

B. J. Webb



NEW ZEALAND MARINE DEPARTMENT

FISHERIES TECHNICAL REPORT

No. 54

**NEW ZEALAND ROCK LOBSTER
JASUS EDWARDSII
(HUTTON)
SOUTH ISLAND FISHERIES**

R. J. STREET

WELLINGTON, NEW ZEALAND

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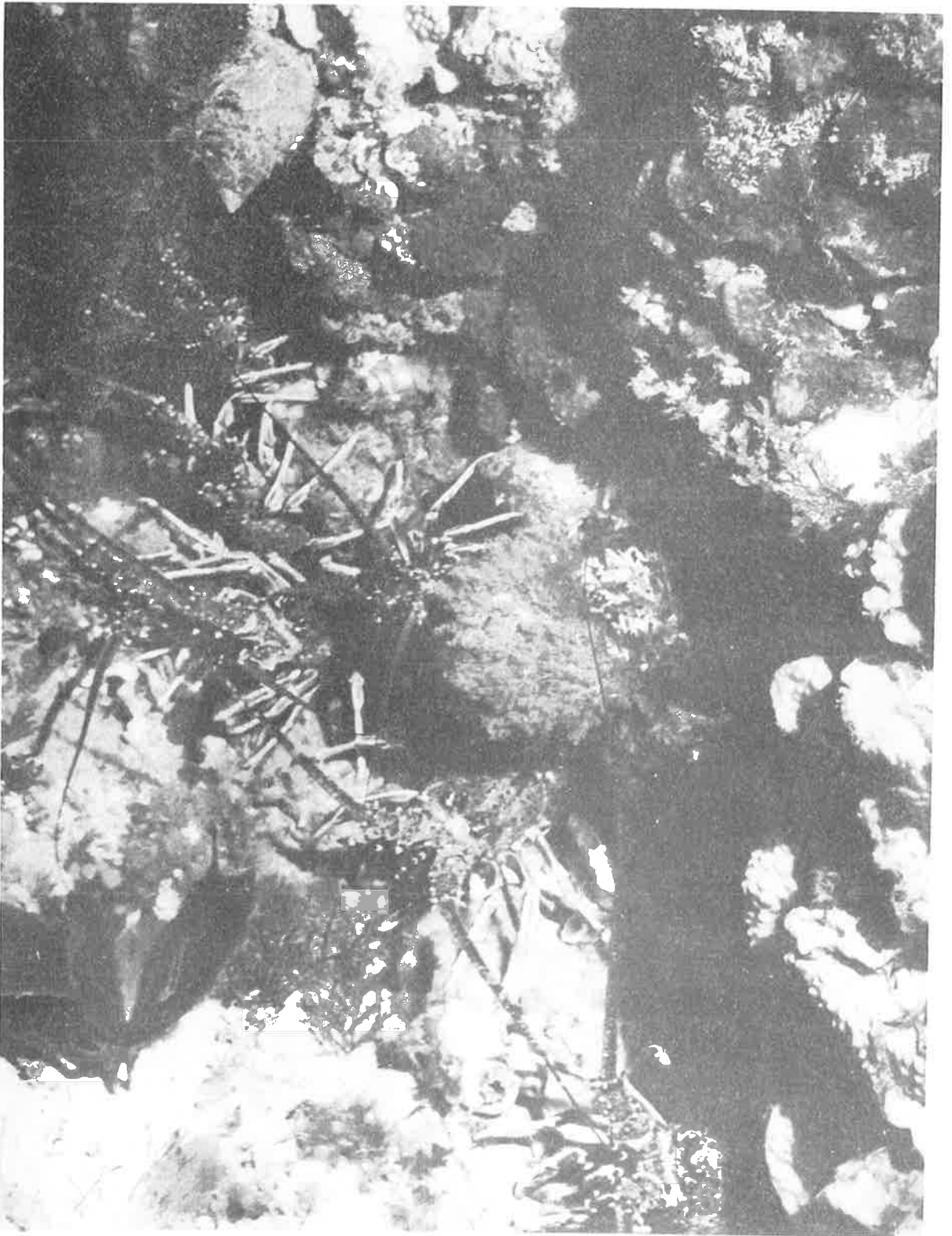
SOUTH ISLAND FISHERIES

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Group of 9" - 10" rock lobsters. N.E. Coast of Stewart Island

12 fathoms

I. SUMMARY

In fishing ports on the west and south coasts of the South Island, landings of rock lobsters reached a peak of 108,072 cwt in 1956. By 1960 the catch from this area had dropped to 52,970 cwt., since then it has stabilized, landings in 1969 being 49,997 cwt.

Many boats entered the industry after delicensing in 1964, and the catch per boat has continued to fall. Fishermen now work more gear to try to maintain catches.

The major part of the catch is rock lobsters just over the size limit.

Marking experiments indicated that at Karitane in 1965, at least 45% of the legal-sized part of the population was taken by fishermen. In Foveaux Strait in 1966, at least 20% of the legal-sized rock lobsters were caught.

When the catch is tailed at sea if heads are discarded on to the fishing grounds rock lobsters will leave the immediate area.

Management of the fishery is discussed.

II. INTRODUCTION

The term "rock lobster" is now being used for Jasus edwardsii in place of "crayfish". The fishery extends over a range from the Three Kings Islands ($34^{\circ}10'S$) to the south coast of Stewart Island ($47^{\circ}15'S$), and eastwards to the Chatham Islands (Fig. 1). The main fishing grounds are located at the Chatham Islands and off the south and south west coasts of the South Island (Fig 2).

Production figures for New Zealand in 1969 were 175,109 cwt of whole rock lobsters, of which 81,451 cwt were landed at the Chatham Islands, and 49,997 cwt in fishing ports on the south and west coasts of the South Island. Rock lobsters

are the most important of New Zealand's fishery resources, in 1969 the landed catch being worth \$8,860,938. The value of frozen tails on the export market is not known at the time of going to print.

A U.S.A. market for frozen tails was developed after 1948. Before 1948 a limited number of boats fished near to their home ports, catching sufficient quantities to supply local markets and to meet small export requirements. Following 1948 more extensive fishing was carried out on the existing grounds, and new areas were worked off South Westland, Fiordland, Stewart Island and in Foveaux Strait. The fishery developed rapidly in these new regions, and catches reached their peak in 1956. After 1956 the catch declined sharply over a period of four years, and then levelled off.

While several papers have dealt with the biology of the New Zealand rock lobster, there is little work published on the status of the fishery. The present study reviews the fishery from the aspects of catch rates and the size composition of the stock. A general description of the fishing grounds and fishing practice in southern New Zealand is given and management of the resource is discussed.

III. BOATS AND GEAR

Vessels which operate on daily trips are mainly 25 to 40 ft. in length, and carry one or two-man crews.

As most of the grounds in Southland and South Westland are away from road-heads and population centres, rock lobster boats fishing these waters have freezers and tail the catch at sea. Freezer boats are mainly 35 to 60 ft. in length, and have freezers of three to ten tons capacity. Two-man crews are usual. Rock lobsters are tailed on board, the tails washed and blooded, and then packed loose into either polythene or calico bags prior to freezing. After discharge into the fish sheds the tails are graded and packed

into 20 lb cartons for export.

Most day and all freezer boats are diesel-engined, and equipped with echo sounders and radio telephones. All vessels have pot hauling gear consisting of a surge drum and a block suspended from a boom.

Pots are usually rectangular steel or wooden frames covered with wire mesh or netting. In Southland steel pots are the most popular.

Some boats in North Otago still work beehive-shaped pots made up of from supplejack vine or cane entwined through wire ribs. These were the earliest type of pots in this area, but over the years they have been replaced by wooden or steel framed pots.

Synthetic ropes are used for floatlines. The number of pots worked per boat varies between about 20 and 80. Most two-handed vessels work about 50 pots at the height of the season.

IV. MATERIAL AND METHODS

Statistical data on the fishery were obtained mainly from fishing returns. Monthly fishing returns are submitted by each vessel, and these record the weight and value of the catch and the area fished. Day boats also log the number of days spent in fishing, as this is the same as the days absent from port. Returns from freezer boats often show only the number of days absent from port. Average catch per day figures can therefore be derived for day boats, and used to gauge the abundance of rock lobsters in different years.

However, a year by year comparison of the average catch per days fishing does not allow for any increase in the number of pots worked. For a more exact measure of the catch for a standard unit of fishing effort, it is desirable to know the number of pots worked, in addition to the weight of the catch taken each day. On the coast of Otago per pot lift there is

only a limited amount of data available from log books kept for several years by some freezer boats. Whilst it is apparent to Southland fishermen that the catch per pot lift has been declining in recent years records from a larger number of boats are needed to determine future trends.

The numbers of boats in each port are taken from the Marine Department's annual report. In most cases vessels taking out a rock-lobster licence do in fact fish for rock lobsters; a few vessels do not fish for rock lobsters although they have licences. Thus the data in Figure 4 may contain some errors. In addition no distinction is made between part-time and seasonal fishermen and full-time rock lobster fishermen.

Records of the size of rock lobsters present in different areas were obtained from measurements carried out on board commercial fishing boats. It was not possible to sample catches from all regions regularly throughout the year; however, in each area catch measuring was carried out at the height of the fishing season. Measurements were recorded as carapace lengths to the nearest 0.1 cm., but to allow for more convenient reference to standard measurements and size limits, they have been converted to total lengths in inches. The carapace/total/tail length conversion was made on the basis of the carapace length being .375 of total length in males and .366 in females, and the tail length being .591 of total length in males, and .600 in females (Street 1969). The total length is the length from the rostral spine to the end of the telson. In 1970 size limits in all areas were standardized on a tail length measurement. (see p. 7).

V. CURRENTS AND ROCK LOBSTER DISTRIBUTION

The two main current systems in southern waters are described by Garner (1961). The Tasman Current, containing water sub-tropical in origin, crosses the Tasman Sea, one branch running northward, and the other southward off Fiordland to the south of the South Island. The Southland Current is a surface current containing water from the Tasman Sea, flowing along the southern coast of New Zealand, and up the Otago Coast.

To the east of the South Island, the Southland Current contains a mixture of water both sub-tropical and sub-antarctic in origin. South of the Tasman Current, and each of the Southland Current, the prevailing current system is the West Wind Drift, containing sub-antarctic water.

It is significant that exploratory rock lobster fishing trips to sub-Antarctic islands influenced by the West Wind Drift current have all been unsuccessful. Waters around the Bounty Islands, the Antipodes Island, and Campbell Island have been potted without success, whilst at the Auckland Islands only three or four rock lobsters were obtained on two of four separate expeditions.

VI. FISHING AREAS

In southern New Zealand rock lobsters are usually found near to rocky sea bottom although in some areas they occur seasonally on sand.

In North Otago rough ground providing cover for rock lobsters extends from Oamaru to north of Otago Harbour, ranging in depths from about 28 fathoms off Moeraki to about 5 fathoms south of Karitane. The North Otago region is worked by day boats from the ports of Oamaru, Moeraki, Karitane and Port Chalmers.

In South Otago grounds extend from south of the Otago Peninsula to south of Long Pt. The area is fished in depths out to 30 fathoms by day boats from Port Chalmers, Taieri Mouth, Nuggets and Waikawa.

In eastern Foveaux Strait around Ruapuke Island and the north east coast of Stewart Island, grounds are near to landing ports, and can be worked by day boats operating from Bluff and Stewart Island. Potting is carried out in depths ranging down to about 20 fathoms.

Around Stewart Island the south and west coasts are the principal fishing areas. In these regions most fishing is done in depths under 60 fathoms although pots are set out to 80 fathoms.

In western Foveaux Strait fishing is pursued around Escape Reefs, Centre Island and off Pahia out to depths of about 30 fathoms.

Waters around Solander Island are potted out to depths of 70 fathoms. Anchorage is poor and the area is exposed to severe weather conditions.

The Fiordland region extends from west of Te Waewae Bay to Jackson Bay. Most rock lobsters are caught within 50 fathoms although bottom out to 100 fathoms has been worked. Catches from deep water do not usually warrant the extra outlay or time spent in working gear. Off the Fiordland coast, from Puysegur Point northwards, the edge of the continental shelf is on the average less than 4 miles offshore (Brodie 1964). Offshore potting is consequently limited by deep water. Between Puysegur Point and Milford Sound, there are a series of good boat anchorages within the different Sounds, providing shelter relatively close to the fishing grounds.

Fiordland, Solander Island, Foveaux Strait, and the west and south coasts of Stewart Island are exposed to prevailing strong onshore winds between north-west and south-west. Fishing time is more restricted in these regions than in the more sheltered waters off North Otago and on the north east coast of Stewart Island.

VII. REGULATIONS

The principal regulations applied to the rock lobster fishery are summarized below.

1. The minimum size limit is 6" tail length, measured on the ventral surface from the after side of the first calcified bar to the tip of the telson. (This corresponds approximately to 10 inches total length). In Otago waters from the Waitaki River to Nugget Point, a $4\frac{1}{4}$ inch tail (7" total length) size limit applies from 21st June - 19th December.
2. The taking of soft shelled rock lobsters is prohibited.
3. Baited set nets are a prohibited method of capture.
4. Females carrying external eggs are protected.
5. Rock lobsters are to be landed ashore alive except those caught between Waipapa Point and Bruce Bay.
6. Buoys and pots are to be marked.
7. Post must have escape gaps $2\frac{1}{8}$ " in width; In Otago the gap size is $1\frac{1}{2}$ ".
8. Amateur fishermen are limited to 6 rock lobsters a day with a maximum of 30 per party.
9. Scuba gear is prohibited for commercial gathering.
10. Commercial fishing is prohibited in certain waters in Hawkes Bay and Taranaki, and within Milford Sound.

The main regulations are shown in comparison with overseas measures in Table 1. The implications of these restrictions are discussed under the section on management.

VIII. CATCHES

Catches each year are reviewed for the different ports, and the size composition of the stocks examined within representative areas.

1. OamaruCatches:

Oamaru is a minor port for rock lobster fishing. Fishing is pursued mainly within the three months from July until September, when catches of small rock lobsters are heaviest (Table 2). Landings reached their peak at 1,243 cwt in 1962 (Figure 3 and 4). The catch per day is relatively high when the season commences in July but it drops sharply as the season progresses.

2. Moeraki(a) Catches:

Landings attained their highest level at 5,426 cwt in 1960, after which they declined to 3,262 cwt in 1963, and then rose to 4,550 cwt in 1968 (Figure 3). The number of fishing boats operating has increased steadily to 29 in 1969 (Figure 4).

Average daily catches for each month from 1954 to 1969 are shown in Table 3. Since 1965, fishing has been carried out mainly in the period from July until December. Fishing effort, in terms of the number of days fishing, has almost doubled between 1956 and 1969, and as in all fishing ports, more pots are now worked by individual boats. In the July to December period the average catch per days fishing has remained steady over the last ten years. In 1968, heavy catches of small 7-10" rock lobsters were made, the average daily catch rate for July being 383 lbs. Figure 5 shows the average daily catch rate from the period September to December in each year when over 10" rock lobsters are more prevalent in catches. The highest average catch rate of 245 lbs was obtained in 1956, followed by a gradual decline until 1965, after which the catch rate rose again until 1967.

(b) Catch Composition:

In July and August catches are predominantly of the 7 to 10 inch size group, and from September to December rock lobsters over 10 inch long form a greater proportion of the catch (Table 4). These two size groups are generally potted in different localities. Smaller rock lobsters moult several months before the larger ones, and enter pots at a correspondingly earlier season (Street 1969).

The size composition of rock lobsters potted in the September to December period, for the years 1962 to 1968 are shown in Figure 6. The area sampled is in a depth of 15 to 24 fathoms, where the size is larger than in regions closer inshore. The modal length of males in 1962, 1963, 1967 and 1968 was 10 - 10½ inches, and in 1964 and 1966 11 - 11½ inches. Females had a modal length of 9½ - 10 inches in 1962 and 1967, 10 - 10½ inches in 1963, 1966, and 1968, and 10½ - 11 inches in 1964.

3. Karitane(a) Catches:

Landings at Karitane are at their peak during the three months from July until September. The highest level at 3,253 cwt was attained in 1959, after which they declined steadily and then rose in 1966 to nearly the 1959 quantity. The catch declined again in 1967, but increased to 3,009 cwt in 1968 (Figure 3 and 4). The number of fishing units increased from 8 in 1956 to 25 in 1969 (Figure 4). In the years immediately prior to 1965 the average catch per day had dropped substantially for the main period of the fishing season from a peak of 510 lb in 1954 to 147 lb in 1964, but it rose again to 380 lb in 1968 (Table 5 and Figure 7). The closed season from January to June, which was introduced in 1965, has resulted in an improved

catch rate in the July - September period. The majority of the small rock lobsters at Karitane moult twice in a year (Street 1969). As length increase takes place only at moulting two periods of growth occur each year. The closed season after December has restricted fishing until after a second moult has occurred, with subsequent benefit to the fishery from increased growth of the rock lobsters.

(b) Catch Composition:

In the main fishing period from July until September, rock lobsters under 10 inches in length usually comprise over 95% of the catch landed on deck (Figure 8). In 1964 the size limit was raised from 6 inches to 7 inches. Subsequent to this there was an increase in the overall size potted. In 1962 the mean size for both males and females was $6\frac{1}{2}$ - 7 inches. In 1961 and 1969 it was 7 - $7\frac{1}{2}$ inches, while from 1963 to 1967 the mean was $7\frac{1}{2}$ - 8 inches for both males and females. In 1968 the mean size was $7\frac{1}{2}$ - 8 inches for males, and 7 - $7\frac{1}{2}$ inches for females.

In the latter half of the Karitane season, from October to December, catches are lower but larger rock lobsters 9 - 11 inches in length increase in numbers.

4. Port Chalmers

Catches:

Vessels landing at Port Chalmers are either day or freezer boats. Catches for day and freezer boats show similar trends to those at Karitane and Bluff respectively. The bulk of the catch landed at Port Chalmers is from Fiordland, and the peak at 14,889 cwt was reached in 1956, after which there was a sharp drop to 1960, followed by fluctuating catches. (Figure 3 and 4).

5. Taieri Mouth

Catches:

The peak year was in 1966, when 2,804 cwt were landed. There was a sharp decline in 1967, but the total catch rose again to 1,750 cwt in 1968 (Figure 3). There has been a twofold increase in the number of fishing boats from 9 to 18 between 1958 and 1969 (Figure 4). Since 1966, most fishing has been carried out between the months of July and December.

During July and August, catches are mainly of small 7 - 10 inch rock lobsters. The size composition of the catch in September 1968 is shown in Figure 9. The average catch per day figures of 413 lb and 299 lb for July and August in 1968, were as high as in previous years (Table 6).

6. Nuggets

(a) Catches:

Catches were at their highest level at 3,575 cwt in 1962. A steady decline in both the total catch and the catch per boat followed. The total catch dropped to a low of 750 cwt in 1967, but landings increased to 1,411 cwt in 1968 (Figure 3 and 4).

Fishing is now confined to the July - December period. Average daily catch rates in the peak months of July, August and September have continued to remain high, the figures in 1969 reaching 533 lb, 515 lb, and 190 lb respectively (Table 7). Sea conditions on the beach landing restrict the number of days the boats are able to put to sea. A relatively high average catch per days fishing therefore results.

(b) Catch Composition:

Rock lobsters under 10 inches in length usually comprise over 90% of the catch (Figure 10). The main fishing grounds are situated about ten miles north of Nugget Point, the area being continuous with that worked by boats from Taieri Mouth. Small size rock lobsters have been characteristic of the population in this area since it was first worked in 1959. The mean size in 1967 for both males and

females was 7 - 7½ inches. In 1962 and 1968 the mean size was 8 - 8½ inches for males and 7½ - 8 inches for females, while in 1966 it was 8½ - 9 inches for males and 8 - 8½ inches for females. In 1969 the mean size was 7½ - 8 inches for males and 7 - 7½ inches for females. (Figure 10).

The small rock lobsters occurring in this area would appear to be the young stock of the larger rock lobsters which are taken in deeper water further north by Taieri Mouth boats. The size composition of the catch to the north of the Nuggets grounds in September 1968, is shown (Figure 9). The mean length for males was 10 - 10½ inches, and for females 9 - 9½ inches.

7. Waikawa

Catches:

Waikawa boats fish in both South Otago and Southland. Peak landings of 3,417 cwt were attained in 1966, but both the total catch and catch per boat have since fallen sharply. (Figure 3 and 4).

8. Bluff, Stewart Island, Riverton and Milford Sound

(a) Catches:

Landing figures for these ports have been combined, as the boats fish common waters in Southland. Catches increased from 1948 until they attained their highest level at 67,183 cwt in 1956 (Figure 3). The total catch fell sharply after 1956, to a low of 27,461 cwt in 1961. Subsequently the total catch rose to 37,752 cwt in 1966, and declined sharply to 28,628 cwt in 1968. Prior to delicensing in 1964, there were 105 fishing boats. This figure has increased steadily each year to reach 233 in 1969 (Figure 4).

A comparison between the monthly catches from 1954 to 1969 illustrates the decline after 1958 in landings from May to September (Table 8). Between 1954 and 1958 monthly landings in July and August ranged between 5,114 cwt and 9,792 cwt. In contrast the 1969 landings for these two months were 253 cwt and 528 cwt. Females carry eggs in this period, and the bulk of the winter catch is composed of medium and large sized males. Stocks of large males have been greatly diminished and the fishery is now dependent on smaller sized rock lobsters, which pot heaviest from October to March: the majority of females have shed their eggs at this period.

There are no data available on average catch per days fishing, but several fishermen operating boats have kept log books recording the daily catch, and the number of pots lifted. This information is tabulated for different areas in Southland where the fishing grounds have been exploited over a period of 15 or more years. The catch rates are expressed as pounds of whole rock lobsters per pot lift (Table 9). In Southland for the year 1966 these boats had an average catch rate of 15.4 lb per pot lift. This catch rate would be higher than the average for the whole fishing fleet but it is considered to be typical of the better boats at that time.

(b) Catch Composition:

Regular catch measuring has been carried out only from south of George Sound to Milford Sound, in the Fiordland area. The size composition of the catch recorded in 1964 and 1966-1969 is shown in Figure 11. The mean length for males was 10 - 10½ inches from 1964 to 1968, 9½ - 10 inches in 1969, and for females 9½ - 10 inches in 1964, 1966 and 1969, 10- 10½ inches in 1967, and 9 - 9½ inches in 1968.

In 1969 the size composition at the south coast of Stewart Island showed for both males and females a mean length of $9\frac{1}{2}$ - 10 inches (Figure 12).

IX. DISCUSSION

(a) Catches:

Most fishing areas have now been worked for periods of between 15 and 20 years. Particularly in Southland waters, catches have declined appreciably since the peak years when accumulated stocks of large rock lobsters were being fished.

Fluctuations in catches can be indicative of the abundance in different years but these changes can also be due to variations in sea conditions and many other factors (e.g. the availability of natural food which would influence rock lobsters potting).

Following the delicensing of the industry in 1964, there has been a marked increase in the number of boats operating, and fishing effort has been further increased by individual fishermen working more pots. No gain in the total catch has resulted from this increased level of fishing. There has been a substantial rise in the value of rock lobsters and this has compensated for the drop in individual catches of each boat (Figure 13).

Nearly all of the regions where rock lobsters occur have now been worked, but unexploited stocks possibly exist on offshore reefs, in deeper water than is currently worked, and on inshore areas inaccessible to most fishing boats. These close inshore areas are now worked to a greater extent as "dory" type boats are being used in Southland. Rock lobsters which shelter on steep rocky faces are also probably inaccessible to fishermen. This situation has been observed underwater by the writer in places on the Fiordland coast where numbers have been seen within fissures and holes on steep faces, which do not offer a surface for pots to rest on.

Potting has been carried out in depths between 60 and 100 fathoms off Stewart Island and Fiordland, but as these depths are not consistently fished, the density of stocks is uncertain. Marking experiments have shown that while some rock lobsters make extensive migrations others do not. (Street 1969). Heavily fished grounds may therefore be slowly restocked by migrations from unexploited areas.

Exploratory trips south of Stewart Island to the Snares Islands have been made by several boats, and substantial numbers of small rock lobsters under the size limit, as well as lesser quantities of large individuals, are reported to have been taken. Continued exploratory fishing in these waters is warranted.

(b) Size Composition of the Catch:

When fishing grounds in Southland and South Westland were first exploited in the early and mid 1950's, catches were composed mainly of large size rock lobsters. On most of these grounds in southern waters, which have been fished for 15 or more years, undersized rock lobsters now form a large proportion of the catch (Table 10). The takeable catch in any year is now very dependent on recruitment of undersized specimens from the previous year. Consequently it is imperative that the catch is sorted rapidly on deck and undersized rock lobsters returned to the sea undamaged as soon as possible.

There are areas where the size has been predominantly small from the outset of fishing, e.g. at Karitance, north of Nugget Point, and inshore along the north east coast of Stewart Island. The Frontispiece shows a group of small 9 - 10 inch rock lobsters in their natural habitat, from 12 fm. on the north east coast of Stewart Island. There is usually little tidal stream in these waters. Currents probably transport larvae into these regions, which are in effect backwaters from the main tidal stream. Marking experiments show that these small

rock lobsters will grow to reach 10 inches. Even after intensive fishing over a number of years, the quantities of these small rock lobsters have continued to be relatively high. There was a substantial increase in the landings of small rock lobsters in Otago during 1968. In view of the intensive fishing carried out on the small populations within Otago, a sharp decline in landings of larger sizes would be expected. At Moeraki, the average catch per days fishing in the September to December period, when larger rock lobsters are potted, has remained fairly steady over the last ten years. (Figure 5). However, boats have had to work an increasing number of pots to try and maintain catches, although this also applies in Southland, where the size limit is larger.

The numbers of undersized fish which are present in catches give an indication of recruitment to the fishery. Observations made on fishermen's catches over a period of 6 years, show that there has been no obvious decline in the quantities of small rock lobsters present on the grounds.

In most areas, fishing has reduced the overall size to the extent where the largest proportion of the marketable catch is just over the size limit. However, the continuing presence of large numbers of small rock lobsters on the fishing grounds is an encouraging sign for the future on the fishery. It would seem that there is a sufficient breeding stock to maintain the population; However the growth rate of rock lobsters is slow and if the capacity to maintain population size was affected by excessive fishing the effects of this on the commercial catch would not appear for several years.

X. FISHING INTENSITY

An estimate of the fishing intensity can be derived from marking experiments. The percentage of marked individuals which are subsequently recovered gives an indication of the rate at which the population is being exploited. For this method to be reliable the following assumptions must be made:

1. Marked fish will behave in the same manner as the rest of the population, and their susceptibility to capture is identical.
2. The marking, holding on deck, and release does not harm them.
3. The tags remain in place.
4. Marked specimens are released in the same area as the rest of the population, and fishing effort is constant for the whole area.
5. All marked fish recovered by fishermen are returned.

Marked rock lobsters were always released in good condition back on to rocky ground. The tags were attached around the narrow junction between the tail and head, with fine stainless steel wire. Although there was no insertion into any tissue, the tags could not slip off when looped around this point, at least until the next moult. Rock lobsters were marked when in a recent moult conditions, so that attachment was ensured for a complete fishing season. All marked individuals were released on to commercial fishing grounds. There is no reason to believe marked rock lobsters behaved differently from the rest of the population.

The recapture rates of rock lobsters marked at Karitane and in Foveaux Strait are discussed below.

(a) Karitane:

In June 1965, 1,100 rock lobsters measuring between 7 inches and 10 inches in length, were tagged and released off Karitane. Up until the end of the season in December 1965, 492 were recovered: a recapture rate of 45%. This would indicate that in the 1965 season, fishermen caught at least 45% of the legal takeable rock lobsters in the area.

The Karitane grounds cover about 8 miles of coastline, and extend out to 2 miles off-shore. Only two of the marked specimens moved away from the area: however with such intensive fishing

there was little time for any movement to take place. The region is subjected to concentrated fishing effort, and this is substantiated by the high recapture rate of tagged rock lobsters.

(b) Foveaux Strait:

In the spring months of 1966, 1,200 rock lobsters were tagged and released in Foveaux Strait. They were mainly males and immature females, $9\frac{1}{2}$ inches to 12 inches in length. Over a period of 11 months, until the next moult, 241 of these were recaptured, which represents 20% of the numbers originally marked. The recapture rate of 20%, which is less than half that recorded at Karitane, indicates a lower intensity of fishing in Foveaux Strait. The fishing grounds in Foveaux Strait are more extensive, and many of the rock lobsters in this area dispersed considerable distances, whereas at Karitane they remained on the local fishing grounds. (Street 1969).

XI. DISCARDING OF HEADS ON GROUNDS

Vessels working in Southland and in South Westland, from Waipapa Point to Bruce Bay, land only tails. The heads are discarded, and it has been asserted that in the early days of the fishery catches decreased locally when heads were dumped on a large scale. Fishermen generally agree that the practice is detrimental to the maintenance of stocks in that area, and care is taken to tail the catch away from the grounds. Fishermen have observed that when heads are placed in a pot baited in the usual manner, rock lobsters will not enter the pot which indicates that discarded heads are avoided.

Underwater observations have confirmed the experiences of fishermen. Strings of heads were anchored in two submerged caverns, one containing 20 and the other 40 rock lobsters. Inspection on the following day showed that all

the rock lobsters had left one cavern and the second contained only 4. After removal of the heads the caverns were fully populated again within 10 days. The experiment was repeated a month later with similar results.

XII. MANAGEMENT OF THE FISHERY

Rock lobster populations are very susceptible to intensive fishing, and in consequence the fishery is subjected to a number of regulations. These measures are concerned with minimum size limits, the protection of egg-bearing females, closed seasons, closed areas, processing and gear and licence limitations. A summary of regulations in South Africa, South West Africa, Australia and New Zealand is shown in Table 1. These countries along with Brazil, are the main suppliers of rock lobster tails to the United States market.

The different type of regulations are discussed below, with reference to the fishery in southern New Zealand. Any suggestions made are those of the author and do not commit the Marine Department in any way. The management of this fishery is one of the subjects being studied by the Parliamentary Fishing Industry Committee 1970.

1. Size Limits:

There are three main reasons for a size limit regulation on fish.

- (a) To limit the annual crop to the sustainable level by restricting fishing to larger fish.
- (b) To set the size limit so as to produce the most desirable sized fish in relation to both fisheries economics and the biology of the fish.
- (c) To set the size limit so that it is above the size at which first maturity is reached, i.e. to allow fish to breed at least once before capture.

A size limit is only practical when the capture of undersized fish can be avoided, or when they can be released undamaged. In contrast to many scale fish caught by lines or in trawl nets, rock lobsters are not damaged after being brought to the surface, and provided undersized specimens are liberated relatively quickly on to the ground where they occur naturally, they have a good chance of survival. The fitting of escape gaps to pots to allow small rock lobsters to leave the pots also reduces damage to undersized stocks.

The smaller size limit in Otago cannot be justified solely on biological grounds. Studies on the growth rate have shown that rock lobsters on grounds where small sizes are typical will grow to reach the 6 inch tail size limit applying outside Otago. However, the fishery in Otago is geared to small rock lobsters and fishing would not be economical if the size limit was raised to a 6" tail. Catches in these regions of small rock lobsters have remained fairly high in 1968 and 1969.

In both 1968 and 1969 catches from Otago waters between Oamaru and Nugget Point were approximately half the total landed at Bluff, Stewart Island, Riverton and Milford Sound for the same period. In proportion to the length of coastline worked and rough bottom available, the yield obtained from between Oamaru and Nugget Point is considerably higher than the production from Foveaux Strait, Stewart Island and Fiordland combined. This makes it appear doubtful to the writer that raising the size limit to a 6" tail would ultimately result in a higher production than is at present being achieved.

The gains to the fishery from a heavy production of small rock lobsters will be attained earlier where a smaller minimum size limit applies. In Otago, the majority of undersized rock lobsters are subjected to capture in pots for only one year before they reach legal size. In all other areas, where the size limit is larger, the majority of undersized rock lobsters are taken in pots for two or three years before they reach legal size. Individual undersized rock lobsters are probably handled many times during one year,

and the longer this sorting period, the greater the chance of mortality resulting from injury during handling, long exposure on deck, being taken by predators after release, or being put back on unfavourable bottom. However after July 1970, all pots must be fitted with escape gaps of a size to allow undersized rock lobsters to leave the pots.

In southern New Zealand, female rock lobsters attain maturity at varying sizes according to locality (Street 1969). Off Fiordland, the majority of females are mature at a carapace length of 8 cm (5.3" tail length) while in eastern Foveaux Strait and around Stewart Island, first maturity is attained between 10.5 cm and 11.5 cm carapace length (6.7 - 7.3" tail length). In North Otago the majority of females reach first maturity between 11 cm and 12 cm carapace length (7.0 - 7.6" tail length). The 10" size limit (6 inch tail) therefore allows most female rock lobsters in Fiordland to breed before they reach takeable size, but in eastern Foveaux Strait, around Stewart Island and in Otago immature females are not protected by the existing size limits. However, once females attain maturity, the growth rate decreases (Street 1969). Female rock lobsters reach a larger size in areas where they mature later, and those which avoid capture and reach maturity in these areas carry more eggs, and consequently have a greater reproductive potential than others which mature at a smaller size. What is not known, however, is the magnitude of the breeding stock necessary to ensure maximum future production in the fishery.

A legal size limit based on carapace length would have an advantage over a total length measurement, in that it is an inflexible measurement which could readily be checked with a gauge. A 10" total length measurement corresponds to a carapace length of 3.7" in females, and 3.8" in males. In Otago, a $2\frac{5}{8}$ " carapace length corresponds to the 7" size limit, which previously existed. Recent regulations prescribe a tail length measurement for all rock lobsters.

2. Protection of Berried Female Rock Lobsters

Female rock lobsters carrying external eggs are protected universally. However, in the British and Canadian lobster fisheries, it is no longer considered necessary to protect berried lobsters. It was found that in years when lobster larvae were very abundant there was no increase in landings in later years when these larvae would be expected to produce lobsters reaching the legal size limit (Thomas 1966). Wilder (1965) states that commercial production is determined largely by factors other than the abundance of egg-bearing females.

However, as year by year assessments of the abundance of rock lobster larvae and the correlation with landings in later years have not been made, it would seem desirable in the meanwhile to retain the ban on landing berried females.

3. Protection of Rock Lobsters in the Soft-Shelled Condition

The ban on landing soft-shelled rock lobsters is aimed at preventing damage to the shell during handling. In the soft-shelled condition they are also less viable out of the water than when hard-shelled. The need for this regulation is questionable, as rock lobsters do not normally trap when they are soft-shelled, although some entering pots when recently moulted may be somewhat soft-shelled. However soft-shell rock lobsters could be taken by divers even when they will not enter pots.

4. Closed Seasons

Closed seasons may be introduced in order to prevent fishing at a period when fish are in an undesirable condition, e.g. when females are carrying eggs, and when they are soft-shelled, or to allow a build up of the population prior to the open season, or to control the crop taken in each season.

Separate moulting periods occur for mature male, mature female and immature rock lobsters (Street 1969). Periods of non-feeding and active feeding are related to the moulting

cycles. Generally rock lobsters are inactive and will not enter traps over about 9½ weeks prior to and after moulting. Small and medium sized male and immature females trap heaviest within three to four months of moulting. Natural closed seasons result from these seasonal patterns of intensive feeding and non-feeding.

The closed season in Otago is of benefit to the fishery in this area, as two periods of growth occur before the fishing season commences in July (Page 12).

5. Closed Areas

Closed areas are sometimes introduced when small fish or breeding fish congregate within specific areas. In New Zealand, a few small areas are closed to commercial rock lobster fishing.

6. Gear Limitations

A restriction on the fishing effort may be imposed by limiting the number of pots that can be worked by each boat. In southern New Zealand the number of pots worked by each boat ranges between 20 and 80, about 50 pots being the average for two-man vessels. As catch rates decline the tendency has been for fishermen to try and offset the drop by working more gear.

There is considerable merit in pot limitation but in practice there would be difficulties in enforcing such a regulation.

7. Escapement Gaps

The principle of using escape gaps in pots is to allow undersize rock lobsters to leave the trap before it is lifted, and thus reduce the chances of their being injured during handling on deck, or being taken by predators after release.

The provision of escape gaps in pots has been enforced in Western Australia since 1965, following successful trials

by Bowen in 1963. In New Zealand, work by Street (1966), Ritchie (1966) and Bain (1967), indicated that escape gaps were generally effective in releasing many of the small rock lobsters. The provision of escape gaps in pots has now been introduced in New Zealand.

8. Processing at Sea

The main objects behind a prohibition on tailing at sea are to ensure that the catch is processed for export at shore facilities of accepted standard, to avoid the wastage of meat in heads and claws, and to prevent any detrimental effects on the fishing grounds by the dumping of heads.

The utilization of leg and body meat is only practical in the early stages of a fishery when larger rock lobsters are more abundant.

In Southland and South Westland, because most grounds are a considerable distance from shore freezers, boats are permitted to tail and freeze the catch at sea. Heads in these waters are dumped away from the grounds either whilst steaming back to or at the anchorage.

9. Licence Limitation

A restriction on fishing effort can be directly achieved by limiting the number of vessels in the fishery. This is one control measure that is used in the main producing Australian states, South Africa and South West Africa.

Rock lobsters are a fishery resource where the supply is limited and the market buoyant. The total yearly catch is not increasing but is being spread out amongst more boats as the number of licences increases. An economic study of the operations of fishing boats and more extensive information on the exploitation rate of the stocks are obviously desirable. However, the present situation with additional boats being added to the fishing fleets and a dependence of the fishery on recruitment of small sized rock lobsters indicate that a restraint on expansion of

fishing effort is necessary, and one direct way of achieving this would be by restricting the entry of any new boats into the fishery.

XIII. ACKNOWLEDGEMENTS

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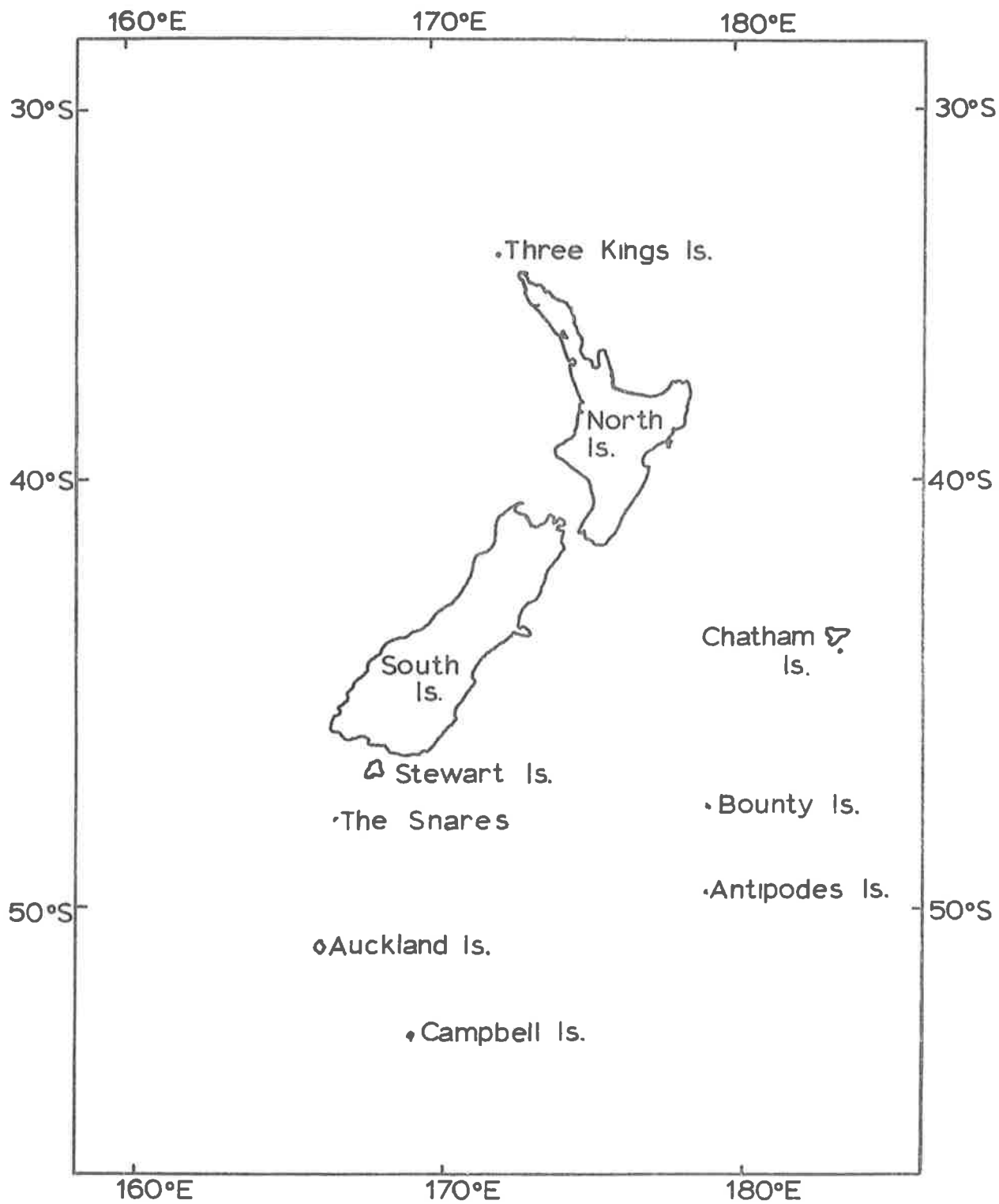


FIG. 1 THE NEW ZEALAND REGION

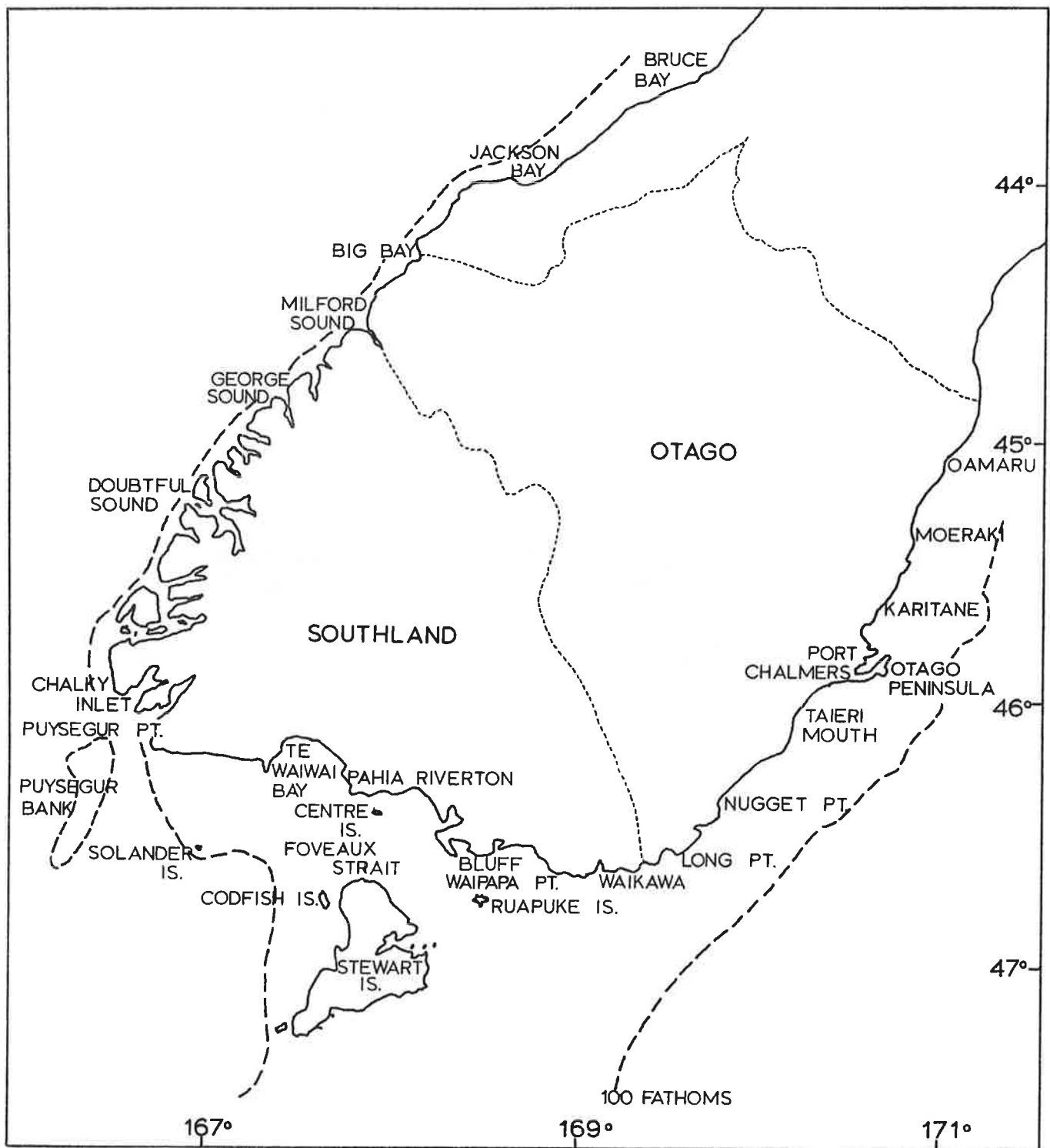


FIG. 2 THE OTAGO AND SOUTHLAND REGIONS

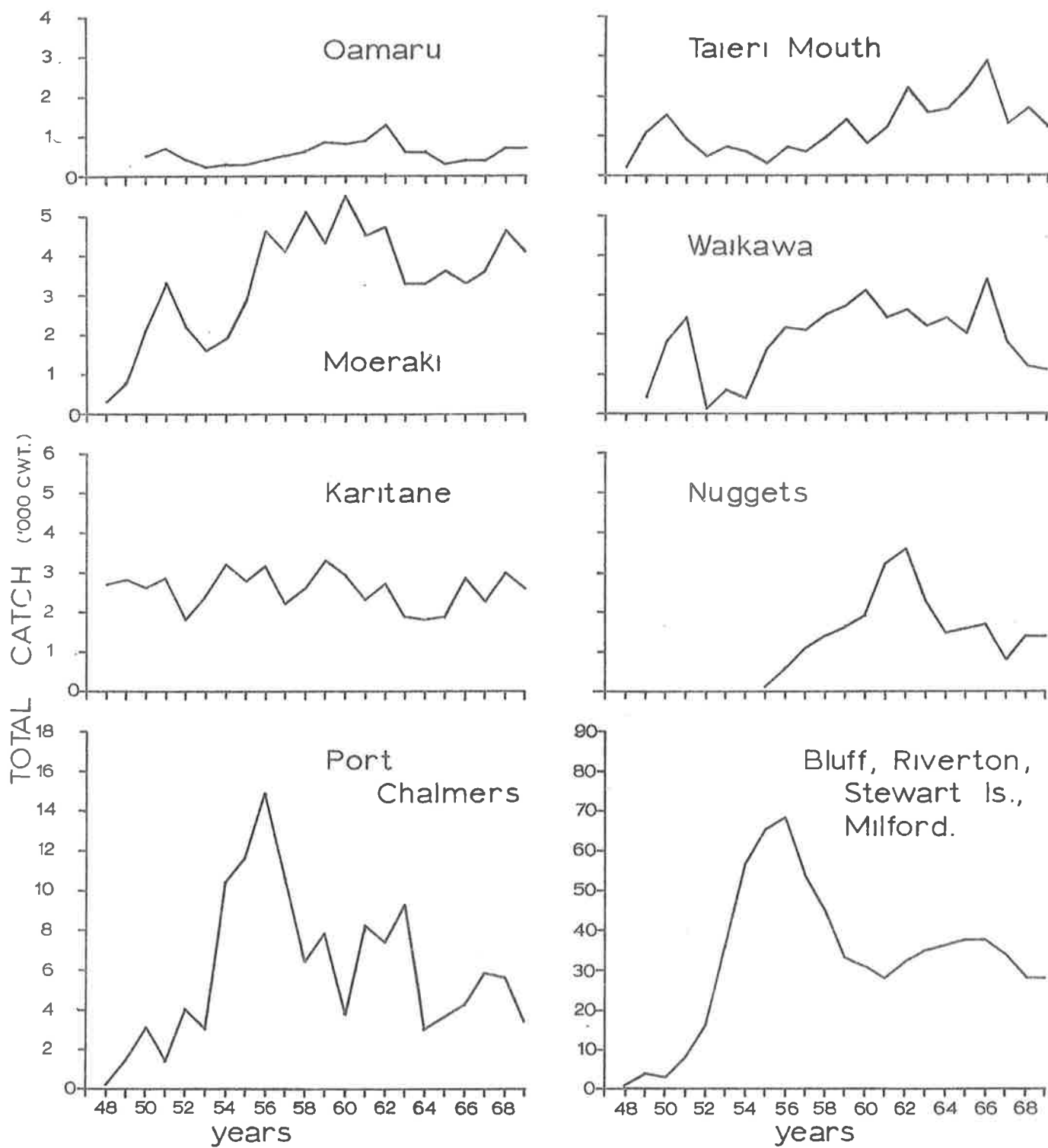


FIG. 3 TOTAL CATCH 1948 - 69

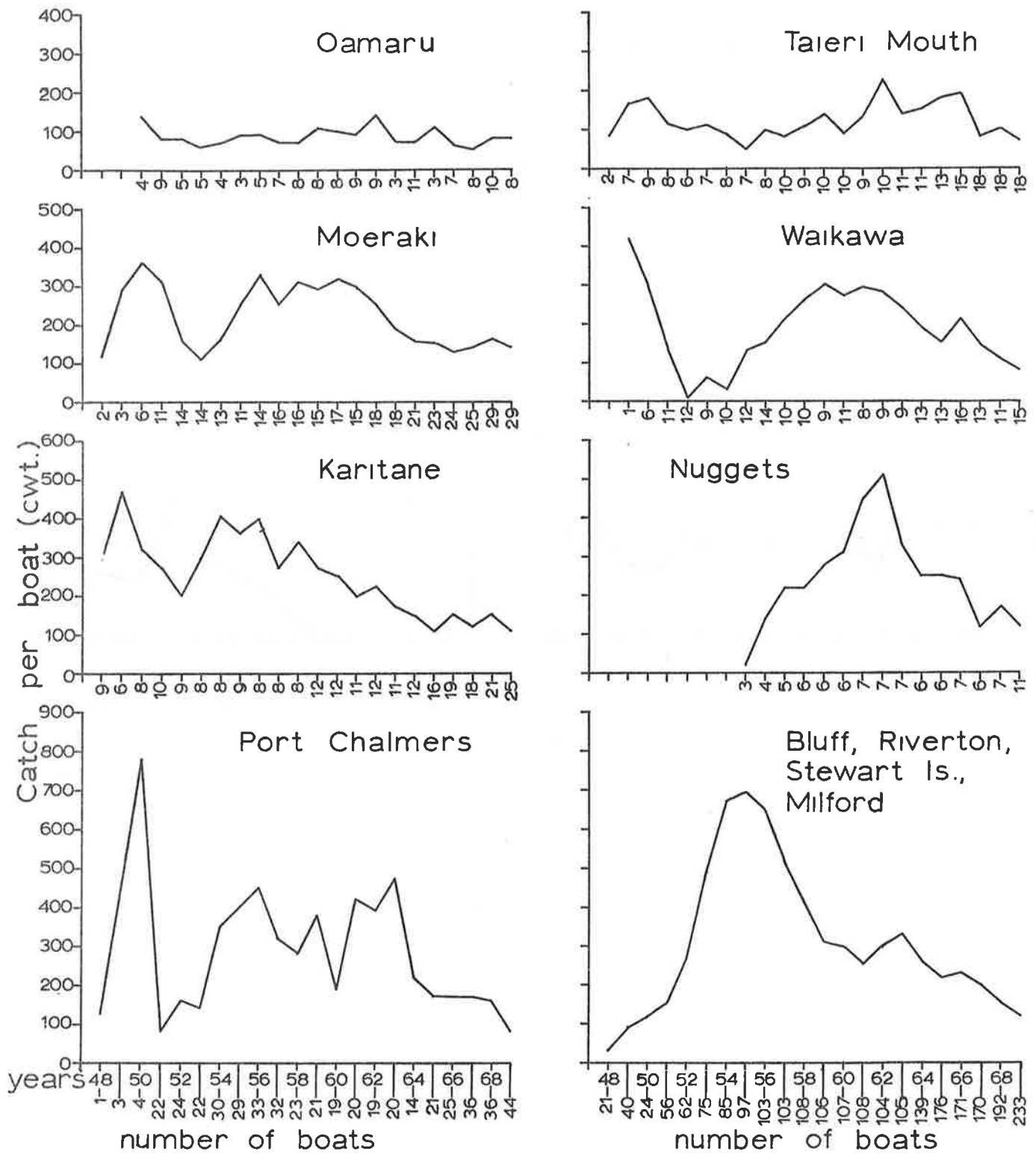


FIG. 4 CATCH PER BOAT, 1948 - 69

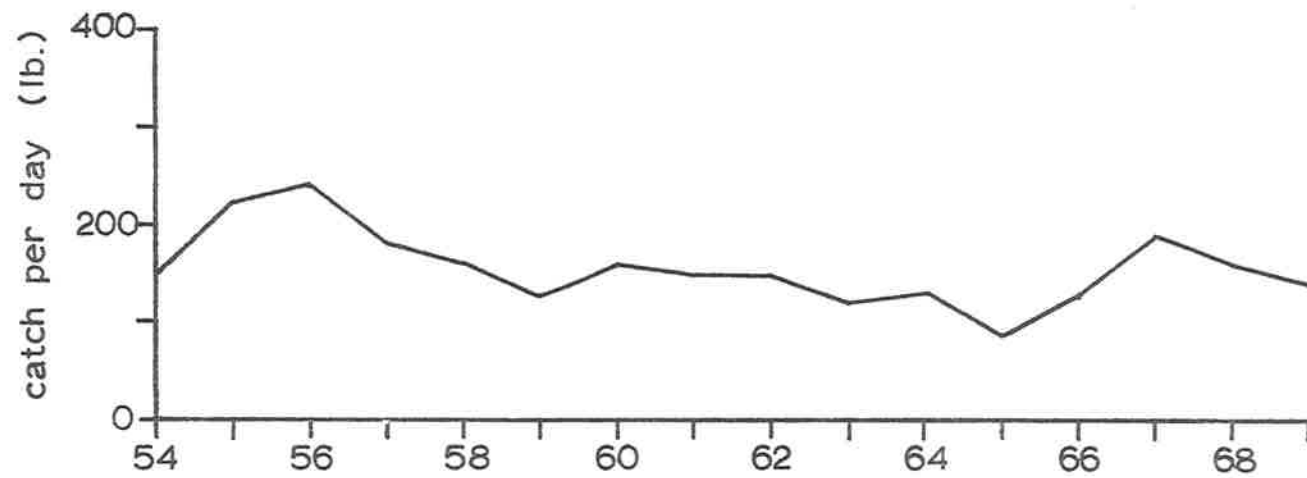


FIG. 5 MOERAKI : Average daily catch rate,
September to December 1954 — 1969

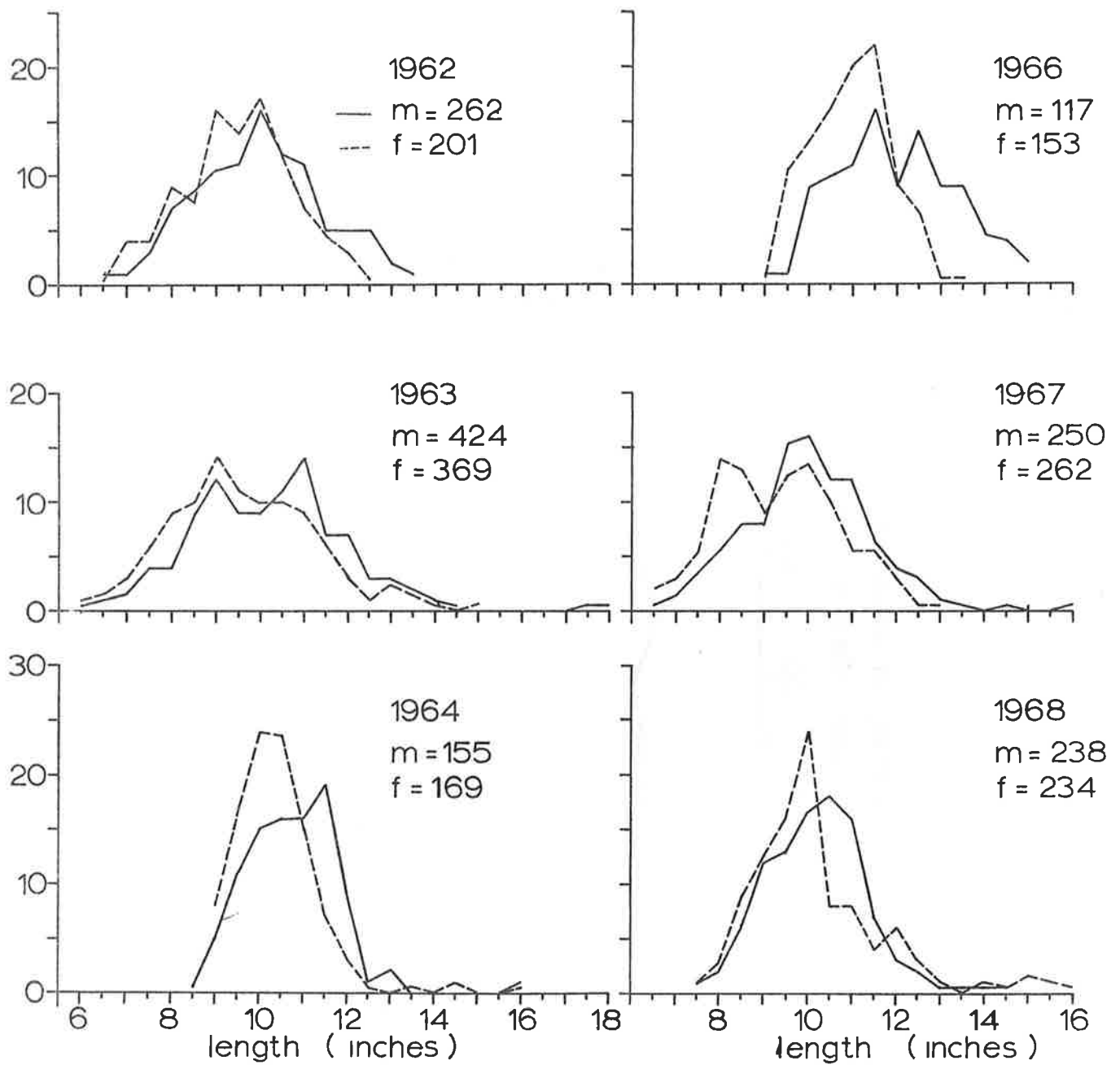


FIG. 6 MOERAKI. Size composition of catch, September - December

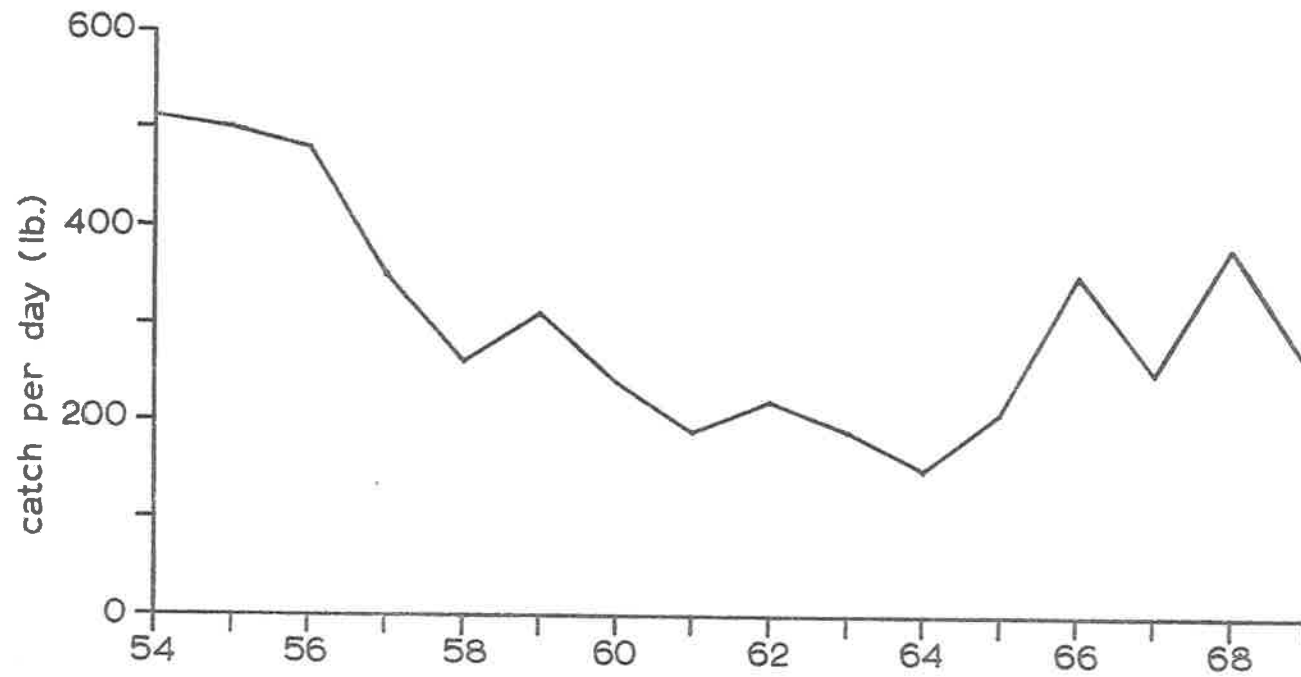


FIG. 7 KARITANE: Average daily catch rate,
 June to September 1954 - 64 and July to September 1965 - 69

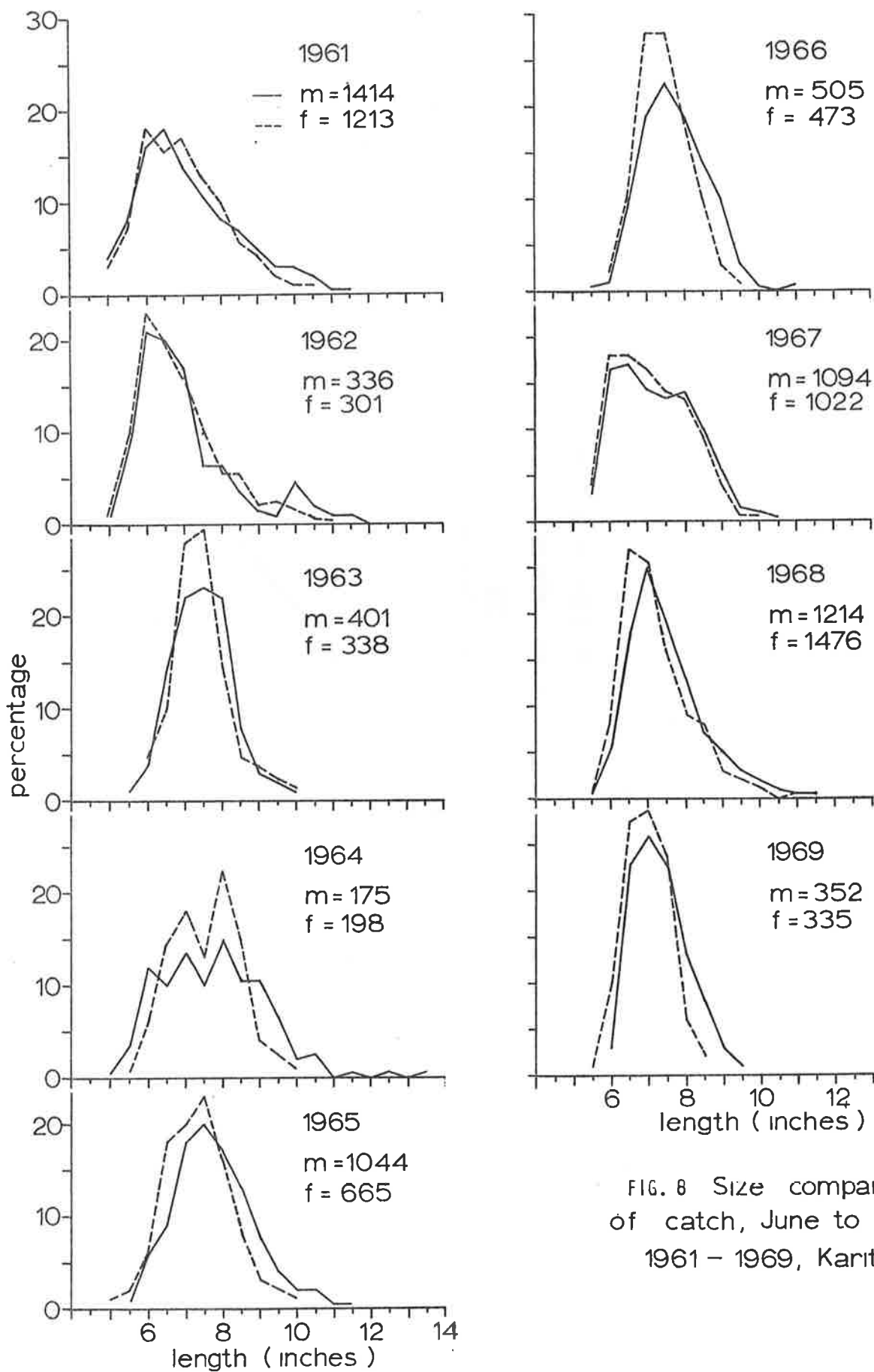


FIG. 8 Size comparison of catch, June to September, 1961 - 1969, Karitane.

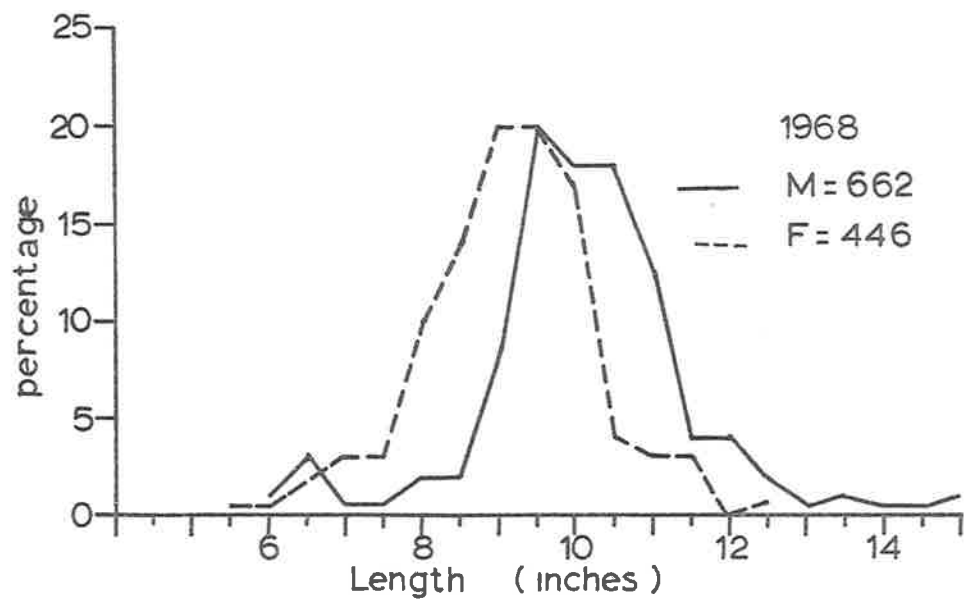


FIG. 9 TAIERI MOUTH. Size composition of catch, September 1968

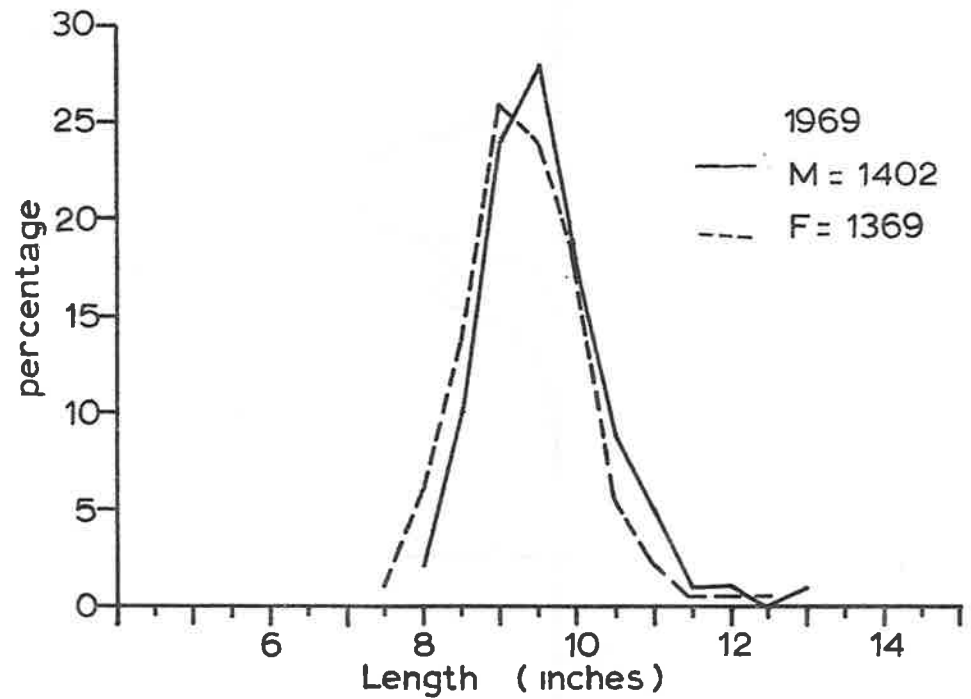


FIG. 12 STEWART ISLAND (South coast). Size composition of catch 1969

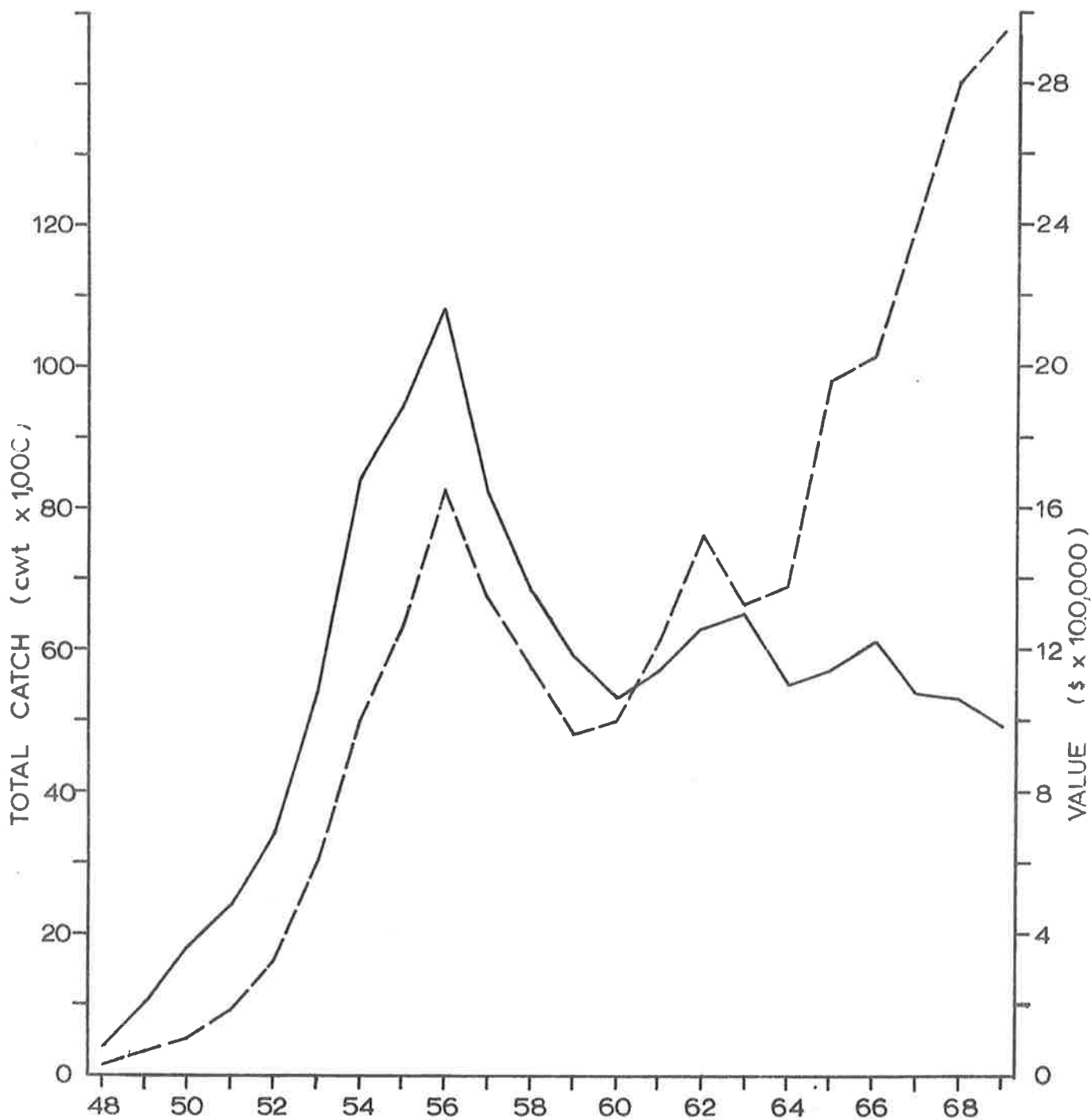


FIG. 13 Weight and Value of landed catch 1948-69, from fishing ports on west and south coast of South Island.

TABLE 1
ROCK LOBSTER MANAGEMENT
IN
SOUTH AFRICA, S.W. AFRICA, AUSTRALIA AND NEW ZEALAND

TYPE OF REGULATION	SOUTH AFRICA (Jasus sp.)	S.W. AFRICA (Jasus sp.)	A U S T R A L I A					NEW ZEALAND (Jasus sp.)
			W.AUSTRALIA (Panulirus sp.)	S. AUSTRALIA (Jasus sp.)	N. S. W. (Jasus sp.)	VICTORIA (Jasus sp.)	TASMANIA (Jasus sp.)	
SIZE AND WEIGHT LIMITS	3.5"Carapace (5.7" Tail)		3 .0"Carapace 5 oz Tail	3.8"Carapace (6" Tail) ex- cept Victor Harbour 3.4"Carapace (5.4" Tail)	11" Total (6.5" Tail)	Male 4.25" Carapace Female 4.0" Carapace (6.5" Tail)	Male 4.25" Carapace Female 4.0" Carapace (6.5" Tail)	6" Tail 4.25" Tail Waitaki River to Nugget Pt. 21st June - 19th December
BERRIED FEMALES	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
SOFT SHELL CONDITION	PROHIBITED	PROHIBITED						PROHIBITED
CLOSED SEASONS	1st July to 31st Oct.	Some areas closed seasonally	30°S - 33°S Jan. 1st - Nov 14th. within one mile of high water. Aprolhos Is. Aug.15th - March 14th. 24°S - 34°S Aug. 15th- Nov.14th	Females: 1st June - 31st Oct. Males: de- pending on area either 1st - 31st Oct. or 1st June - 31st Oct.		Females: 1st June - 31st Oct. Males: 1st - 31st Oct.	Depending on area. Females: 1st June- 31st Oct. or 1st June- 30th Nov. Males: 1st Sept. - 31st Oct or 1st Oct - 31st Oct. or no closure.	

Table 1 continued-

CLOSED AREAS	Several inshore regions	Certain areas sanctuaries. Some areas periodically or seasonally closed.	Boats may fish only area defined on licence in any one year.					Milford Sound. Certain areas in Hawkes Bay and Taranaki.
GEAR LIMITATIONS			3 pots per ft. of vessel Maximum No.200	Depending on area either 1 crew-1 pot per ft. of vessel plus 20: 2 crew-1 pot per ft. plus 40: or 1 pot per ft. of vessel plus 10.		Between 12 & 25 depending on length of vessel	Between 15 & 40 depending on length of vessel	
ESCAPE GAPS			2" Gaps in pots.					2 $\frac{1}{8}$ " Gaps in pots. Otago 1 $\frac{1}{2}$ " gaps in pots
TAILING AT SEA	PROHIBITED	PROHIBITED	Freezer boats allowed to operate in defined area			PROHIBITED	PROHIBITED	Prohibited except in Southland & South Westland.
LICENCE LIMITATIONS	LIMITED	LIMITED	LIMITED	LIMITED		LIMITED	LIMITED	
PRODUCTION ,000 Metric Tons	7.0 (1968)	9.5 (1968)	9.0 (1968-69)	2.4 (1968-69)	0.2 (1968-69)	0.8 (1968-69)	1.4 (1968-69)	8.8 (1969)

TABLE 2 - O A M A R U

L = Total landings ('000lbs)
 D = Days fished
 C/D = Average catch per boat day 1954-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	L	2.8	5.3	.9	.1	-	1.3	4.4	5.7	9.3	1.2	.6	.3
	D	12	25	12	1	-	9	40	45	65	16	7	4
	C/D	233	212	75	100	-	144	110	127	143	75	86	75
1955	L	.3	-	.5	.3	.3	.7	4.8	10.0	11.5	2.8	1.5	-
	D	3	-	7	4	4	8	22	32	39	28	10	-
	C/D	100	-	71	75	75	87	218	313	295	100	150	-
1956	L	1.0	1.5	1.1	1.2	.2	2.9	9.9	8.3	16.9	8.5	1.6	9.6
	D	8	14	15	5	2	29	36	50	67	44	9	11
	C/D	125	107	73	240	100	145	275	166	252	193	178	87
1957	L	-	1.2	.2	.3	.2	2.4	20.9	11.5	15.2	4.1	.8	1.5
	D	-	12	3	3	3	14	42	63	79	31	7	12
	C/D	-	100	67	100	67	171	498	183	192	132	114	125
1958	L	1.2	1.9	.2	.4	2.4	23.5	9.6	11.4	6.5	2.8	1.9	2.4
	D	8	14	3	5	10	52	46	70	51	14	9	17
	C/D	150	136	67	80	240	452	208	163	127	206	211	141
1959	L	2.2	6.8	2.2	.6	2.4	13.8	28.2	10.6	11.3	5.2	3.1	2.0
	D	15	32	15	2	14	32	81	82	84	60	27	13
	C/D	147	212	147	300	171	431	348	129	136	87	115	154
1960	L	5.6	3.9	5.4	2.8	7.4	23.4	22.3	9.5	2.5	1.9	3.8	2.8
	D	27	20	24	17	29	70	84	71	40	20	35	22
	C/D	207	195	225	165	255	334	265	134	63	95	109	127

Table 2 continued.

1961	L	3.4	4.3	3.9	3.7	6.0	19.6	16.9	11.9	6.4	5.2	7.8	4.7
	D	26	22	28	34	41	62	66	84	60	50	48	26
	C/D	131	195	139	109	146	316	256	142	107	104	163	181
1962	L	6.9	9.0	7.3	3.4	2.2	23.1	39.1	22.4	9.8	3.5	5.6	3.5
	D	31	38	52	25	24	58	110	101	82	46	38	23
	C/D	223	237	140	136	92	398	355	222	119	75	147	152
1963	L	4.8	3.6	2.4	2.1	1.9	13.6	12.7	5.5	2.8	6.3	5.2	4.8
	D	28	26	13	15	21	62	67	45	29	31	28	30
	C/D	171	138	185	140	90	219	189	122	97	203	186	160
1964	L	-	3.9	2.1	1.2	.6	14.6	14.8	8.4	6.1	4.3	3.5	3.4
	D	-	25	25	21	8	43	72	66	75	47	36	25
	C/D	-	156	84	57	75	339	206	127	82	91	97	136
1965	L	.6	4.0	1.2	.1	-	-	13.2	3.7	4.1	1.0	3.0	1.8
	D	7	18	8	2	-	-	54	34	43	16	31	24
	C/D	86	22	150	50	-	-	244	109	95	63	97	75
1966	L	1.3	2.9	-	-	-	-	21.5	5.7	4.1	2.5	.8	.9
	D	15	23	-	-	-	-	62	45	26	19	10	18
	C/D	87	126	-	-	-	-	347	127	158	132	80	55
1967	L	.5	4.8	-	-	-	-	24.4	6.5	1.2	1.5	.8	1.5
	D	5	17	-	-	-	-	99	54	11	19	11	17
	C/D	96	285	-	-	-	-	259	120	110	77	73	87
1968	L	1.4	2.3	-	-	-	-	15.0	20.4	6.8	6.9	2.0	1.7
	D	18	21	-	-	-	-	53	85	54	32	16	20
	C/D	76	110	-	-	-	-	283	241	124	214	125	84
1969	L	.3	-	-	-	-	-	19.4	14.4	9.4	7.0	2.1	2.1
	D	6	-	-	-	-	-	130	129	84	74	36	24
	C/D	50	-	-	-	-	-	226	112	112	91	60	90

TABLE 3 - M O E R A K I

L = Total landings ('000lbs)
 D = Days fished
 C/D = Average catch per boat day 1954-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	L	7.3	9.1	2.7	-	1.7	11.9	48.6	50.6	35.5	21.2	15.3	6.9
	D	56	50	21	-	25	117	238	237	234	144	94	54
	C/D	130	182	128	-	68	101	204	213	156	147	163	128
1955	L	12.4	12.6	2.0	-	2.6	4.9	32.8	67.3	62.1	34.8	35.4	47.7
	D	97	87	31	-	32	66	188	237	261	190	176	164
	C/D	127	145	65	-	81	74	174	284	238	183	201	291
1956	L	32.7	14.8	1.6	-	2.1	9.4	42.1	69.8	97.2	56.0	29.6	16.7
	D	131	117	27	-	23	88	217	262	260	224	168	90
	C/D	240	126	59	-	91	107	194	266	374	250	176	185
1957	L	17.1	22.8	6.6	10.6	2.8	23.8	47.9	55.7	45.6	31.7	32.6	28.8
	D	116	166	75	97	46	186	203	228	211	222	225	134
	C/D	147	137	88	109	61	128	236	244	216	143	145	215
1958	L	35.8	30.9	41.2	10.8	18.9	27.8	18.2	57.6	45.9	46.2	48.9	31.9
	D	176	200	267	114	163	194	151	287	259	269	292	212
	C/D	203	155	154	94	116	143	120	201	177	171	167	150
1959	L	31.8	28.9	8.7	9.9	4.3	38.7	61.6	51.8	44.6	28.3	22.3	12.6
	D	194	240	130	96	59	196	243	258	259	203	217	112
	C/D	163	120	67	103	73	197	253	201	172	139	103	112
1960	L	27.9	37.1	14.6	12.9	16.1	52.4	87.2	79.5	66.7	41.9	37.3	21.8
	D	258	285	219	123	210	243	325	341	343	286	239	134
	C/D	108	130	67	105	77	215	268	233	194	146	156	162

Table 3 continued

1961	L	20.4	46.2	13.3	12.5	10.4	33.6	29.1	34.4	33.6	65.6	47.1	35.3
	D	189	354	163	207	175	279	200	293	275	355	302	210
	C/D	108	131	81	60	59	120	146	117	122	185	156	168
1962	L	46.6	29.4	29.8	4.6	6.6	30.7	63.5	81.3	47.5	62.3	52.0	29.4
	D	297	251	281	98	92	249	332	417	336	385	336	180
	C/D	157	117	106	47	72	128	191	195	141	162	155	163
1963	L	20.0	19.6	7.6	1.6	3.3	11.6	9.7	40.5	23.6	46.6	56.4	31.2
	D	215	222	117	33	63	132	136	287	248	407	394	244
	C/D	93	88	65	48	52	88	71	141	95	115	143	128
1964	L	43.6	23.6	8.6	3.8	3.8	15.8	32.8	56.9	45.6	40.4	37.5	28.5
	D	297	273	109	39	51	155	243	374	357	296	243	229
	C/D	147	86	79	97	74	102	135	152	128	136	154	124
1965	L	16.5	19.4	4.7	-	.1	6.1	115.9	32.2	31.1	41.3	25.4	12.1
	D	185	228	128	-	11	112	461	275	342	369	287	222
	C/D	89	85	37	-	9	54	251	117	91	112	89	55
1966	L	3.6	2.7	.5	.1	.2	3.8	108.1	69.6	56.2	53.6	24.0	15.4
	D	87	84	25	9	12	37	358	395	361	339	213	139
	C/D	41	32	20	11	16	102	302	176	155	158	112	112
1967	L	6.3	6.3	.8	-	-	1.7	85.2	30.7	74.2	101.6	45.5	27.1
	D	85	113	37	-	-	45	434	289	345	409	272	231
	C/D	74	56	22	-	-	40	196	171	215	248	167	118
1968	L	7.5	5.0	-	-	.3	2.8	203.7	91.5	88.2	66.7	23.2	17.0
	D	104	98	-	-	8	59	532	450	426	338	243	177
	C/D	71	52	-	-	35	47	383	230	207	197	95	96
1969	L	.2	4.0	1.2	-	-	2.6	187.0	67.0	25.7	66.0	61.3	18.0
	D	4	76	40	-	-	72	588	436	254	405	359	185
	C/D	60	53	30	-	-	37	319	154	102	163	171	97

TABLE 4 - M O E R A K I

Landings (in '000 lbs) each month

% (by number) of Rock Lobsters over 10" total length 1957-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1957	Landing	17.1	22.8	6.6	10.6	2.8	23.8	47.9	55.7	45.6	31.7	32.6	28.8
	% 10" +	65	65	24	17	9	21	39	12	15	35	62	66
1958	Landing	35.8	30.9	41.2	10.8	18.9	27.8	18.2	57.6	45.9	46.2	48.9	31.9
	% 10" +	76	45	19	6	8	19	20	14	24	35	31	43
1959	Landing	31.8	28.9	8.7	9.9	4.3	38.7	61.6	51.8	44.6	28.3	22.3	12.6
	% 10" +	51	62	32	3	4	12	10	15	47	57	66	74
1960	Landing	27.9	37.1	14.6	12.9	16.1	52.4	87.2	79.5	66.7	41.9	37.3	21.8
	% 10" +	72	39	22	10	11	10	16	25	42	65	76	79
1961	Landing	20.4	46.2	13.3	12.5	10.4	33.6	29.1	34.4	33.6	65.6	47.1	35.3
	% 10" +	52	13	9	5	16	17	9	27	57	76	79	62
1962	Landing	46.6	29.4	29.8	4.6	6.6	30.7	63.5	81.3	47.5	62.3	52.0	29.4
	% 10" +	46	42	39	24	10	13	23	36	60	79	85	87
1963	Landing	20.0	19.6	7.6	1.6	3.3	11.6	9.7	40.5	23.6	46.6	56.4	31.2
	% 10" +	58	48	29	13	10	19	16	23	56	69	83	88

Table 4 continued

1964	Landing % 10" +	43.6 57	23.6 65	8.6 58	3.8 34	3.8 29	15.8 29	32.8 41	56.9 42	45.6 72	40.4 83	37.5 83	28.5 89
1965	Landing % 10" +	16.5 100	19.4 100	4.7 100	- -	.1 100	6.1 100	115.9 7	32.2 9	31.1 22	41.3 48	25.4 67	12.1 76
1966	Landing % 10" +	3.6 100	2.7 100	.5 100	.1 100	.2 100	3.8 100	108.1 5	69.6 17	56.2 40	53.6 62	24.0 77	15.4 88
1967	Landing % 10" +	6.3 100	6.3 100	.8 100	- -	- -	1.7 100	85.2 5	49.4 39	74.2 38	101.6 77	45.5 87	27.1 69
1968	Landing % 10" +	7.5 100	5.0 100	- -	- -	.3 100	2.8 100	203.7 2	91.5 13	88.2 45	66.7 73	23.3 70	17.0 66
1969	Landing % 10" +	.2 100	4.0 100	1.2 100	- -	- -	2.6 100	187.0 3	67.0 15	25.7 32	66.0 35	61.3 61	18.0 72

TABLE 5 - K A R I T A N E

L = Total landings ('000 lbs)

D = Days fished

C/D = Average catch per boat day 1954-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	L	-	-	-	-	.4	67.9	127.7	102.6	39.5	16.5	5.9	.2
	D	-	-	-	-	2	152	165	195	155	84	25	3
	C/D	-	-	-	-	200	447	774	526	255	198	236	75
1955	L	-	-	-	-	.1	31.9	113.8	96.3	49.6	17.1	5.2	5.1
	D	-	-	-	-	4	111	165	163	144	79	42	26
	C/D	-	-	-	-	25	287	690	591	344	216	124	196
1956	L	2.4	1.9	.7	-	1.2	35.7	117.7	91.2	71.3	22.0	7.1	5.0
	D	8	15	4	-	11	134	180	170	170	98	44	32
	C/D	300	127	175	-	109	266	654	536	419	224	161	156
1957	L	.1	-	-	2.0	6.7	41.1	77.2	62.7	36.6	9.5	2.5	.9
	D	2	-	-	13	51	141	141	174	142	61	31	10
	C/D	50	-	-	154	131	291	547	360	258	156	80	90
1958	L	.2	3.9	3.1	-	13.8	71.2	55.6	62.9	40.5	26.4	11.8	7.1
	D	3	12	23	-	84	171	130	180	152	129	88	157
	C/D	77	325	134	-	164	416	428	349	266	205	134	124
1959	L	2.4	2.4	4.3	3.9	3.9	87.2	120.3	75.9	22.7	15.4	17.2	8.1
	D	11	28	55	48	41	186	180	189	118	117	136	89
	C/D	218	86	78	81	95	469	668	402	192	132	126	91
1960	L	18.1	23.0	13.8	9.5	16.2	59.9	95.6	43.8	22.2	10.7	4.8	12.1
	D	154	200	124	122	152	236	277	250	186	142	74	101
	C/D	118	115	111	78	107	254	345	175	119	75	65	119

Table 5 continued

1961	L	8.1	19.9	5.0	5.0	11.3	61.9	61.0	30.9	11.0	19.7	9.5	19.4
	D	73	146	69	75	110	251	216	225	169	214	149	172
1962	C/D	110	136	72	67	103	247	282	137	65	92	64	112
	L	19.0	11.3	11.8	3.2	10.7	64.8	81.6	42.0	15.3	13.2	12.1	13.4
1963	D	157	131	173	65	111	277	267	215	157	148	142	117
	C/D	121	86	68	49	96	234	306	195	97	89	85	115
1964	L	25.8	15.2	7.9	3.8	2.9	33.5	31.1	51.5	16.2	16.8	7.7	2.2
	D	184	130	106	60	54	190	125	231	151	195	122	51
1965	C/D	140	117	75	63	54	176	248	223	107	86	63	43
	L	20.2	23.1	6.9	5.9	4.6	30.7	31.6	35.6	17.2	10.1	4.5	7.5
1966	D	135	174	94	104	88	214	185	199	172	135	84	57
	C/D	149	133	73	57	52	143	171	179	100	75	53	141
1967	L	.3	-	.3	-	-	.6	85.1	41.2	32.1	26.1	8.4	9.5
	D	9	-	4	-	-	23	295	213	244	229	126	140
1968	C/D	33	-	75	-	-	26	288	193	132	114	67	68
	L	-	.2	-	-	-	-	175.1	79.9	30.4	17.6	4.0	3.7
1969	D	-	3	-	-	-	-	324	304	173	174	64	32
	C/D	-	66	-	-	-	-	540	262	175	101	64	117
1970	L	-	-	-	-	-	-	125.2	51.8	32.5	19.4	5.6	15.8
	D	-	-	-	-	-	-	352	253	225	186	81	113
1971	C/D	-	-	-	-	-	-	356	206	145	105	70	140
	L	.5	.5	-	-	-	-	188.5	90.0	32.6	9.2	2.2	1.4
1972	D	15	12	-	-	-	-	358	283	172	91	36	19
	C/D	30	39	-	-	-	-	527	315	181	101	62	75
1973	L	-	-	-	-	-	-	180.0	67.2	21.7	23.5	10.4	2.0
	D	-	-	-	-	-	-	506	340	192	211	160	17
1974	C/D	-	-	-	-	-	-	356	198	114	113	66	118

TABLE 6 - TAIERI M O U T H

L = Total Landings ('000 lbs)

D = Days fished

C/D = Average catch per boat day 1954-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	L	3.2	2.8	-	-	.9	6.7	10.3	30.8	14.5	3.3	.3	1.1
	D	24	9	-	-	5	31	30	73	45	19	3	8
	C/D	133	311	-	-	180	216	343	422	322	174	100	137
1955	L	.9	.8	-	-	.2	3.9	8.5	13.0	9.0	.5	-	.7
	D	4	4	-	-	2	39	52	55	39	3	-	20
	C/D	225	200	-	-	100	100	163	236	231	166	-	35
1956	L	-	-	-	3.9	.1	1.6	10.5	21.2	29.2	21.6	1.5	.7
	D	-	-	-	10	3	13	45	59	69	63	11	6
	C/D	-	-	-	31		123	233	359	423	343	136	116
1957	L	.3	.5	.5	-	.1	7.5	14.5	24.7	17.3	7.0	1.4	.1
	D	7	8	6	-	3	46	70	92	93	48	13	2
	C/D	43	62	83	-	33	163	297	268	187	146	107	50
1958	L	-	2.1	.9	12.7	5.3	29.6	1.1	16.8	22.2	16.1	9.1	.4
	D	-	32	10		24	84	7	70	92	63	27	5
	C/D	-	66	90		220	352	157	240	241	256	339	80
1959	L	6.6	14.9	12.6	5.6	-	18.1	26.7	15.9	13.7	19.2	14.0	7.0
	D	29	48	40	57	-	79	84	77	74	104	59	28
	C/D	227	310	315	223	-	229	317	206	185	185	237	250
1960	L	3.7	-	5.7		1.0	.4	12.2	22.4	12.6	6.3	4.5	11.1
	D	23	-	20	29	3	4	41	76	53	43	24	28
	C/D	160	-	196	193	330	100	297	295	238	147	187	396

Table 6 continued

1961	L	6.8	9.6	.8	-	-	2.9	4.2	13.9	15.7	29.0	22.3	34.2
	D	23	36	6	-	-	20	35	73	95	114	79	100
	C/D	296	267	133	-	-	145	120	190	165	255	282	34
1962	L	52.6	2.9	3.5	.4	2.2	3.9	5.9	32.3	29.7	37.4	34.2	38.8
	D	113	15	20	4	14	18	23	88	114	119	97	105
	C/D	465	193	175	100	157	217	257	367	261	314	352	369
1963	L	18.6	11.9	13.3	.9	1.2	4.2	5.1	22.3	15.4	18.8	37.5	15.8
	D	64	41	37	36	10	22	25	81	79	79	122	66
	C/D	291	290	359	25	120	191	204	275	195	238	307	239
1964	L	32.2	21.1	9.0	3.7	.9	5.6	12.4	30.4	29.5	14.4	15.0	10.9
	D	88	73	50	26	5	32	51	100	126	83	74	72
	C/D	366	289	180	142	180	175	243	304	234	173	203	151
1965	L	16.9	84.9	38.1	2.2	1.0	.1	7.4	15.1	28.5	17.8	12.0	10.9
	D	68	89	54	8	10	4	56	90	156	114	89	98
	C/D	248	954	705	275	100	32	132	168	182	156	135	111
1966	L	68.5	20.9	2.2	.4	-	.3	21.6	79.1	34.9	37.8	4.3	2.7
	D	91	93	22	2	-	5	36	197	118	149	50	31
	C/D	753	225	100	200	-	66	600	402	296	254	86	87
1967	L	2.0	5.6	0.5	-	-	1.2	20.9	20.5	10.6	24.3	13.5	16.3
	D	16	46	10	-	-	16	141	128	151	155	131	124
	C/D	126	122	55	-	-	80	148	161	130	162	103	131
1968	L	7.5	4.6	-	-	-	.8	46.2	58.8	20.5	17.9	12.2	9.2
	D	70	62	-	-	-	15	112	196	157	135	116	104
	C/D	108	74	-	-	-	57	413	299	131	133	105	89
1969	L	2.1	.5	.2	-	-	1.8	56.1	43.5	15.2	11.6	10.4	3.0
	D	21	15	6	-	-	22	194	163	122	106	97	50
	C/D	100	31	34	-	-	90	289	266	125	110	108	65

TABLE 7 - NUGGETS

L = Total landings ('000 lbs)
 D = Days fished
 C/D = Average catch per boat day 1954-1969

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	L	-	-	-	-	-	-	-	-	-	-	-	-
	D	-	-	-	-	-	-	-	-	-	-	-	-
	C/D	-	-	-	-	-	-	-	-	-	-	-	-
1955	L	-	-	-	-	-	-	-	-	-	-	-	9.0
	D	-	-	-	-	-	-	-	-	-	-	-	47
	C/D	-	-	-	-	-	-	-	-	-	-	-	191
1956	L	5.2	4.9	7.5	1.5	1.5	.7	-	1.0	9.7	14.8	7.6	10.9
	D	32	31	17	13	8	1	-	8	31	33	21	16
	C/D	163	158	441	115	187	700	-	125	313	448	362	681
1957	L	7.6	3.3	.9	10.7	4.9	2.6	3.0	2.3	19.3	24.7	15.8	5.9
	D	18	14	3	40	24	19	20	9	59	58	42	18
	C/D	422	235	300	268	204	137	150	255	327	525	376	328
1958	L	18.5	14.9	7.2	.3	.5	-	-	3.5	14.8	21.6	46.0	33.5
	D	54	43	30	3	2	-	-	16	54	68	93	79
	C/D	343	346	240	100	250	-	-	219	274	318	495	424
1959	L	39.9	10.7	.6	1.5	-	.3	2.8	12.3	32.5	48.7	29.5	11.4
	D	89	27	6	10	-	3	11	65	81	83	53	20
	C/D	448	396	100	150	-	100	254	189	401	586	557	570
1960	L	12.2	9.9	6.4	2.5	-	.4	19.0	35.8	44.0	49.0	10.0	7.0
	D	48	51	33	22	-	2	40	49	71	75	40	29
	C/D	254	194	194	114	-	200	475	731	619	653	253	241

Table 7 continued

1961	L	3.3	12.3	7.2	7.9	1.9	1.3	3.7	69.6	53.7	112.0	43.7	44.8
	D	30	65	52	59	4	7	18	96	57	102	88	112
	C/D	110	189	138	134	475	185	295	725	942	1098	496	400
1962	L	46.0	2.3	.6	.7	2.2	2.0	10.9	109.1	67.8	78.2	34.4	31.5
	D	130	7	13	9	10	4	16	85	97	98	84	53
	C/D	354	329	46	77	222	500	681	1284	699	797	408	594
1963	L	26.7	14.3	4.4	.2	-	.2	1.4	57.9	50.0	40.5	45.0	20.5
	D	67	40	27	3	-	4	7	58	66	71	72	47
	C/D	398	358	163	67	-	50	200	999	758	570	625	436
1964	L	7.6	12.9	2.3	-	-	-	4.1	48.3	48.3	17.7	14.7	10.8
	D	23	49	21	-	-	-	22	75	87	56	49	37
	C/D	330	263	110	-	-	-	186	644	555	316	300	292
1965	L	3.3	.9	1.5	.1	-	-	18.9	45.9	50.0	21.7	11.8	7.9
	D	15	13	3	.1	-	-	62	57	86	62	49	45
	C/D	220	69	500	100	-	-	300	805	581	350	240	175
1966	L	-	2.0	.1	-	-	-	25.7	105.9	41.4	19.9	4.1	2.7
	D	-	9	1	-	-	-	25	94	56	59	16	31
	C/D	-	222	114	-	-	-	1028	1126	739	337	255	87
1967	L	-	-	-	-	-	-	17.8	13.4	11.2	32.0	9.1	1.7
	D	-	-	-	-	-	-	59	36	54	115	39	5
	C/D	-	-	-	-	-	-	302	373	208	278	233	340
1968	L	1.2	.3	-	-	-	-	48.7	65.1	24.1	4.7	8.6	3.1
	D	14	8	-	-	-	-	64	105	74	34	52	19
	C/D	88	44	-	-	-	-	762	621	326	140	167	163
1969	L	-	-	-	-	-	-	59.7	59.6	11.0	11.6	10.5	-
	D	-	-	-	-	-	-	112	116	55	50	82	-
	C/D	-	-	-	-	-	-	533	515	190	133	128	-

TABLE 8 - BLUFF-STEWART ISLAND, RIVERTON AND MILFORD

MONTHLY LANDINGS IN CWT. 1954-1969

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1954	3,889	4,272	4,442	1,361	4,254	4,626	7,704	8,444	2,838	1,930	6,076	7,097
1955	5,224	5,911	7,709	2,260	2,353	5,208	7,103	8,122	4,654	4,369	4,585	7,422
1956	5,369	6,781	6,194	3,451	1,511	2,302	6,974	9,792	4,893	7,556	6,809	5,544
1957	2,576	8,414	8,402	1,624	903	1,501	5,769	8,460	5,606	2,695	3,291	4,150
1958	2,024	10,036	4,262	370	650	244	6,763	5,114	3,039	4,737	3,028	4,087
1959	6,695	4,235	2,971	688	168	488	1,075	2,932	2,229	3,589	3,696	4,145
1960	3,002	3,535	1,682	948	572	796	1,560	2,723	2,841	5,935	3,920	3,825

Table 8 continued

1961	2,199	4,754	1,446	1,156	458	426	993	1,850	2,073	3,800	3,895	4,411
1962	1,646	4,853	2,446	871	335	1,118	786	863	2,173	8,408	4,496	3,583
1963	2,703	7,810	1,893	1,276	324	595	1,873	824	1,375	4,875	5,294	5,800
1964	1,782	4,519	5,468	673	25	1,556	1,757	778	1,746	6,146	4,826	6,100
1965	5,813	3,803	3,121	867	415	844	2,332	1,705	1,036	3,567	7,557	6,206
1966	4,068	5,043	2,493	629	348	413	1,557	1,625	3,084	7,108	6,230	5,154
1967	4,888	2,836	3,366	655	183	334	1,491	938	2,584	5,198	5,078	5,538
1968	4,391	3,364	3,037	709	235	447	943	1,059	1,475	3,582	3,844	5,542
1969	5,486	3,659	1,958	702	278	238	253	528	1,425	2,902	5,205	6,037

TABLE 9

Average Catch per pot-lift (from fisheries log-books) for different fishing areas in Southland and Fiordland.

P = Number of pots lifted.

C = Catch in lbs whole rock-lobsters per pot.

(a) R U A P U K E

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1963	P	-	-	-	-	-	-	-	-	174	597	837	264
	C	-	-	-	-	-	-	-	-	8.4	21.9	26.7	24.3
1964	P	122	60	-	-	-	-	-	-	612	566	149	512
	C	7.5	4.2	-	-	-	-	-	-	11.4	16.5	19.5	21.6
1965	P	27	-	-	-	-	-	-	222	276	381	506	312
	C	7.2	-	-	-	-	-	-	4.2	4.2	14.4	27.0	19.8
1966	P	182	-	-	-	-	-	25	499	476	562	336	-
	C	10.2	-	-	-	-	-	6.6	8.7	7.5	20.4	11.7	-

Table 9 continued -

		(b) <u>WESTERN FOVEAUX STRAIT</u>											
YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1962	P	-	-	-	-	-	-	-	-	-	-	420	210
	C	-	-	-	-	-	-	-	-	-	-	45.6	18.9
1963	P	-	-	-	-	-	-	492	-	-	-	64	309
	C	-	-	-	-	-	-	59.7	-	-	-	59.1	31.2
1964	P	-	384	210	240	75	573	449	78	-	-	348	222
	C	-	13.5	10.8	6.0	10.0	57.0	30.0	9.9	-	-	31.2	18.3
1965	P	929	564	606	-	-	320	845	320	-	-	-	192
	C	24.3	15.9	19.2	-	-	16.2	21.0	27.3	-	-	-	11.4
1966	P	-	477	-	-	78	100	875	47	-	-	-	-
	C	-	12.6	-	-	6.9	13.2	10.8	2.4	-	-	-	-

Table 9 continued-

(c) S O U T H A N D W E S T S T E W A R T I S L A N D

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1965	P	-	-	-	-	-	-	-	-	430	1006	1234	595
	C	-	-	-	-	-	-	-	-	4.4	16.8	20.1	14.7
1966	P	40	-	-	-	-	-	-	72	575	1577	231	-
	C	6.3	-	-	-	-	-	-	12.9	11.4	30.0	23.4	-

(d) S O L A N D E R

1965	P	-	-	-	-	-	-	-	-	-	-	388	852
	C	-	-	-	-	-	-	-	-	-	-	25.4	21.3
1966	P	295	-	-	-	-	-	-	-	-	-	-	912
	C	20.4	-	-	-	-	-	-	-	-	-	-	22.5
1967	P	707	505	161	-	-	-	-	-	-	-	-	-
	C	13.5	9.9	5.1	-	-	-	-	-	-	-	-	-

Table 9 continued -

(e) FIORDLAND

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1963	P	501	410	265	-	-	393	155	-	-	-	-	-
	C	39.9	27.0	25.2	-	-	36.8	42.6	-	-	-	-	-
1964	P	72	849	318	-	-	-	-	-	-	-	-	-
	C	18.0	18.0	19.5	-	-	-	-	-	-	-	-	-
1965	P	-	-	-	-	-	-	-	260	-	-	-	-
	C	-	-	-	-	-	-	-	6.3	-	-	-	-
1966	P	1669	1412	647	50	-	-	-	82	450	1311	993	645
	C	16.5	15.6	9.6	4.8	-	-	-	4.1	9.9	12.6	23.1	14.4
1967	P	115	505	77	-	-	132	-	-	-	-	-	-
	C	13.5	9.9	9.0	-	-	4.5	-	-	-	-	-	-

TABLE 10

Percentage of Male (M) and Female (F) undersized rock-lobsters in catches in separate areas.

YEAR	MOERAKI				KARITANE				TAIERI MOUTH				NUGGETS				STEWART ISLAND		FIORDLAND	
	< 7		< 10		< 7		< 10		< 7		< 10		< 7		< 10		< 10			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
1961					46	45	94	98												
1962	1	+	43	55	51	53	90	96					14	20	95	98				
1963	1	2	41	54	19	15	99	99												
1964			16	25	26	23	94	99									46	65		
1965					16	27	96	99												
1966			21	40	10	12	98	100					1	+	88	98		45 70		
1967	+	2	43	60	37	40	98	99					31	48	96	95		45 43		
1968			34	40	24	35	96	98	4	2	38	72	13	17	93	97		43 80		
1969					26	39	100	100					14	29	99	99	64	71 52 52		

