

**COASTAL OBSERVATION PROGRAM - ENGINEERING (COPE)**

**FLYING FISH POINT - JOHNSTONE SHIRE**

**For the Years 1976 to 1979**

**Beach Protection Authority**

**November 1980**

All reasonable care and attention has been exercised in the collection, processing and compilation of the COPE data included in this report. However the accuracy and reliability of this information is not guaranteed in any way by the Beach Protection Authority and the Authority accepts no responsibility for the use of this information in any way whatsoever.

## DOCUMENTATION PAGE

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### ABSTRACT:

This report provides a summary of primary analyses of COPE data on wind, wave and beach processes observed at Flying Fish Point near Innisfail in the Johnstone Shire in northern Queensland. The data were recorded by volunteer observer the late Mr H.C. Millard during the period January 1976 to the end of December 1979. The recordings were made twice 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).

### 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.*

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## 1.0 INTRODUCTION

### 1.1 The Program

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 volunteer members of the public 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 program. 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 1976 to 1979 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**

Flying Fish Point is located within the Johnstone Shire and is 4 kilometres north-east of Innisfail in North Queensland. It lies near the northern spit of Innisfail Harbour at the mouth of the Johnstone River. The small settlement of Flying Fish Point is immediately adjacent to the COPE station. The location of the Flying Fish Point COPE station is shown in Fig. 1.

### **2.2 Observers**

This station has been manned by the late Mr. H.C. Millard during the period January 1976 to December 1979. Mr. Millard was a retired resident of Flying Fish Point living near the COPE station.

### **2.3 Observed Parameters**

The observer at this station usually recorded at 9.00 a.m. and 3.00 p.m. daily during the four year period 1976 to 1979.



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
- Fixed Contour Level
- Distance to Fixed Contour
- Distance to Vegetation
- Foreshore Slope
- Longshore Current Speed
- Longshore Current Direction

\* At the Flying Fish Point COPE station, wave angles were difficult to assess reliably, and have therefore been omitted from the relevant Figures and Tables in this report.

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 Mourilyan Harbour. Datum is Low Water Datum.

- M.H.W.S. - 2.3 metres
- M.H.W.N. - 1.6 metres
- M.S.L. - 1.33 metres
- M.L.W.N. - 1.1 metres
- M.L.W.S. - 0.4 metres.

#### 2.5 Description of the Beach

The beach of the Flying Fish Point station is a clean sandy beach with an indistinct dune system which has been developed for residential purposes. It exhibits the following characteristics:-

- Typical beach slopes: foreshore slope 1 in 8.
- Beach width: typically 15 metres from dune.
- D50 sand size: 1.00 mm averaged over several years.
- Dunal system: main dune 3 metres above mean sea level.
- Vegetation: well established Goatsfoot creeper with other foredune vegetation, and coconut palms on the hind dune.

## 2.6 Supervision of Station

The observer was instructed in the recording program by the Authority's 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 Johnstone 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 January 1976 to December 1979 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 Fig. 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 (Fig. 3).

- (b) the percentage occurrence of various combinations of wave heights and periods (Fig. 4).
- (c) surf zone width with an indication of the existence or otherwise of an offshore bar on Figs. 5 to 12.
- (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 (Fig. 13 to Fig. 20). 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 0.9 m fixed contour level at the station.
- 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 Figs. 21 to 24 which provide a visual representation of the data.

**TABLE 1**  
**MONTHLY AND ANNUAL**  
**MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE OCCURRENCES**

YEAR: 1976

Month	Mean Wave Period (secs)	Mean Wave Height (m)	Percentage Occurrence - Wave Type				
			SP	PL	Surge	SP/PL	Calm
JANUARY	5.6	.27	1.6	-	66.1	12.9	19.4
FEBRUARY	5.8	.26	-	-	43.1	24.1	32.8
MARCH	5.8	.22	-	-	46.8	14.5	38.7
APRIL	5.6	.39	-	-	40.0	56.7	3.3
MAY	5.4	.31	-	-	55.0	28.3	16.7
JUNE	5.5	.26	-	-	54.8	16.7	28.6
JULY	5.5	.30	-	-	45.2	32.3	22.6
AUGUST	5.5	.24	-	-	41.9	24.2	33.9
SEPTEMBER	5.5	.20	3.4	-	36.2	17.2	43.1
OCTOBER	5.5	.22	1.6	-	37.1	21.0	40.3
NOVEMBER	5.5	.20	-	-	50.0	11.7	38.3
DECEMBER	5.5	.23	-	-	37.1	25.8	37.1
WHOLE YEAR	5.6	.26	.6	-	45.9	23.9	29.6

SP - Spilling  
 PL - Plunging  
 SP/PL - Combined Spilling and Plunging.

TABLE 2  
MONTHLY AND ANNUAL  
MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE OCCURRENCES

YEAR: 1977

Month	Mean Wave Period (secs)	Mean Wave Height (m)	Percentage Occurrence - Wave Type				
			SP	PL	Surge	SP/PL	Calm
JANUARY	5.5	.26	-	-	38.1	28.6	33.3
FEBRUARY	-	-	-	-	-	-	-
MARCH	5.6	.27	-	-	52.5	11.9	35.6
APRIL	5.6	.49	-	-	22.0	74.6	3.4
MAY	5.5	.26	-	-	48.4	19.4	32.3
JUNE	5.4	.35	-	-	58.7	28.3	13.0
JULY	5.7	.41	-	-	18.0	67.2	14.8
AUGUST	5.6	.40	-	-	16.1	62.9	21.0
SEPTEMBER	5.6	.30	-	-	25.0	38.3	36.7
OCTOBER	5.5	.43	-	-	11.3	67.7	21.0
NOVEMBER	-	-	-	-	-	-	-
DECEMBER	5.6	.35	-	-	18.0	50.0	32.0
WHOLE YEAR	5.6	.35	-	-	30.0	45.8	24.2

SP - Spilling  
 PL - Plunging  
 SP/PL - Combined Spilling and Plunging.

**TABLE 3**  
**MONTHLY AND ANNUAL**  
**MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE OCCURRENCES**

YEAR: 1978

Month	Mean Wave Period (secs)	Mean Wave Height (m)	Percentage Occurrence - Wave Type				
			SP	PL	Surge	SP/PL	Calm
JANUARY	5.6	.43	-	-	11.5	60.7	27.9
FEBRUARY	5.6	.43	-	-	7.1	67.9	25.0
MARCH	5.6	.43	-	-	19.4	58.1	22.6
APRIL	5.6	.40	-	-	27.1	43.8	29.2
MAY	-	-	-	-	-	-	-
JUNE	5.5	.24	-	-	32.8	27.6	39.7
JULY	5.5	.42	-	-	24.2	50.0	25.8
AUGUST	5.5	.41	-	-	9.7	59.7	30.6
SEPTEMBER	5.6	.36	-	-	26.7	36.7	36.7
OCTOBER	5.5	.54	-	-	25.8	58.1	16.1
NOVEMBER	5.5	.36	-	-	33.3	30.0	36.7
DECEMBER	5.1	.26	-	-	45.2	14.5	40.3
WHOLE YEAR	5.5	.39	-	-	23.9	46.1	30.0

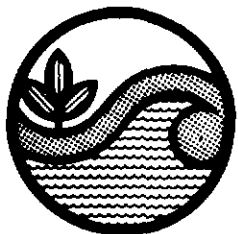
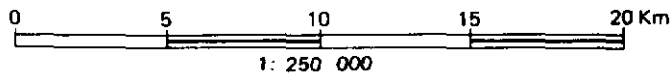
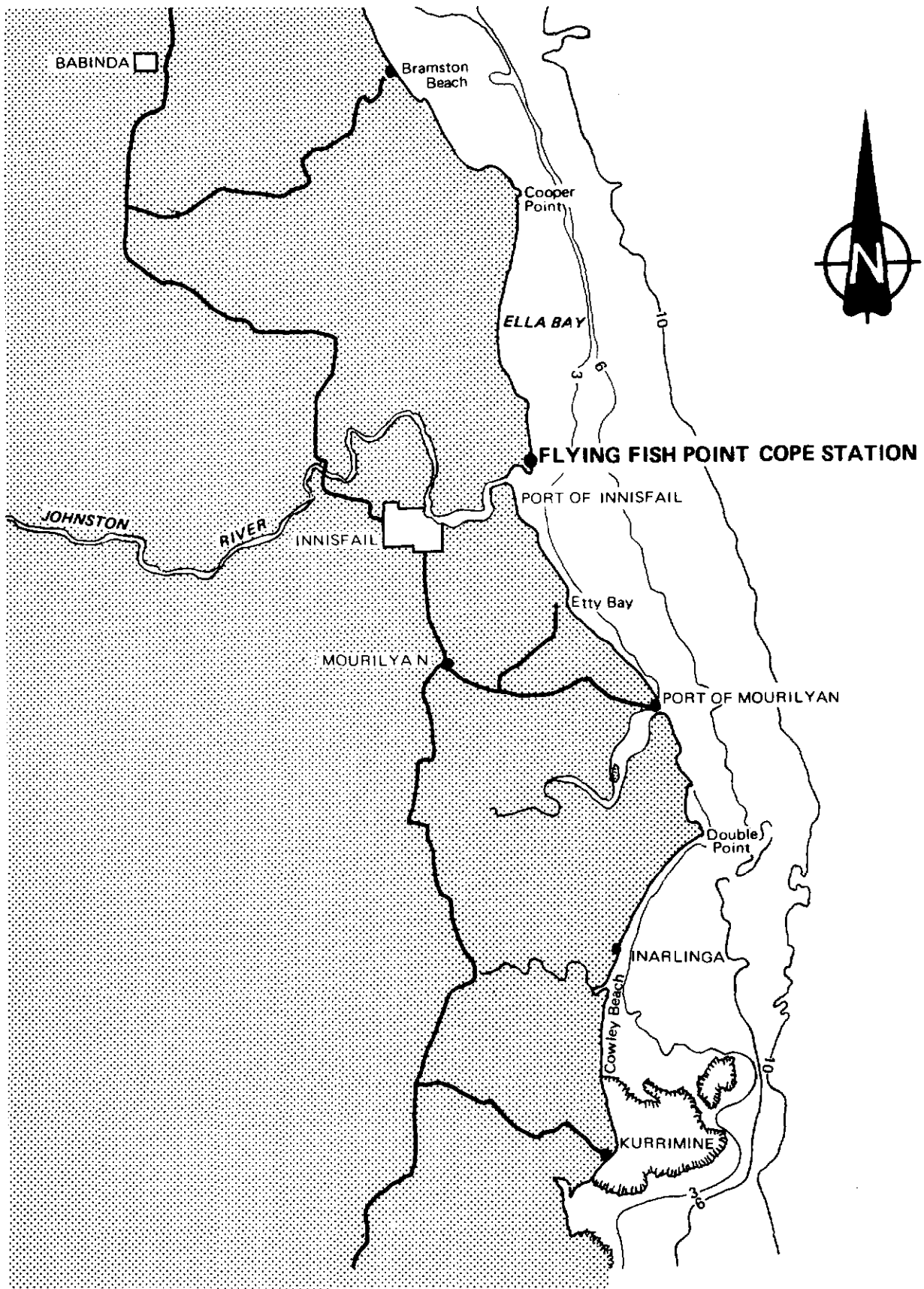
SP - Spilling  
 PL - Plunging  
 SP/PL - Combined Spilling and Plunging.

**TABLE 4**  
**MONTHLY AND ANNUAL**  
**MEAN WAVE HEIGHT/MEAN WAVE PERIOD AND WAVE TYPE OCCURRENCES**

YEAR: 1979

Month	Mean Wave Period (secs)	Mean Wave Height (m)	Percentage Occurrence - Wave Type				
			SP	PL	Surge	SP/PL	Calm
JANUARY	5.0	.48	-	-	33.3	40.7	25.9
FEBRUARY	5.2	.44	-	-	39.3	39.3	21.4
MARCH	5.2	.38	-	-	59.7	12.9	27.4
APRIL	5.2	.50	-	-	47.5	33.9	18.6
MAY	5.2	.54	-	-	47.4	42.1	10.5
JUNE	5.2	.54	-	-	43.2	43.2	13.5
JULY	5.0	.41	-	-	53.3	26.7	20.0
AUGUST	5.1	.34	-	-	51.7	10.0	38.3
SEPTEMBER	5.1	.46	-	-	41.0	35.9	23.1
OCTOBER	-	-	-	-	-	-	-
NOVEMBER	-	-	-	-	-	-	-
DECEMBER	-	-	-	-	-	-	-
WHOLE YEAR	5.1	.45	-	-	46.2	31.0	22.8

SP - Spilling  
 PL - Plunging  
 SP/PL - Combined Spilling and Plunging.



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**LOCALITY PLAN**

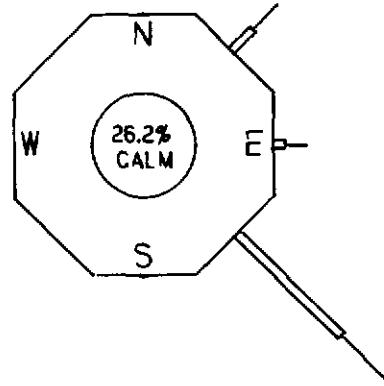
**COPE  
Flying Fish Point**

**Figure 1**  
**C 03.1**



COPE - COASTAL OBSERVATION PROGRAMME ENGINEERING  
**WIND GRAPH JAN 1976 TO SEPT 1979**  
 JOHNSTONE SHIRE ... FLYING FISH POINT 2802

ALL OBSERVATIONS

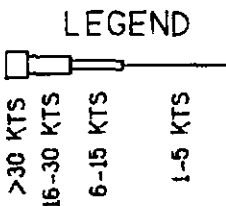
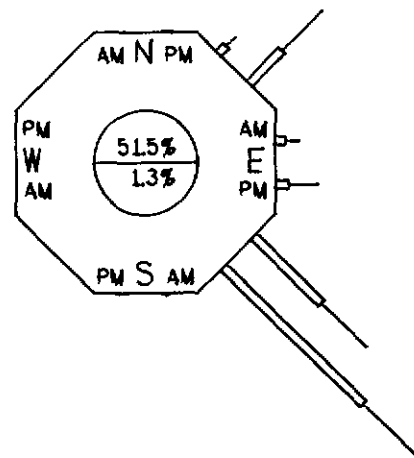


TOTAL NO OF OBSERVATIONS 2366

MORNING / AFTERNOON OBSERVATIONS

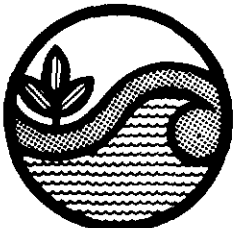
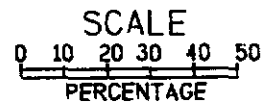
NOTES

FIGURES IN CENTRAL CIRCLE  
 REPRESENT PERCENTAGE  
 OF CALM OBSERVATIONS.  
 UPPER FIGURE FOR AM  
 LOWER FIGURE FOR PM



NO OF MORNING OBSERVATIONS 1171  
 NO OF AFTERNOON OBSERVATIONS 1195

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 MEAN TIME :- AFTERNOON OBS. 1731. HRS

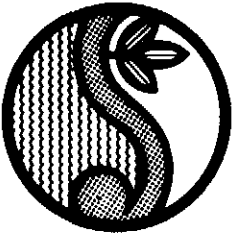


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WIND DATA

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**Figure 2**  
 C 03.1

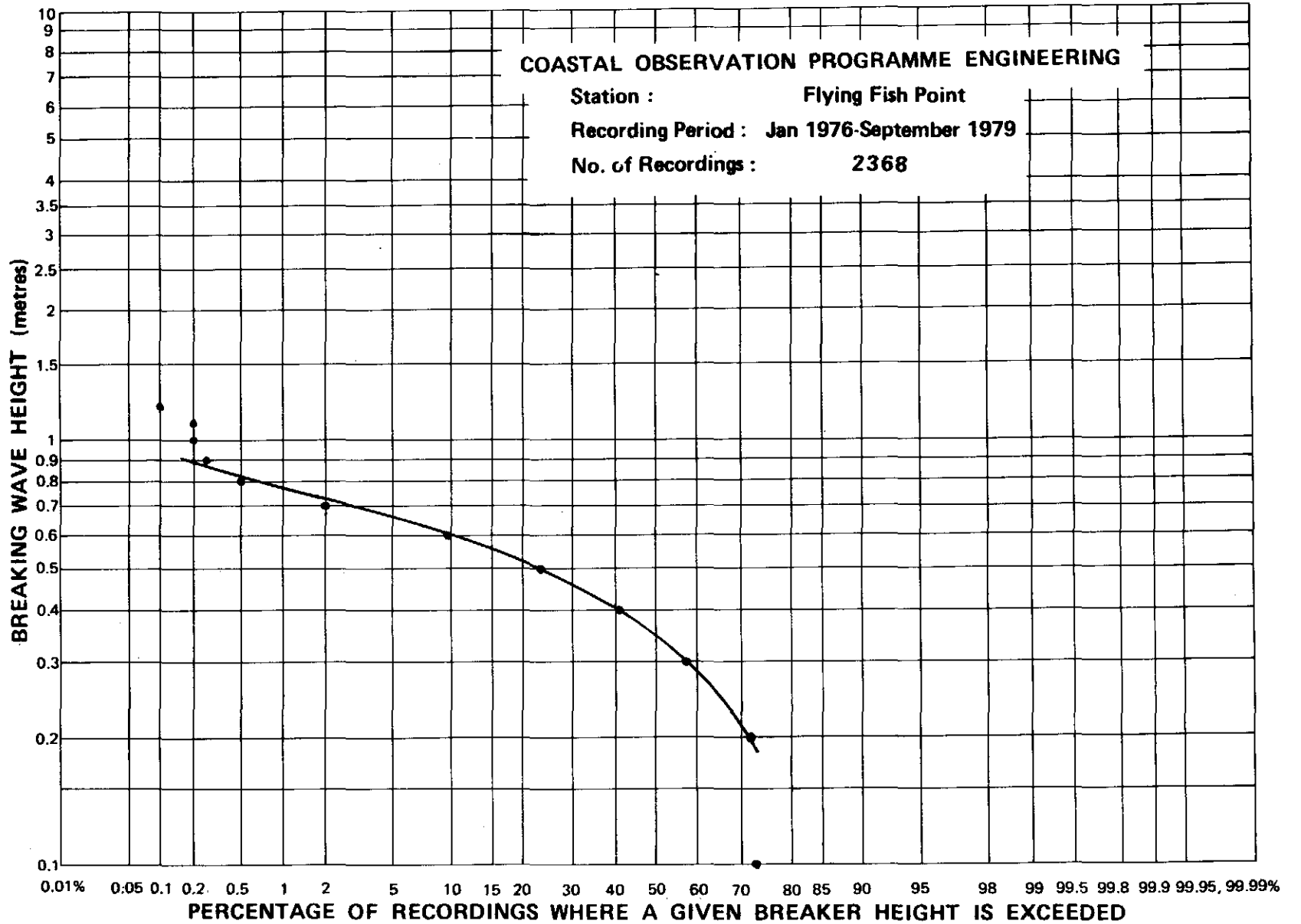


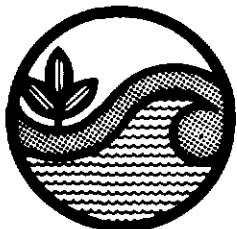
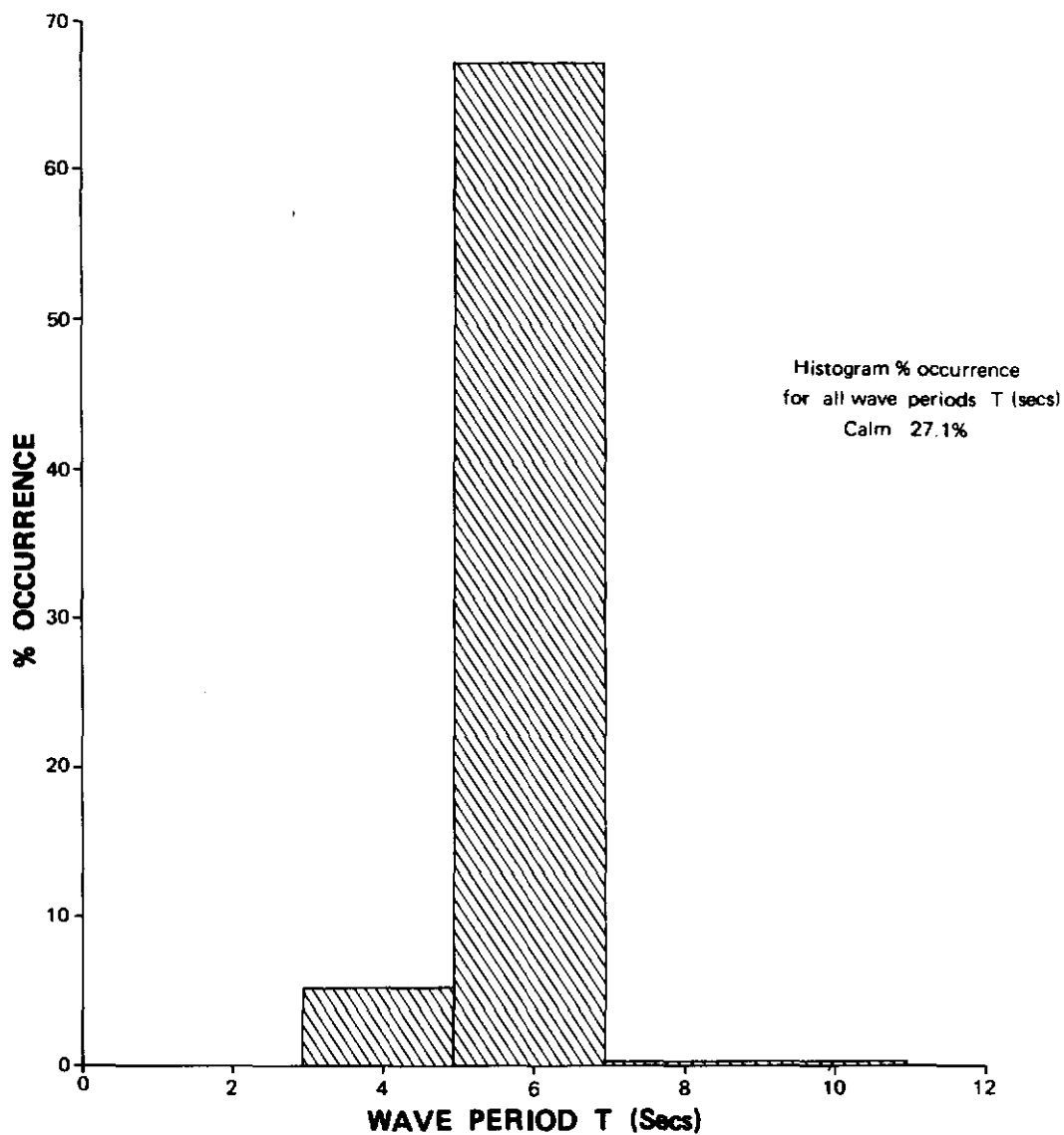
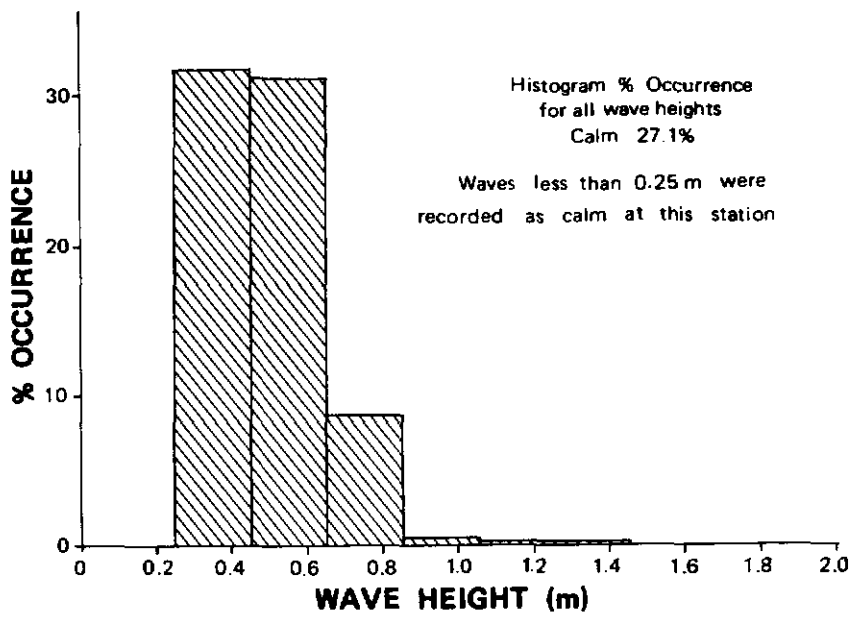
WAVE HEIGHT & EXCEEDANCE

Figure 3  
C 03.1

Flying Fish Point

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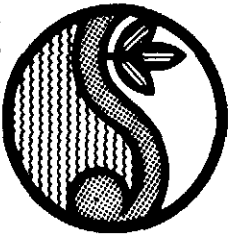


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**WAVE HEIGHT AND PERIOD % OCCURRENCE**

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Flying Fish Point

**Figure 4**  
C 03.1



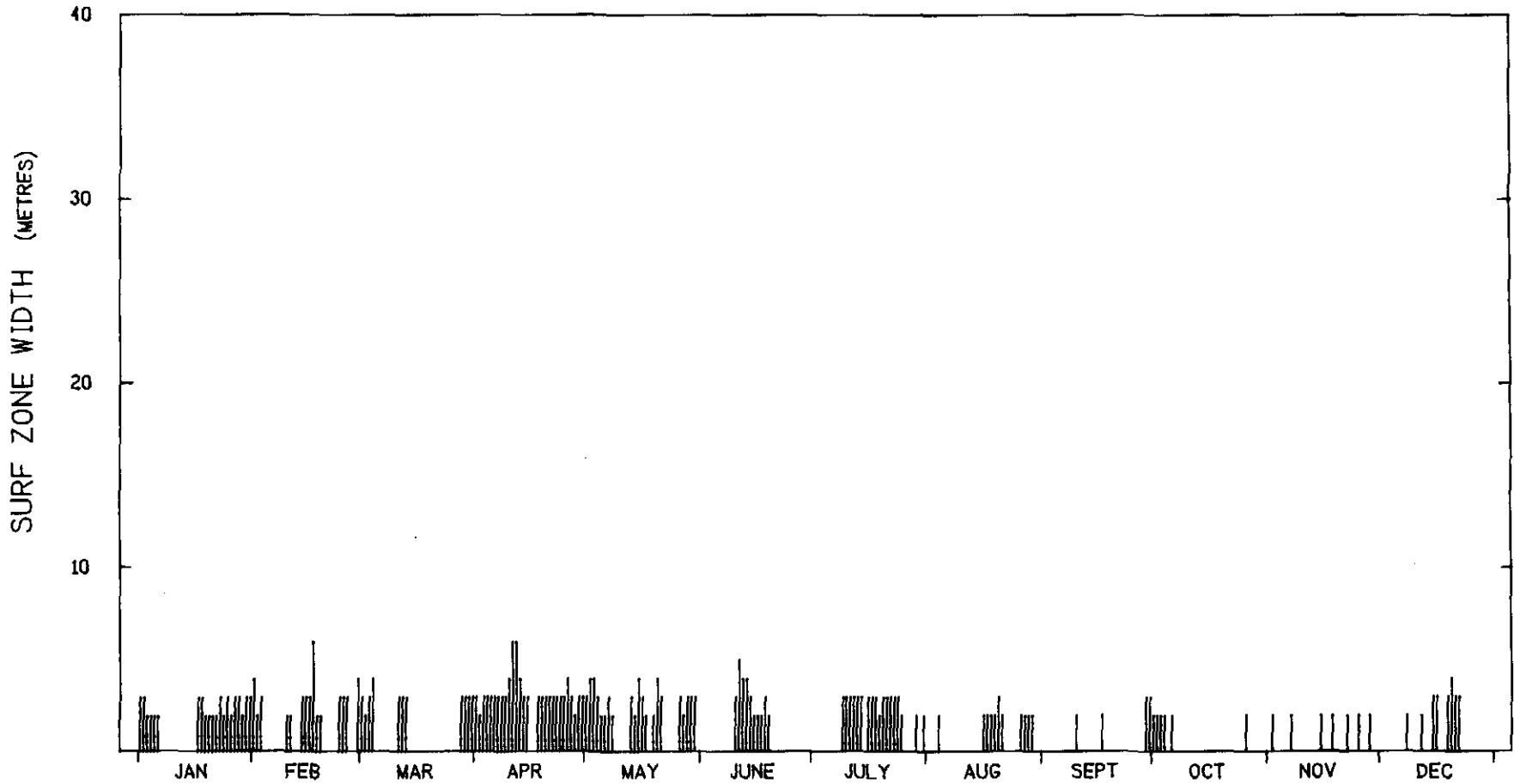
SURF ZONE WIDTH - MORNING 1976

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SURF ZONE WIDTH SUMMARY - 1976

MORNING OBSERVATIONS

NO. OF VALUES 355

MEAN SURF ZONE WIDTH 1.2 M

COPE

Flying Fish Point

Figure 5

C 03.1



SURF ZONE WIDTH - AFTERNOON 1976

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Flying Fish Point

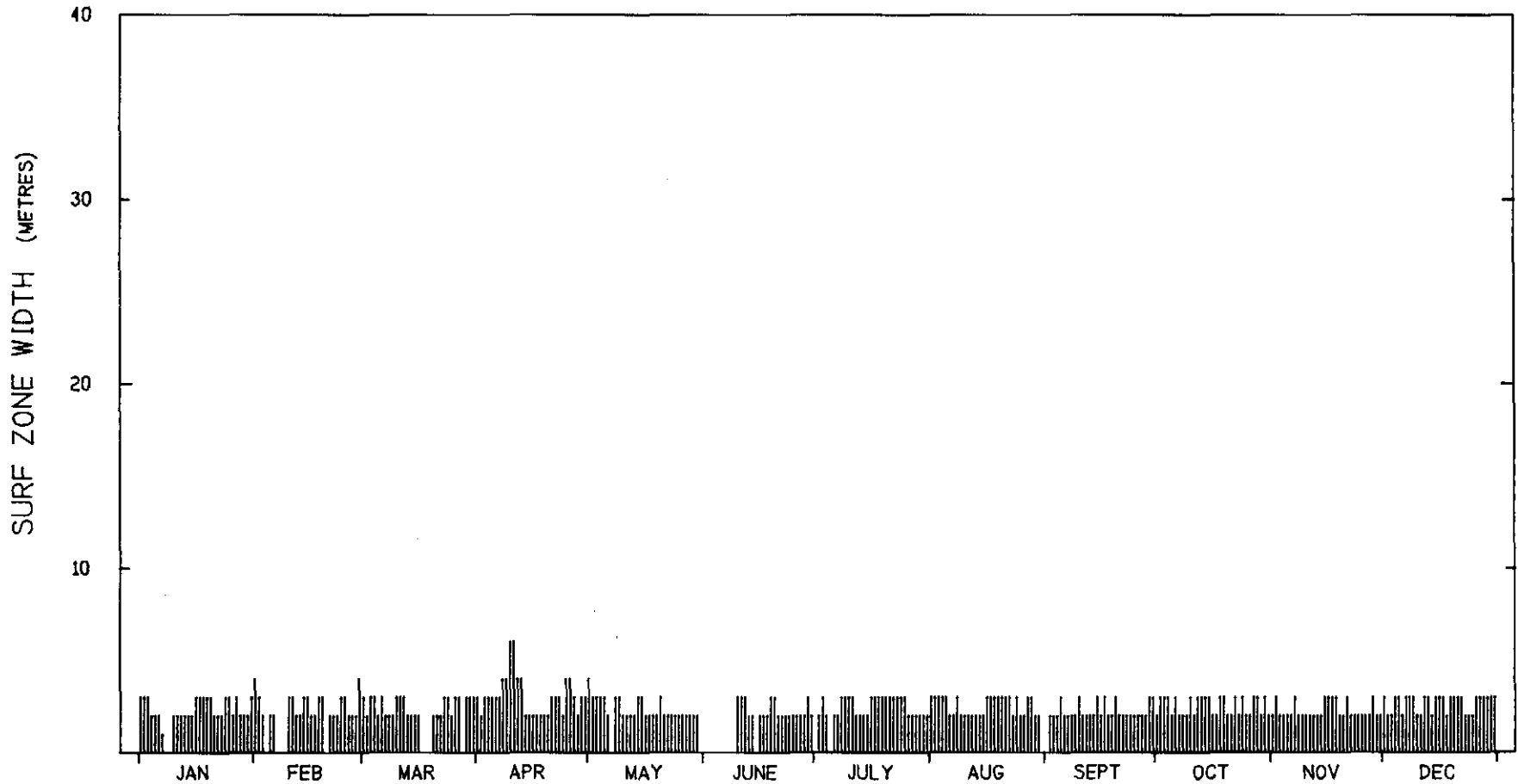
Figure 6  
C 03.1

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PROGRAMME ENGINEERING

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SURF ZONE WIDTH SUMMARY - 1976

AFTERNOON OBSERVATIONS

NO. OF VALUES 355

MEAN SURF ZONE WIDTH 2.4 M



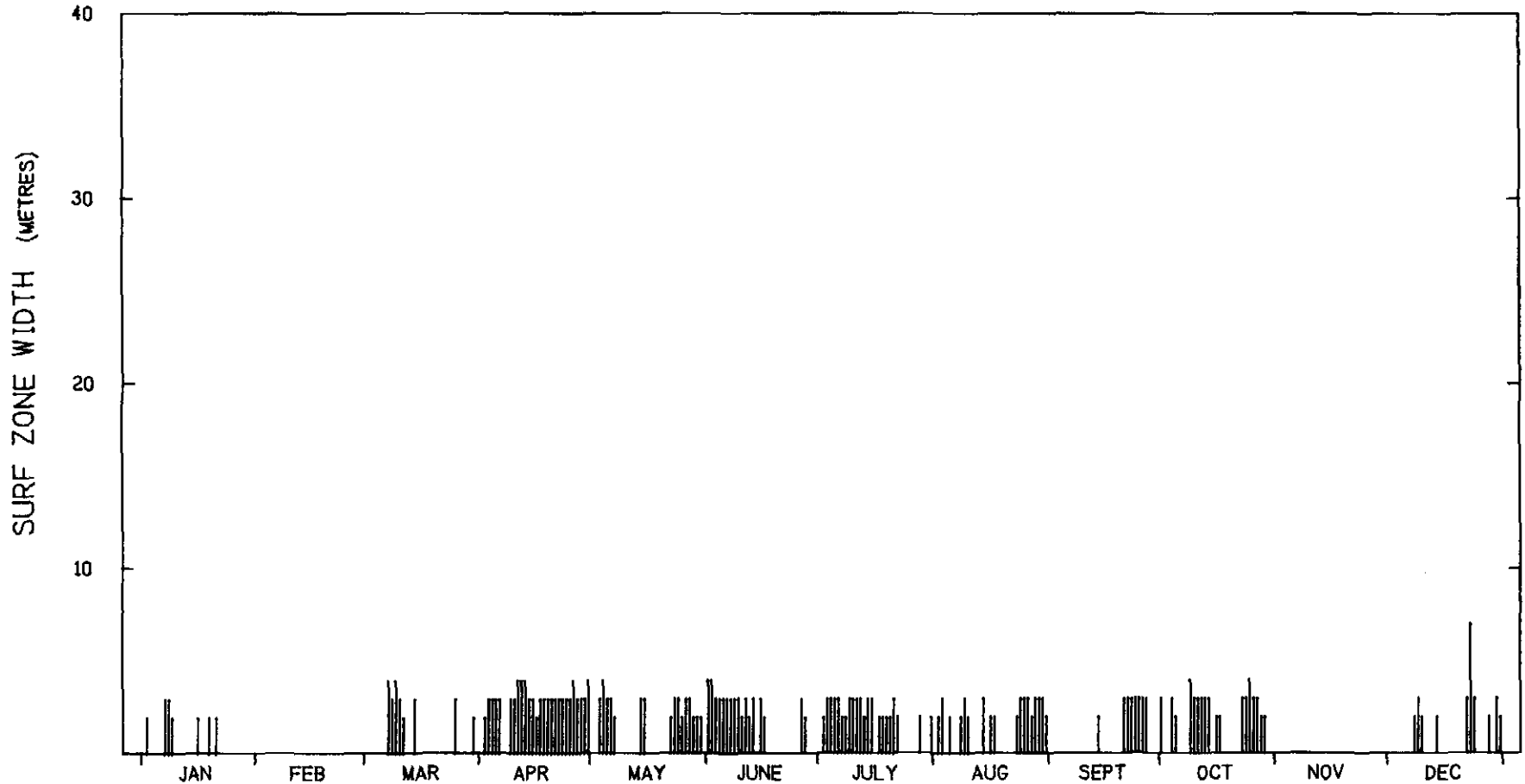
SURF ZONE WIDTH - MORNING 1977

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FLYING FISH POINT ..

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SURF ZONE WIDTH SUMMARY - 1977

MORNING OBSERVATIONS

NO. OF VALUES 280

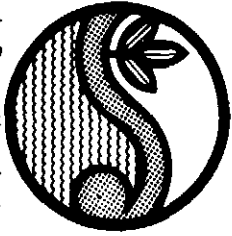
MEAN SURF ZONE WIDTH 1.5 M

COPE

Flying Fish Point

Figure 7

C 03.1



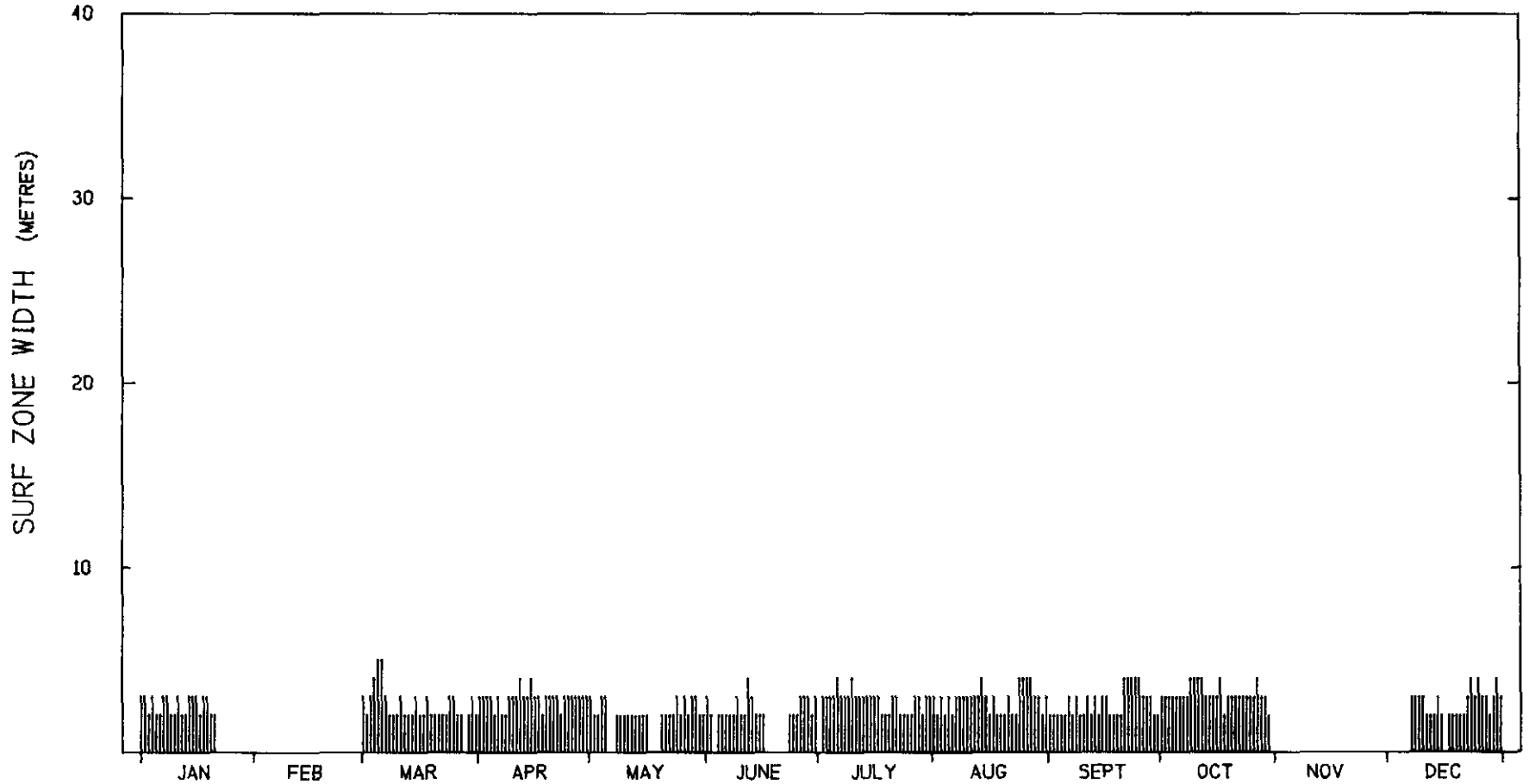
SURF ZONE WIDTH - AFTERNOON 1977

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SURF ZONE WIDTH SUMMARY - 1977

AFTERNOON OBSERVATIONS

NO. OF VALUES 284

MEAN SURF ZONE WIDTH 2.6 M

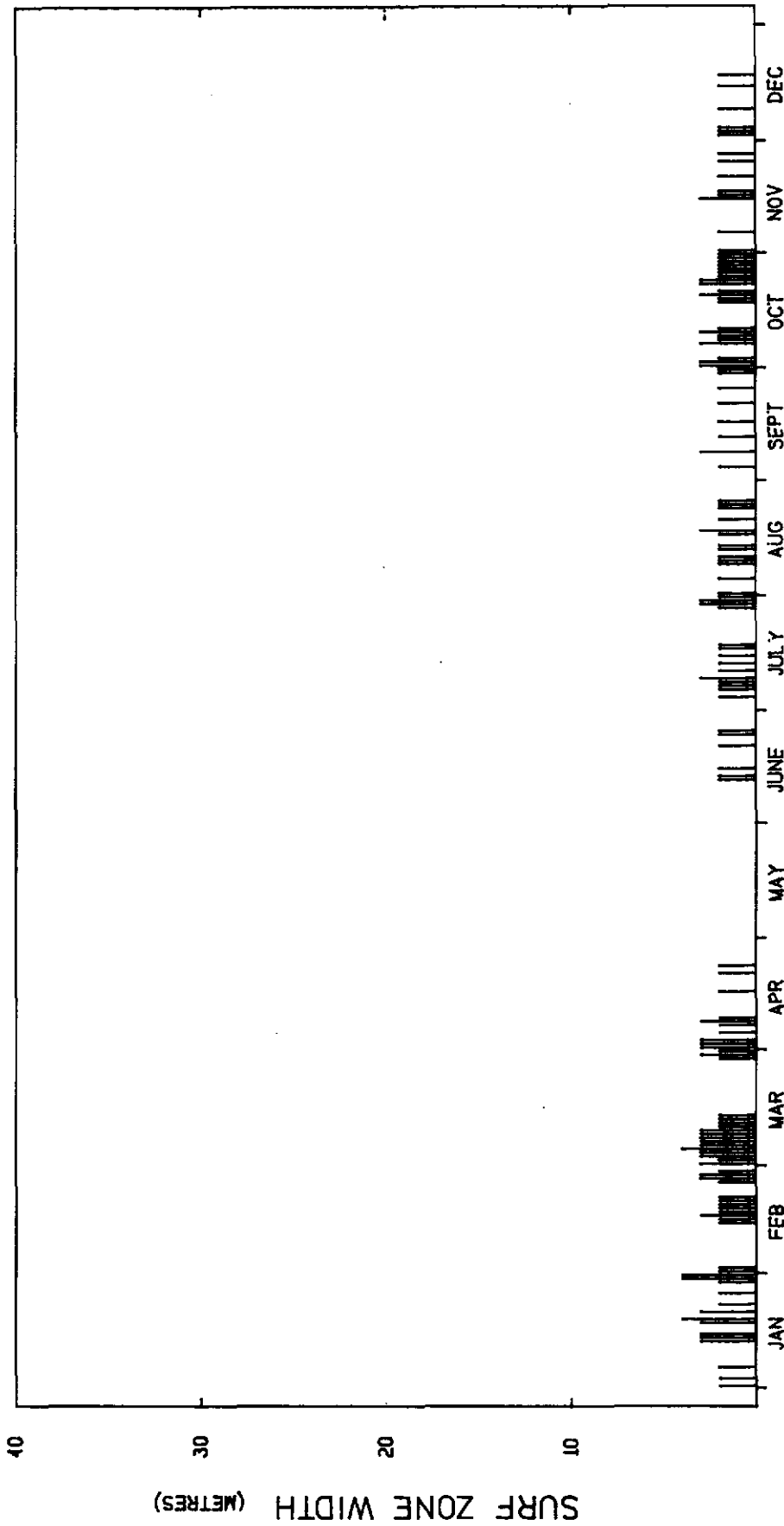
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Flying Fish Point

Figure 8

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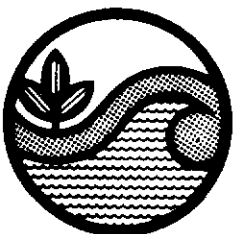


SURF ZONE WIDTH SUMMARY - 1978

MORNING OBSERVATIONS

NO. OF VALUES 327

MEAN SURF ZONE WIDTH .9 M



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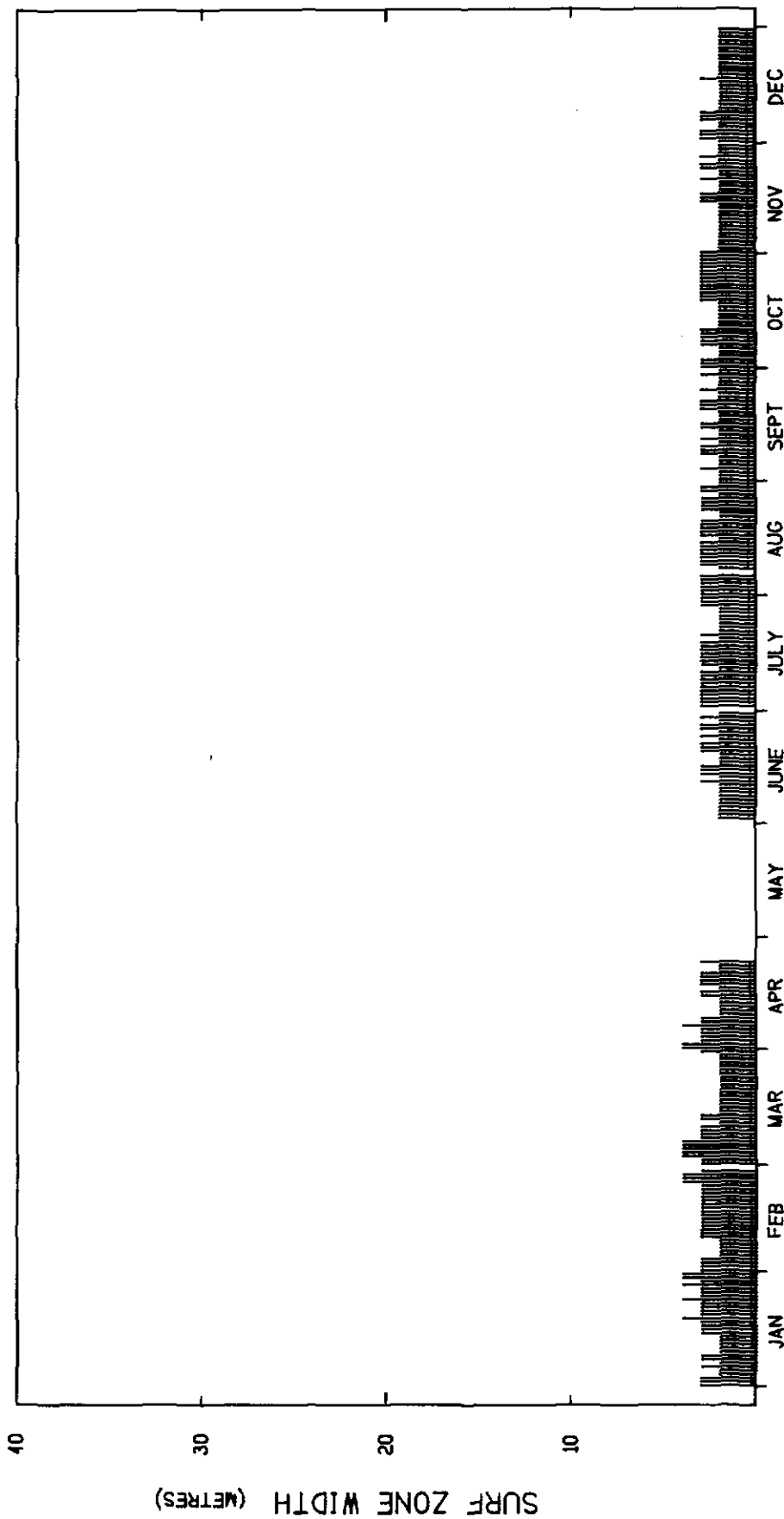
SURF ZONE WIDTH - MORNING 1978

COPE  
Flying Fish Point

Figure 9  
C 03.1



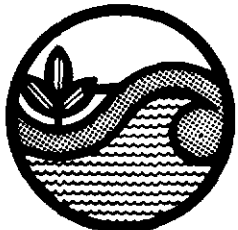
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**SURF ZONE WIDTH SUMMARY - 1978**  
AFTERNOON OBSERVATIONS

NO. OF VALUES 327

MEAN SURF ZONE WIDTH 2.6 M

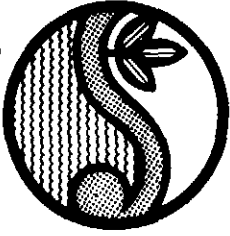


Beach Protection Authority

**SURF ZONE WIDTH - AFTERNOON 1978**

COPE  
Flying Fish Point

**Figure 10**  
C 03.1



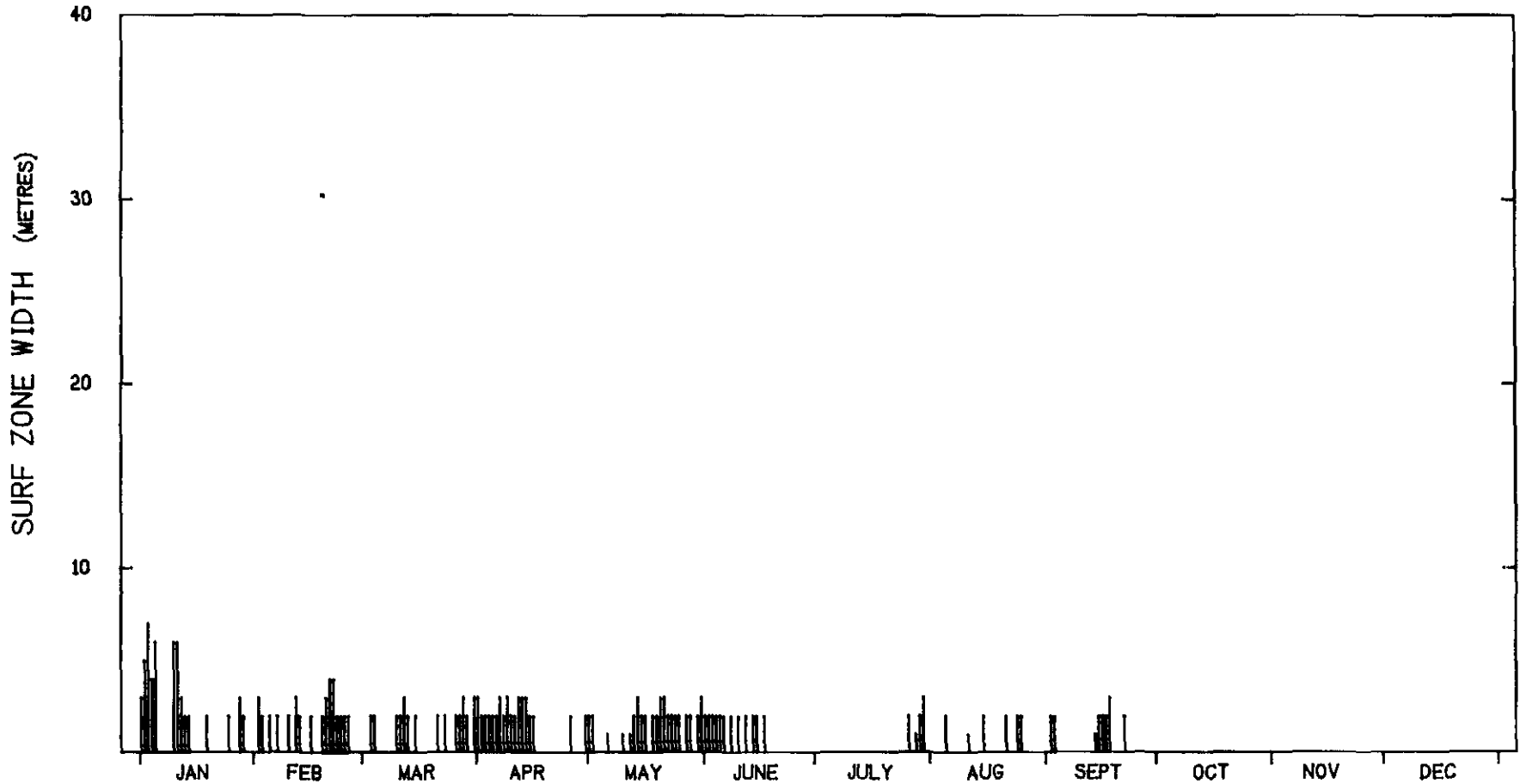
SURF ZONE WIDTH - MORNING 1979

COPE - COASTAL OBSERVATION PROGRAMME ENGINEERING

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SURF ZONE WIDTH SUMMARY - 1979

MORNING OBSERVATIONS

NO. OF VALUES 211

MEAN SURF ZONE WIDTH 13 M

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Figure 11

C 03. 1



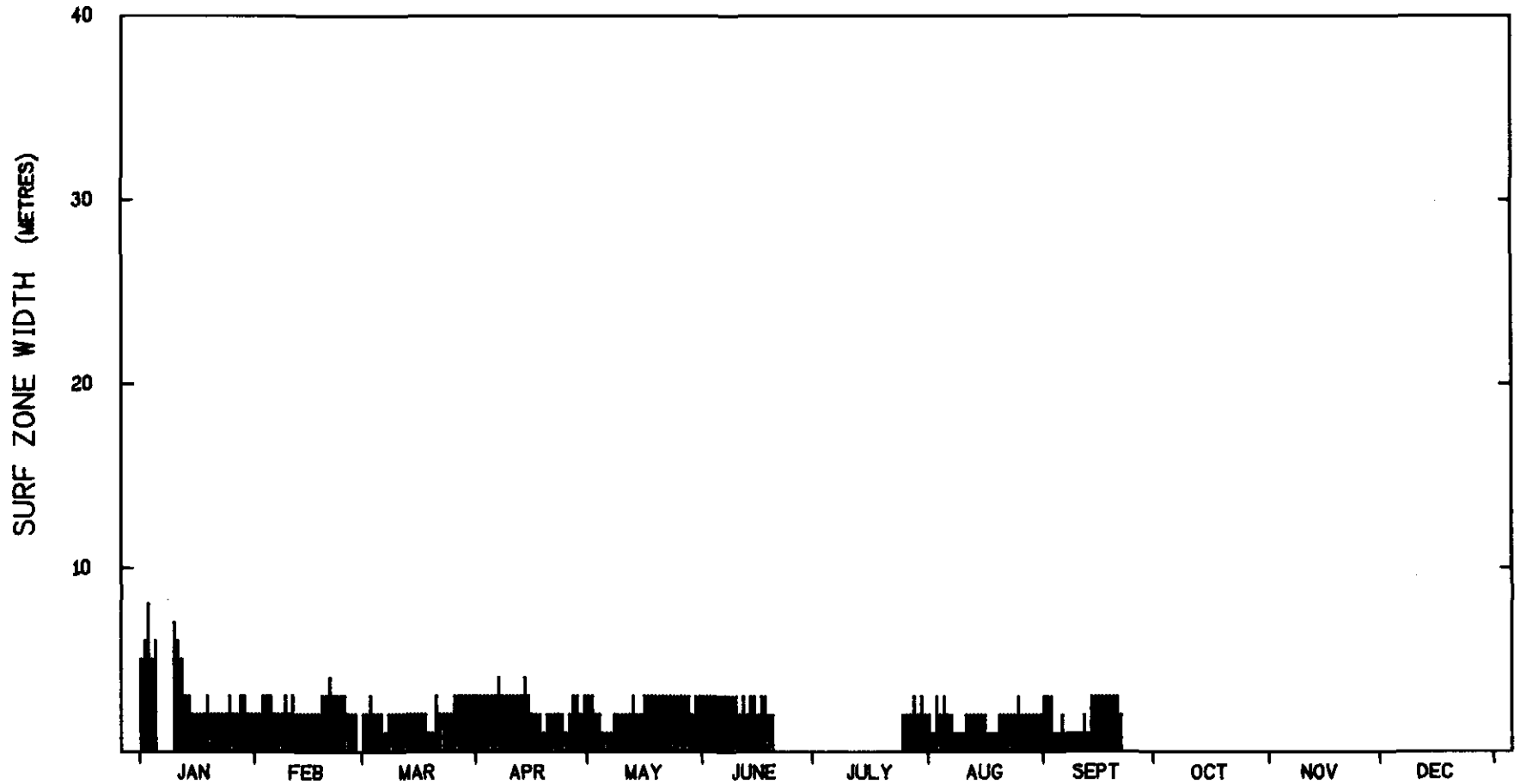
SURF ZONE WIDTH - AFTERNOON 1979

COPE - COASTAL OBSERVATION PROGRAMME ENGINEERING

FLYING FISH POINT ..

JOHNSTONE SHIRE ....

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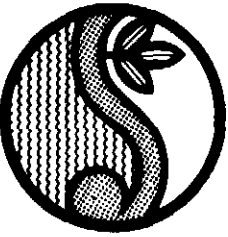
SURF ZONE WIDTH SUMMARY - 1979  
AFTERNOON OBSERVATIONS

NO. OF VALUES 228

MEAN SURF ZONE WIDTH 2.5 M

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Flying Fish Point

Figure 12  
C 03.1



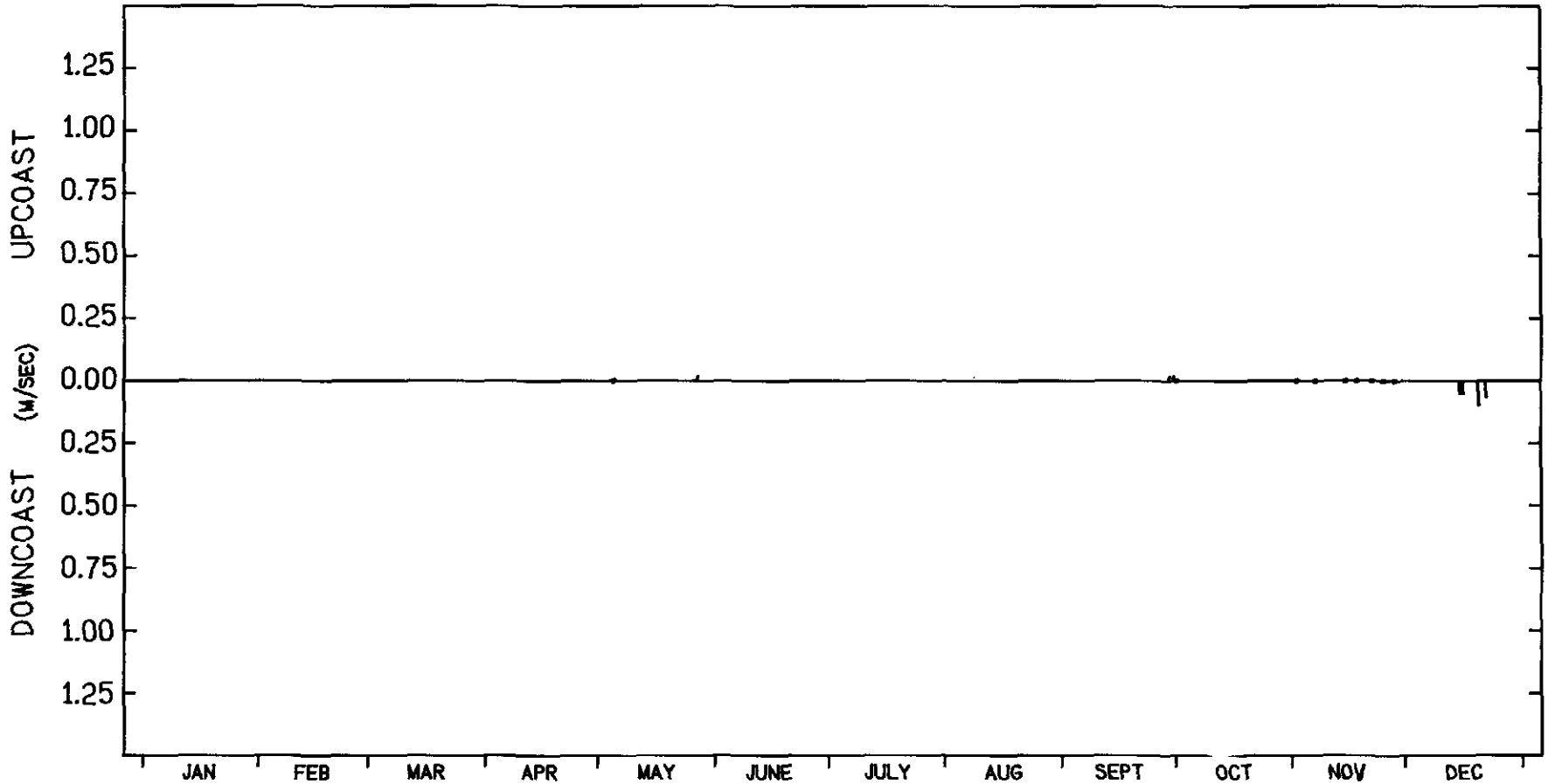
LITTORAL CURRENTS - MORNING 1976

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JOHNSTONE SHIRE ....

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LITTORAL CURRENT SUMMARY - 1976

NO OF VALUES 16    MEAN VEL -.014 M/SEC DOWN    MEAN UP COAST VEL .017 M/SEC  
 MORNING OBSERVATIONS

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Flying Fish Point

Figure 13

C 03.1



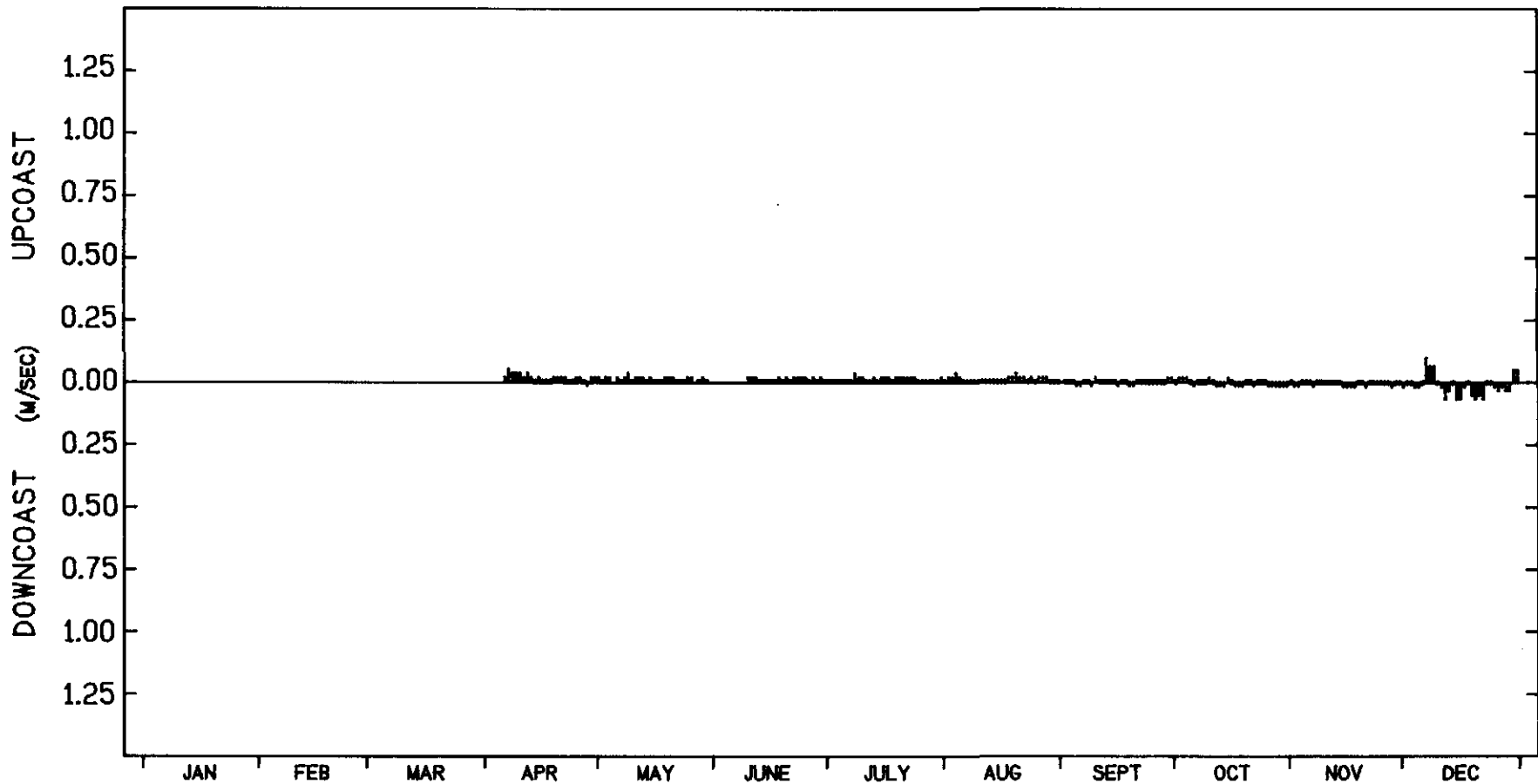
LITTORAL CURRENTS - AFTERNOON 1976

COPE - COASTAL OBSERVATION PROGRAMME ENGINEERING

JOHNSTONE SHIRE ....

FLYING FISH POINT

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LITTORAL CURRENT SUMMARY - 1976

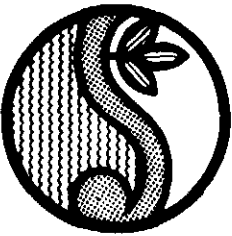
NO OF VALUES 257    MEAN VEL .002 M/SEC UP    MEAN UP/COAST VEL .022 M/SEC  
 AFTERNOON OBSERVATIONS

COPE

Flying Fish Point

Figure 14

C 03.1



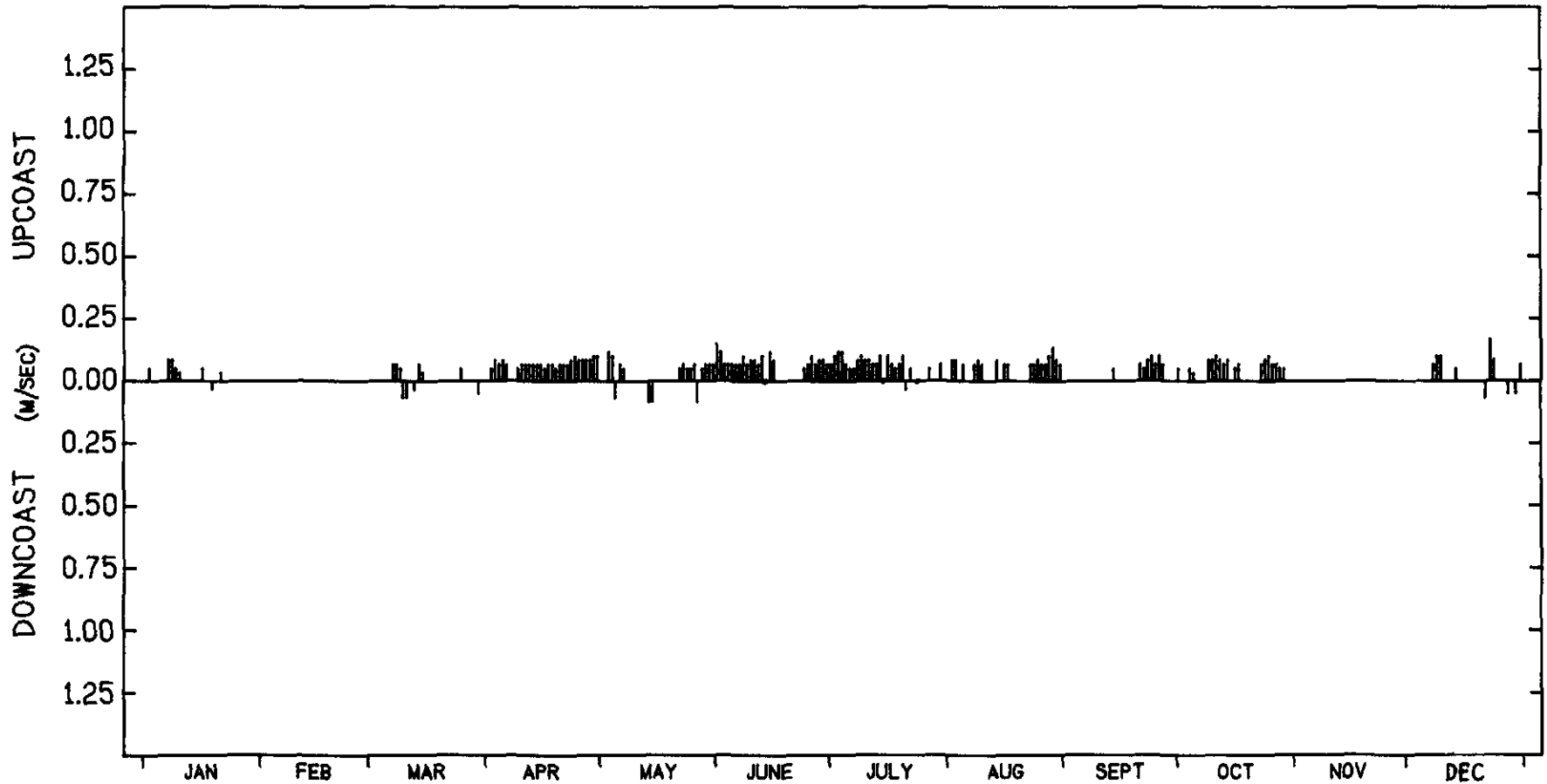
LITTORAL CURRENTS - MORNING 1977

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JOHNSTONE SHIRE ....

FLYING FISH POINT

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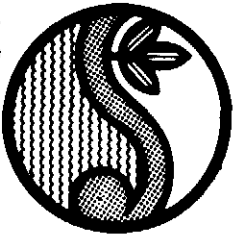


LITTORAL CURRENT SUMMARY - 1977

NO OF VALUES 164    MEAN VEL .062 M/SEC UP    MEAN UP COAST VEL .074 M/SEC  
 MORNING OBSERVATIONS

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Flying Fish Point

Figure 15  
C 03.1



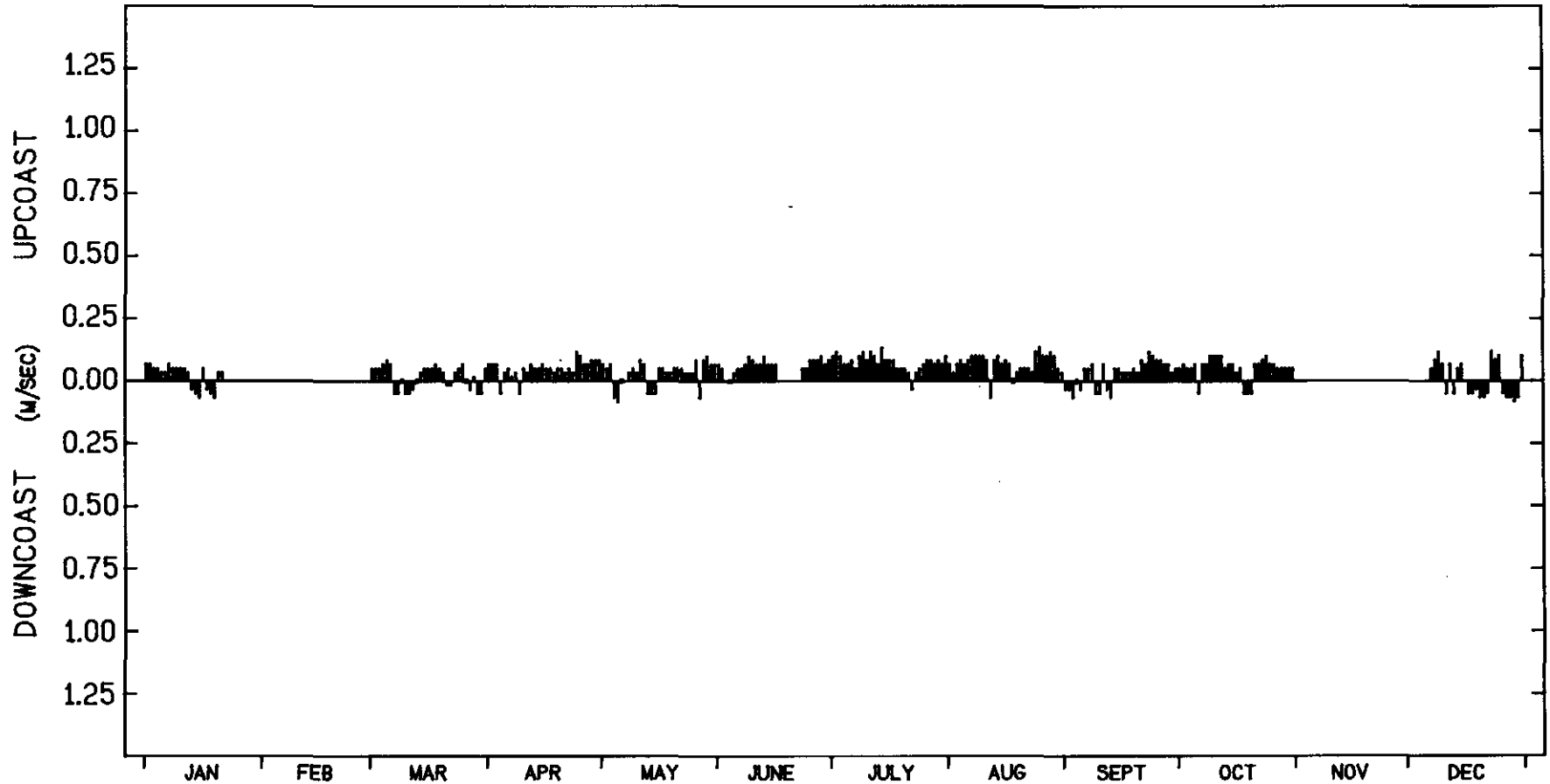
LITTORAL CURRENTS - AFTERNOON 1977

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FLYING FISH POINT

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LITTORAL CURRENT SUMMARY - 1977

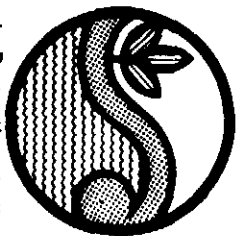
NO OF VALUES 283    MEAN VEL .043 M/SEC UP    MEAN UP COAST VEL .065 M/SEC  
 AFTERNOON OBSERVATIONS

COPE

Flying Fish Point

Figure 16

C 03.1



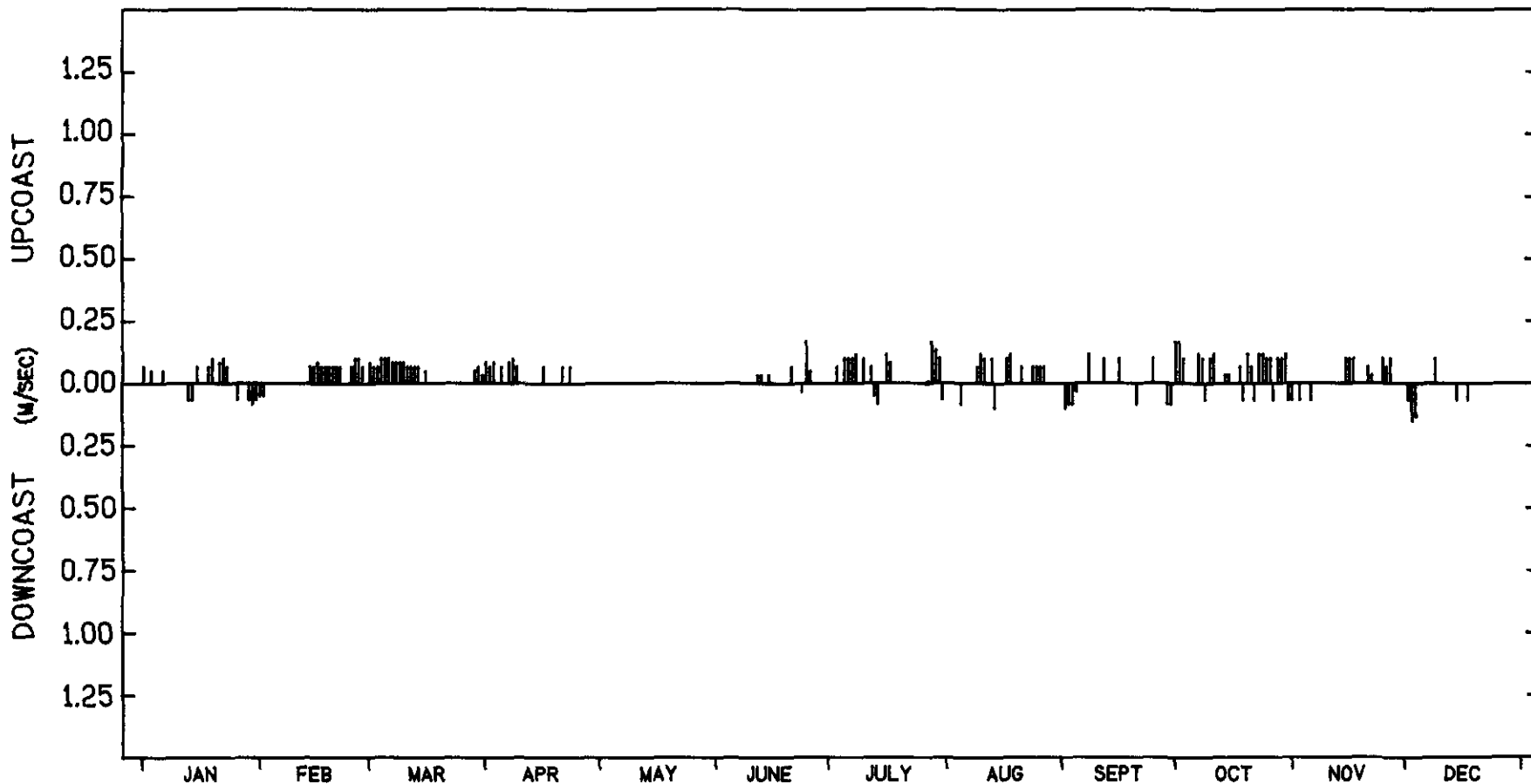
LITTORAL CURRENTS—MORNING 1978

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PROGRAMME ENGINEERING

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LITTORAL CURRENT SUMMARY - 1978

NO OF VALUES 146    MEAN VEL .047 M/SEC UP    MEAN UP COAST VEL .084 M/SEC  
MORNING OBSERVATIONS

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Flying Fish Point

Figure 17

C 03.1





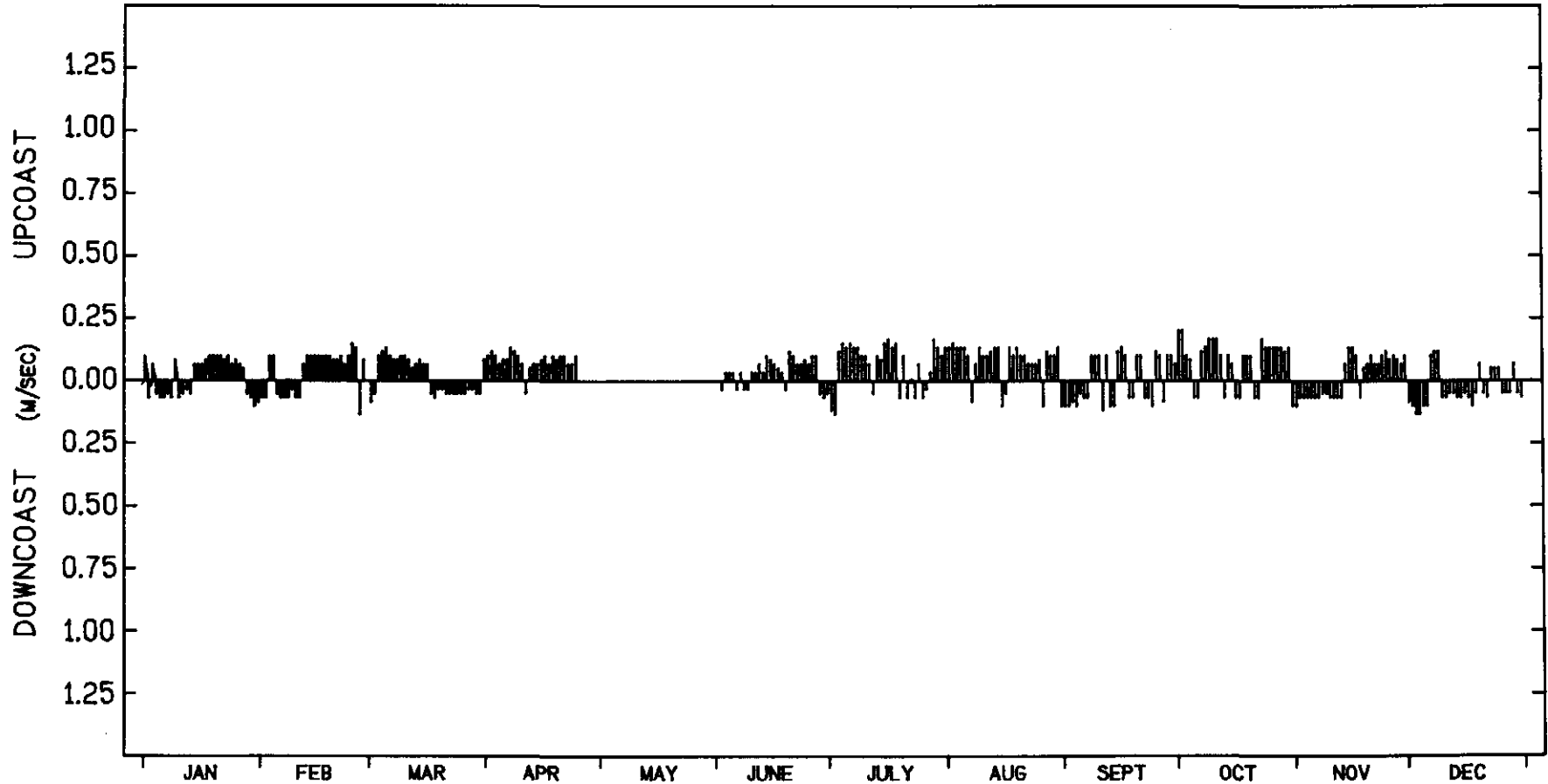
LITTORAL CURRENTS - AFTERNOON 1978

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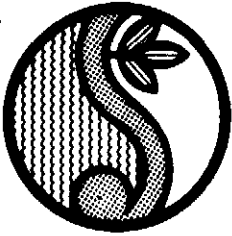


LITTORAL CURRENT SUMMARY - 1978

NO OF VALUES 327    MEAN VEL .035 M/SEC UP    MEAN UPCOAST VEL .097 M/SEC  
 AFTERNOON OBSERVATIONS

Figure 18  
C 03.1

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Flying Fish Point



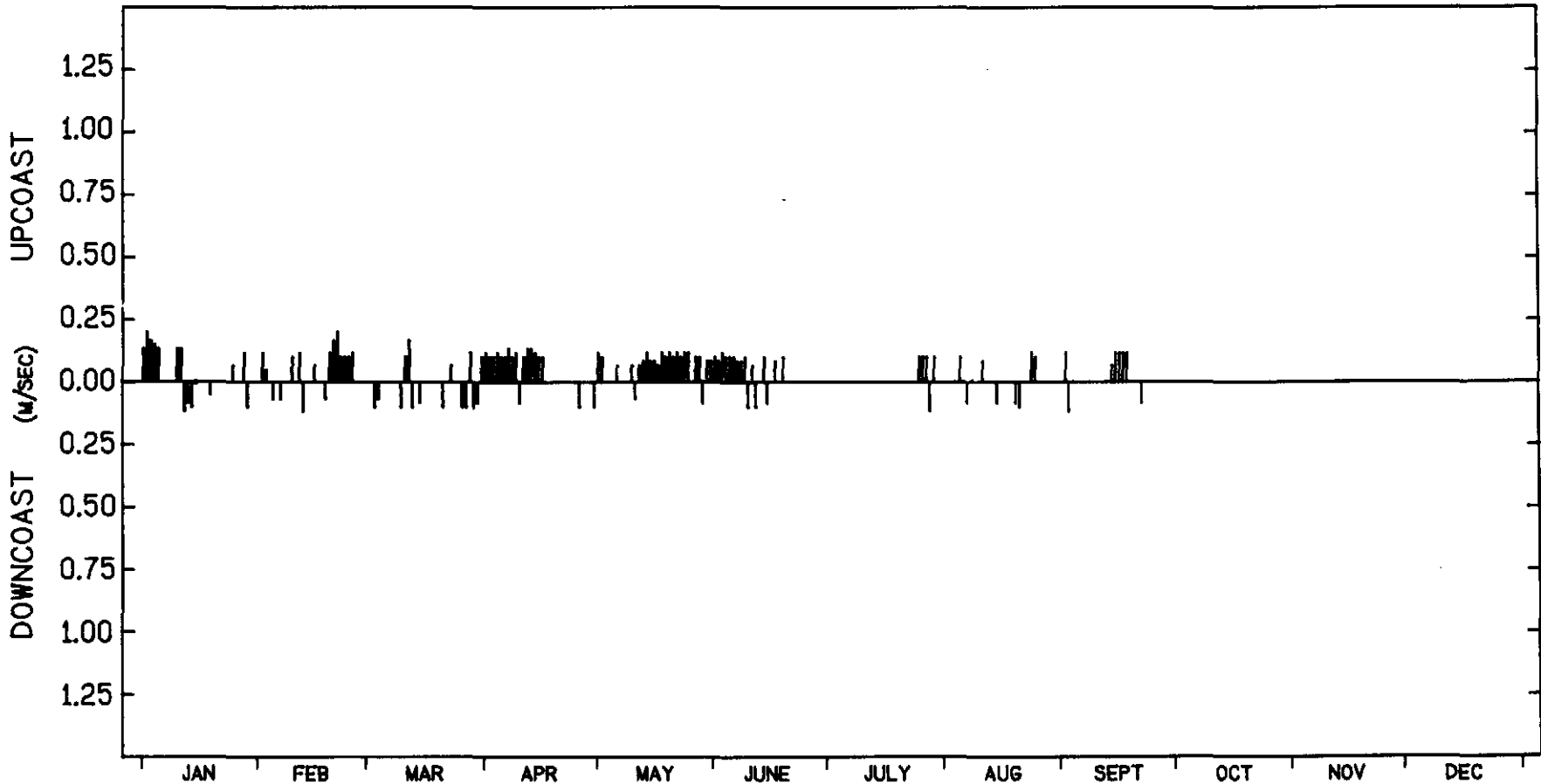
LITTORAL CURRENTS — MORNING 1976

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JOHNSTONE SHIRE ....

FLYING FISH POINT

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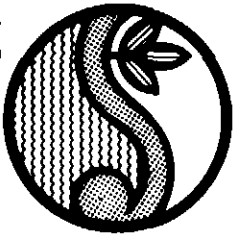


LITTORAL CURRENT SUMMARY - 1979

NO OF VALUES 125    MEAN VEL .052 M/SEC UP    MEAN UPCOAST VEL .106 M/SEC  
 MORNING OBSERVATIONS

COPE  
Flying Fish Point

Figure 19  
C 03.1



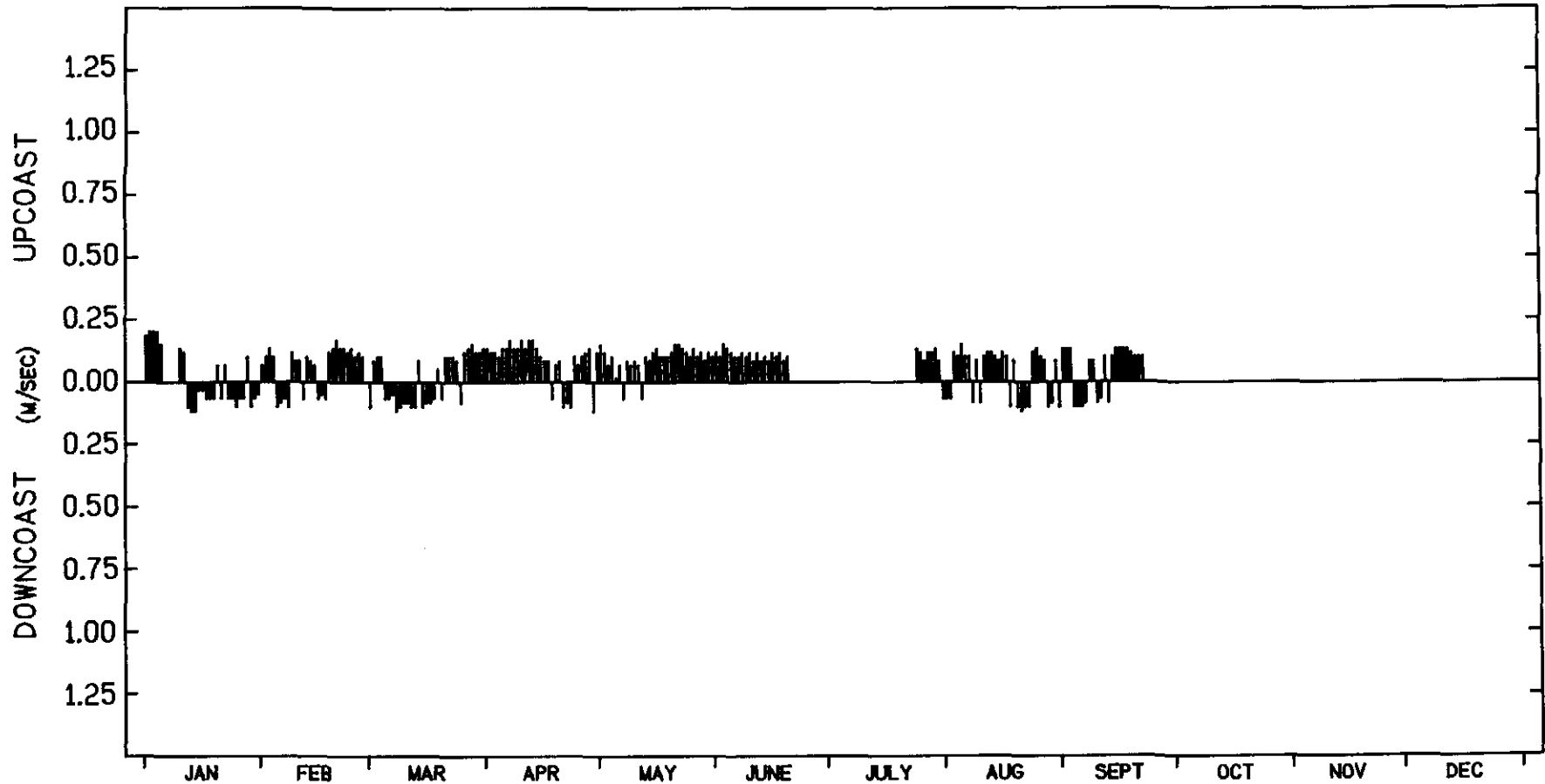
LITTORAL CURRENTS - AFTERNOON 1979

COPE - COASTAL OBSERVATION PROGRAMME ENGINEERING

JOHNSTONE SHIRE ....

FLYING FISH POINT

2902



LITTORAL CURRENT SUMMARY - 1979

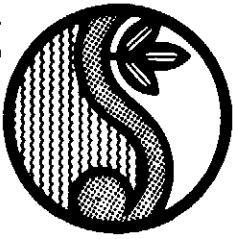
NO OF VALUES 228    MEAN VEL .053 M/SEC UP    MEAN UP COAST VEL .111 M/SEC  
 AFTERNOON OBSERVATIONS

COPE

Flying Fish Point

Figure 20

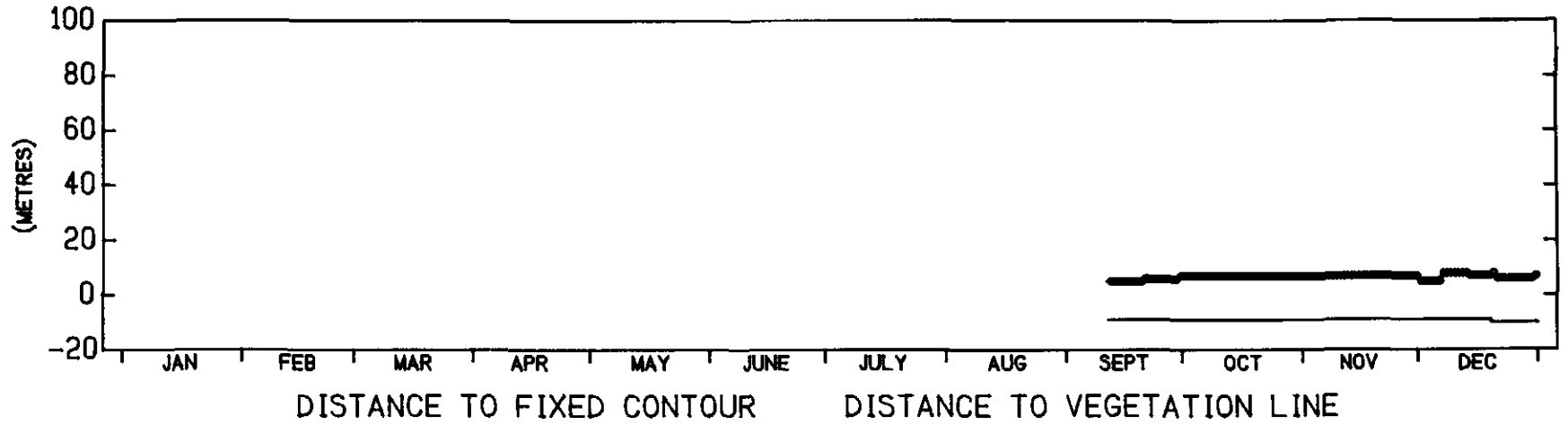
C 03.1



BEACH PROFILE PARAMETERS — 1976

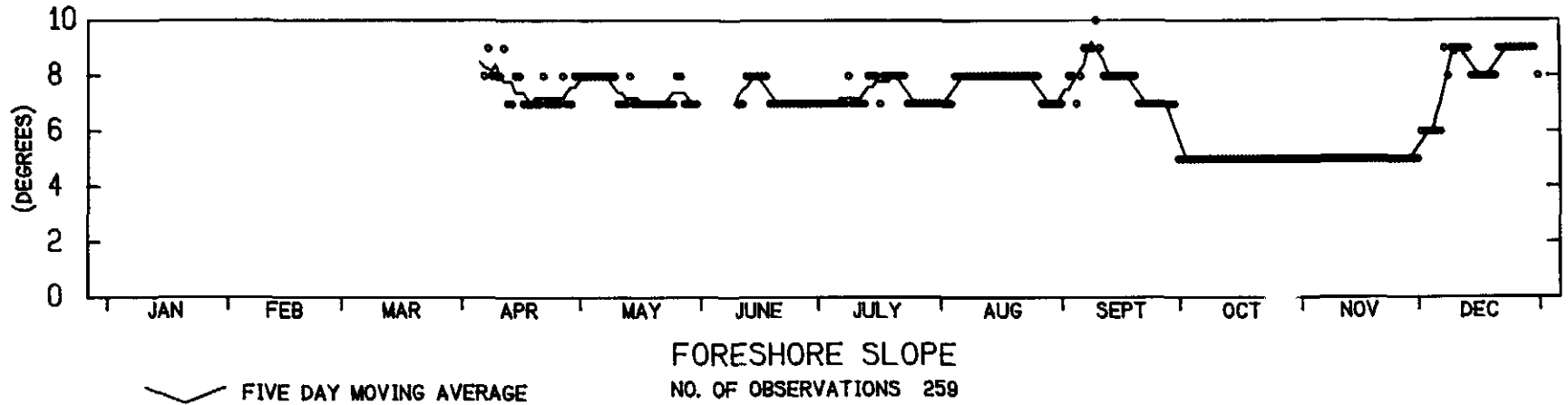
COPE - COASTAL OBSERVATION  
PROGRAMME ENGINEERING

JOHNSTONE SHIRE .... FLYING FISH POINT 2802 YEAR : 1976



..... INDICATES DISTANCE TO FIXED CONTOUR : 111 OBSERVATIONS  
— INDICATES VEGETATION LINE : 111 OBSERVATIONS

FIXED CONTOUR LEVEL IS .9 M ABOVE MSL



COPE  
Flying Fish Point

Figure 21  
C 03.1



BEACH PROFILE PARAMETERS—1977

COPE - COASTAL OBSERVATION  
PROGRAMME ENGINEERING

JOHNSTONE SHIRE ..... FLYING FISH POINT 2802 YEAR : 1977

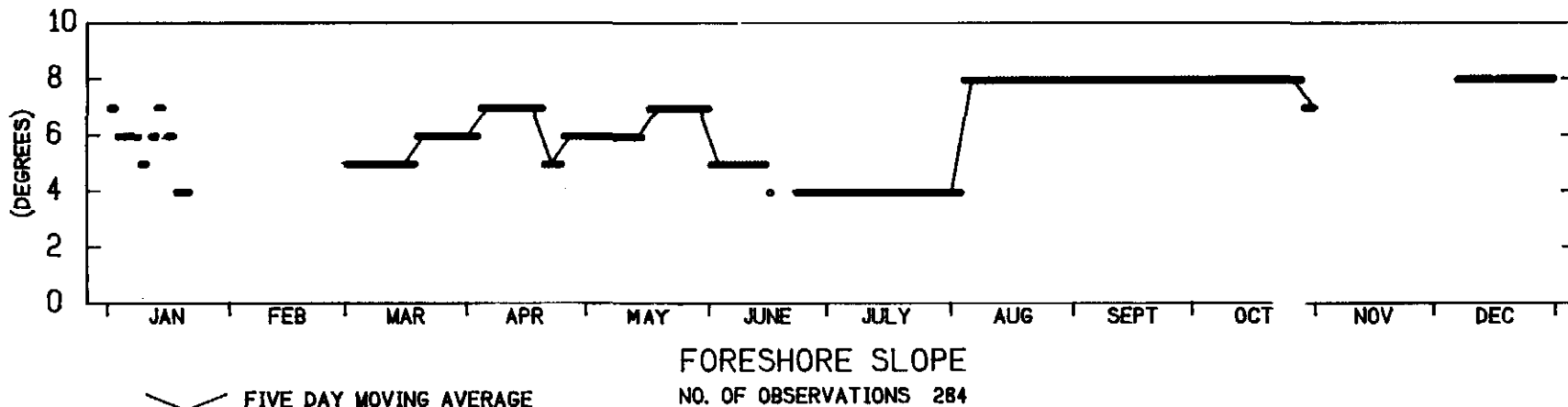
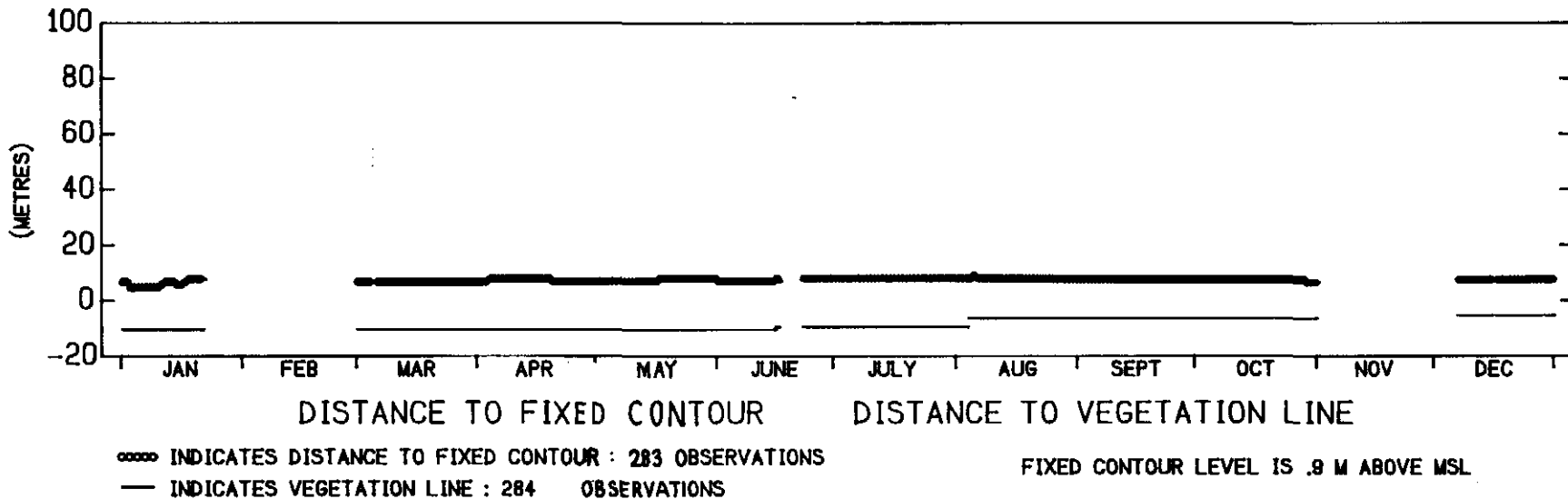


Figure 22  
C 03.1

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Flying Fish Point

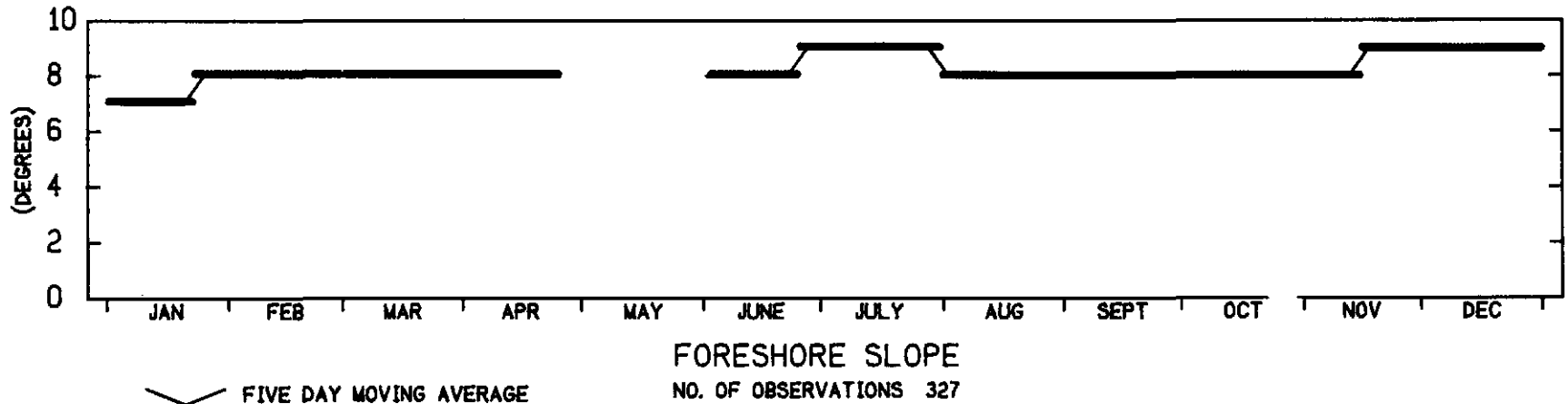
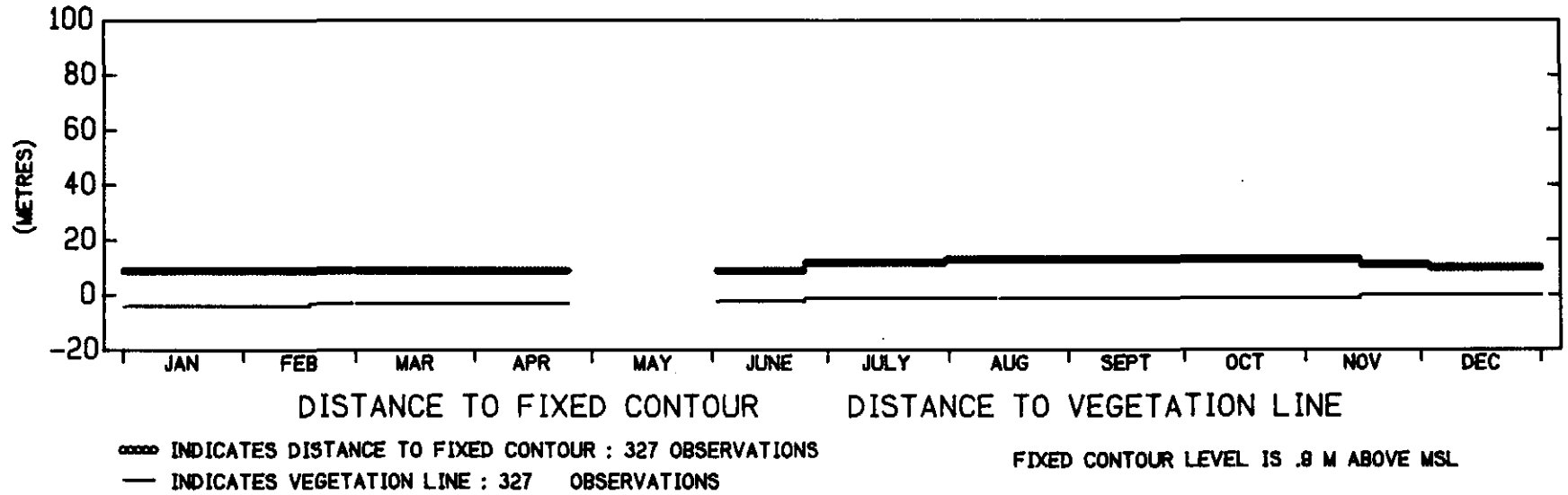


BEACH PROFILE PARAMETERS — 1978

COPE - COASTAL OBSERVATION  
PROGRAMME ENGINEERING

JOHNSTONE SHIRE .... FLYING FISH POINT .. 2802

YEAR : 1978



COPE

Flying Fish Point

Figure 23

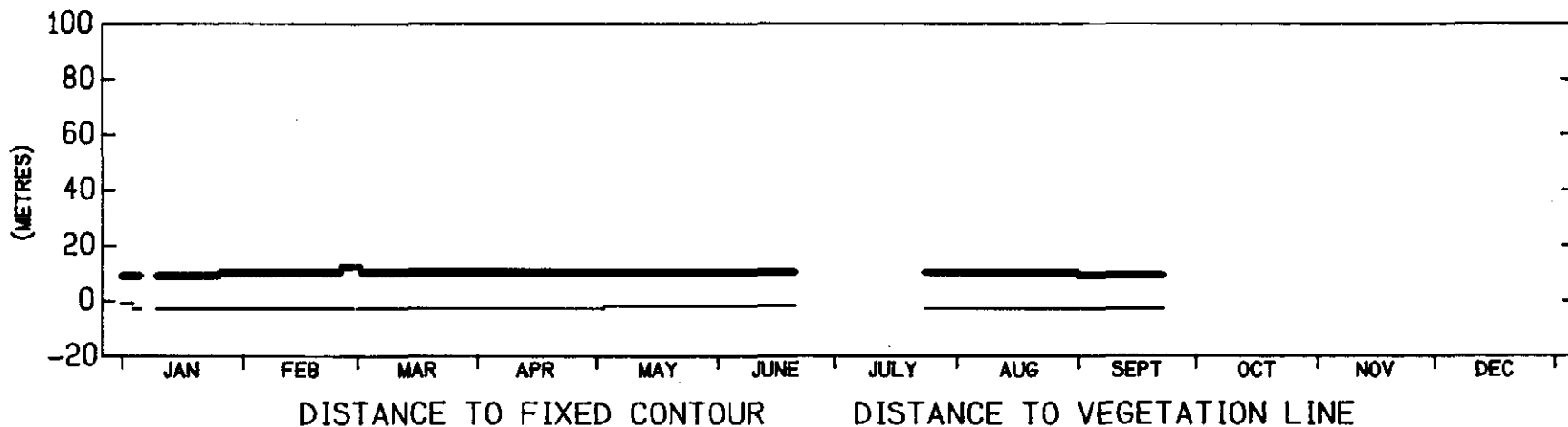
C 03.1



BEACH PROFILE PARAMETERS — 1979

COPE COASTAL OBSERVATION  
PROGRAMME ENGINEERING

JOHNSTONE SHIRE .... FLYING FISH POINT 2802 YEAR : 1979



oooo INDICATES DISTANCE TO FIXED CONTOUR : 228 OBSERVATIONS  
— INDICATES VEGETATION LINE : 228 OBSERVATIONS

FIXED CONTOUR LEVEL IS .9 M ABOVE MSL

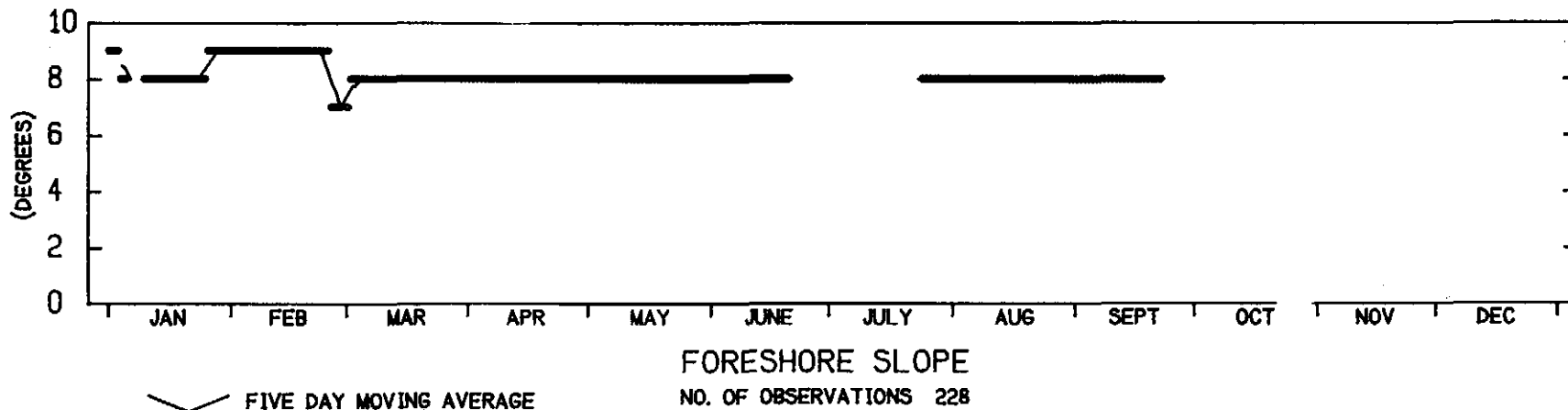


Figure 24  
C 03.1

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Flying Fish Point