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NEW ZEALAND MARINE DEPARTMENT

**FISHERIES TECHNICAL REPORT
NO. 44**

**TOHEROA SURVEY - WELLINGTON
WEST COAST BEACHES 1966**

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FISHERIES TECHNICAL REPORT

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SUMMARY

The three most important toheroa beaches in the Wellington District extend over $12\frac{1}{2}$ miles and were surveyed by trenches spaced at 100 yards to $\frac{1}{2}$ mile intervals.

Toheroa were thickest along the mid-tide level and evenly distributed along each beach.

There were very clear surface signs on Hokio Beach and the heaviest deposits of phytoplankton for several years.

The total toheroa population numbered 786,920 of which 585,800, (74%) were of legal size.

The greatest number and density was on Hokio Beach with 96,000 toheroa per mile. South Waitarere carried the second greatest number of toheroa with North Waitarere third.

The largest toheroa were on Hokio Beach with a peak of abundance in the population at 9.0 to 11.0 cm. Toheroa on North and South Waitarere Beaches were smaller with a peak of abundance at 8.0 to 9.5 cm and 9.5 to 10.5 cm respectively.

Several changes occurred in a 12 months period. The numbers of toheroa on North Waitarere decreased by 52% but increased on Hokio by 86% and South Waitarere Beach by 40%.

More intensive sampling i.e. trenches spaced closer together, gave a variation in the estimated number of toheroa of up to 31% more or less than the original estimate.

Further experiments should be done to test the accuracy of the sampling method.

A special effort should be made to locate undersized toheroa particularly those one year old.

The beaches are well stocked with toheroa.

TOHEROA SURVEY - WELLINGTON WEST COAST BEACHESJUNE 1966INTRODUCTION

Toheroa (Amphidesma ventricosum Gray) are present on 46 miles of beach on the west coast of the Wellington District. There is an open fishing season of two months every year with the Marine Department conducting surveys at regular intervals to measure the numbers and population structure.

This report gives the results of a survey in 1966 and discusses changes in the population over a twelve months period. It also describes an experiment to test the accuracy of the sampling method.

BEACHES SURVEYED

The three most productive beaches, located in 1965 and listed below, were surveyed again in 1966.

<u>Beach</u>	<u>Boundaries</u>	<u>Length (Miles)</u>
North Waitarere	Manawatu River to Waitarere Beach Entrance	5
South Waitarere	Waitarere Entrance to Hokio Stream	3
Hokio	Hokio Stream to Ohau River	4½

They extend for 12½ miles in a north to south direction and are dissected by five rivers of varying size. They are exposed to heavy surf, containing abundant phytoplankton, the food of the toheroa. The three beaches are similar in structure with fine uniform sand, varying degrees of slope and backed by an extensive area of sand dunes. North Waitarere is the steepest and therefore the narrowest beach.

SURVEY METHODS

These are described in detail in Technical Report No. 21.

Visual Examination

An examination of marks on the surface of the sand, left after withdrawal of the two siphon tubes, revealed that toheroa were evenly spread along the beaches. The population was there-

fore sampled by digging trenches at regular intervals.

Trenches

Trenches 1 foot wide and an average length of 60 feet were dug at half mile intervals across each beach as detailed on the location map. Digging started in the middle of the bed and continued out towards the high and low water levels until it appeared that no more toheroa were present.

Additional trenches were spaced at 440 yard intervals on a two mile section and at 130 yard intervals on a quarter mile section of Hokio Beach, to determine if the estimate of the number of toheroa, varied with an increase in the sampling intensity.

The number of toheroa in a trench, multiplied by the distance in feet from the previous trench, gave the number of toheroa in that section. They were divided into legal size, over 3.0 inches (7.6 cm) in length and undersized, less than 3.0 inches.

RESULTS

There had been no change in the distribution of the toheroa since the previous survey. They extended in a continuous bed, 15 to 30 yards wide, along the mid-tide level of the three beaches becoming scarce within a mile of the mouths of the Manawatu River and Hokio Stream. Surface signs were clear particularly on Hokio Beach.

TABLE 1

NUMBER OF TOHEROA PER BEACH
(Figures for 1965 (thousands) in brackets)

Beach	Length (Miles)	Trenches (No.)	Legal	Under-sized	Total
N. Waitarere	5	9	150,480 (274)	34,320 (111)	184,800 (385)
S. Waitarere	3	6	132,000 (63)	34,320 (26)	166,320 (89)
Hokio	4½	14	303,320 (200)	132,480 (110)	435,800 (310)

Legal Size Toheroa

Hokio Beach had the greatest population of legal size toheroa with North Waitarere supporting half the number and South Waitarere slightly less again, (Table 1). It also had the highest density of toheroa per mile of beach, carrying one and a half times that of South Waitarere and twice that of North Waitarere (Table 2).

Undersized Toheroa

Hokio Beach had four times the number of undersized toheroa than either of the other two beaches (Table 1). It also had the highest density of toheroa, with four times as many as North Waitarere and three times that of South Waitarere Beach.

The percentage of undersized toheroa in the population was highest in Hokio, 30% compared with South Waitarere, 20% and North Waitarere, 18%.

TABLE 2

NUMBER OF TOHEROA IN THOUSANDS
PER ONE MILE OF BEACH

(Figures for 1965 in brackets)

Beach	Legal	Undersized	Total
N. Waitarere	30 (54)	6 (22)	36 (77)
S. Waitarere	44 (21)	11 (10)	55 (29)
Hokio	67 (44)	29 (24)	96 (69)

POPULATION STRUCTURENorth Waitarere

Toheroa varied in length from 5.5 to 11.5 cm with the bulk of the population at 8.0 to 9.5 cm and 2½ to 4 years old, (Fig. 1).

South Waitarere

There were smaller toheroa than on North Waitarere beach, but the maximum size was the same.

The main size group was from 9.5 to 10.5 cm in length and 4 to 5 years old with a second small group at 6.0 cm in length, (Fig. 1).

Hokio

The bulk of the population was 9.0 to 11.0 cm in length, 4 to 6 years old, with a second group at 5.0 to 6.0 cm, (Fig. 1). Both the smallest and the largest toheroa (4.5 to 13.0 cm) were on this beach.

Comparison of Beaches

The average size of toheroa increased from north to south, with toheroa on the Hokio Beach having the greatest size range, (4.5 to 13.0cm shell length).

North Waitarere had more toheroa (18%), just on the legal size limit of 7.5cm compared with the other two beaches, (2%), and would probably have the most problem with the unlawful taking of under-sized toheroa.

The smallest toheroa found on each of the three beaches were two years old, with a shell length of 5.0 to 6.5cm.

COMPARISON WITH 1965 SURVEYNumber of Toheroa

Hokio has become the most productive beach by maintaining a steady rate of increase in the number of toheroa over the past 5 years and is now carrying its greatest population since 1950. Legal size toheroa increased in 12 months by 103 thousand, (50%) and undersize by 22 thousand (20%) with the number of toheroa per mile increasing from 69 to 96 thousand.

South Waitarere Beach has become the second most prolific, carrying its greatest number of toheroa since 1948. Legal size toheroa increased in 12 months by 69 thousand (100%) and undersize by 8 thousand (30%) with the density rising from 29 to 55 thousand toheroa per mile.

North Waitarere Beach has fallen from first to third place with the number of legal size toheroa decreasing by 124 thousand (45%) and undersize by 77 thousand (69%). The density also dropped by 50%.

This decrease could have been caused by heavy exploitation. It was predicted after the 1965 survey that this beach, because of the high density and clear surface marks, would probably be the most popular to the public and suffer the greatest extraction of toheroa.

Size of Toheroa

There was a decrease in the number of undersize toheroa, in 12 months, on North Waitarere with a disappearance of toheroa under 5.0 cm in length. The maximum size of toheroa remained the same. This decrease could also be due to heavy exploitation; very small toheroa are easily damaged by digging and the large number just below the minimum legal length, would be subject to illegal taking.

South Waitarere had a reduction in the number of toheroa over 10.5 cm, with the maximum size 1 cm smaller than last year. The average length of undersize toheroa was also slightly less.

There was an increase in the numbers of two year old toheroa (5.0 to 6.0 cm) on Hokio Beach but a reduction in the percentage of toheroa between 10.0 to 11.5 cm.

The main bulk of the population was more evenly spread between 9.0 to 12.0 cm with an increase in the percentage of the population over 11.5 cm in length.

DISCUSSION

The population of toheroa on the three beaches appear to be in a healthy condition, with undersize toheroa forming 25% of the total stock. This is lower than last year (31%) and was caused by the reduction on North Waitarere. However, it is still better than the conditions prevailing between 1935 to 1951, when undersize toheroa made up less than 5% of the total population.

The surveys in 1965 and 1966 both showed a predominance of legal to undersize toheroa and this appears to have been a feature of the beaches since the first investigation in 1933. It is very likely that undersize, particularly one year old toheroa, are easily overlooked during a survey. In fact there was no sign of one year old toheroa in 1965 yet two year old toheroa were found on two beaches in 1966.

The effects of exploitation are not clear, particularly as there was an increase, rather than a reduction, in the number of legal size toheroa on two of the beaches, after the open season. It appears from a study of the history of the fishery, (Table 3) that fluctuations in the number of toheroa are caused by some natural event, rather than by overfishing.

TABLE 3NUMBER OF TOHEROA 1935 TO 1966

Year of Survey	Person	North and South Waitarere	Hokio
1966	Tunbridge	351,000	436,800
1965	"	475,000	311,000
1961	"	45,000	16,000
1957	Win	119,000	118,000
1955	Sorensen	99,000	175,000
1951	McKenzie and Kaberry	All beaches 323,000	
1948	Cassie	-	700,000
1940	Rapson	All beaches 2 million	
1935	Young	2½ million	-

EXPERIMENTAL TRENCHESResults

The number of toheroa on the three beaches was estimated first from trenches spaced at one mile and then half mile intervals. The numbers decreased by 26% on doubling the number of trenches on North Waitarere but increased by 1% on South Waitarere and 31% on Hokio Beach, (Table 5).

Trenches were dug at quarter mile intervals on a two mile section of Hokio Beach and three estimates were made from the trenches at 1 mile, half mile and quarter mile intervals. The number of toheroa increased by 100% in the second estimate and 16% in the third.

More intensive sampling of a quarter mile section, with trenches at 110 yard intervals, resulted in a decrease of 19% in the estimate of the toheroa numbers in that area, (Table 4).

To sum up: an increased number of trenches, i.e. more intensive sampling, resulted in two cases, in decreases of 19 and 26% and in four cases of increases of 1, 16, 31 and 100% in the number of toheroa.

TABLE 4
NUMBER OF TOHEROA FROM EXPERIMENTAL TRENCHES

Length of Experimental Section	Distance apart of Trenches (Number of Trenches in Brackets)			Change in Original Estimate
<u>Twelve Miles</u>	<u>1 mile</u>	<u>$\frac{1}{2}$ mile</u>		
North Waitarere	(5)248,160	(9)182,160		26% decrease
South Waitarere	(3)163,680	(6)166,320		1% increase
Hokio	(4)290,400	(8)380,160		31% increase
<u>Two Miles</u>	<u>1 mile</u>	<u>$\frac{1}{2}$ mile</u>	<u>$\frac{1}{4}$ mile</u>	
Hokio	(2)92,140	(4)192,410	(8)223,080	100% increase then 16% "
<u>Quarter Mile</u>	<u>$\frac{1}{4}$ mile</u>	<u>110 yards</u>		
Hokio	(1)47,520	(4)38,610		19% increase

Discussion

The increase of 100% is considered exceptional. One of the trenches at the one mile interval was close to the Hokio Stream and on the edge of the toheroa bed. It held only 4 toheroa and reduced the number estimated for that section of the beach. It illustrates, however, that the accuracy of the estimate, particularly with trenches at widely spaced intervals, depends on an even distribution of toheroa on the beach.

A visual examination of the distribution of toheroa is therefore important before deciding on the distance between trenches.

The experiment showed that trenches at half mile intervals could give variations in the estimated number of toheroa of up to 31% more or less than the actual number of toheroa present. Closer digging, involving considerable increased effort, also gave variations up to 19% and these results were obtained from areas with an even distribution of toheroa.

It would be wise, with such an area of beach to survey and the time factor to consider, not to intensify the number of trenches but to determine the error in the estimate at various intervals between the trenches. This would require further experimental digging on a selected portion of beach.

CONCLUSION

The beaches are well stocked with toheroa, particularly Hokio.

It is possible that there are undersized toheroa present, particularly under 5.0 cm in length, which are being missed by each survey. The next survey should therefore examine up to the high tide mark and down into the water at low tide level.

Further experiments should be carried out to determine the accuracy of the trench method for the estimation of toheroa numbers.

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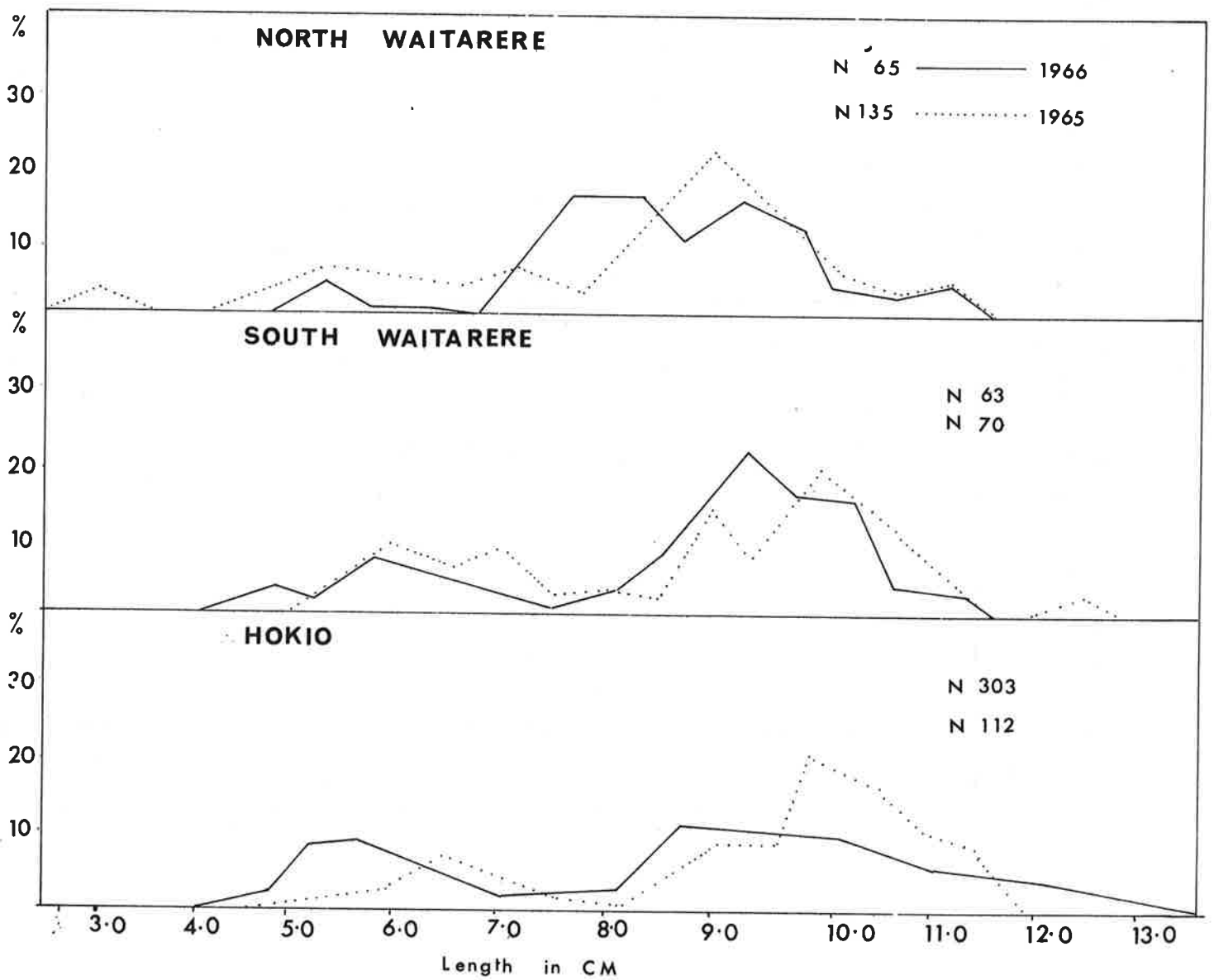
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TABLE 5NUMBER AND SIZE OF TOHEROA IN EACH TRAVERSE

Shell Length in cm.	Traverse Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	<u>North Waitarere</u>							<u>South Waitarere</u>							
13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11.5	-	-	-	-	1	-	2	-	-	-	2	-	-	-	-
11.0	-	-	-	-	-	-	1	-	1	-	1	1	-	-	-
10.5	-	-	-	1	-	2	-	-	-	-	2	4	2	2	-
10.0	-	-	1	-	2	3	3	-	-	1	2	3	3	1	-
9.5	-	-	5	1	1	-	3	1	-	2	1	4	5	2	-
9.0	-	-	2	-	1	3	1	-	-	2	3	-	1	1	-
8.5	-	-	1	-	2	2	4	1	1	-	2	1	-	-	-
8.0	-	-	2	1	1	2	4	-	1	-	-	1	-	-	-
<u>Size limit</u>	-----														
7.5	-	-	-	1	-	2	3	-	-	-	-	-	1	-	-
7.0	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
6.5	-	-	-	-	1	-	-	-	-	-	-	1	-	1	1
6.0	-	-	-	-	-	1	-	-	-	-	1	2	1	-	1
5.5	-	-	1	1	2	-	-	-	-	1	-	-	-	-	-
5.0	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-
4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	0	0	12	5	11	15	21	2	3	7	15	17	13	8	3

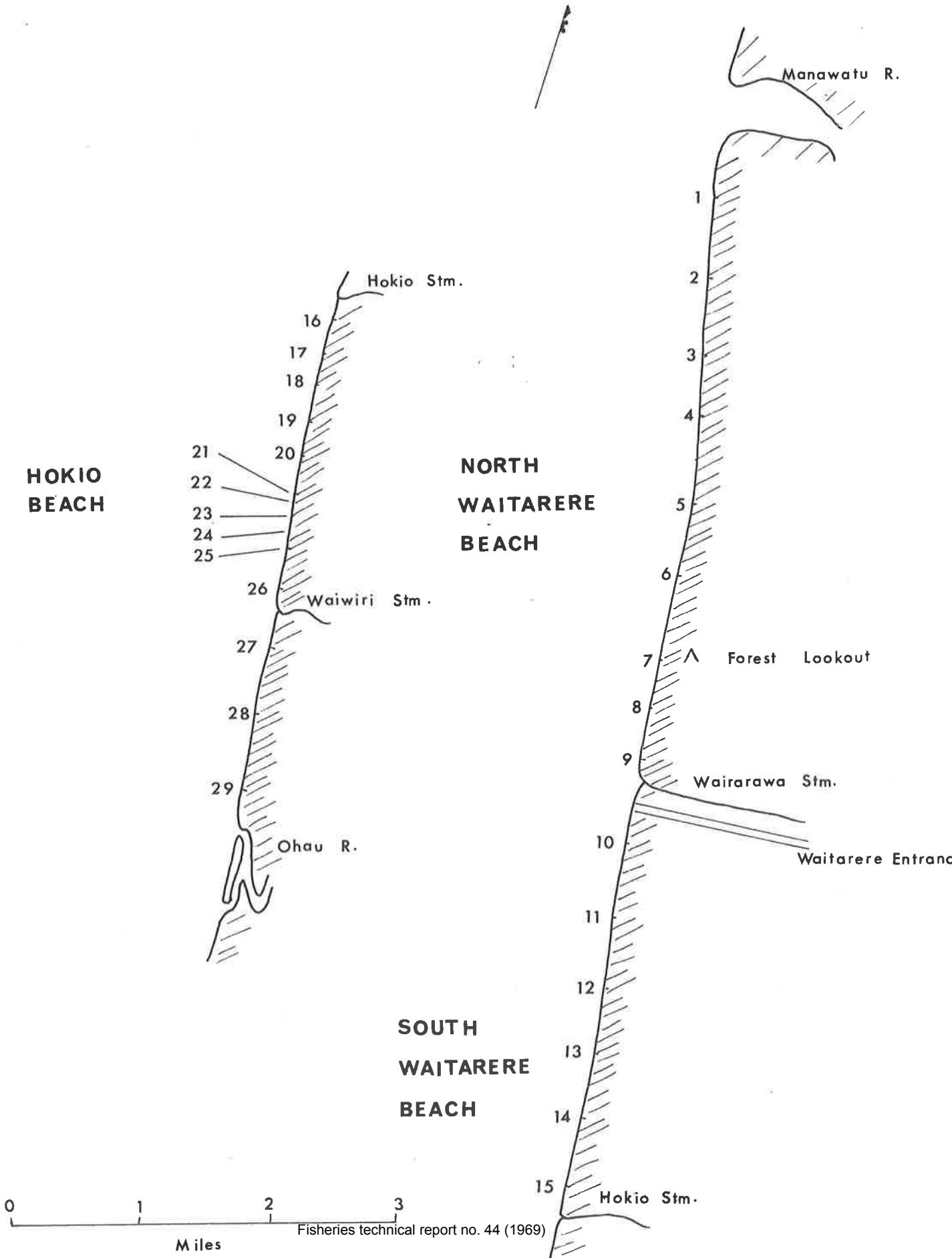
Shell Length in cm.	Traverse Number													
	16	17	18	19	20	21	22	23	24	25	26	27	28	29
	<u>Hokio</u>													
13.0	-	-	-	-	-	-	-	1	-	-	-	-	-	-
12.5	-	-	-	1	-	2	-	-	3	-	-	-	3	-
12.0	-	-	-	1	-	-	2	-	2	1	-	2	3	-
11.5	-	-	1	-	-	1	3	1	3	-	-	2	6	1
11.0	-	-	4	1	1	6	1	2	1	-	1	2	1	1
10.5	-	1	4	1	-	4	6	1	3	-	2	2	3	1
10.0	1	-	3	3	3	4	5	-	3	2	2	1	3	1
9.5	1	3	2	-	1	2	7	2	3	3	3	-	-	1
9.0	-	4	2	3	1	2	3	2	1	5	2	9	-	3
8.5	-	1	1	2	1	-	1	-	-	3	1	1	-	-
8.0	-	-	1	-	-	-	2	-	-	2	2	-	-	1
<u>Size limit</u>														
7.5	1	-	-	-	1	-	1	-	-	-	1	1	-	-
7.0	-	-	-	-	-	4	1	-	1	1	-	2	-	-
6.5	-	2	1	2	1	3	1	-	3	2	2	1	-	1
6.0	1	4	2	1	3	3	4	4	1	4	2	1	-	-
5.5	-	6	4	-	1	2	3	1	3	5	-	-	1	1
5.0	-	1	2	-	-	3	-	-	-	1	-	-	-	-
4.5	-	3	-	-	-	-	-	-	-	-	-	-	-	-
4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	4	25	27	15	13	36	40	14	27	29	18	24	20	11

FIG 1 LENGTH PERCENTAGE DISTRIBUTION OF
TOHEROA 1965 - 66



LOCATION MAP

Numbers Indicate Position Of Traverse



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