engineering

LANDSBOROUGH SHIRE

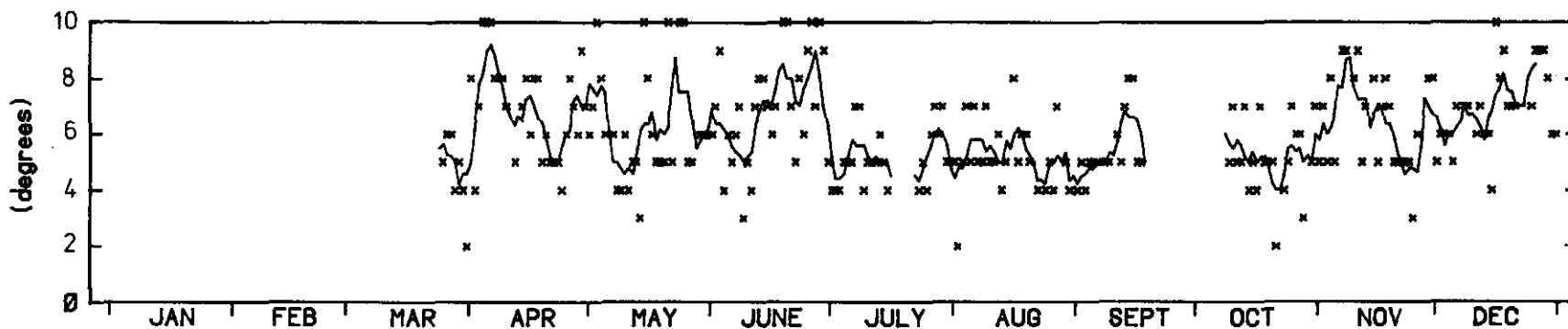
SHELLY BEACH

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DISTANCE TO BERM AND VEGETATION LINE - 1975

xxxxx Indicates Distance to Berm : 191 Observations
 — Indicates Distance to Vegetation Line : 229 Observations



FORESHORE SLOPE - 1975

∩ Five Day Moving Average

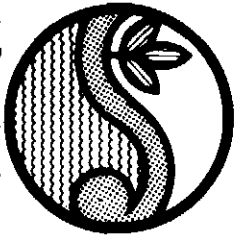
No. of Observations : 229

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Shelly Beach

Figure 22

C 05.1



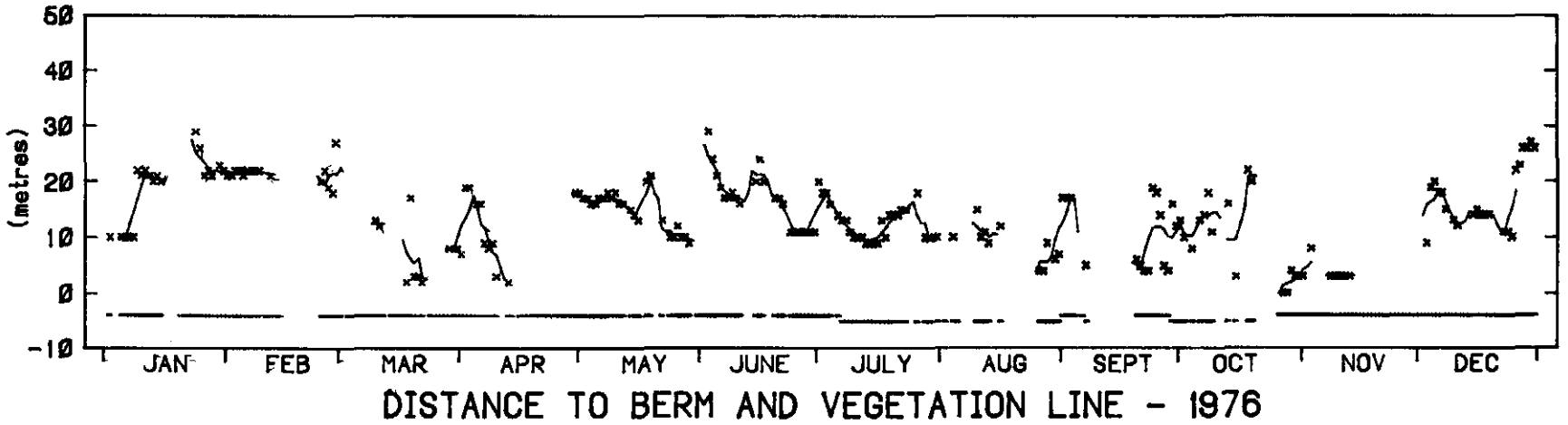
BEACH PROFILE PARAMETERS - 1976

COPE - Coastal Observation Programme Engineering

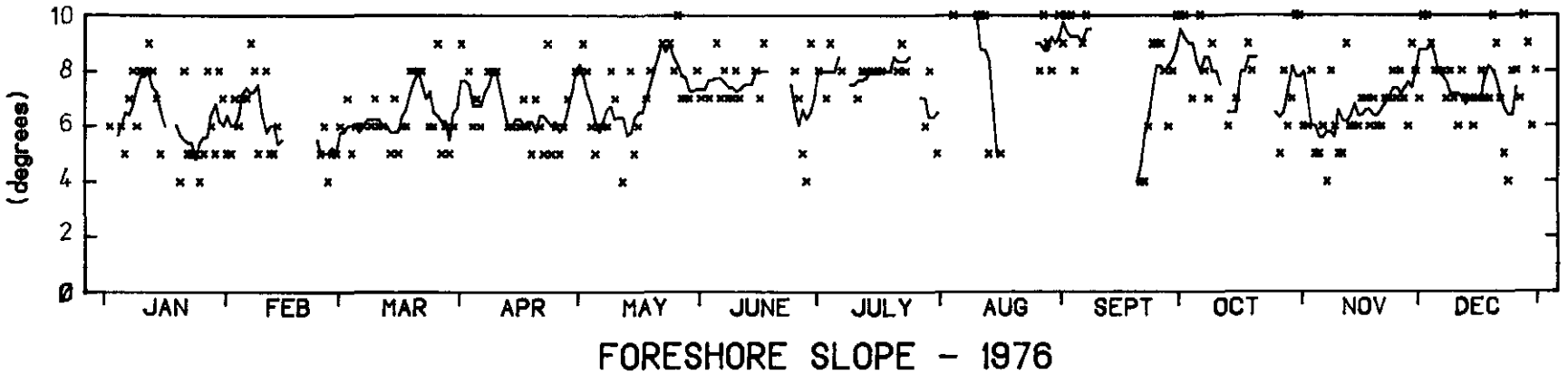
LANDSBOROUGH SHIRE

SHELLY BEACH

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xxxxx Indicates Distance to Berm : 199 Observations
 — Indicates Distance to Vegetation Line : 281 Observations



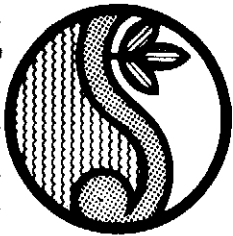
Five Day Moving Average

No. of Observations : 254

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Figure 23

C 05.1



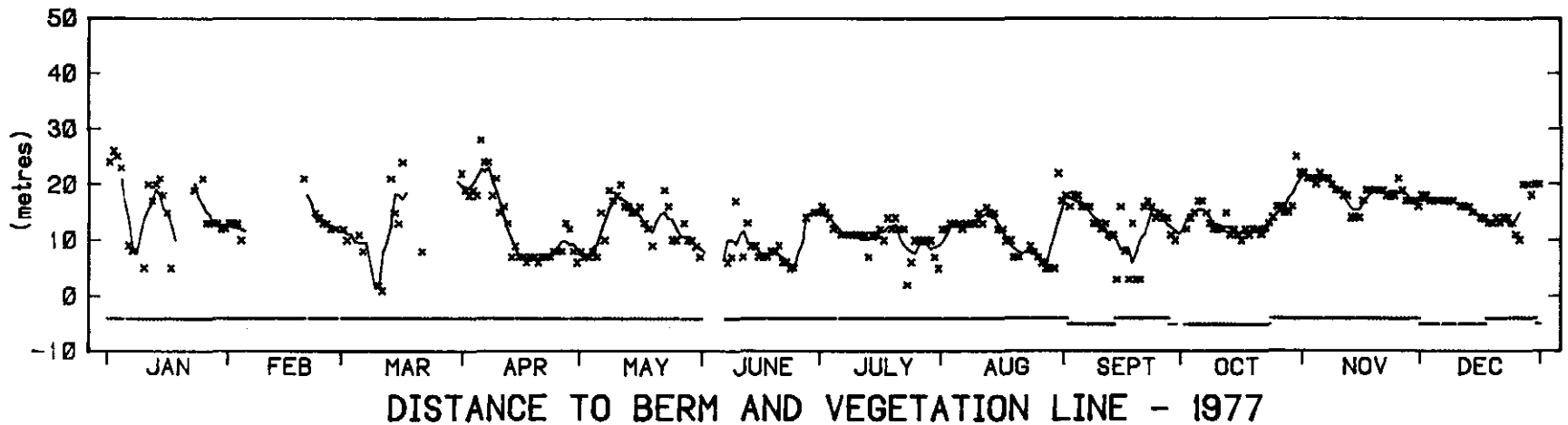
BEACH PROFILE PARAMETERS - 1977

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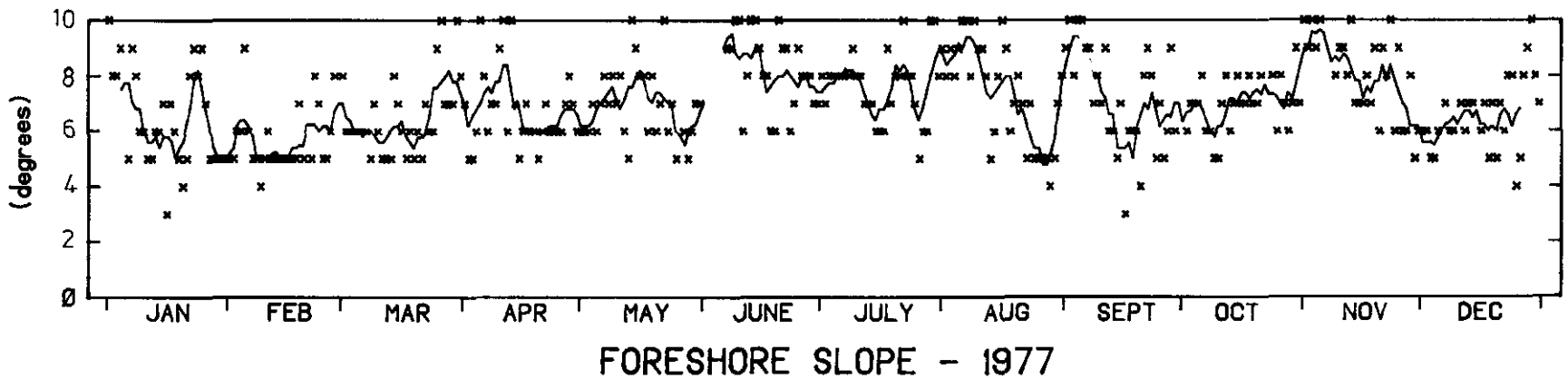
LANDSBOROUGH SHIRE

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xxxxx Indicates Distance to Berm : 298 Observations
 — Indicates Distance to Vegetation Line : 350 Observations



Five Day Moving Average

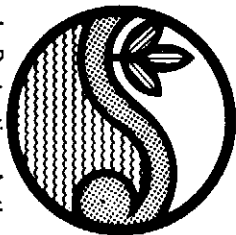
No. of Observations : 345

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Figure 24

C 05.1



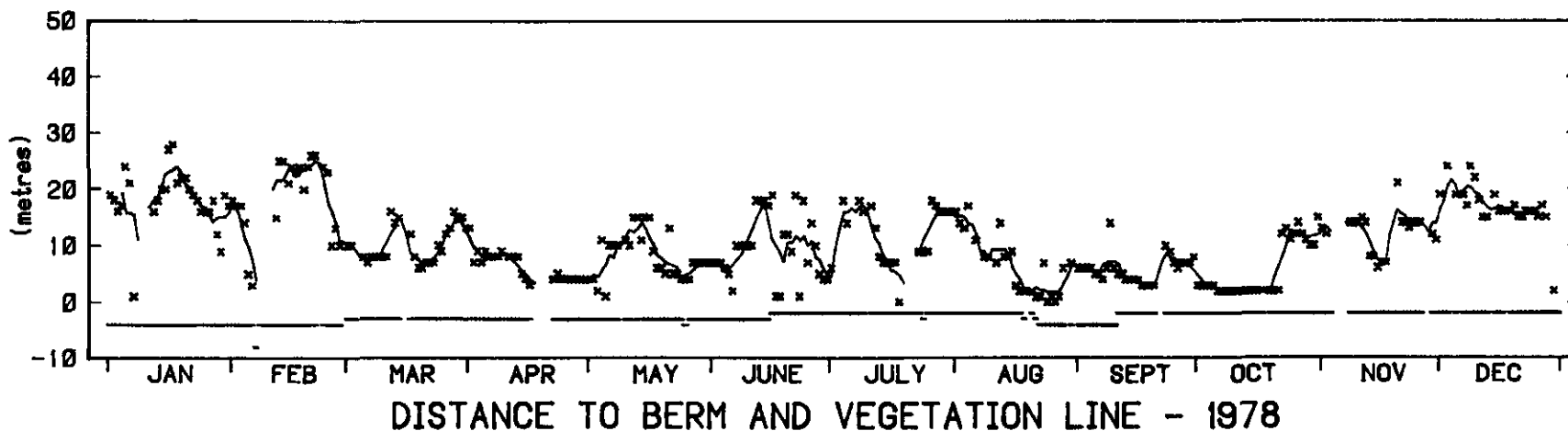
BEACH PROFILE PARAMETERS - 1978

COPE - Coastal Observation Programme Engineering

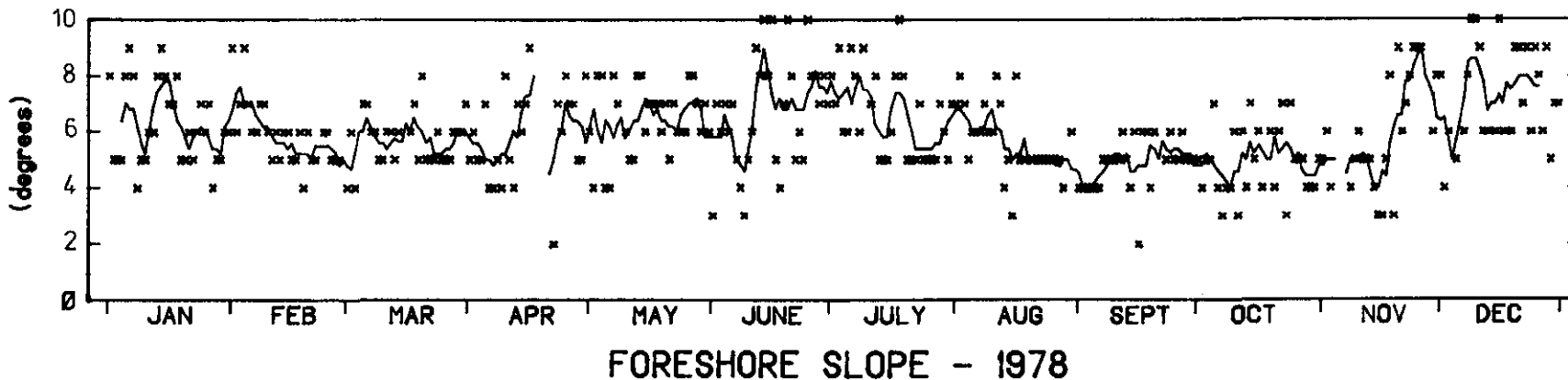
LANDSBOROUGH SHIRE

SHELLY BEACH

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xxxxx Indicates Distance to Berm : 310 Observations
 — Indicates Distance to Vegetation Line : 338 Observations



Five Day Moving Average

No. of Observations : 338

COPE

Shelly Beach

Figure 25

C 05.1