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DREDGE OYSTER SURVEYS FOVEAUX STRAIT PRE - 1960

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COMPILED MAINLY FROM MARINE DEPARTMENT RECORDS

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ABSTRACT

The discovery and early exploitation of the dredge oyster (*Ostrea lutaria*, Hutton) in Foveaux Strait is discussed. A brief but fuller account appears in "Rakiura", the Centennial Survey of Stewart Island by Dr Basil Howard, 1940.

The early exhaustion of the shallow water inshore beds was followed by the discovery of larger deep water stocks in Foveaux Strait proper, and the industry gradually transferred itself to the mainland with headquarters at Bluff. Diesel powered dredging vessels, too, gradually replaced the steam powered craft which, in turn, had replaced the sailing cutters used initially.

The location and extent of the Foveaux Strait oyster beds has long been a debatable point, and the diminishing returns in both quantity and size of oysters from beds intensively worked led to fears, in some quarters at least, that the fishery would become completely exhausted.

To obtain factual information as to the productiveness and extent of the oyster beds, and the conditions in different parts of the area, surveys were conducted in 1906, 1926, and 1945. The results of these three major surveys are outlined briefly and charts for the first two are reproduced. For comparative purposes a chart of Foveaux Strait is also appended showing zones and areas containing the principal oyster beds as at January 1963.

I. INTRODUCTION

The location and extent of the Foveaux Strait oyster beds has long been a debatable point. The first commercial abstraction was from the shallow waters of Port Adventure on Stewart Island in the 1860's of last century, but such was the exploitation that by 1867 the oysters had become so small as to be of little market value and fishing there virtually ceased.

In August of 1867, however, extensive deeper water beds were discovered off Port William. These, too, were exploited with complete disregard for the future until, in 1872, it was apparent the beds were nearly exhausted. In the same year an oyster bed of much greater extent was discovered off Halfmoon Bay between Fish Rock and Bench Island, and operations were transferred to the new site and the other beds left to recover.

By mid-1877 it was once again found the oysters had decreased in size and, at the fishermen's request, a closed season was declared from 1 August 1877 to February 1879. In 1877, too, Government asked Mr W.H. Pearson, then Commissioner of Crown Lands at Invercargill, to report on the state of the oyster beds. Pearson forwarded an extensive report and opposed the idea of closure of beds for long periods, stating that dredging must continue at intervals to remove the parasites and enemies of the oyster which would otherwise work unchecked and play havoc with the shellfish. He also put forward a plan for the rehabilitation of stocks at Port Adventure by the leasing of sections for cultivation of oysters.

In the next decade investigations revealed that oysters were present over a wide area of Foveaux Strait and larger dredging vessels, at first steam but later motor powered, were introduced to work deeper beds in open waters. From this time onward, too, the industry gradually transferred itself to the mainland with head-quarters at Bluff.

Most of the preceding information is culled from "Rakiura", the Centennial Survey of Stewart Island by Dr Basil Howard, 1940.

That which follows is taken mainly from Marine Department records.

II 1906 SURVEY

Following complaints from retailers in Wellington and Christchurch in 1905 that badly culched oysters from Bluff had been received, the then Chief Inspector of Fisheries, Mr L.F. Ayson, suggested a short inspection be made of the industry at Bluff. This was carried out by Ayson himself who reported on 14 August 1905 that all oysters seen were well culched and that the minimum size of oyster allowed to be taken, (then 1¾ inches), was so small as to be quite useless for the market. He was convinced the oyster vessel owners realised it was in their own interests to have the culching carefully done. The report concluded with the opinion that a careful inspection and survey of the oyster beds should be made at the earliest opportunity.

Arrangements were made to charter the oyster vessel S.S. "Despatch" and in January of 1906 a survey was made by Mr R.E. Hunter who was assisted by Messrs Whealler and Coupar, both oystermen of 20 years experience. Work commenced on 16 January and ceased on 30 January, but boisterous weather restricted activities to seven days.

Hunter's report of 2 February 1906 stated the oyster beds extended for 25 miles, with occasional gaps, from 11 miles W.S.W. of Waipapapa Point to 10 miles E.S.E. of Centre Islands, varying in width from one-half to two miles, and in depths from ten to twenty fathoms. He thought the supply of oysters "inexhaustible". The beds surveyed were numbered 1 to 12 and the attached table (Table 1) gives the significant details, whilst the attached chart (Figure 1) shows their location in Foveaux Strait. The following brief notes culled from Hunter's report, give the condition of the beds in 1906:

Bed 1 - Discovered about 1888 this bed was worked during the open season for the first seven or eight years. Then, because the oysters became smaller, the bed was left idle for several years. Oysters found on this bed are now large and of good quality; as many as four thousand dozen, (approx. 62 sacks), have been caught by one craft in one day. Small oysters were found on the outskirts, the bed apparently increasing in all directions.

Bed 2 - Oysters are of good quality, although quantities of dead shell are found and abundance of starfish.

Bed 3 - Oysters of good quality and medium size. The bed has been worked occasionally since found.

Bed 4 - The oysters on this bed are of poor quality and great quantities of dead shell and seaweed were found. No oysters were taken off it for over twenty years.

Bed 5 - The bed has been worked occasionally during the open seasons. Oysters are large and of good quality, and the bed more free from dead shell than the preceding one.

Bed 6 - This bed is really a continuation of Bed 5.

Bed 7 - Discovered about 1882 and worked for several seasons. Then abandoned on account of oysters being small and the rough nature of the bottom.

Bed 8 - One of the earliest beds found and worked. Very few oysters found, the bed appearing to be overgrown with seaweed etc. In the early days two hundred dozen was considered a fair day's catch off this bed.
(Note - a catch of approx. 3 sacks seems low for a day's fishing).

Bed 9 - Owing to rough nature of bottom it was impossible to get the exact area. Quantities of dead shell were found, the oysters appearing to have died off considerably.

Bed 10 - Discovered during present survey. Although oysters were known to exist in that direction the bed had not previously been located. The oysters found were in excellent condition and the bed remarkably free of dead shell.

Bed 11 - Oysters of poor quality and a large quantity of dead shell. Owing to its great distance from Bluff this bed is never likely to become popular.

Bed 12 - Discovered on the last day of the survey. Oysters of good quality though small: it is probably a newly formed bed.

Speaking generally, Hunter stated he found quantities of dead cockle shells on the northern side and quantities of seaweed on the southern side, whilst oysters found on the outskirts of all the beds were in clusters and smaller than those in the middle of the beds. This, he contended, demonstrated the beds were extending in all directions, and he also stated there was no doubt oysters would be found by following the trend of the current to the westward of beds marked on the submitted chart. He concluded, however, that beds at a greater distance than those already located were never likely to become popular.

On oyster predation and mortality he stated oysters have a dangerous enemy in the shape of a species of starfish commonly called "Five Fingers". "When the oyster shell is open for the purpose of feeding, these fish insert a tentacle, probably unintentionally, which being of a very brittle nature breaks off and leaves the oyster exposed, thereby killing it. Large numbers of the above species of starfish are to be found on the beds, most particularly where dead shells are abundant."

Table 1: Foveaux Strait Oyster Beds as determined by R.E. Hunter in 1906.

No.	Name	Discovery	Area	Depth (Fathoms)
1	East Bed	1888	$4\frac{1}{2}$ x $2\frac{1}{4}$ miles	12
2	Ruapuke Bed	1892	2 x $\frac{3}{4}$ "	$13\frac{1}{2}$
3	Dog Island Bed	1898	$3\frac{1}{2}$ x $1\frac{3}{4}$ "	15
4	Bird Island Bed	1880	$2\frac{1}{4}$ x $1\frac{1}{4}$ "	14
5	West Bed	1885	$4\frac{1}{2}$ x $2\frac{3}{4}$ "	17
6	West Bed (Extension)	1889	$2\frac{1}{2}$ x 1 "	17
7	North Island Bed	1882	$2\frac{1}{4}$ x 1 "	18
8	Halfmoon Bay Bed	1870	1 x $\frac{1}{2}$ "	23
9	Port William Bed	1870	$\frac{1}{2}$ x $\frac{1}{2}$ "	20
10	Not named*	1906	7 x 2 "	20
11	Lucky Beach Bed	1904	$1\frac{1}{2}$ x 1 "	20
12	New River Bed	1906	$2\frac{1}{2}$ x 1 =	20

*This is possibly what is now known as the Saddle Bed charted out of position, (Young, 1927).

III 1926 SURVEY

Towards the end of 1925, Mr L.F. Ayson, the then Chief Inspector of Fisheries, reported that from information to hand with regard to the oyster season which closed on 31 October, the oysters were plentiful and of good quality. With regard to increasing the size limit from the current minimum of 1¾ inches he considered the present size seemed to have given satisfaction for a number of years and no alteration should be made without further investigations which, since the last inspection of beds was in 1906, he thought should be carried out. The suggestion for another survey was supported by Mr A.E. Hefford, a "Fisheries Expert" and later Chief Inspector of Fisheries and, ultimately, Mr M.W. Young, Biologist of the Marine Fisheries Investigation Station at Portobello, was appointed to carry out investigations. Work commenced in March 1926, first by trips on operating oyster boats and later, when the season closed, with a chartered oyster vessel during January 1927 when Mr Hefford also participated.

The main object of the survey was stated in the "Scheme of Work" to be the obtaining of information as to the extent and productiveness of the beds and the condition of the oysters in different parts of the grounds. The method to be followed was to work a commercial dredge on the different oyster beds in order to get the following data:

(a) As to the relative yield of the different beds.
(b) As to the proportion of oysters of different sizes on the various beds.
(c) As to the condition of the oysters with regard to sexual ripeness and "fat".
(d) As to the fauna of the oyster grounds with special reference to enemies and competitors of the oyster.
(e) Temperature and salinity of water.

Young made nine trips to Bluff during the 1926 oyster season, each trip occupying from seven to fourteen days, but much sea time was lost due to the unsettled weather experienced that winter. The "Summer Survey" occupied a further eight days. From his report of 65 pages, and attached tables, graphs and charts, the following information is culled:

1. Sampling - samples were measured in the months of March to August, inclusive, the total sampled being 19,272 oysters during the "Winter Survey". Continuous westerly gales limited dredging in September and no sampling was undertaken. Further sampling took place during the short "Summer Survey" of January 1927.

2. Sampling Procedure - the time was taken when the dredge reached bottom, and whilst towing the depth would be sounded, a water sample taken, and the temperature recorded. The position of the vessel was fixed as nearly as possible. By this time the dredge was ready to haul and the time was again noted to give the duration of the haul. After the dredge had been washed by surging, the contents were tipped on the deck. The oysters were picked out and their quantity and quality noted. A list was made of the more prominent forms of other fauna and specimens preserved for future identification.

3. Distribution - oysters were found at intervals in the Straits and in some places were in such quantity as to constitute beds of commercial importance which were known by definite local names. "Occasionally new patches are discovered but they are generally of small area ...."

   "The Government survey of 1906 tested the Straits pretty thoroughly as far as commercial working goes, but it is worthy of mention that from the positions marked they missed the Saddle Bed altogether. They also show an extensive bed further out which has yet to be rediscovered."

   "The results of the 1927 survey go to show that there are not oysters all through the Straits even in small quantities, and that the North Island and Oban beds both yielded such small returns that they can be neglected for commercial purposes."

   "The beds of commercial importance within reasonable distance of Bluff may be defined as follows:

"The East, Ruapuke, Guano and Bird Island Beds, all of which are practically touching one another, and extend from off the N.E. corner of Ruapuke to off Bird Island. Further to the west of the Ruapuke beds we come to the West Bed which is fairly extensive. Off Saddle Point we have an extensive bed which merges into the Port William Bed to the east and the Lucky Beach Bed in the west, and extends well out into the Straits - I am of the opinion that it was some extension of this bed which the 1906 survey found in the middle of the Straits. A small bed is also reported off the New River Heads. (See Figure 2). ... It is to be regretted that time did not permit either survey to follow up the oysters until they petered out to the westward or to the east. It may not be of commercial importance to discover beds so far from the home port that the distance and weather conditions would probably preclude their being worked; but as a source of spat they would be of inestimable value to the industry in future years."

"There is a natural break between the Eastern and Western areas formed by a band of sandy bottom free from oysters running across the Straits between the Ruapuke and West Beds. This line, which may be found by ruling a line between Bluff Hill Signal Station and Fife Rock, I have taken as my division ...."

4. Relative abundance on Different Beds - in the survey 18 beds were named and sampled. The following table (Table 2) gives their relative abundance at the time:

Table 2. Table of relative abundance of oysters from beds sampled by Young during the 1926-27 Survey.

Bed or Area	No. of Hauls	Total Hauling Time	Catch	Catch Per Hour
North Is. Bed	4	38 mins	12 doz.	18.9 doz.
Pt. Adventure	3	19 "	0.5 "	1.6 "
Off The Neck	3	21 "	0.0 "	0.0 "
Oban Bed	10	58 "	11.75 "	12.2 "
Pt. William (1)	6	24 "	5.75 "	14.4 "
Saddle Bed	6	62 "	599.5 "	580.5 "
Lucky Beach	5	42 "	131.0 "	187.2 "
Pt. William (2)	3	14 "	15.0 "	64.3 "
West Bed (1)	5	33 "	216.0 "	392.5 "
Caroline Bay	6	47 "	153.75 "	196.1 "
Guano Rock Bed	7	52 "	171.75 "	198.2 "
Ruapuke Bed	11	77 "	297.50 "	231.9 "
New Bird Is.	7	48 "	137.50 "	171.8 "
West Bed (2)	5	36 "	206.25 "	344.0 "
East Bed	29	182 "	1438.25 "	474.1 "
Saddle to 8-mile Bed	5	29 "	142.00 "	294.00 "
Eight-mile Bed	6	41 "	132.00 "	193.8 "
Off New River	3	17 "	7.50 "	26.5 "

"It will thus be seen that the highest productivity is shown for the Saddle Bed (580.5 dozen per hour) with East Bed a good second (474.1 dozen per hour). These figures all agree with well known results from commercial dredging."

5. <u>Productivity of the East Bed</u> - Young considered only the East Bed sufficiently well sampled during the 1927 Survey and estimated the total oysters present as follows:

"Approx. area East Bed = 10 sq. miles (= 6,400 acres x 4,840 sq. yards)

Area covered by 10 ft dredge in one hour = 9,387 sq. yds

No. of oysters caught per hour with above = 474 dozen

Therefore 9,387 sq. yds yield = 474 dozen

Therefore oysters on 10 sq. miles = $\frac{474 \times 6{,}400 \times 4{,}840}{9{,}387}$

= 1,551,218 dozen

"Taking this figure as approximately representing the oyster population, the time taken by the fleet to clean up all the oysters of every size from the East Bed would be as follows:

"The fleet carries approximately 11 dredges of 12 feet each. One 10 ft dredge catches 474 dozen per hour.
Therefore the fleet with 132 feet of dredge would catch 6,527 dozen per hour.
Therefore the number of hours required by the fleet to clean out the bed

$$= \frac{1{,}551{,}218}{6{,}257} = 235 \text{ hours}$$

"At 8 hours a day the fleet would exhaust the bed in 29.3 days so on the average of 12 fishing days per month the East Bed would last only about 2½ months if the whole of the fleet fished on it continuously and took oysters of all sizes."

6. <u>Abundance in Relation to Depth</u> and other factors - it was considered that depth of water had no apparent relation to the relative abundance of oysters since shallow waters of the east beds yielded approximately the same number of oysters per haul as the deeper waters of the Saddle Bed, whilst others in either deep or shallow water did not yield the same results.

The opinion was expressed that relevant abundance was entirely dependent on the class of bottom taken in conjunction with tidal and current movements. It was not thought that salinity or temperature would vary greatly throughout the Strait since the fast running tides would tend to keep the water well mixed and of uniform composition and temperature.

7. Size Distribution - the mode or size group of maximum occurrence for the "Winter Survey" of 1926 was found to be constant at 2½ inches, and 6 cms (approx. 2.4 inches) during the "Summer Survey" of January 1927.

Young's Table of Measurements for the 1926 survey (Table 3) is given below, followed by his table from it (Table 4) expressing the results as monthly percentages and a graph (Figure 3) showing the sizes of oysters measured as percentages of the total.

Table 3: Table of measurements of oysters in March-August of the 1926-27 survey.

MONTH	1"	1¼	1½	1¾	2"	2¼	2½	2¾	3"	3¼	3½	3¾	TOTALS
MARCH	91	65	107	118	197	472	942	930	496	127	36	5	3,586
APRIL	9	3	26	39	185	707	1034	660	226	32	4	0	2,925
MAY	3	22	18	33	221	869	926	440	116	22	2	0	2,672
JUNE	11	33	48	51	179	464	510	337	130	39	7	0	1,809
JULY	13	14	40	49	195	491	506	346	126	42	7	0	1,829
AUGUST	22	44	96	120	584	1382	2028	1417	543	168	47	0	6,451
SIZE TOTAL	149	181	335	410	1561	4385	5946	4130	1637	430	103	5	19,272
% OF TOTAL	0.8	0.9	1.7	2.1	8.1	22.8	30.9	21.4	8.5	2.2	0.5	0.03	

Table 4: Monthly percentages of oysters sampled in March-August of the 1926-27 Survey.

MONTH	1"	1¼	1½	1¾	2"	2	2½	2¾	3"	3¼	3½	3¾	TOTALS
MARCH	2.5	1.8	3.0	3.3	5.5	13.2	26.3	25.9	13.8	3.5	0.9	0.1	
APRIL	0.3	0.1	0.9	1.3	6.3	24.2	35.4	22.6	7.7	1.1	0.1	0.0	
MAY	0.1	0.8	0.7	1.2	8.3	32.5	34.7	16.5	4.3	0.8	0.1	0.0	
JUNE	0.6	1.8	2.7	2.8	9.9	25.7	28.2	18.6	7.2	2.2	0.4	0.0	
JULY	0.7	0.8	2.2	2.7	10.7	26.9	27.7	18.9	6.9	2.1	0.4	0.0	
AUGUST	0.3	0.7	1.5	1.9	9.1	21.4	31.4	22.0	8.4	2.6	0.7	0.0	

The following table (Table 5) shows the size groups measured from the beds sampled during the "Summer Survey" of January 1927, when measurements were taken in centimetres, with each expressed as a percentage of the sub-total measured.

The succeeding table (Table 6) shows the "Summer Survey" results as beds combined into areas with percentage sub-totals and percentages of the gross total of 4,135 oysters measured. A new area, the Southern area, is introduced here to separate beds such as the Oban, Port William and North Island beds which did not feature in the 1926 "Winter Survey" and are not included in either Eastern or Western areas.

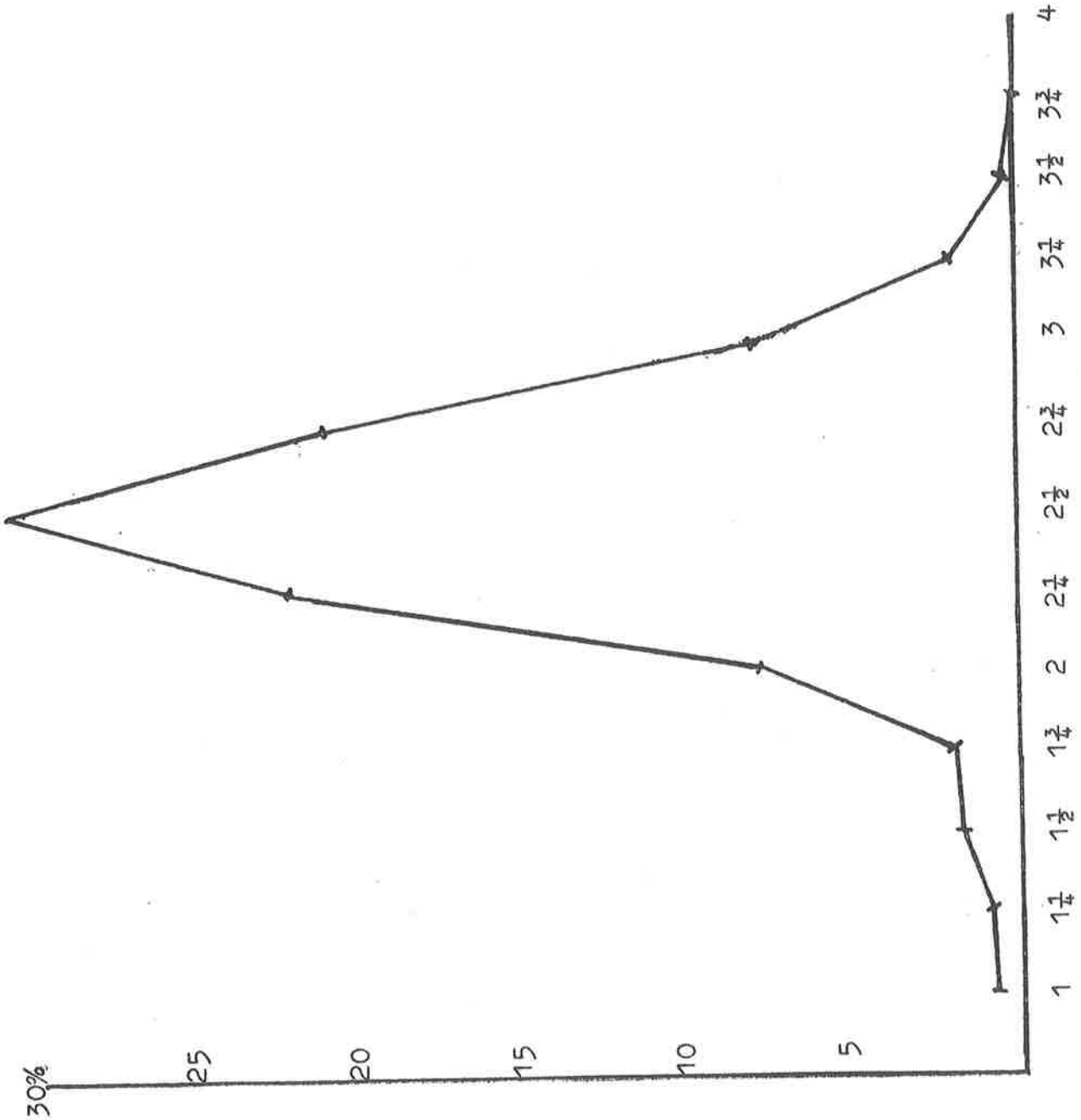


FIGURE 3

Sizes of oysters, measured in quarter inches, graphed as a percentage of the total sample (19,272) in the 1926-27 Survey.

Serial No.	BED OR AREA	SIZE GROUPS (cms) 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	TOTALS
1	OBAN/NORTH IS.	0	0	1	1	1	1	2	4	60	103	388	212	141	29	21	0	1	0	0	965
	% of TOTAL	0	0	.1	.1	.1	.1	.2	.4	6.2	10.7	40.4	22.0	14.6	3.0	2.2	0	.1	0	0	
2	PORT WILLIAM	1	0	2	0	5	5	10	2	8	5	18	9	18	7	10	0	1	1	1	103
	% of TOTAL	1.0	0	1.9	0	4.9	4.9	9.7	1.9	7.8	4.9	17.5	8.7	17.5	6.8	9.7	0	1.0	1.0	1.0	
3	LUCKY BEACH	0	2	0	1	0	1	4	8	19	26	125	78	64	16	11	4	1	0	0	382
	% of TOTAL	0	.5	0	.3	.5	.3	1.1	2.1	5.0	12.0	32.7	20.4	16.7	4.2	2.9	1.1	.3	0	0	
4	OBAN	0	2	1	1	6	3	16	4	14	12	11	8	16	6	17	6	4	0	1	128
	% of TOTAL	0	1.7	.8	.8	4.7	2.3	12.5	3.1	11.0	9.4	8.6	6.2	12.5	4.7	13.3	4.7	3.1	0	.8	
5	NORTH IS.	4	3	7	5	12	8	17	23	104	118	136	40	22	4	1	0	0	0	0	504
	% of TOTAL	.8	.6	1.4	1.0	2.4	1.6	3.4	4.6	20.6	23.4	27.0	7.9	4.4	.8	.2	0	0	0	0	
6	SADDLE	1	3	7	5	6	18	21	12	76	70	135	61	61	16	14	2	1	0	0	510
	% of TOTAL	.2	.6	1.4	1.0	1.2	3.5	4.1	2.6	14.9	13.7	26.5	12.0	12.0	3.1	2.7	.4	.2	0	0	
7	EAST (HAWKS 48-52)	1	0	9	10	23	13	17	18	21	27	68	50	41	15	14	5	2	1	1	336
	% of TOTAL	.3	0	2.7	3.0	6.8	3.9	5.1	5.4	6.3	8.0	20.3	14.9	12.2	4.5	4.2	1.5	.6	.3	.3	
8	EAST (GENERAL)	0	0	2	4	9	9	13	16	24	18	37	38	20	12	5	0	0	0	0	207
	% of TOTAL	0	0	1.0	1.9	4.4	4.4	6.3	7.7	11.6	8.7	17.9	18.4	9.7	5.8	2.4	0	0	0	0	
9	WEST (S.E. END)	0	2	5	7	6	5	14	27	108	95	118	44	20	3	1	0	0	0	0	455
	% of TOTAL	0	.4	1.1	1.5	1.3	1.1	3.1	5.9	23.7	20.9	26.0	9.7	4.4	.7	.2	0	0	0	0	
10	EIGHT MILE	0	0	5	4	2	4	8	9	46	55	115	62	35	6	5	1	0	0	0	357
	% of TOTAL	0	0	1.4	1.1	.6	1.1	2.2	2.5	12.9	15.4	32.2	17.4	9.8	1.7	1.4	.3	0	0	0	
11	OFF NEW RIVER	4	3	12	3	11	4	7	10	20	30	28	30	13	11	2	0	0	0	0	188
	% of TOTAL	2.1	1.6	6.4	1.6	5.9	2.1	3.7	5.3	10.6	16.0	14.9	16.0	6.9	5.9	1.1	0	0	0	0	

Table 5 - Table of size groups, in cm., of oysters, by beds, sampled in the "Summer Survey" of 1927

SIZE GROUPS (cms)

Serial No.	BED OR AREA	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	TOTALS
8:9	EASTERN	1	0	11	14	32	22	30	34	45	45	105	88	61	27	19	5	2	1	1	543
	% of TOTAL	.2	.0	2.0	2.6	5.9	4.1	5.5	6.3	8.3	8.3	19.3	16.2	11.2	5.0	3.5	.9	.4	.2	.2	
3: 7: 10: 11 12	WESTERN	5	10	29	20	27	32	54	67	269	296	521	275	193	52	33	7	2	0	0	1,892
	% of TOTAL	.3	.5	1.7	1.1	1.4	1.7	2.9	3.6	14.2	15.6	27.6	14.5	10.2	2.8	1.8	.4	.1	0	0	
1: 2: 4: 5	SOUTHERN	5	5	11	7	24	17	45	33	186	238	553	269	197	46	49	6	6	1	2	1,700
	% of TOTAL	.3	.3	.7	.4	1.4	1.0	2.7	1.9	11.0	14.0	32.6	15.6	11.6	2.7	2.9	.4	.4	.1	.1	
1: 12 incl.	SUMMER SURVEY TOTAL	11	15	51	41	83	71	129	134	500	579	1179	632	451	125	101	18	10	2	3	4,135
	% of TOTAL	.3	.4	1.2	1.0	2.0	1.7	3.1	3.2	12.1	14.0	28.5	15.3	10.9	3.0	2.4	.4	.2	.1	.1	

Table 6 - Table of oysters, in cm., by aggregation of beds into areas "Summer Survey" of 1927.

During the "Summer Survey" some beds were sampled for "under" and "over" 6 cm and the results (Table 7) not included in the preceding tables, are summarised below:

Table 7: "Under" and "over" oyster totals and percentages from beds not included in preceding tables. "Summer Survey" of 1927.

Bed	Under 6 cm	Over 6 cm	Total	% under 6 cm
Caroline Bay	118	176	294	40
East Bed	156	95	251	62
Guano Rock	122	164	286	43
Ruapuke	54	120	174	31
Total	450	555	1,005	45

It appeared from these results that the East Bed had a larger percentage of oysters under 6 cm. than the other beds sampled. This was thought to be due to this bed having been fished for a longer period, and more continuously, than the others. "Every time the ground is fished the larger oysters are taken and the smaller left. In time this factor in itself will lead to a preponderance of the smaller size groups ..."

"Another factor is that there is a good accumulation of clean shell on the East Bed, possibly due to the continual dredging, and this gives the spat a good fixing ground resulting in the presence of more small oysters on this ground than on an area which had been allowed to grow foul with marine growths such as sponges."

8. Analysis of a Commercial Haul - the quantity of material from the last haul for the day from "Dawson's Patch" near Ruapuke Island on 22.3.26 was emptied on deck after the dredge had been surged as usual to clean out the worst of small rubbish. The following analysis was made:

Total weight of sample	1,101 lb
Weight of live oysters	25 lb (22.7%)
Weight of rubbish	85 lb (77.3%)
No. of dead oysters (½ No. of valves)	219 (all mature except 6)
No. of starfish - mostly *Pectinura maculata*	59
Total No. of oysters alive	182
No. of oysters over present limit	156 (85.7%)
No. of oysters under present limit	26 (14.28%)
No. of oysters under proposed limit 2¼"	52 (28.57%)

Brittle shell; majority good quality and flavour.

9. Spawning of Dredge Oysters - the Report gives the following views on this topic:

The sexual ripeness of the oyster has a direct bearing on its fitness for human consumption. After spawning the oyster is thin and watery and has a dirty colour and is excessively bitter to the taste.

"I examined a large number of oysters at Bluff during the season and found them in good condition from March until the last month of the season when spawning oysters started to appear."

"A considerable number of the oysters purchased in the last month of the season were obviously spent or on the point of spawning. They were of dark colour and had a very bitter taste. They were not fit for human consumption and their occurrence in such quantity is a strong recommendation for cutting out the last month of the present season."

10. Fauna of Foveaux Strait - specimens of the life on the beds during the season were preserved for later examination and the Report gives lists and tables under the following headings:

(a) A list of the more common forms found during the "Summer Survey" which were in sufficient numbers to be prominent.

(b) A list of fauna other than Mollusca.

(c) A list of Mollusca found during both "Winter" and "Summer Surveys".

11. Predators and Competitors - after listing the associated organisms into living enemies (directly and indirectly injurious), and inanimate enemies, the Report deals with them as follows:

(a) Skates and Rays are not plentiful and may be ruled out as economic enemies.

(b) Octopods are generally of small size and probably do not affect mature oysters, but "they must play havoc with the spat".

(c) Echinodermata teem in the Strait the most common being an ophuroid, *Pectinura maculata*, called "Fivefingers". This type is probably unable to attack a mature oyster, but may be responsible for enormous loss of spat annually. Larger starfish are also plentiful and are capable of attacking large oysters. Sea urchins are also common but probably have little effect on mature oysters and may prey on spat.

(d) Crabs are not very plentiful and may prey on sick oysters and spat.

(e) Whelks of various kinds are common "but I do not think we have the destructive dog whelk of the English beds".

(f) Mussels - the number dredged was comparatively small and can have little effect as competitors for food or spatting position.

(g) Boring Sponge (*Clione*) is undoubtedly the oyster's worst enemy and a very large percentage of the shells of oysters from the western area are simply honeycombed. Even where the damage has not penetrated the shell sufficiently to weaken or kill the oyster, it is spoiled for commercial purposes in that the oysters transport badly and the shells break easily when being opened. If the sponge has penetrated to any extent the oyster is sick and watery.

(h) Weed and other organisms affect oysters by so fouling the bottom that the oyster spat is either unable to find an attachment surface or, if settled, may getsmothered before maturity.

(i) Sanding has little effect on Straits oyster beds although, according to fishermen, edges of some beds are covered from time to time.

(j) Mud, too, has little effect on tidal parts but may account for the dearth of spat in more sheltered Port Adventure.

12. The Report concludes with the following remarks and recommendations:

(a) That the size of oyster permitted to be taken etc., be increased from 1¾ inches to 2⅛ inches.

(b) That the cost of a licence for oystering be increased from the present 10/- per boat per annum to £5 per dredge carried.

(c) As the beds are fairly well supplied the closing of any part is not recommended, although the Eastern Area could quite well do with a rest to give the present population of small oysters a chance to grow unmolested. "Our only policy at present can be with reference to the curtailment of the season".

(d) The present collection of oyster statistics was inadequate and the use of a daily return card by each boat is advocated.

(e) The question of the number of boats engaged in the industry should be carefully watched. "The freezing, canning and export trades are all capable of great extension but I am doubtful if the beds would stand the extra fishing involved".

(f) No changes in regulations concerning Port Adventure should be made and any proposal to take oysters during the off season should be declined.

(g) Oyster planting experiments should be carried out.

(h) Boats should not be permitted to leave port more than 1½ hours before sunrise "as the men cannot culch properly in the dark."

(i) Errors in charts of the day require investigation and attention.

(j) Further hydrographical and hydrological studies should be made.

(k) The use of oyster vessels on other fisheries, e.g. trawling, during the off season should be considered.

Apparently little, if anything was done in the next decade to implement the above recommendations for the Sea Fisheries Investigation Committee (of which Mr Young was a member) made the following recommendations in their Report to Government (H-44A) of 1937-38:

1. That all oyster beds inside a line drawn from Bluff Hill on the mainland to Dog Island thence to Bird Island, thence to South Point off Ruapuke Island, and thence to Waipapa Point be closed for a period of not less than three years.
2. That this portion of the industry remain subject to the Industrial Efficiency Act until such time as the Fisheries Act can be amended to provide for the refusal of licences and that no further licence be issued until a survey of the beds has revealed that the stocks will stand up to additional abstractions.
3. That the width of the dredges used shall not exceed 12 ft.
4. That the "bit" of the dredge shall not exceed 2½ inches in depth.
5. That the legal size of dredge oysters shall be increased from 1¾ inches to 2⅛ inches.
6. That a complete survey of the known oyster beds be undertaken during the period October, 1938, to February, 1939, such survey to be a cooperative effort between the merchants and the Government.
7. That a further survey be conducted, again by cooperative effort, to establish the existence of new oyster beds within working distance of Bluff.
8. That the oyster season be reduced by a fortnight in each year at the commencement of the season - i.e., the starting date should be altered from 1 February to 14 February.

The above recommendations were implemented, at least in part, in the next few years by gazetted regulations amending previous legislation. Provision for extending the close season was the subject of an Order in Council on 20 December 1948, and for an alteration to the close season as it affected the South Island on 12 June 1940.

The control of numbers of oyster dredging licences remained under the Industrial Efficiency Act until the passing of the Fisheries Act in 1945, and endured until the abolition of restrictive licensing by an Act Amendment in 1963.

The raising of the size of oyster permitted to be taken was fixed at $2\frac{1}{8}$ inches by regulation gazetted on 12 February 1941 and has remained at this size ever since.

The many regulations concerning oysters contained in the earlier Sea Fisheries Regulations were revoked on 3 July 1946. They were consolidated and re-enacted, with amendment, in the Oyster Fishing Regulations on that date. Provision was made in these regulations, amongst other things, for seizure of oysters unlawfully taken or gear used in such taking, the furnishing of weekly returns of oysters dredged, close seasons, and general and local restrictions.

IV 1945 SURVEY

In 1944 the Foveaux Strait oyster dredgers were operating on a limit quota of 7,000 sacks for the season per vessel and the industry sought Government permission to determine the existence and extent of any new oyster beds to the eastward or westward of the area normally worked, and on their reaching their individual quotas. After consultations with industry and Seamen's Union representatives an agreement was drafted for a cooperative survey to determine these matters and indicate whether it would be safe to expand the industry further or, alternatively, whether exploitation was already too severe.

The agreement was signed by all parties on 8 January 1945 and stipulated as follows:

(a) Each oyster dredging vessel operating in the 1945 season should in turn, as decided by ballot, be made available for survey and prospecting work for 14 consecutive days.

(b) Time lost through bad weather not to be made up by service on additional days; time lost from other causes to be made up.

(c) All oysters taken during the survey to be handled by the owner of the vessel in the normal way.

(d) Oysters taken during survey not to be included in the 7,000 limit.

(e) Any limits or closed areas dictated by survey results to be applicable only after completion of survey.

(f) Government not to be responsible for any wages or costs arising during the survey excepting those incurred by a Government observer.

(g) Prospecting or survey to be in such areas as the Government observer directs.

(h) Upkeep and operating costs during survey to be responsibility of vessel's owner.

(i) Minister of Marine undertakes to extend the oyster season from 1 February to 30 September 1945.

Early in 1945 Captain Ernest F. Watson was appointed as observer in charge of the survey which was scheduled to commence on 14 February and, following a discussion with industry and Union representatives, certain concessions were made the most important being that each vessel should do her 14 days in two periods of 7 days each. The survey commenced on 15 February and was suspended on 26 April for reasons which will be apparent later.

Reporting on the 1945 Survey to the Minister of Marine it was stated that the results amplified the previous opinion of Marine Department - that oysters are not to be found in Foveaux Strait in payable quantities apart from the known beds, and that "our procedure to limit the annual catch is fully justified."

So far as survey work and results were concerned the above report stated:

(a) "Navigational difficulties on the small craft used for oyster work, together with the fact that charts of the area had a number of inaccuracies with respect to relative positions, made the task unexpectedly unreal. During the early stages of the survey these difficulties became apparent and the task of accurately plotting the position of the boat completely overshadowed the recording of biological data to an extent that only worthwhile catches of oysters were recorded".

(b) "Added to this was the action of some of the oystermen in refusing the second tour of duty to work in the area because of the scarcity of oysters. The second tour of the survey confined operations to beds in the known oystering area that was not squared off on the chart ..."

(c) "The action of the oystermen in refusing the second tour of survey except on the known oyster grounds, while it detracted from the value of the survey making it most incomplete, did in a practical way establish that the oyster grounds in Foveaux Strait were in fact limited to those areas already known, and that conservational measures were necessary to maintain production without depleting the beds to a point where further dredging would be uneconomic."

(d) "Nowhere in the area set for survey were oysters found in quantities comparable in any way with those on the known areas."

(e) "The magnitude of the navigational difficulties precluded the recording of biological data in the detail intended and hence it is not possible to present tabulated results to reconstruct an ecological map of the area."

(f) "The results from trips in the survey area compared with trips in the area of known oyster beds revealed beyond all doubt that in the survey area there were a few beds of oysters that could be worked commercially, but none that would attract the boats while the areas at present dredged produce even one-third of their present quantities."

The Report concluded with the following recommendations:

(a) "That the principle of having an annual catch limit variable as to conditions be approved."

(b) "That no further oyster dredging licences be issued except in replacement of existing licences, provided that any cooperative movement by returned servicemen would receive serious consideration."

(c) "That a full biological survey be undertaken when we have the funds and staff to do the job properly."

Note: No plan or chart of the 1945 survey has been located although it seems certain one was prepared to show the stations to be sampled to east and west of the beds normally worked and the stations which were worked.

In respect of the above recommendation for an annual catch limit variable as to conditions, the current 7,000 sack limit, per boat, originally proposed in 1939 and applied shortly afterwards, was lifted in 1946 in which year heavy catches were taken from the eastern area.

As already stated the restriction on numbers of operating vessels was continued until repealed in 1963.

V. 1960 SURVEY

No further survey of the Foveaux Strait oyster beds took place until 1960.

This survey was completed by Mr D.H. Stead, Marine Department, Bluff and the detailed results are being prepared for publication; probably within the Marine Department Technical Report Series.

A chart of the Foveaux Strait showing the Zones and Areas containing the principal oyster beds as at January 1963 is included (Figure 4) for reference purposes.

REFERENCES

Howard, B., 1940
"Rakiura", Centennial Survey of Stewart Island.

- Marine Department, Wellington, Annual Report on Fisheries, Wellington.

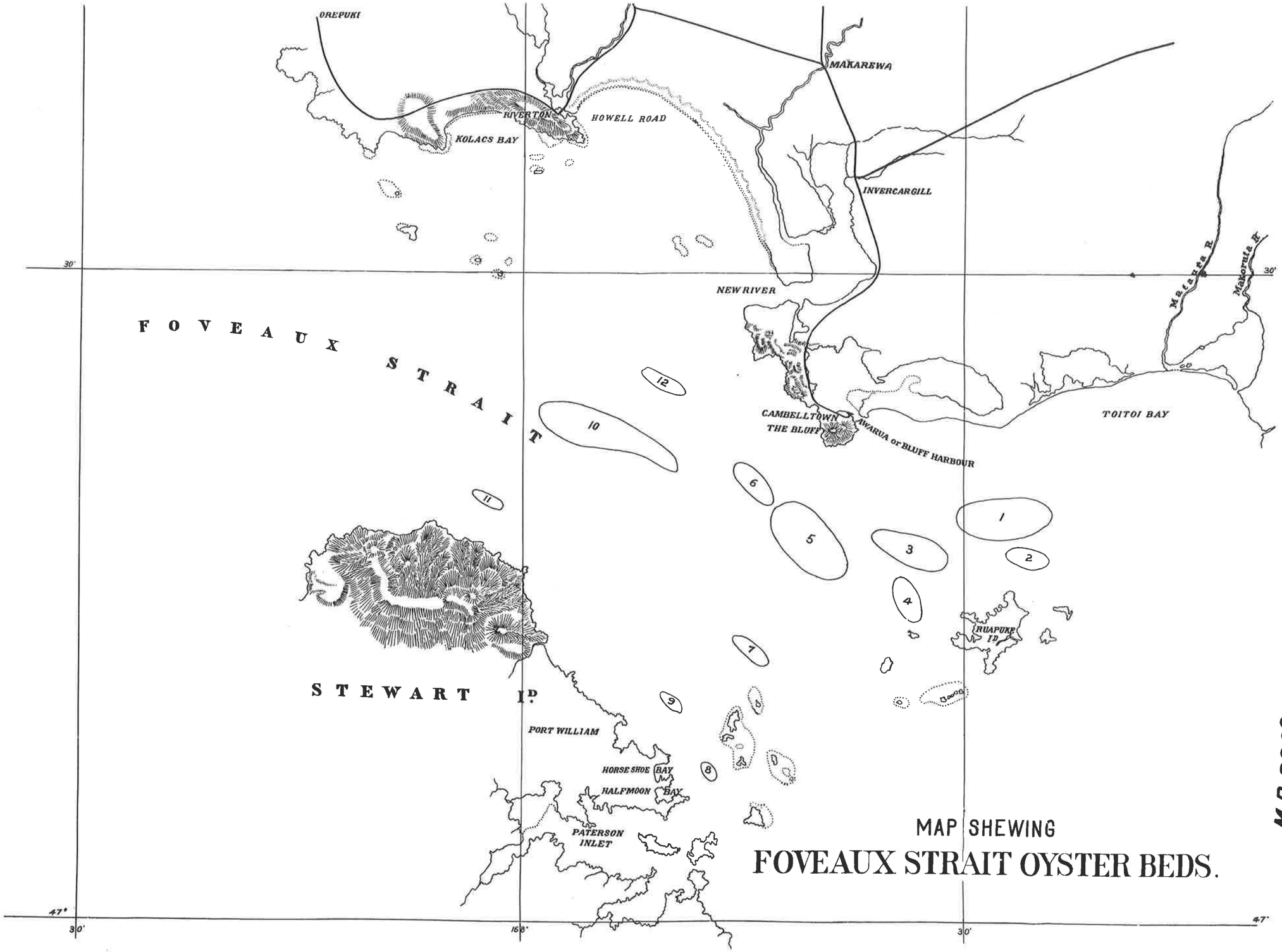
- Marine Department, Wellington, Reports on file re Dredge Oyster Surveys and other aspects, Wellington.

- Report of Sea Fisheries Investigation Committee, 1937-38, H.-44A, Wellington.

Figure 1. Chart of Foveaux Strait showing the oyster beds determined during the 1906 survey. (From Deposited Plan M.D. 2960).

Figure 2. Chart of Foveaux Strait showing location of 129 stations worked during the 1926-27 survey. (From a chart submitted with Mr M. Young's report).

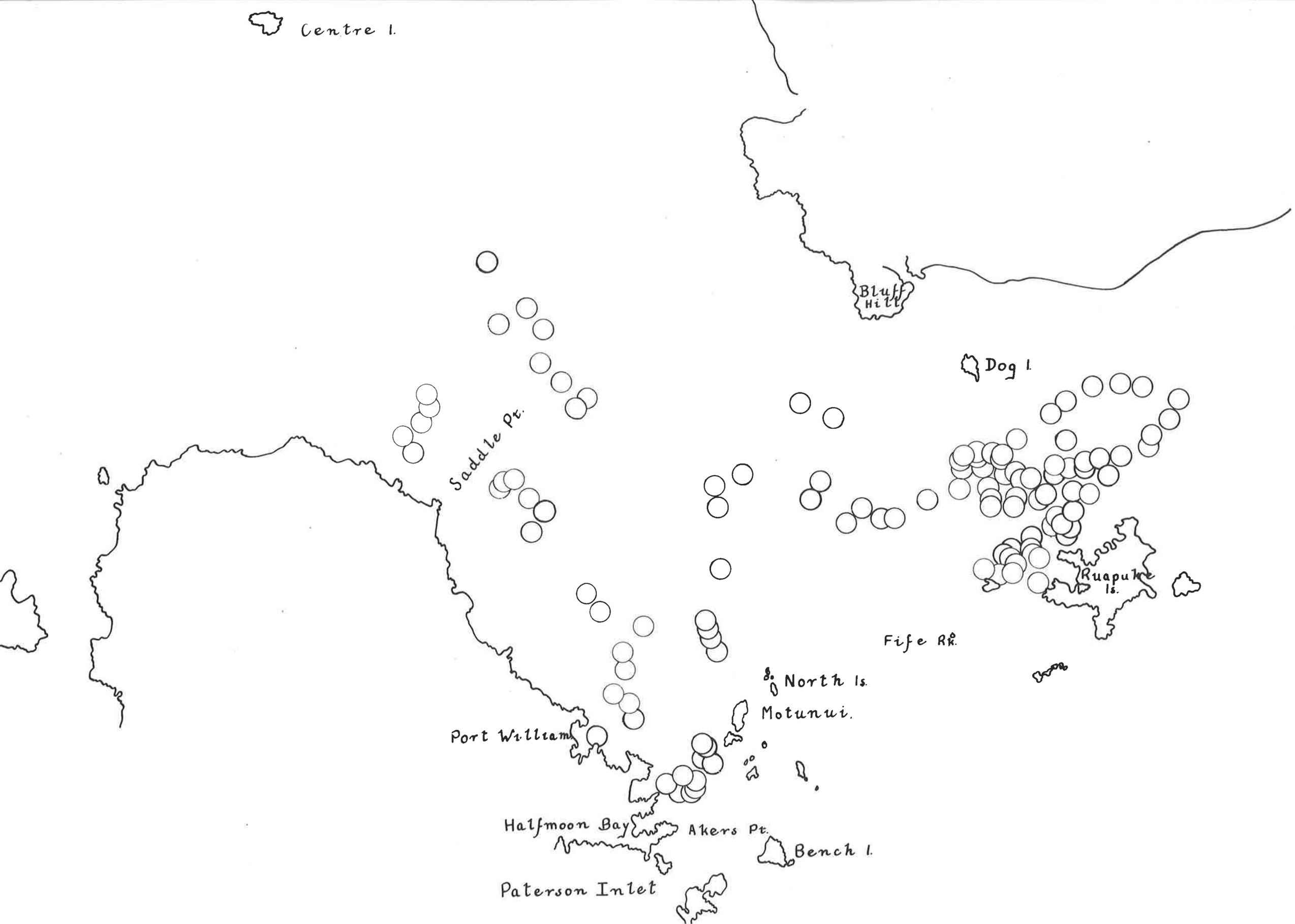
Figure 4. Chart of Foveaux Strait showing Zones and Areas containing the principal oyster beds as at January 1963.



MAP SHEWING

FOVEAUX STRAIT OYSTER BEDS.

M.D. 2960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Dog I.
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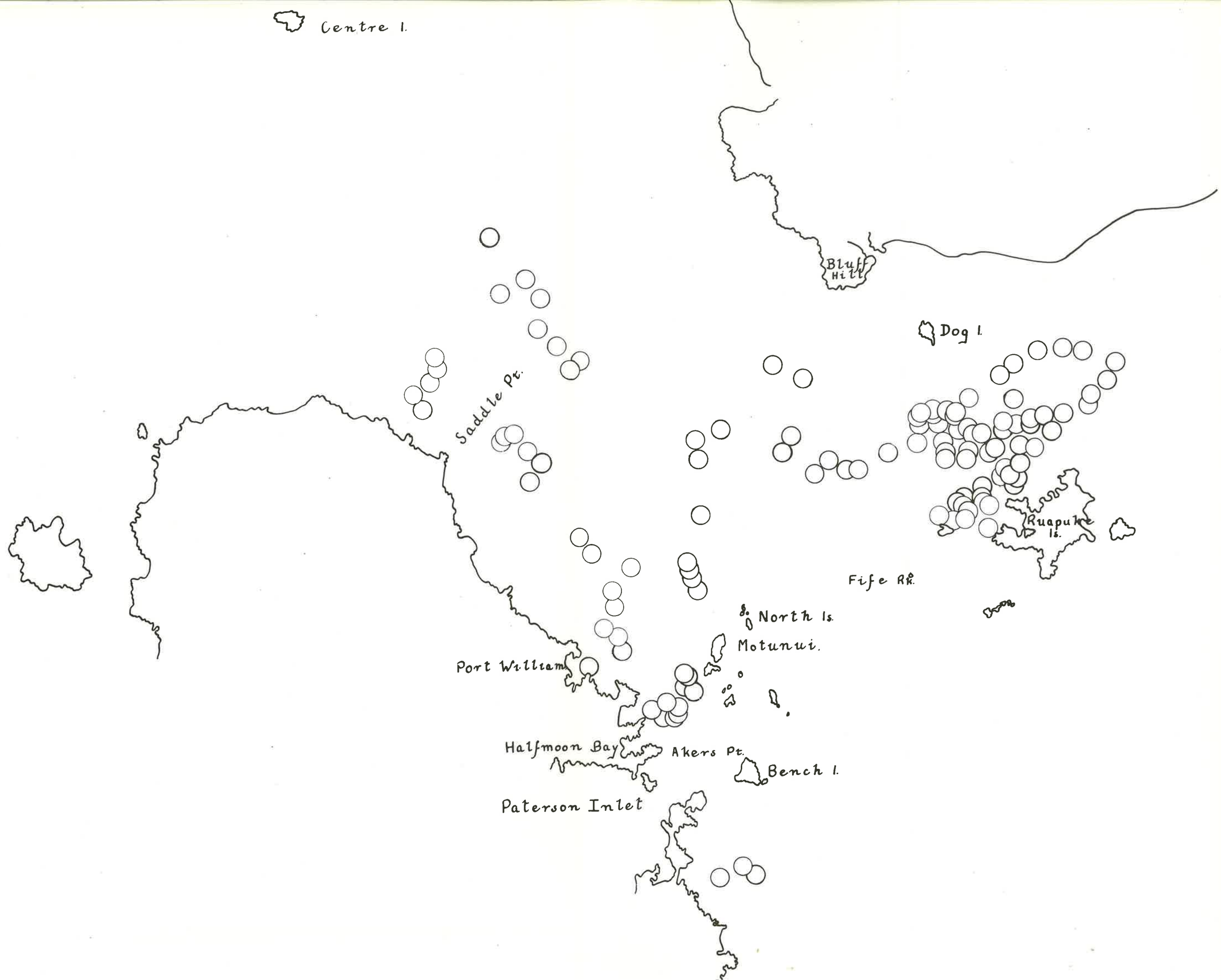
Fife Rk.
North Is.
Motunui.
Port William
Halfmoon Bay
Akers Pt.
Bench I.
Paterson Inlet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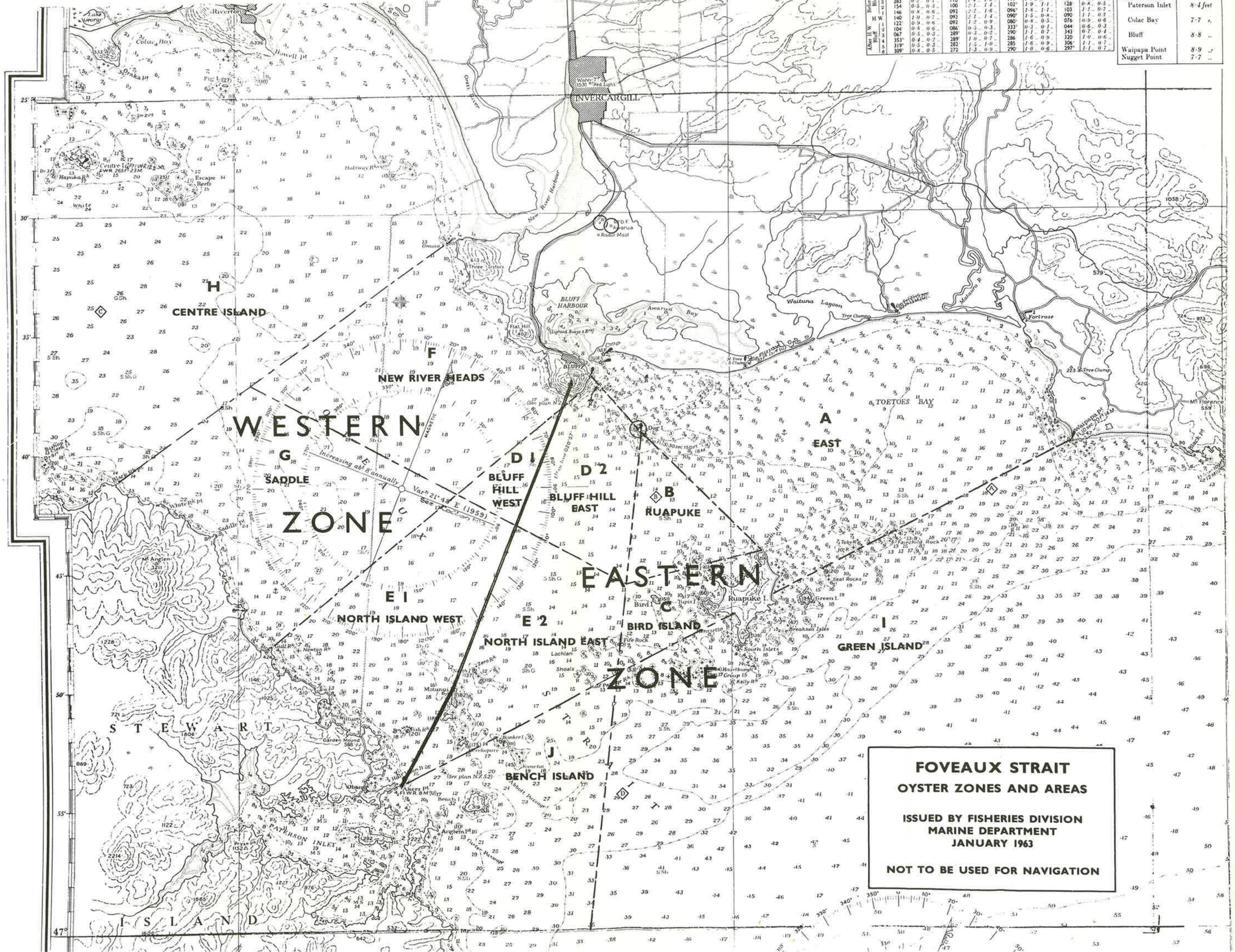

		Before H.W. Bluff																			
	5	310°	0·6	0·3	226	0·6	0·4	186	0·5	0·5	257	0·6	0·4
	4	274	0·3	0·2	130	0·7	0·5	137°	1·1	0·6	224°	0·6	0·4
	3	283	0·2	0·1	110	1·4	1·0	111	1·7	0·9	167°	0·6	0·4
	2	154	0·5	0·3	100	2·1	1·4	102°	1·9	1·1	128	0·8	0·5
	1	146	0·8	0·6	092	2·2	1·6	096°	1·8	1·1	103	1·1	0·7
H.W.		140	1·0	0·7	092	2·1	1·4	090°	1·5	0·8	090	1·1	0·5
After H.W. Bluff	1	122	0·9	0·6	092	1·2	0·9	080°	0·8	0·5	076	0·9	0·6
	2	104	0·8	0·6	086	0·5	0·3	333°	0·3	0·1	044	0·6	0·3
	3	067	0·5	0·3	289°	0·3	0·2	290	1·1	0·7	343	0·7	0·4
	4	353°	0·4	0·2	289°	1·0	0·7	286	1·6	0·9	320	1·0	0·6
	5	319°	0·5	0·3	282	1·5	1·0	285	1·6	0·9	306°	1·1	0·7
	6	309°	0·8	0·5	272	1·3	0·9	290	1·0	0·6	297°	1·1	0·7

	Mean Springs
Stewart Island –	
Paterson Inlet	8·4 feet
Colac Bay	7·7 ,,
Bluff	8·8 ,,
Waipapa Point	8·9 ,,
Nugget Point	7·7 ,,