REPORT ON 1985/86 TASMAN/GOLDEN BAY AND PELORUS SOUND JUVENILE SNAPPER TRAWL SURVEY

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Introduction

During February/March 1986 Fisheries Management Division completed the latest in a series of juvenile snapper trawl surveys in Tasman/Golden Bay and Pelorus Sound. The primary objective of the survey was to determine the relative level of annual recruitment to the regions snapper stocks by obtaining length frequency measurements of juvenile snapper. These fish compose the southern most snapper stocks in New Zealand, and as is common with most species near the edge of their range, spawning success is highly variable from year to year. The juvenile surveys enable management to detect variations in relative year class strength which may have an effect on the commercial and recreational fishery in the future.

Background/Method

The first juvenile survey was conducted in southern Tasman Bay during December 1983. A total of ten sites were sampled and over three thousand juvenile fish were captured and measured. The following year the survey was extended to cover Golden Bay and Inner Pelorus Sound. Results confirmed the importance of these areas as juvenile nursery grounds.

The 1986 survey was the most extensive yet with 47 trawl shots being completed throughout Tasman/Golden Bay and Pelorus Sound. Commercial trawl vessels were chartered to do the survey work. The Nelson based pair trawl vessels Starlight and Seamist were used in Tasman/Golden Bay and the Lady Jane I, a Havelock based single trawl vessel, was used in Pelorus Sound.

In order to retain juvenile fish that would usually pass through the cod end mesh used by commercial vessels a fine mesh (20 mm) liner was sewn into the cod end of the nets used during the survey. Tow duration was generally between 15 - 17 minutes. One shot off Rabbit Island was restricted to 11.5 minutes due to the extremely high catches made in this area. Ten tows were of extended duration, made when fishing in areas thought to have low juvenile abundance. Tow sites were chosen where possible to replicate previous survey sites.

Following completion of the tow the net was hauled and the catch placed on the deck. All juvenile snapper were quickly transferred to plastic holding bins filled with circulating sea water. The remaining catch was examined and a note taken of its species composition. The fork lengths of all juvenile snapper were recorded before they and other non commercial fish were returned to the sea. Samples of juvenile snapper were retained for aging studies.

Results - Catch length frequencies

a) Golden Bay

Six trawl shots were made in Golden Bay (Figure 1). Significant numbers of juvenile snapper were taken at all sites except No 6 (Table 1). The principal by catch species included jack mackerel, gurnard, trevally, flatfish and spotties.

The length frequency distributions of juvenile snapper taken in each tow are shown in Figure 2. Only details of those tows in which more than 30 juvenile snapper were taken are presented. In all tows a significant number of juvenile fish were found grouped between 10 - 15 cm. Previous aging studies have shown that snapper of this length are one year old. Fish above 25 cm in length fell into two groups. The first group in the 25 - 28 cm, (4 year old) size range and the second in the 30 - 34 cm size (5 year old) range. Very few fish were found between 15 - 25 cm (2-3 year old).

b) Tasman Bay

Fifteen trawl shots were made in Tasman Bay (Figure 3). Few fish were taken along the Abel Tasman coastline and the boulder bank. However tows off Motueka, Ruby Bay and Rabbit Island took significant numbers of juvenile snapper. Catches along Rabbit Island were particularly spectacular with over 1100 juvenile fish taken in one tow of 11 minutes (Table 2). Principal by catch species once again included jack mackerel, gurnard, flat fish, spotties and kahawai. The length frequency distributions of juvenile snapper taken in each tow are shown in Figure 4. Again only those tows in which significant numbers of juvenile fish were taken are presented.

Catch composition of all tows except No 18 are dominated by fish grouped in the 11 - 16 cm size range (one year old). Generally small groups of fish were represented in the 21 - 24 cm (3 year old) and 28 - 33 cm (4 year old) size ranges. However in tow No 18 the 28 - 33 cm group forms a significant proportion of the catch.

c) Pelorus Sound

The 1986 survey was extended to cover 25 sites in Pelorus Sound (Figure 5). In addition to sites previously sampled in Mahau Sound, Kenepuru Sound and Hikapu Reach during the 1984 survey, fourteen new sites were sampled in the outer Pelorus Sound.

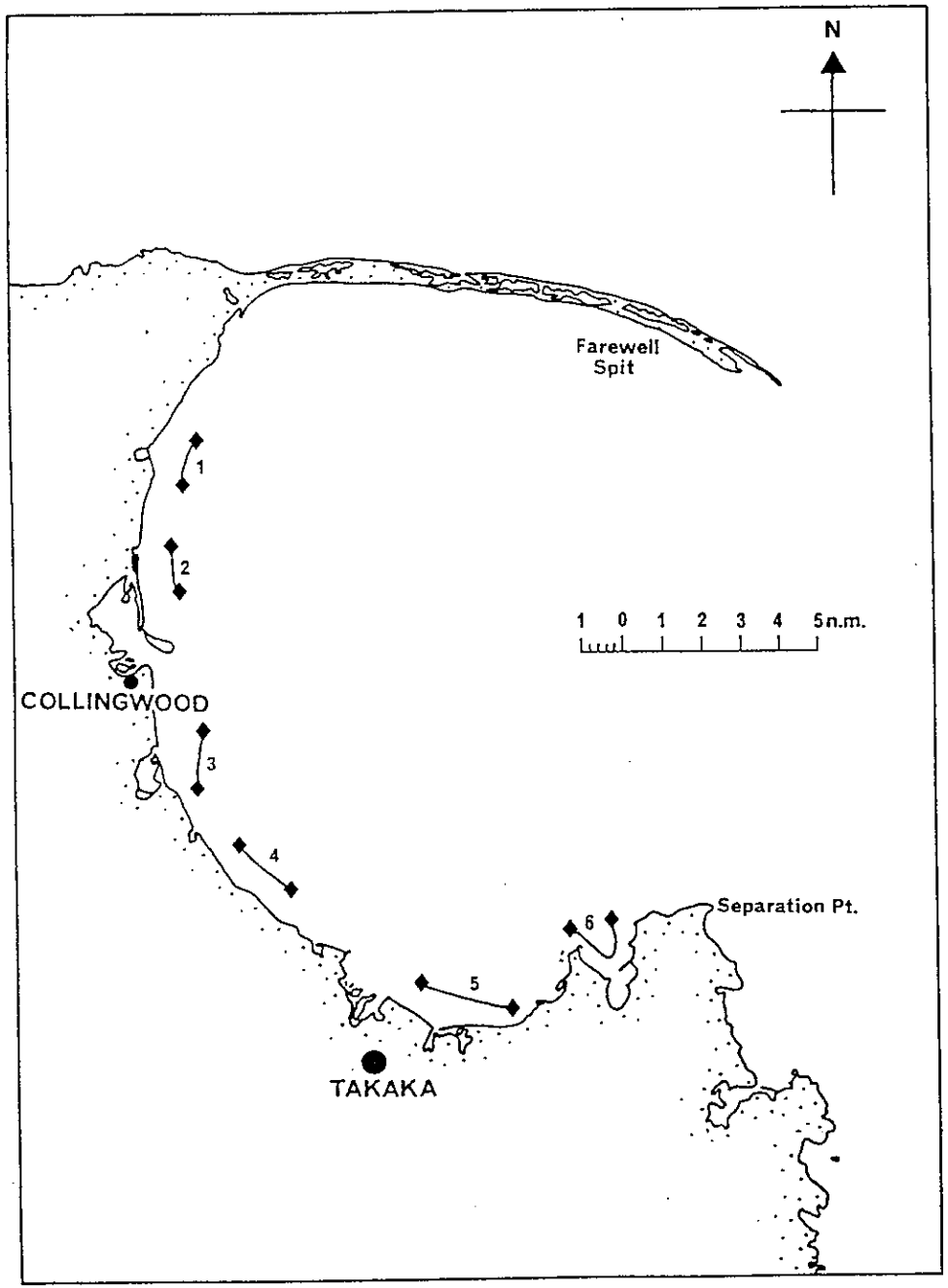


Figure 1

Position of tows made in Golden Bay.

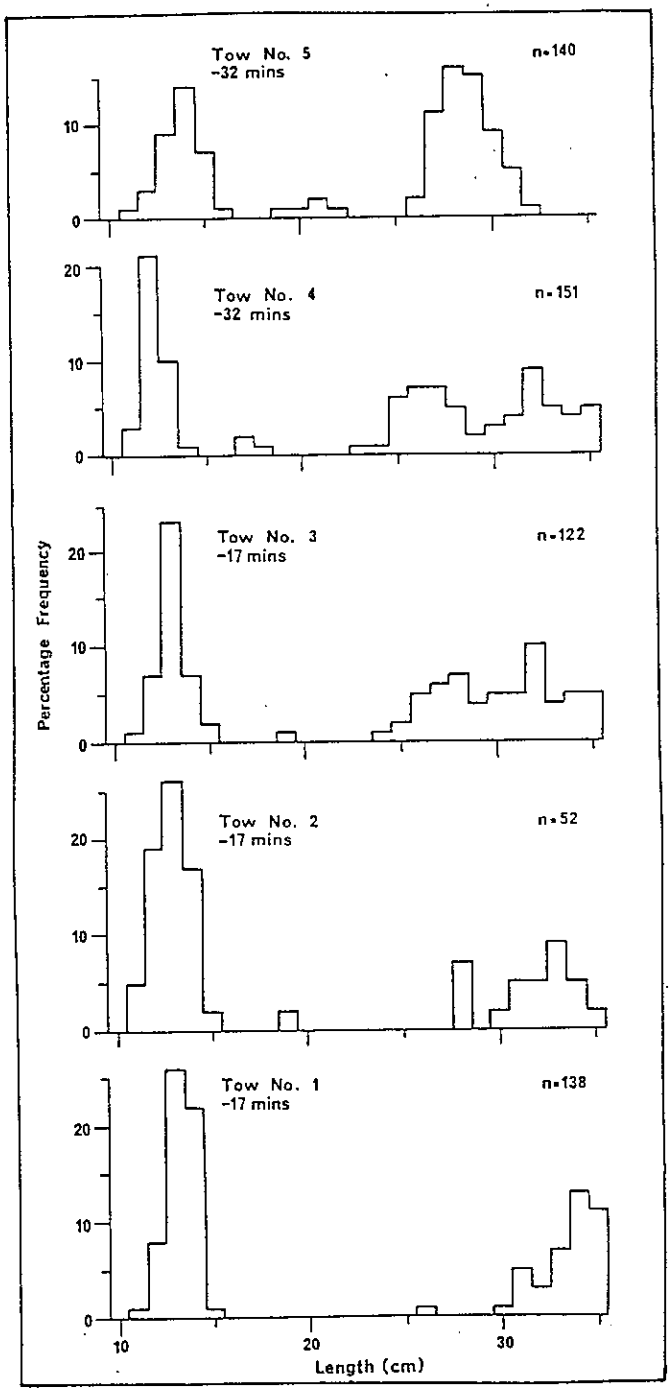


Figure 2

Length frequency distribution of juvenile snapper taken in

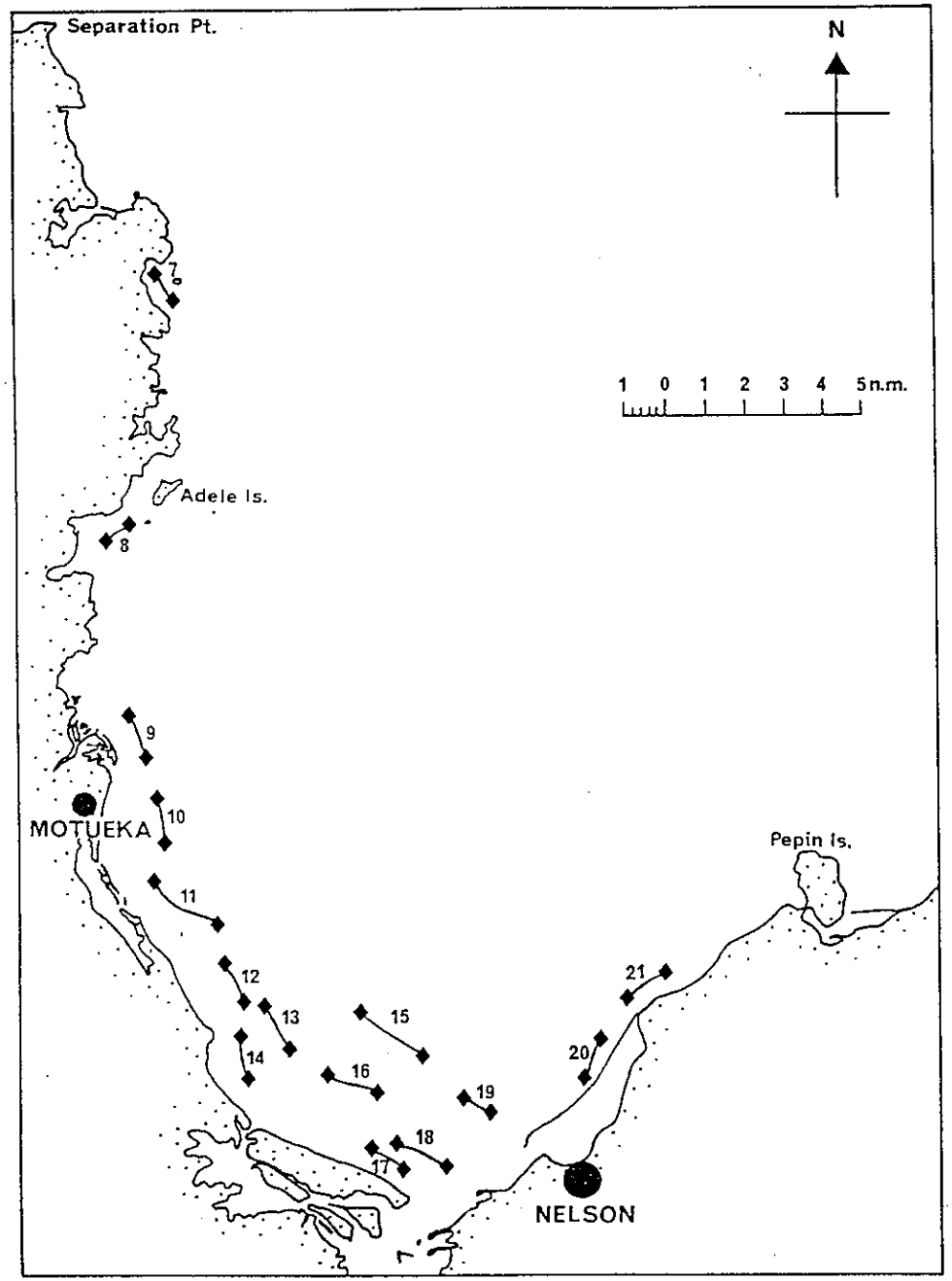


Figure 3

Position of tows made in Tasman Bay.

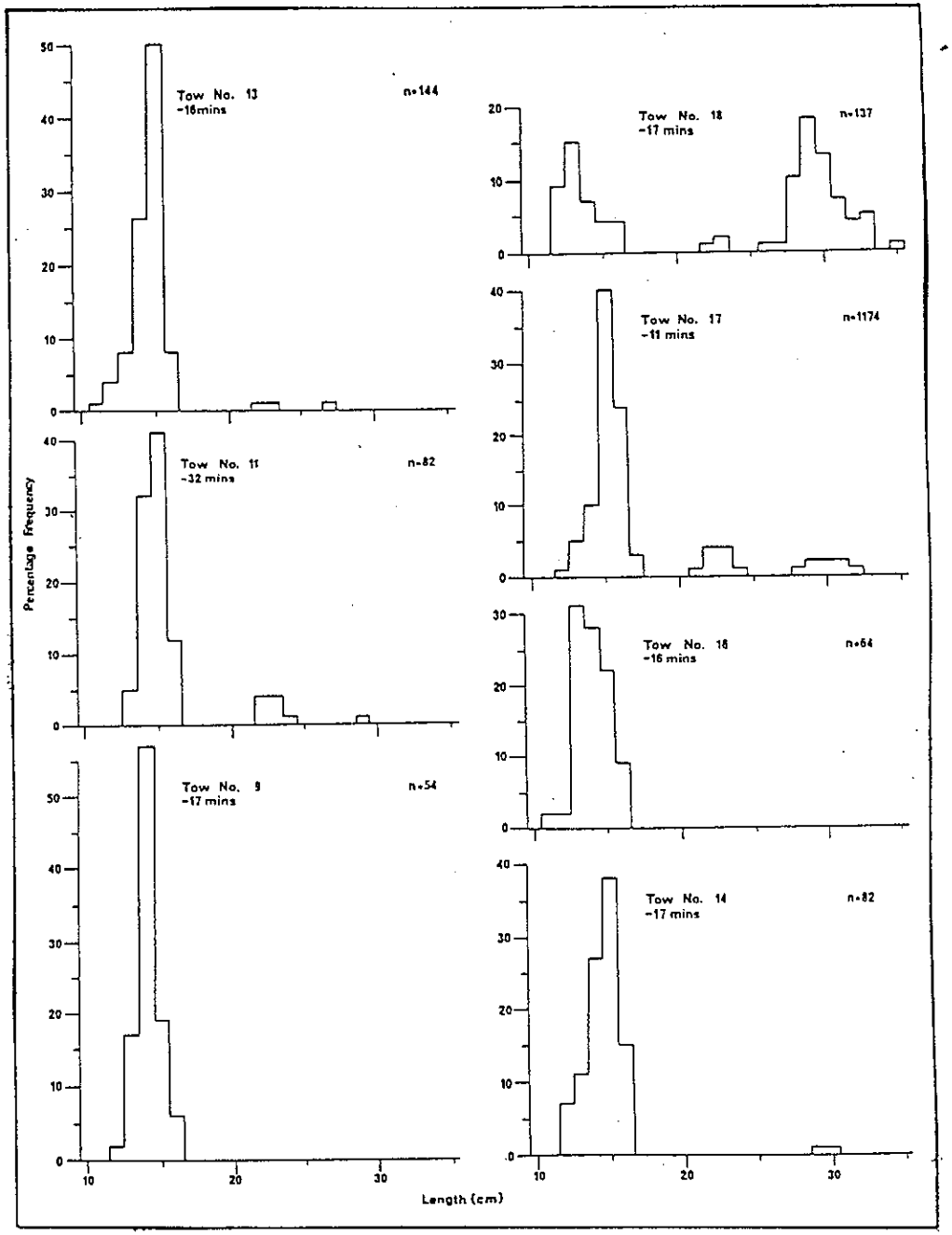


Figure 4

Length frequency distribution of juvenile snapper taken in Tasma Bay from those tows where more than 50 fish were caught.

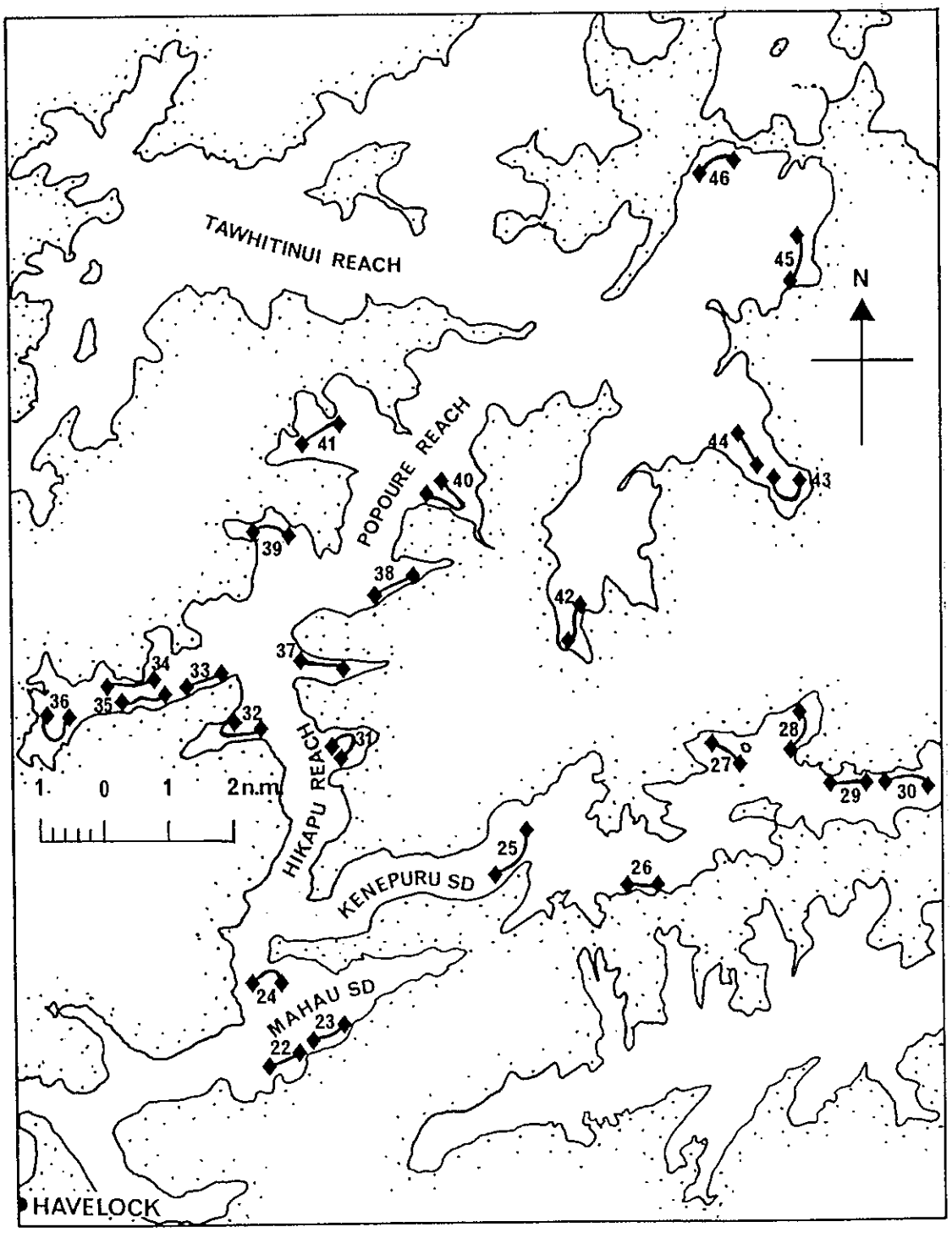


Figure 5

Position of tows made in Pelorus Sound.

Details of catch per tow are presented in Table 3. Significant numbers of juvenile snapper were found in Mahau Sound, Kenepuru Sound, Nydia Bay and Clova Bay. No snapper were taken from Beatrix Bay and very few from Crail Bay and sites along Popure Reach. Significant by-catch species included jack mackerel, flat fish, yellow eyed mullet, spotties and sprats.

Discussion - Population structure and recruitment.

The relationship between age and average length of Tasman Bay snapper is shown in Figure 6. When data from all tows in Tasman Bay are combined the age structure of the juvenile population becomes quite obvious as shown in Figure 7. Here results of surveys conducted in December 1983 and January 1985 are also presented so that trends in Juvenile recruitment to the stock can be identified. Figures 8 and 9 present the same information for Golden Bay and Pelorus Sound respectively.

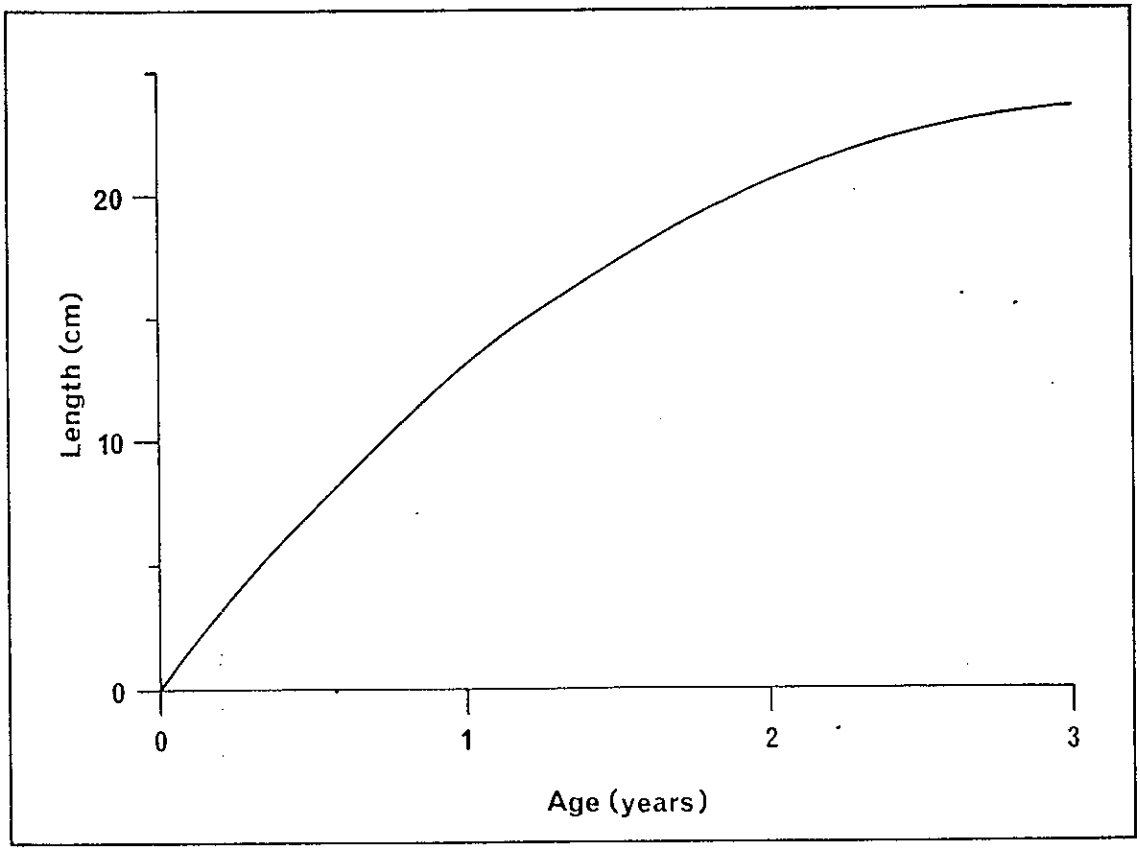


Figure 6

The relationship between age and average length for Tasman Bay/Golden Bay snapper from the 1984/85 juvenile snapper survey.

a) Tasman Bay

Results of the February 1986 survey show a strong 1+ year class making up 83% of the juvenile catch taken in Tasman Bay. The presence of this year class suggests that juvenile recruitment during the 1984/85 season was successful. These fish currently forming a group around 15 cm in length should begin to enter the commercial/recreational catch during 1988/89. The effects of poor juvenile recruitment during the 1982/83 and 1983/84 seasons can be seen by the absence of the 1+ age class in the December 1983 survey and the loss of 1+ and 2+ fish in the January 1985 survey. The most recent survey has subsequently shown very few fish coming through as 2+ and 3+ fish in the 17 - 25 cm length range. This gap in the population age structure is likely to have a detrimental effect on recruitment to the commercial/recreational catch over the next 2 - 3 years. The January 1985 survey shows a strong 3+ year class in the 22 - 27 cm length range. These fish were detected earlier as a 2+ group during the 1983 survey. Results of this years work indicate that these fish have largely been fully recruited into the adult stock.

Although fish larger than 30 cm are taken during the trawl surveys it is unlikely that the proportion of larger fish taken accurately represent the true proportion of those fish in the population. This is because these larger fish have enough reserves of energy to swim ahead of the trawl gear during tows of short duration and are therefore less vulnerable to capture by the gear.

b) Golden Bay

Patterns of juvenile recruitment seen in Golden Bay over the last two years appear to be similar to those of Tasman Bay (figure 8). The 1986 survey shows a gap in the population structure in the 2+ and 3+ length range. This was detected during the 1985 survey when no fish less than 17 cm in length were taken. Juvenile recruitment during the 1984/85 season seems to have been successful with 1+ fish forming 44% of the juvenile catch taken during our most recent survey. This similarity in age structure between the juvenile populations of Tasman Bay and Golden Bay tends to support earlier theories, based on tagging results, that they are both of the same stock.

c) Pelorus Sound

Results of survey work conducted in Pelorus Sound suggest that juvenile recruitment over each of the past four years has to some degree, been successful figure 9. Three distinct age classes were found during the 1985 survey and the presence of a strong 1+ year class this year suggests that juvenile recruitment was again successful during the 1984/85 season. Unlike Tasman and Golden

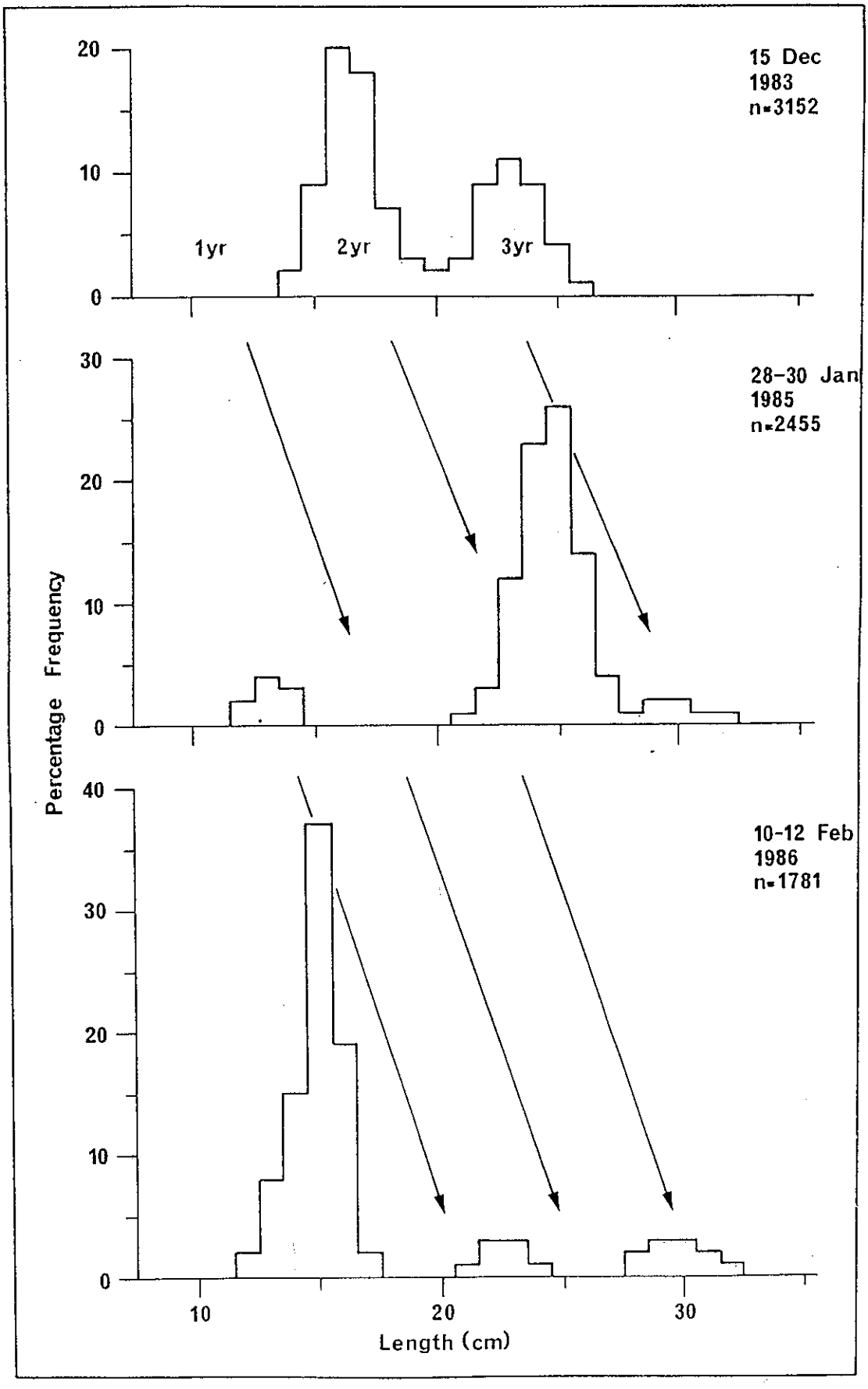


Figure 7

Age structure of juvenile Tasman Bay snapper caught during the three surveys.

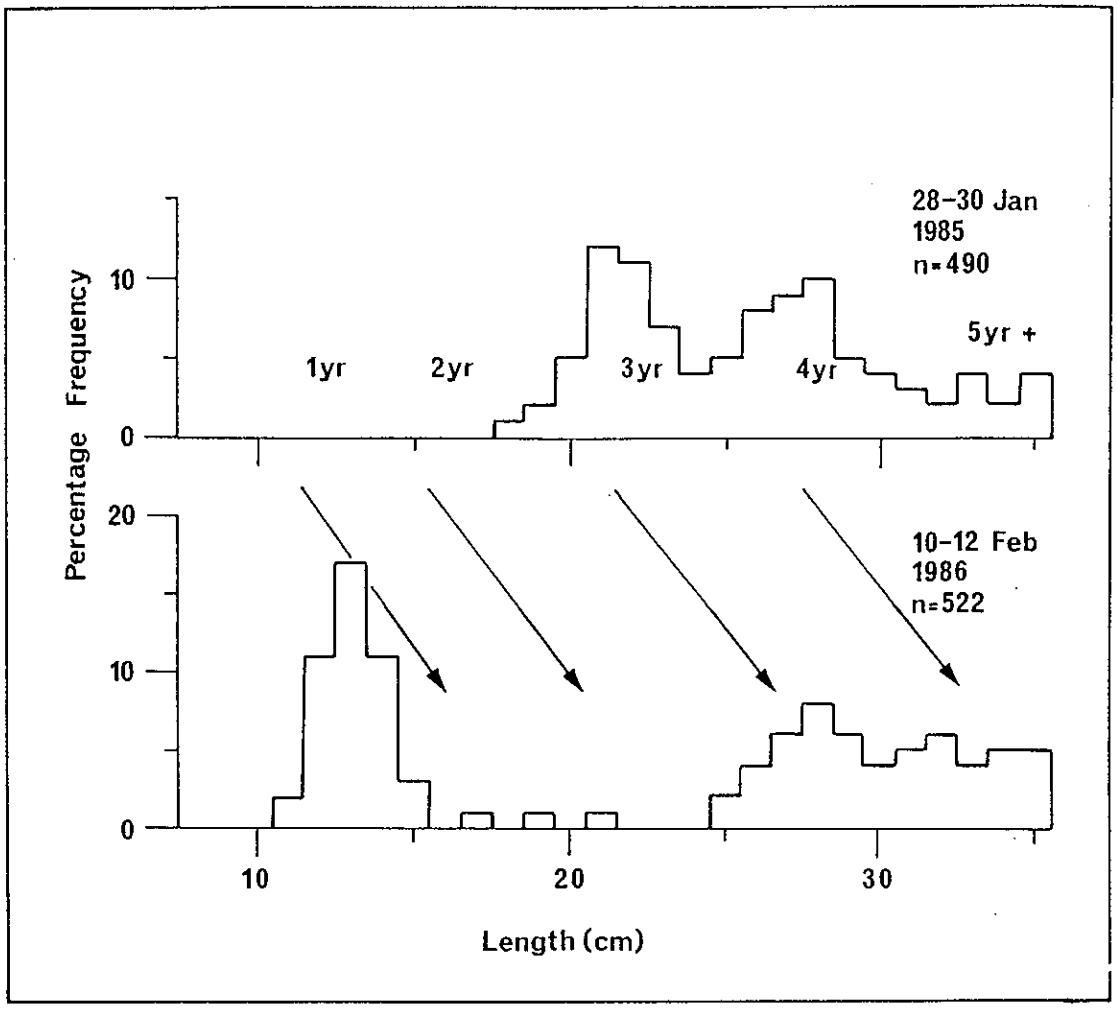
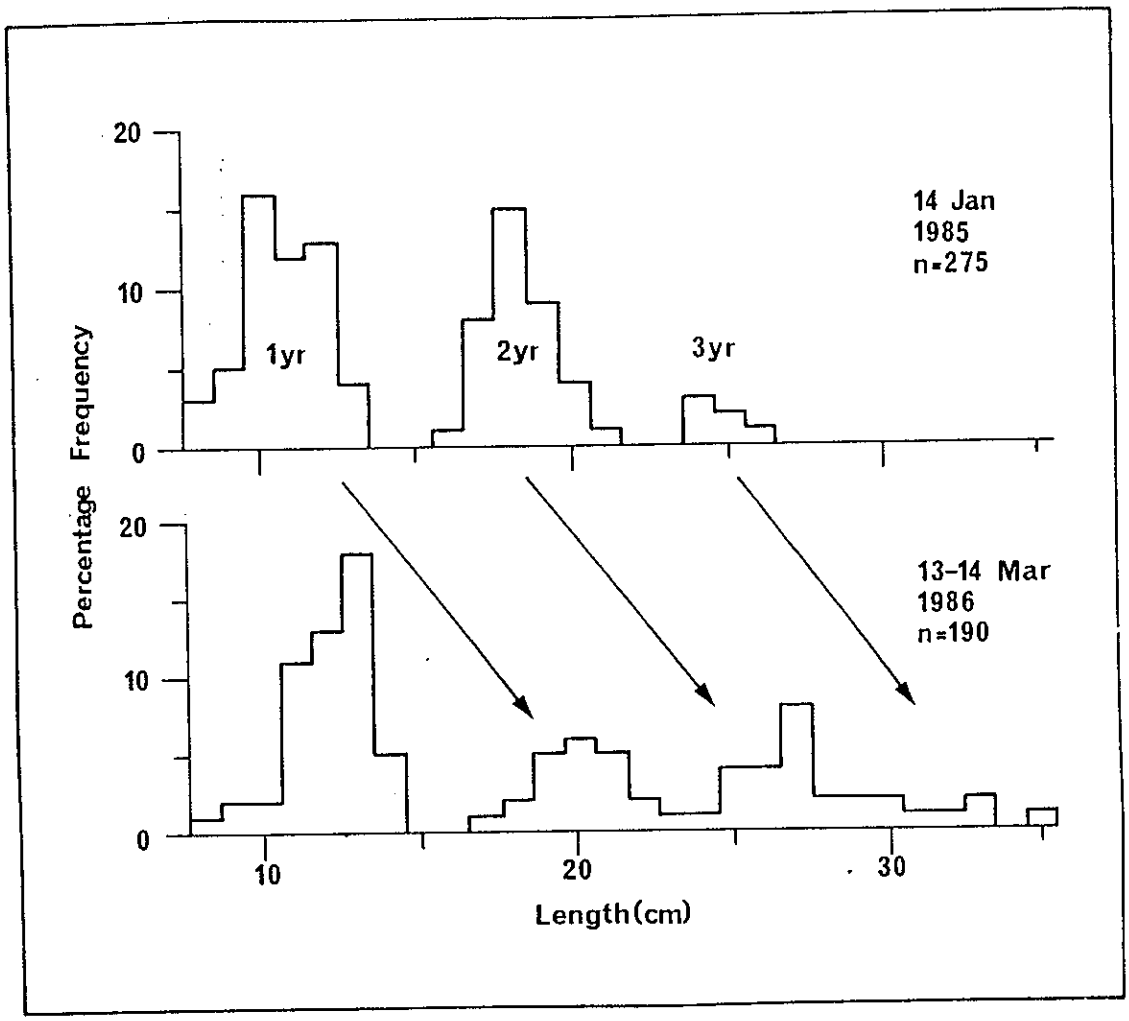


Figure 8

Age structure of juvenile Golden Bay snapper during the past two years.

Bay no missing year classes appear in the Pelorus Sound juvenile population age structure. This is taken to indicate that consistent recruitment to the Pelorus Sound snapper fishery can be expected, at least over the next three years.

Figure 9 Age structure of juvenile snapper from Pelorus Sound during the past two years.



Management implications

The level of annual recruitment to the Tasman/Golden Bay snapper stock is highly variable. Fluctuations in recruitment are likely to be due to unfavourable environmental conditions being prevalent at the time of adult spawning and during the early stages of juvenile development. Strong year classes make up a major part of the catch in the fishery in the first few years following recruitment. Consequently, the recruitment failures occurred in Tasman and Golden Bay during the 1982/83 and 1983/84 seasons are likely to have a detrimental effect on both commercial and recreational catches in the near future.

Although fisheries management may have no control over the principal factors affecting juvenile recruitment, management measures can be designed to optimize the return from those recruits that do enter the fishery. Such measures include setting minimum trawl/set net mesh sizes and minimum fish size

limits. In addition the closure of recognised juvenile nursery areas reduces the exploitation of juvenile fish, protects juvenile fish habitat and provides reserves for fish that are able to reseed commercial fishing grounds.

Minimum Mesh Sizes

Currently the minimum cod end mesh size permitted within the southern Tasman Bay spawning/nursery ground during the spawning period is 125 mm (5"). This mesh size effectively reduces the catch of juvenile fish by assisting the escapement of small fish from the trawl gear. Elsewhere within the region minimum mesh sizes are generally set at 100 mm (4") for both trawl and set net gear.

Minimum Size Limit

The minimum size limit for snapper is set at 25 cm (10"). Fish length is determined as being from the tip of the nose to the end of the middle ray of the tail fin.

Nursery Areas

The proposed draft Challenger Fisheries Management Plan outlines management measures aimed at restricting fishing activity in nursery areas. Some restrictions apply year round, others only apply for certain times of the year when small fish congregate in the area.

Current/proposed areas closed specifically to protect juvenile fish include:
- The bryozoan coral area around Separation Point.
- Inshore areas of Tasman Bay. (Adele Island-Moutere Bluffs-Nelson lighthouse).
- Inner Pelorus Sound (Mahau Sound-Kenepuru Sound-Hikapu Reach-Nydia Bay).

Appendix

Table 1 - Golden Bay

Tow No	Location	Dur (mins)	Snapper Length (cm) <15	16-25	26-35	>35	Total
1	Pakawau	17	53	0	38	47	138
2	Waikato	17	27	1	15	9	52
3	Parapara	17	45	4	62	11	122
4	Patons Rk	32	48	15	71	17	151
5	Pohara	32	48	9	81	2	140
6	Wainui	31.5	0	0	5	1	6

Table 2 - Tasman Bay

Tow No	Location	Dur (mins)	Snapper Length (cm) <15	16-25	26-35	>35	Total
7	Tonga Is	16.5	11	0	0	0	11
8	Marahau	13	0	0	0	0	0
9	Kumeras	17	51	3	0	0	54
10	Motueka	16.5	5	1	0	0	6
11	Jacketts Is	32	64	17	1	0	82
12	Mapua Bluffs	16.75	11	0	1	0	13
13	Mapua Bluffs	16.75	127	16	1	0	144
14	Ruby Bay	17	68	12	2	0	82
15	Chip Line	32	5	0	0	0	5
16	Rabbit Is	16.5	58	6	0	0	64
17	Rabbit Is	11.5	659	421	94	0	1174
18	Blind Ch	17	47	9	81	0	137
19	Off Cut	16.5	6	1	0	0	7
20	Boulder Bank	16.5	0	0	1	0	1
21	Boulder Bank	17	0	0	1	0	1

Table 3 - Pelorus Sound

Tow No	Location	Dur (mins)	Snapper length (cm) <15	16-25	26-35	>35	Total
22	Mahau So	15	7	7	2	3	19
23	Mahau So	15	1	3	4	0	8
24	Nthn Ent Mahau Sd	15	1	0	4	0	5
25	Snapper Point	30	0	0	3	19	22
26	Te Mahia	15	0	6	5	4	15
27	Goulter Bay	15	2	0	2	1	5
28	Waitaria Bay	15	6	7	2	0	15
29	Kenepuru Head	15	8	4	0	0	12
30	Kenepuru Head	15	7	11	4	0	22
31	Nikau Bay	15	1	3	1	2	7
32	Maori Bay	17	11	0	0	0	11
33	Nydia Bay	15	10	0	3	0	13
34	Nydia Bay	15	0	0	1	1	2
35	Nydia Bay	16	13	0	0	0	13
36	Nydia Head	15	16	1	0	0	17
37	Four Fathom Bay	15	2	1	1	2	6
38	Yncyca Bay	15	0	0	0	1	1
39	Fairy Bay	15	0	0	0	0	0
40	Sou'West Bay	30	0	0	0	0	0
41	Nor'west Bay	15	5	0	0	0	5
42	Wet Inlet Crail Bay	15	2	0	0	0	2
43	Clova Bay	17	5	7	9	9	30
44	Clova Bay	15	0	1	1	1	3
45	Beatrix Bay	15	0	0	0	0	0
46	Beatrix Bay	15	0	0	0	0	0