Bull (1986)

REPORT ON THE 1985/86 SCALLOP SPAT SETTLEMENT STUDIES

- NELSON AREA

M F Bull

Challenger Fisheries Report No. 7
Ministry of Agriculture & Fisheries
NELSON

May, 1986.

REPORT ON THE 1985/86 SCALLOP SPAT SETTLEMENT STUDIES - NELSON AREA

Introduction

The programme of monitoring settlement of scallop spat in the Nelson area in the 1985/86 summer was a continuation of the work carried out in the previous four years. Once again the work was concentrated in Golden Bay as it has direct relevance to the scallop enhancement programme being carried out in that area. As in the previous year collectors were spread over a wide area to provide information on the distribution of spat settlement within Golden Bay and this year an attempt was also made to monitor settlement at four sites in Tasman Bay as it is planned that enhancement operations should be extended to cover that area in the 1986/87 summer. Again limited work was done on changes in gonad condition of adult scallops and abundance of scallop larvae so that in the event of settlement failure possible causes could be identified.

Methods

Seven of the eight sites used in Golden Bay in the 1984/85 summer were again used this year. The Wainui Bay site was however excluded because catches of scallop spat in that area had been poor during the previous three years and sampling at the site involved a considerable increase in steaming time.

The four sites used in Tasman Bay were chosen because of their potential suitability as commercial spat catching areas with consideration being given mainly to avoiding conflict with other users (e.g. trawling and shipping lanes), their proximity to port for servicing and the requirement for adequate depths for subsurface longline placement (Figure 2).

Each site was marked by a large windy buoy or pole buoy and two independent droppers marked only by small cray pot buoys were placed nearby. The droppers in Golden Bay were first placed in the water on 14.11.85 and serviced at approximately fortnightly intervals until their recovery on 16.4.86. Three of the Tasman Bay sites were also established on 14.11.85 but gear was not placed at site B until 10.1.86 as that site is in an area extensively fished by pair trawlers during November and December.

At each visit to the collector sites a Japanese spat bag consisting of 0.8 m of green mesh and 0.8 m of blue mesh was placed at between 2 m and 4 m from the bottom of each of the droppers. These bags were removed after approximately 10 weeks in the water and taken to the laboratory for spat counts to be made. At sites 1 and 7 in Golden Bay a plankton sample was taken using a WP2 drop net. Initially these samples were taken in the top 10 m of the water column but during a cruise of the research vessel Kaharoa in January it was found that there was a

concentration of bivalve larvae at the 10 - 15 m level and from 23.1.86 onwards the plankton net drops were extended to 15 m.

Each fortnight samples of 20 adult scallops (mostly H = 75-85) were taken from near collector sites 1 and 2 and surface and bottom temperatures plus surface salinities recorded for those sites. The scallop samples were frozen and sent to Nelson for measurement of gonad index (= wet weight of gonad divided by wet weight of their soft parts) and assessment of stage of development.

Most of the field work in Golden Bay was carried out by Mr R W Dawber of Parapara financed through Talleys Fisheries Fishing Industry Development Fund grant. The Tasman Bay collectors were serviced on a rather less regular basis by MAF Fisheries Officers during the course of their sea patrols. All samples were processed at the FMD laboratory in Nelson. The plankton samples were sieved through 120 and 150 micron sieves and counts were made of the larvae of Pecten novaezelandiae, Chlamys sp, Atrina zelandica and Perna canaliculus and the larvae of all other bivalves combined from material retained by each sieve. The spat bags were washed out and sieved through a 2 mm mesh (measured on the side). The Pecten and Perna spat retained on the sieve were then counted although in the case of large catches numbers were estimated by weighing and counting sub samples. The dominant size groups in each sample were noted.

Results

The seasonal pattern of gonad index was very similar at sites 1 and 2 with indication of a spawning peak in mid December and a larger peak in early - mid February (Figure 3). There was also apparently a small peak of spawning in early March. The relative abundance of scallop larvae in early December suggests there should also have been a spawning in early November but gonad sampling was not established early enough to detect this. The high numbers of large scallop larvae recorded in late January probably relates to spawning associated with the drop in gonad condition in mid December and the smaller peak in late March may relate to the apparent spawning in early - mid February. However replicate plankton samples taken on previous occasions indicate that the distribution of scallop larvae can be quite patchy and data from spat sampling as done on this occasion should not be pushed too far, the main purpose of the sampling being to indicate whether spawning had occurred in the event of a settlement failure. It was also hoped that the sampling would provide information on the spawning cycle of the horse mussel Atrina zelandica for which interest in commercial exploitation has recently been shown. Atrina larvae were in fact discovered in all samples collected after 21.2.86 with highest numbers being recorded in the samples taken on 6.3.86.

As in the previous year counts in excess of 1000 scallops per bag were made on at least one occasion at all sites in Golden Bay

except site 5 (Figure 4 and 5). The highest catch (4595) was made at site 1 on bags put in the water on 28 th November and at five of the sites catches in excess of 1000 spat per bag were made in bags put down on the 28.11.85 and 12.12.85. Catches over 2000 spat per bag were also made at sites 1 and 6 in bags put down on 21 February and at three of the other site catches over 1000 per bag were made at this time.

The prime November - December spat catching period was largely missed in Tasman Bay due to the delayed placement of gear at site B and loss of gear at the other sites. A collector bag tied to the main marker buoy at site C in early December caught only 61 scallop spat but this does not fairly represent settlement at this time as there was no subsurface buoy on this line and the bag would have been considerably affected by wave movement and may possibly have laid on the seabed at low tide. The best catch made in Tasman Bay was 870 scallops in a bag placed at site D on 4 th March and best catches at sites B and C were also recorded in bags placed at this time (322 and 505 respectively).

At all the Golden Bay sites heavy mussel settlement (500 - 6000 per bag) occurred on collectors, placed on December 12 th and 28 th. The majority of these mussels were less than 5 mm in length when the collectors were recovered after 10 weeks in the water where as bags placed in mid January had mussel spat of 12 mm after ten weeks which suggests that the settlement must have occurred in early to mid January. At sites 1, 2 and 3 there was also a significant settlement of mussels on collector bags placed on or after February 21 st. Settlements after the end of February may well have remained undetected because of their small size and the use of the 2 mm sieve during processing of all samples.

During the 1984/85 spat sampling programme it was noted that there were large and apparently unexplainable differences in the catch of both Pecten and Perna spat in a few of the replicate spat bag pairs. This situation was even more pronounced in Golden Bay this year with in over 50% of cases the scallop catch in one bag of a replicate pair being less than a third of the catch in the other. Because of this great variation maximum catches rather than mean catches have been used in discussing settlement success and seasonality (figures 4 - 7). In Tasman Bay the catches of scallop spat were more uniform with nine of the ten replicates having a within-pair difference of less than 40% but the potential for variation noted clearly demonstrates the need for caution in interpreting results from limited sampling of this nature.

Discussion

Catches of scallop spat at the Golden Bay sites during November and December were of a similar size to those in the 1984/85 season but the January catches were considerably lower (see table 1). It was noted in late January that the bulk lot of collectors

at site 1 were covered in 'slime' (end product of an algal bloom) and if this fouling had occurred over a wide area it could explain the poor settlement recorded for the January collectors. As in previous years catches from February onwards were low although maximum catches in collectors placed at sites 1 and 6 in late February were respectively 2125 and 3727 spat per bag. There is some evidence of late settlements of a significant size having occurred in previous years (e.g. the settlement of spat in pearl nets placed in the water on 12.3.85) but big settlements after January appear to be more hit and miss than in the November - January period.

The good catches made in November during the last three years suggests that significant spawnings must occur from at least October onwards and raises the possibility of attempting to make commercial spat catches in November. In the last three years collectors placed in the water in November have caught fewer mussels than those placed in December but this advantage would have to be weighed against possible problems associated with harvesting the catch in the January - February period which is the hottest period of the year.

Surface and bottom temperatures at site 1 are shown in figure 8. As in the previous year peak temperatures occurred in early February and this years temperatures were very similar to last year. Scallops were again in very good condition this summer and recent MAF dredging surveys indicate that the stock of adult scallops in the bay has continued to increase in size (at least a three fold increase in scallops over 80 mm length occurred between February 1985 and January 1986). While this increase in spawning capacity did not result in an increase in settlement success in the collectors it will be interesting to see if it leads to improved recruitment on the wild beds. The January 1986 dredging survey indicated very poor natural recruitment in Golden bay during the 1984/85 summer despite the wide spread settlement in collector bags and gives further support to the theory that recruitment in Golden Bay may be largely limited by lack of available settlement surfaces and subsequent survival rather than availability of scallop larvae.

This summers repeat of last years successful spat catching over a wide area gives further support to the possibility of enhancing scallop recruitment by placing artificial settlement materials around Golden Bay on a rotational basis but a decision to shift to this method for future enhancement operations will depend on the results of studies currently being carried out on the cost effectiveness of this and other techniques.

The results obtained from the Tasman Bay collectors this summer were rather inconclusive due to the peak November - January settlement period being largely missed. However the indication of settlements in excess of 250 spat per bag at three of the four sites in the off peak period suggests that any one of these sites could be suitable. Final choice of a site for placement of bulk

catching material in the 1986/87 summer will depend on other considerations such as the potential navigational hazard, the sub strata type and the proximity to port.

Future directions of the scallop spatfall monitoring programme

The five years funding of the spatfall monitoring programme by the Fishing Industry Development Grant awarded to Talleys Fisheries has now expired and there is a need to review those parts of the programme that must be continued for the scallop enhancement project to operate effectively. We have now built up a good picture of the seasonality of spat settlement in Golden Bay and shown that spat in at least some years high levels of spat settlement can be obtained over a wide area. It is necessary however to keep some monitoring going so that in the event of a spat catching failure in the collectors placed at site 1 for the enhancement project we will know whether there has been a total failure or if the failure was only at the time of placement of the bulk collectors. Likewise it will be important to know whether a failure has resulted from lack of spawning or some other factor and for this reason it is considered necessary to continue with the gonad condition work at site 1 at least until it has been established that a settlement has occurred in the bulk lot of collectors. It is therefore proposed that spat bags should be placed at site 1 on a fortnightly basis for 1 st November 1986 until the end of March 1987 and that samples of adult scallops should be taken from the area for conditions analysis from at least early October until mid January. Work at other sites in Golden Bay would be discontinued.

It is likely that one of the Tasman Bay sites will be chosen by the scallop enhancement team as an area for placement of ten longlines carrying xmas tree mussel rope for settlement and natural release of scallop spat this summer. The success of this trial will be assessed by dive survey work but it will be necessary to relate settlement levels seen on the ropes and on the seabed to the level of settlement previously obtained in Golden Bay and it will therefore be necessary to place test collector bags in the water along side the xmas tree rope equipment during the whole settlement period. It is therefore proposed that test collector bags should be placed in the water on a fortnightly basis at the chosen site from 1 st November 1986 until mid March 1987. Further it is recognised that we have minimal information on the location of suitable spat collecting sites in Tasman Bay and it is proposed that collector bags should be placed on a fortnightly basis at three other sites during the main settlement period (i.e. 1 st November to mid January).

In light of the great variation in catches made in replicate spat bags this summer it is recommended that the number of droppers at each site be increased from two to four.

Acknowledgements

This year preparation of equipment, all the drafting and most of the laboratory work associated with this study was carried out by Tony Moore for FMD. Mr Hosoya and Mr Ishiyama of OFCF assisted with plankton counts and gonad condition analysis. The Tasman Bay sites were serviced by local Fisheries Officers and the Golden Bay sites were serviced mainly by Mr R Dawber on behalf of Talleys Fisheries. Thanks are due to all these people and also to the Directors of Talleys Fisheries for aiding the research on scallop recruitment and settlement by their assistance with the scallop enhancement project and their direction of the Fishing Industry Development grant awarded to their company towards the five year spatfall monitoring trial now completed.

Figure 1 Location of the seven spat catching stations in Golden Bay (no's 1 - 7) and two stations for collection of scallops for gonad condition analysis (A and B).

Figure 2 Location of stations in Tasman Bay.

Figure 3 Top: Abundance of Pecten and other bivalve larvae in samples collected at site 1.

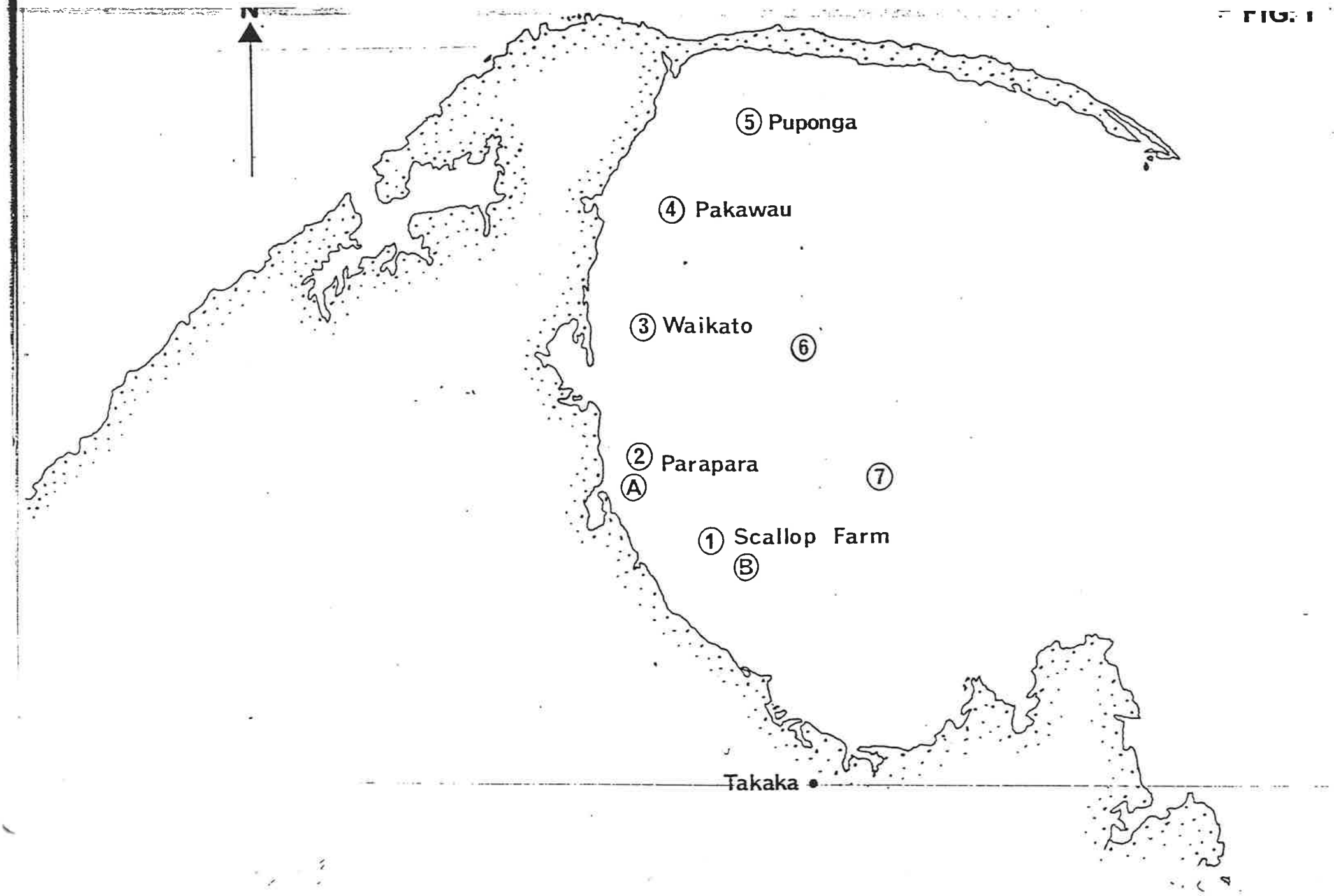
Middle: Abundance of Pecten and other bivalve larvae in samples collected at site 7.

Bottom: Seasonal variation in gonad index (weight of gonad/weight of other soft parts) for scallops taken near sites 1 and 2.

Figures 4 and 5 Maximum recorded catches of Pecten spat in collector bags placed at seven sites in Golden Bay on a fortnightly basis and recovered after ten weeks in the water.

Figures 6 and 7 Maximum recorded catches of mussel spat (Perna) in collector bags placed at seven sites in Golden Bay on a fortnightly basis and recovered after ten weeks in the water.

Figure 8 Surface and bottom temperatures recorded at site 1 in Golden Bay during the 1985/86 summer.


N
⑤ Puponga
④ Pakawau
③ Waikato
⑥
② Parapara
Ⓐ
⑦
① Scallop Farm
Ⓑ
Takaka

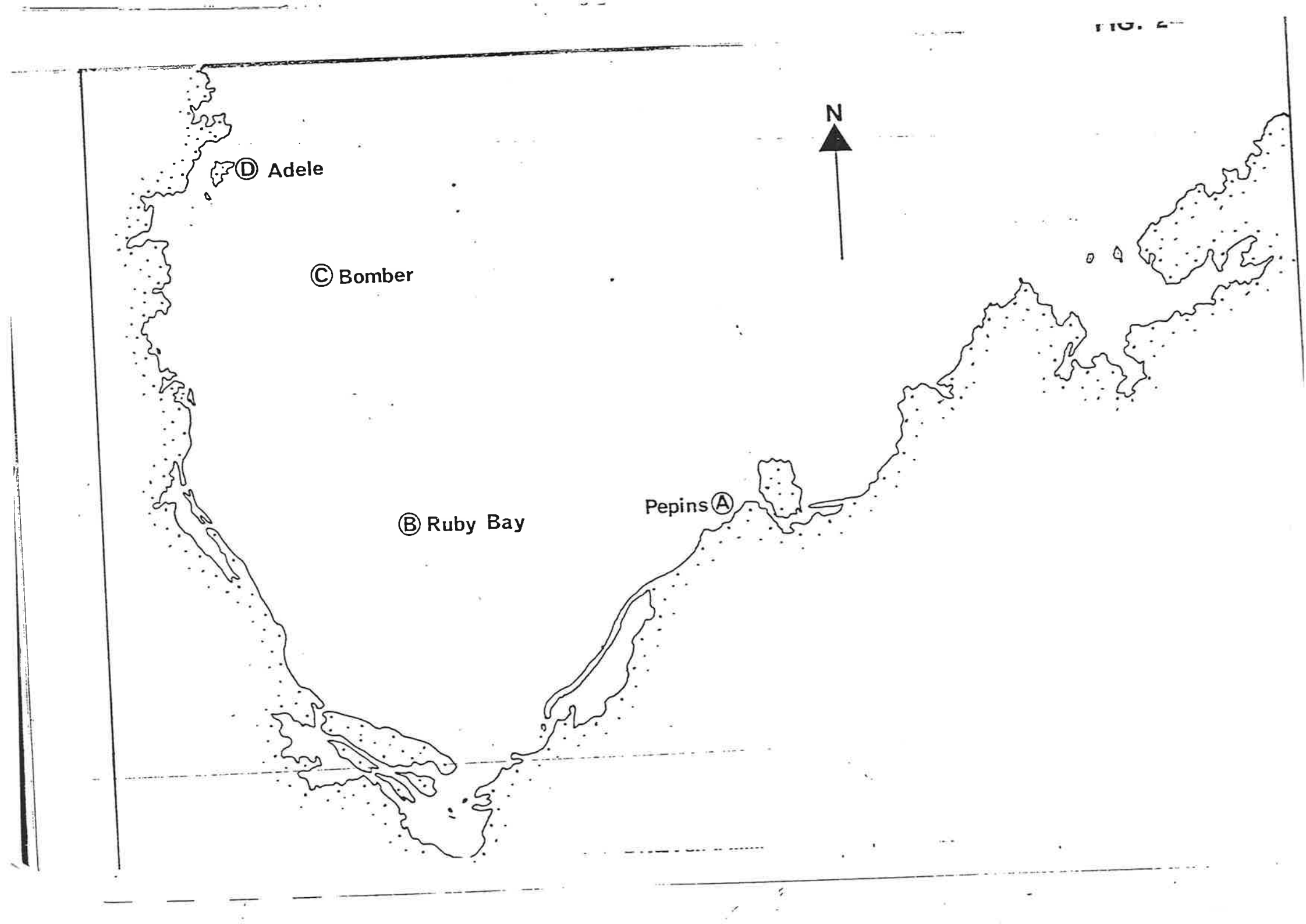

N
Ⓓ Adele
Ⓒ Bomber
Ⓑ Ruby Bay
Pepins Ⓐ

FIG. 3

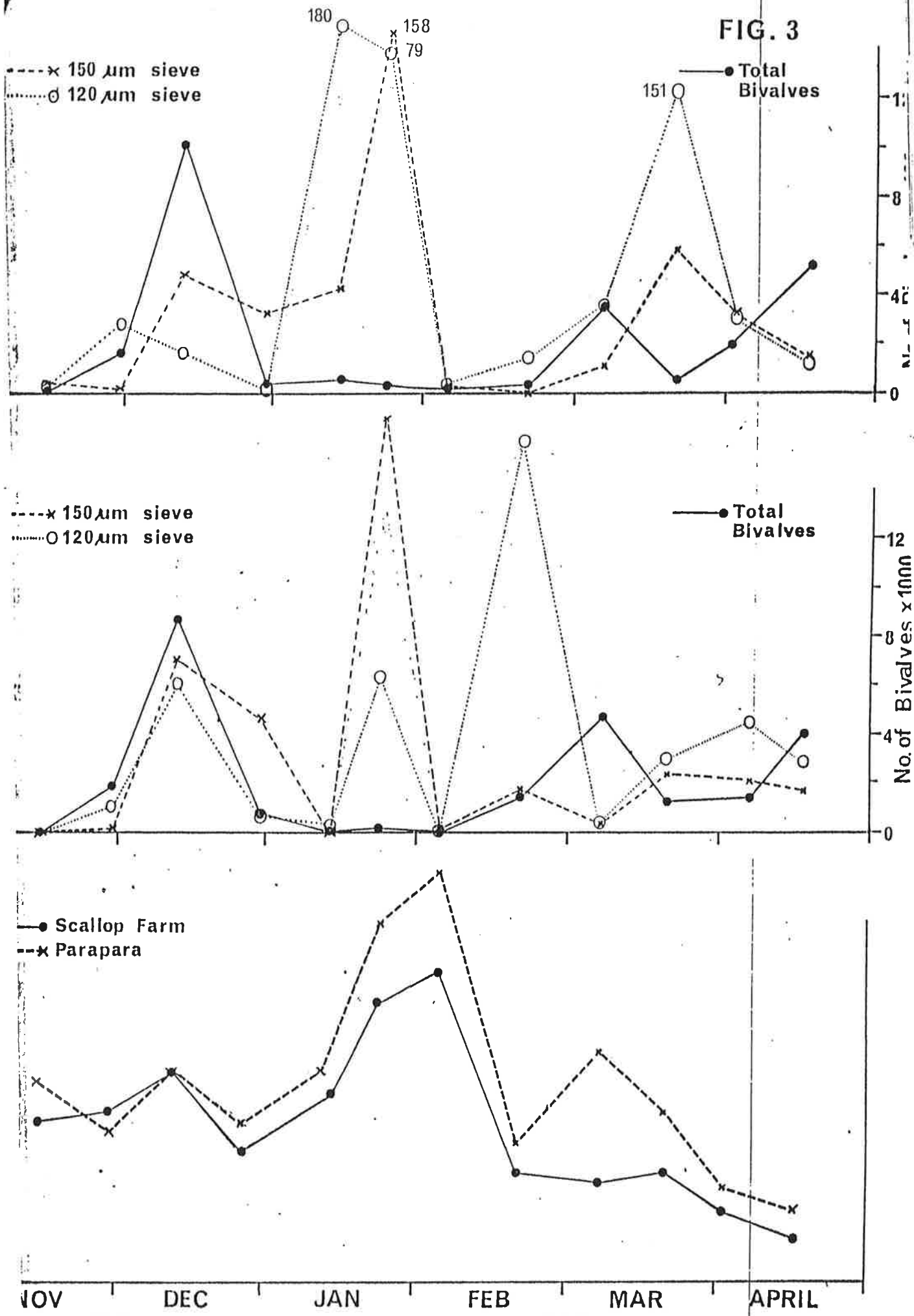

180
158
79
151
150 µm sieve
120 µm sieve
Total Bivalves
No. of Bivalves x1000
Scallop Farm
Parapara
NOV
DEC
JAN
FEB
MAR
APRIL
1985
1986

FIG. 4

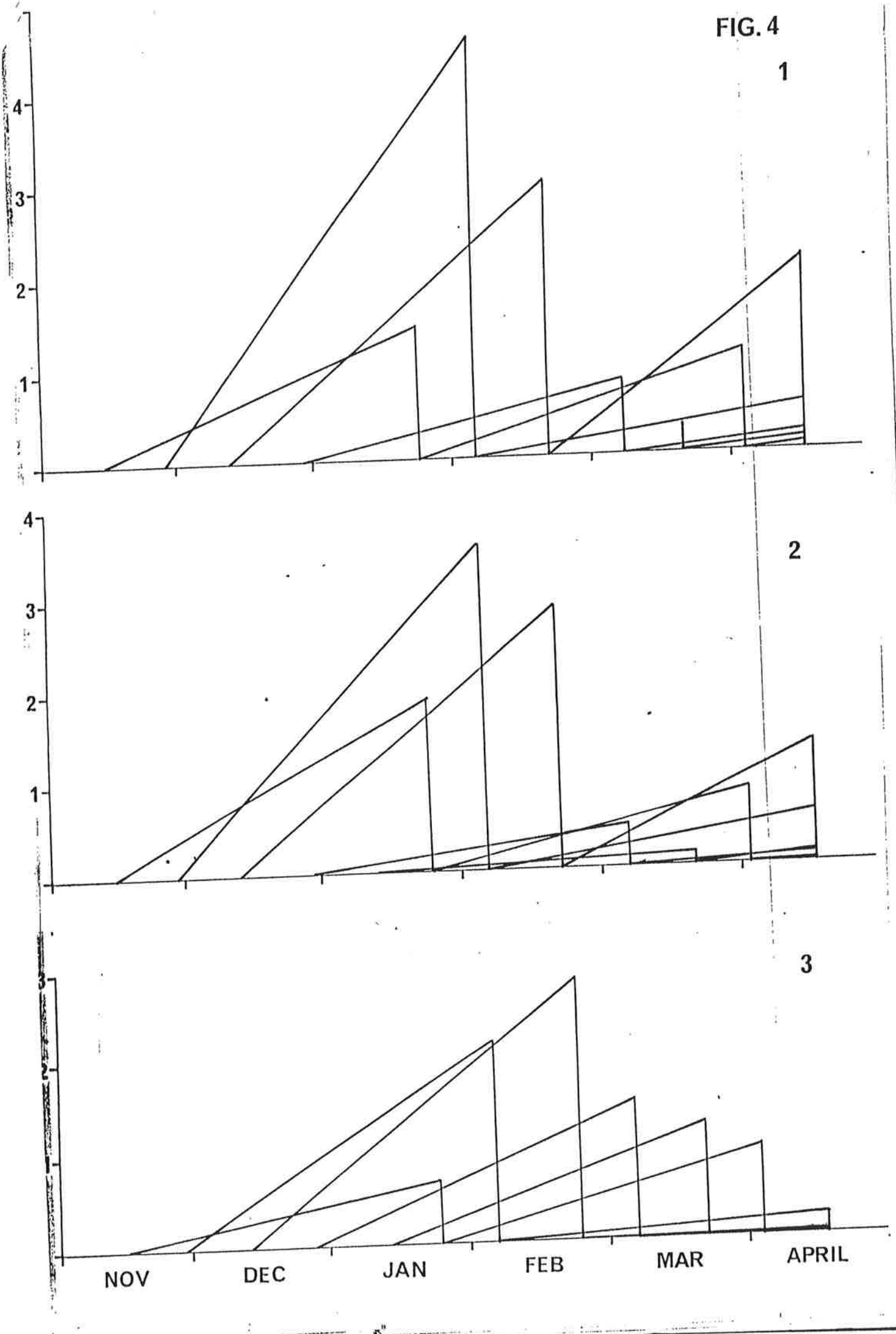
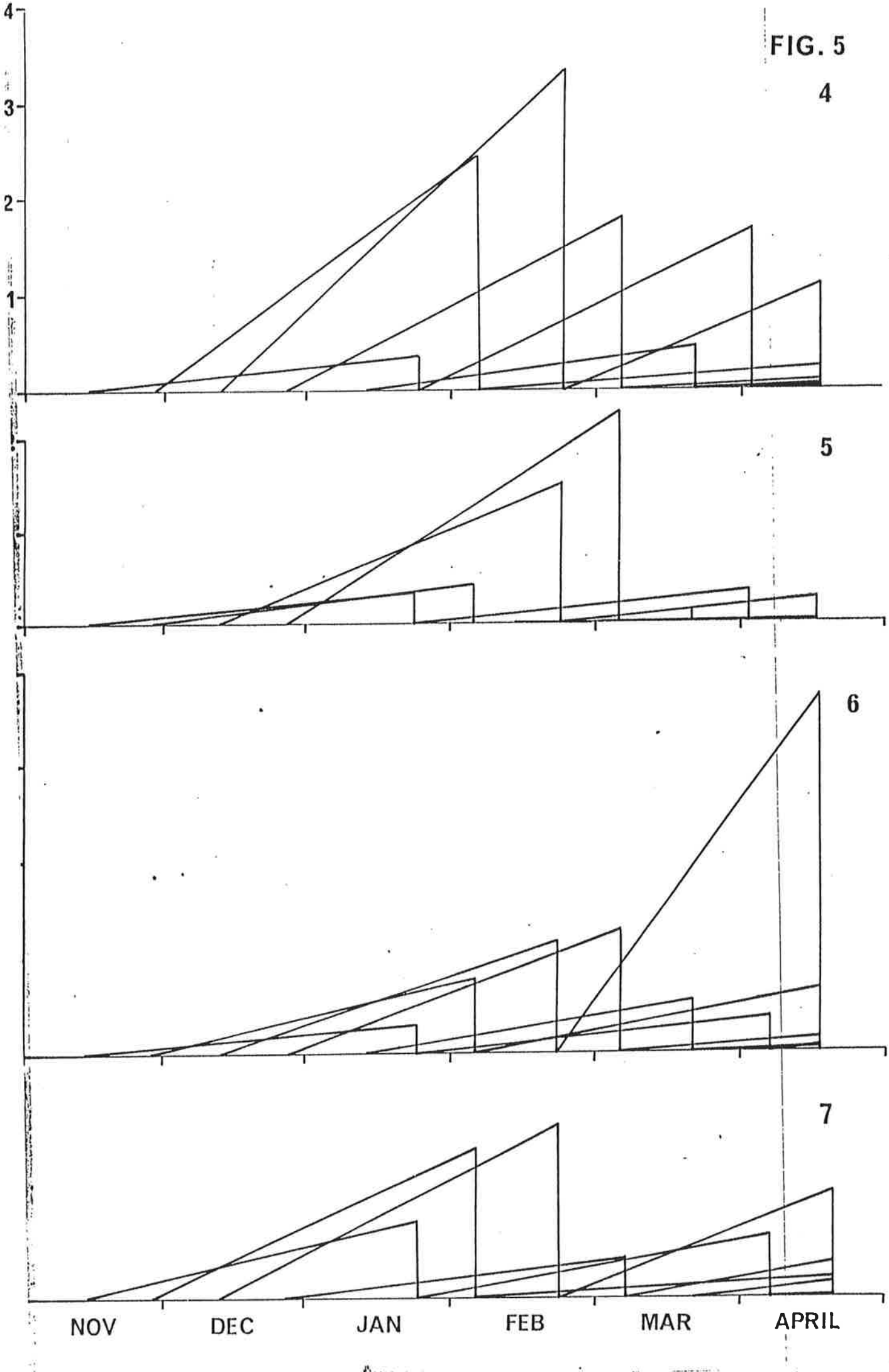


FIG. 5



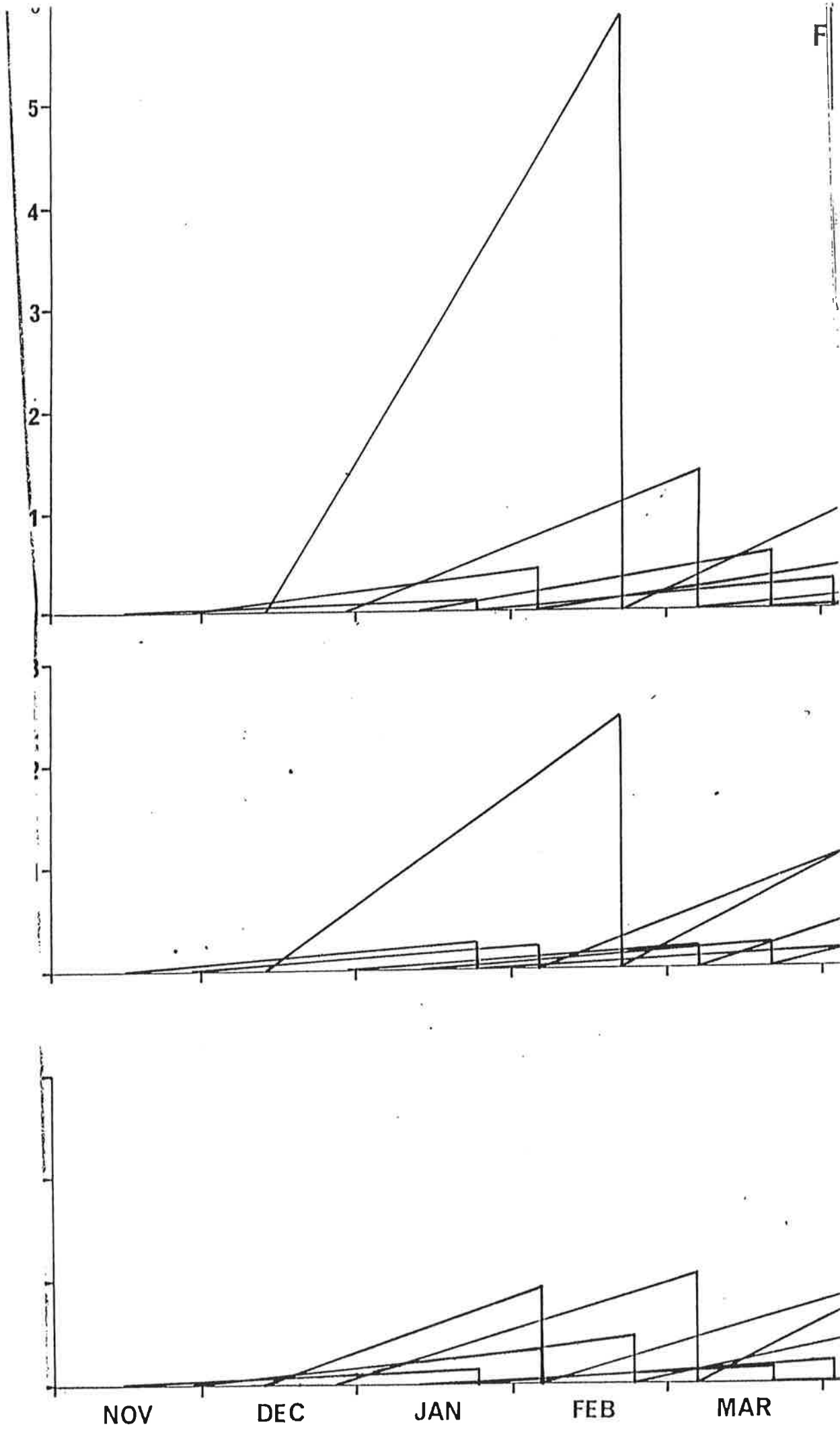
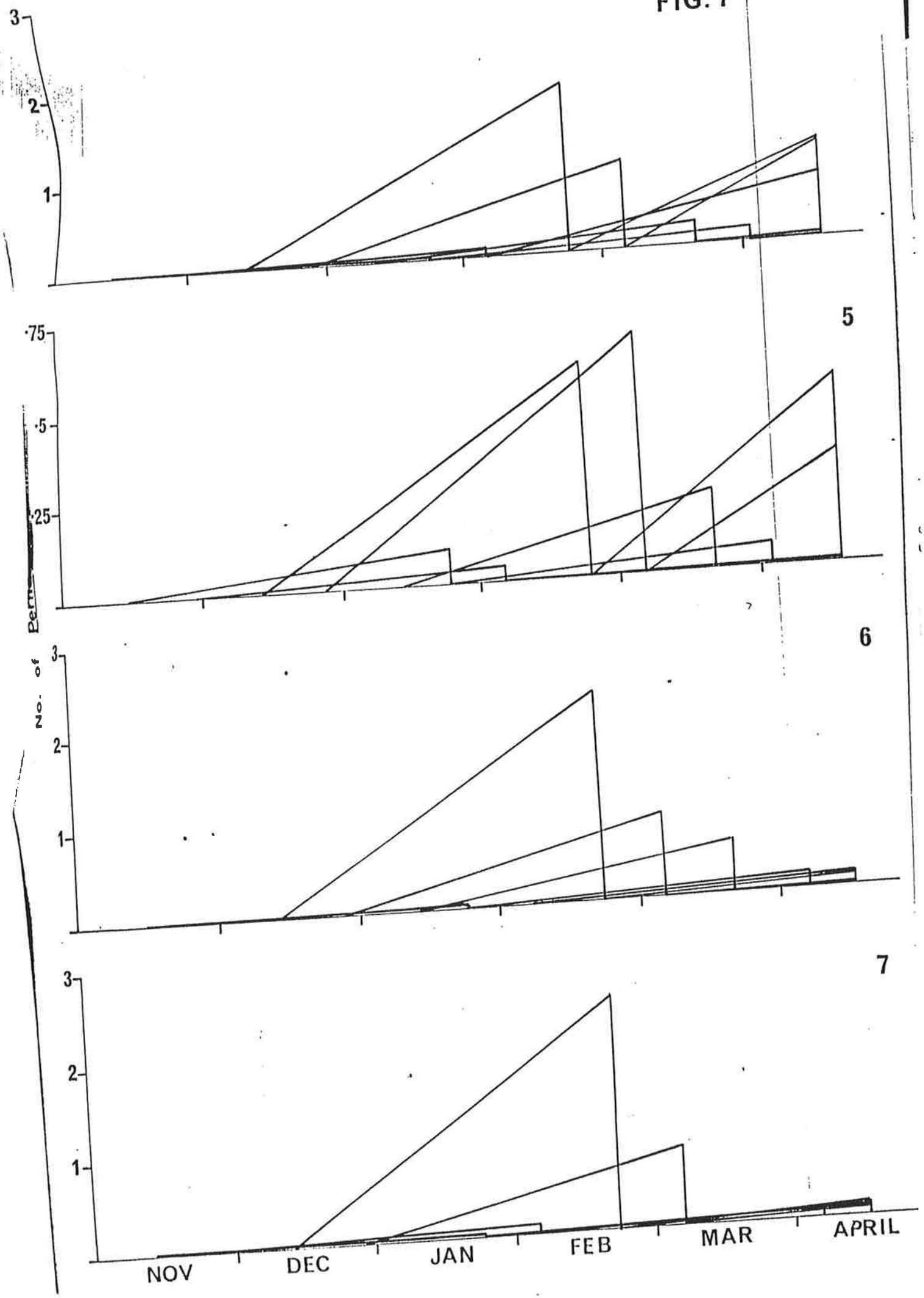

5
4
3
2
1
NOV
DEC
JAN
FEB
MAR

FIG. 7



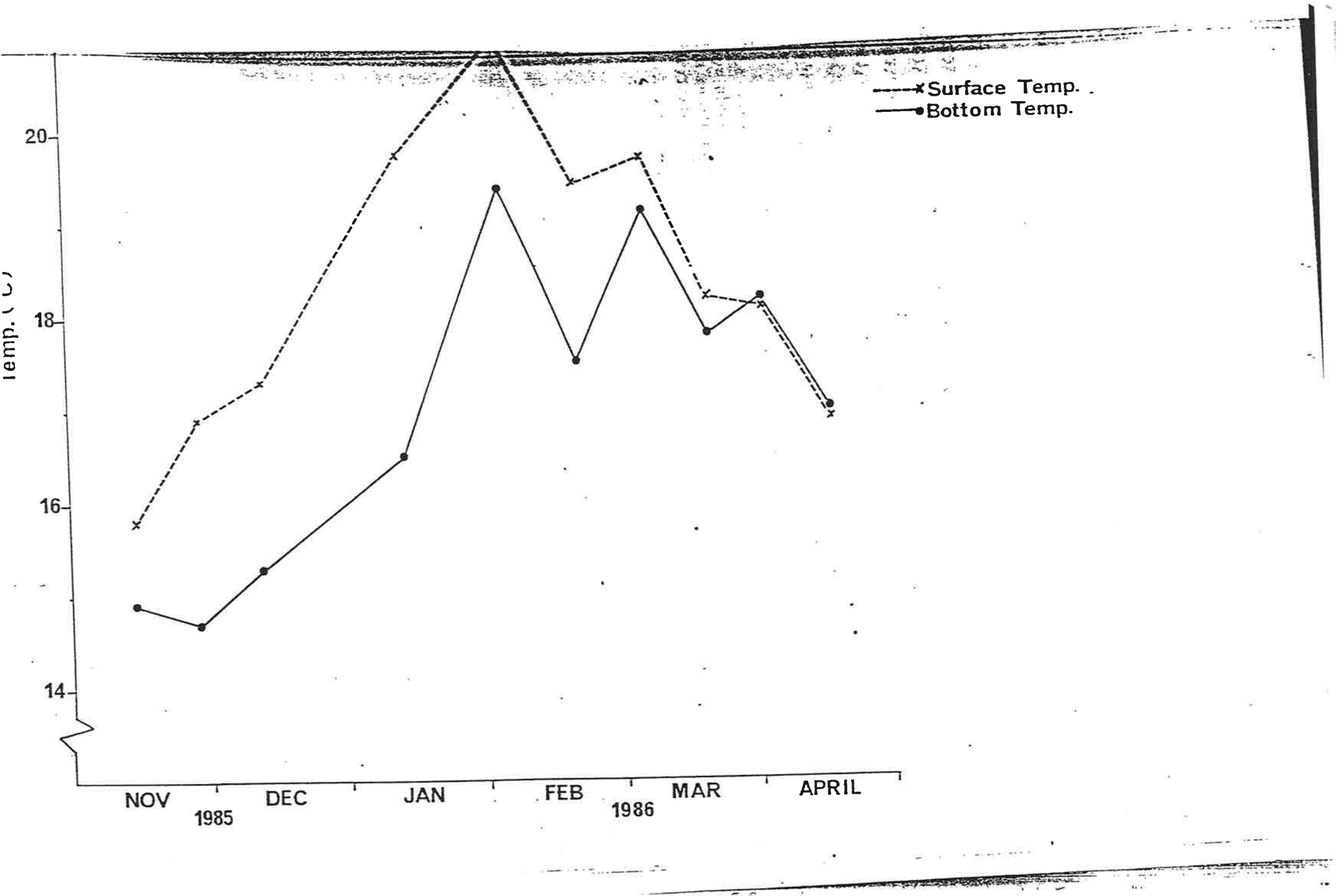

Surface Temp.
Bottom Temp.
20
18
16
14
NOV
1985
DEC
JAN
FEB
1986
MAR
APRIL

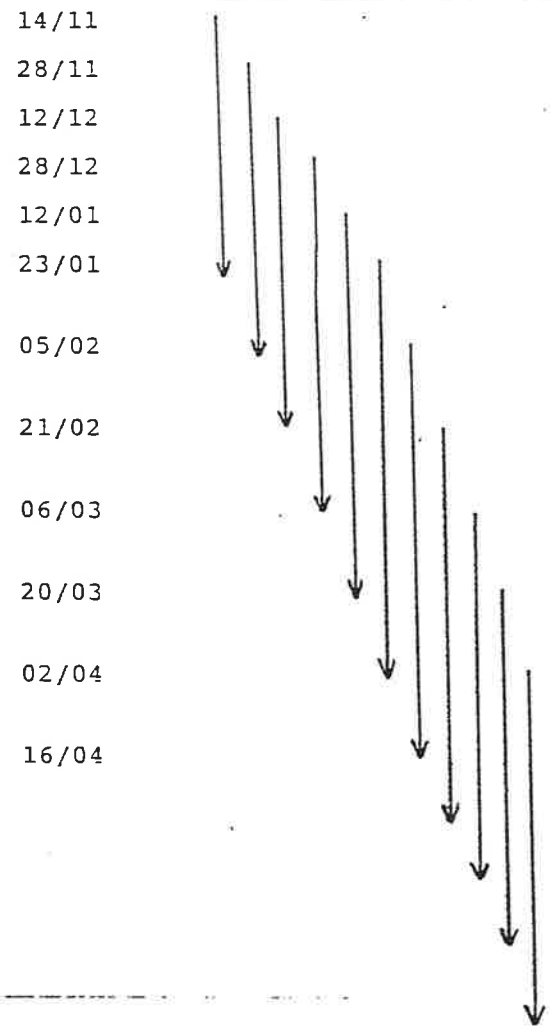
Table 1

Maximum recorded catches of Pecten spat in 'Talley type' spat bags placed in G
Bay in the periods indicated.

Season	November		December		January		February		March		A
	early	late	early	late	early	late	early	late	early	late	earl
979/80	-	-	-	355	-	-	-	-	-	-	-
980/81	-	-	-	90	-	-	-	-	-	-	-
981/82	-	-	335	-	-	1610	-	-	-	-	-
982/83	-	-.	3600	2448	1575	477	121	51	64	48	0
983/84	2650	4400	2376	2638	1580	1782	461	39	10	1	7
984/85	-	2192	5910	3986	3187	905	177	648	357	4	-
985/86	1882	4595	3039	1479	1238	1138	533	2125	246	194	91

te Figures shown for the 1979/80, 1980/81 and 1981/82 seasons are for collec
gs placed by Talleys Fisheries during their own scallop farming trials. Figu
e remaining seasons refer to counts in spat bags put down at site 1, 2 and 3
F/Talleys spatfall monitoring trials.

SCALLOP SPAT SETTLEMENT IN GOLDEN BAY 1985/86



Dates Visited	Period Test Bags in Water	Number of Pecten in Bags						
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
14/11								
28/11								
12/12								
28/12								
12/01								
23/01		399	1882	669	343	22	254	550
		1484				34	298	781
05/02		4595	3544	2168	2441	44	773	846
		1650				22		1552
21/02		3039	2854	2819	3353	90	1174	1125
		2850				164		1785
06/03		464	444	1479	1800	215	1293	408
		834				36		317
20/03		59	100	1238	475	1	549	
		319		155	413	12		
02/04		28	231	128	2182	35	397	356
		1138	818	961	344	12		634
16/04		533	13	204	110	2	123	212
		21	426	47	211		642	45
		109	1321	48	1125	2	2115	1068
		2125	6	7	65	27	3727	23
		22	81	45	101	2	151	16
		246	14	22	89	1	131	347
		194	105	2	21	0	46	148
		51	23	6	88	0	6	28
		91	0	6	12	0	58	11
		0	12	0	0	0	44	0

SCALLOP SPAT SETTLEMENT IN TASMAN BAY - 1985/86

Dates Visited	Period Test Bags in Water	Number of Pecten in Bags			
		Site A	Site B	Site C	Site D
11/12					
10/01					
4/01				61	
4/02					
4/03					
0/03		5			
3/04		120	316	24	
		10	195		
			106		
			153		
			263	212	
/04			278		
		111	322	505	574
		100	270	496	870
		131		86	16
		123		67	5