An Examination of Harvested and Unharvested Abalone Populations in the Moresby Island Area

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AN EXAMINATION OF HARVESTED AND UNHARVESTED ABALONE POPULATIONS IN THE MORESBY ISLAND AREA

by

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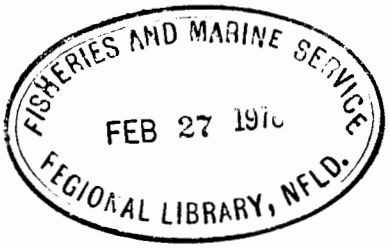

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ABSTRACT

Adkins, B. E., and A. P. Stefanson. 1977. An examination of harvested and unharvested abalone populations in the Moresby Island area. Fish. Mar. Serv. MS Rep. 1435: 23 p.

In October 1976, we dived at 11 sites on the east coast of Moresby Island to examine density and size structure of abalone populations in both harvested and unharvested areas. We found abalone density in the harvested areas to be $1.3/m^2$, compared with $4.4\text{-}10.0/m^2$ in the unharvested areas.

The population size structure varied with exposure. We found smaller abalone in more exposed areas. Wave exposure and competition for food with the red sea urchin are discussed as possible factors leading to their size differences.

Key words: Abalone, population density, size distribution.

RÉSUMÉ

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En Octobre 1976, nous avons plongé en onze endroits le long de la côte est de l'île Moresby, afin d'observer la densité et la répartition des tailles des populations d'Ormeaux dans des milieux exploités ou non. La densité dans les régions exploitées était de $1,3/m^2$, comparativement à 4,4 à $10,0/m^2$ pour les régions non exploitées.

La répartition des tailles variait avec l'exposition; les plus petits sujets vivant dans les milieux les plus exposés. Nous discutons de l'exposition aux vagues et de la compétition pour la nourriture avec l'oursin, comme facteurs possibles de la différenciation des tailles.

Mots-clés: Ormeau, densité de population, répartition des tailles.

INTRODUCTION

In the summer of 1976, intense harvesting of the northern abalone Haliotis kamtschatkana took place in Cumshewa Inlet on Moresby Island.

The purpose of this study was to examine population densities and size structures in the commercially fished and unfished areas in Cumshewa Inlet and in commercially unfished areas in Juan Perez Sound; and to obtain an indication of the impact of fishing on these populations. Population size structure was examined in these areas, and an attempt was made to relate it to habitat exposure, algal cover and competition with the red sea urchin Strongylocentrotus franciscanus.

METHODS

A total of 11 dives using scuba was made during the period October 13-18, 1976, in order to survey abalone populations in commercially fished and unfished locations on Moresby Island. These dive sites (Fig. 1-5) were located from Grey Point south to Juan Perez Sound. Population density was determined at each location by making sequential counts along horizontal transects parallel to shore with a 1.0 m^2 quadrat. These transects were run at 10-15 m intervals and varied in depth between 2 and 6 m. Population size structure was determined by measuring to the nearest mm, with calipers underwater or with a measuring board on the surface, the lengths of a sample of 100-300 individuals taken from a randomly selected area within each site. Observations were made of algal cover, substrate, slope, and exposure at each location.

RESULTS

A. CUMSHEWA INLET

Intense commercial fishing occurred in Cumshewa Inlet during the summer of 1976. This was partly because abalone in this area were abundant and exceptionally large; also the inlet is semi-protected and easy to fish. Over 9,450 kg were taken from here during August 1976. Two sites were examined in this survey to determine abalone densities in commercially fished and unfished populations.

1. Fairbairn Shoals

Fairbairn Shoals is a large flat area with water depths averaging 9 m (Fig. 1). A dense canopy of giant kelp (Macrocystis integrifolia) and bull kelp (Nereocystis luetkeana) covers the entire area. The kelps Pterygophora californica, Costaria costata, and Laminaria spp. formed a light understory. Cobbles and large boulders formed the substrate.

During August 1976, at least 6,500 kg of abalone were harvested from this area. We examined three sites where fishing had been most intense. At each site recent indications of fishing, such as broken shells on live abalone, were visible. Abalone density was estimated from quadrats to average 1.3/m^2 in the three sites examined. Length measurements taken from 165 abalone ranged between 31 and 140 mm with a mean of 120 mm. Of the abalone measured, 94% were above the legal size limit of 102 mm. Population structure is shown in Fig. 6.

2. Haans Islet

Haans Islet, although it supports a large abalone population was not, to our knowledge, commercially fished during 1976. The site examined lies directly across the inlet from the heavily fished areas on Fairbairn Shoals (Fig. 1).

A dense Macrocystis and Nereocystis canopy covered most of the area. The kelps Laminaria spp., Eisenia arborea and sea lettuce (Ulva sp.) were the major algae in the light understory. The substrate is similar to that of Fairbairn Shoals, but bedrock is also present.

No evidence of commercial fishing was found at this site. The mean abalone density was 5.7/m^2. Lengths taken from 139 abalone ranged between 59 mm and 132 mm with a mean of 102 mm (Fig. 7). Of the abalone measured, 65% were above the legal size limit.

B. CUMSHEWA HEAD TO GREY POINT

Except for having a greater exposure, the area between Cumshewa Head and Grey Point appeared to be similar to Fairbairn Shoals. This area has an average depth of 9 m and was covered by a dense canopy of Macrocystis. The kelps, Desmarestia viridis, Egregia menzesii, Alaria nana and surf grass Phyllospadix scouleri formed the understory. The substrate is bedrock at Cumshewa Head and cobbles and boulders at Grey Point. The entire area is exposed to Hecate Strait and so is subject to heavy wave action. We made two dives in this area (Fig. 2) and found only three abalone.

C. JUAN PEREZ SOUND

Juan Perez Sound has been closed to commercial fishing of abalone since November 3, 1973, but was commercially fished prior to that date. This area is subject to recreational fishing by sports divers and by pickers on the beaches at low tides. Because of the isolation and exposure of the areas where abalone density is high, and the low human density locally, the number of abalone taken from the Sound is very small. Three locations in Juan Perez Sound were surveyed.

1. Tar Islands

The Tar Islands are a group of small islands in the northernmost reach of Juan Perez Sound. Sites on two moderately exposed small islets were surveyed (Fig. 3). In both areas, the substrate is bedrock sloping gradually to 12 m. There was a light Nereocystis and Egregia canopy, with Eisenia and Pterygophora forming a dense under storey. Below the kelp zone, at 6 m, Strongylocentrotus franciscanus occurred at densities up to $20/m^2$.

The mean abalone density was $4.4/m^2$. The abalone on the Tar Islands were generally smaller than those measured in Cumshewa Inlet (Fig. 8). Length measurements taken from 299 abalone ranged between 23 and 116 mm, with a mean of 84 mm. Fifteen percent were above the legal size limit.

2. Bischof Islands

Two moderately exposed sites were examined on a small islet in the northwest corner of the Bischof Islands (Fig. 4). The substrate in both areas is bedrock sloping gradually to 9 m. The most abundant algae present were Eisenia and Pterygophora extending to a depth of 6 m. Below this zone, S. franciscanus occurred at densities up to $20/m^2$.

Abalone density was $6.9/m^2$. Length measurements taken from 99 abalone ranged between 60 and 129 mm with a mean of 89 mm (Fig. 9). Eleven percent were above the legal size limit.

3. Murchison Island

Murchison Island is a large island in the center of Juan Perez Sound. A small rock on the west side of the island, exposed to Hecate Strait, was surveyed (Fig. 5).

Solid substrate and a steep slope characterized this site. Hedophylum sessile, Alaria, Eisenia and Pterygophora formed the algal cover to a depth of 6 m. S. franciscanus occurred below this zone at densities up to $12/m^2$.

Abalone density averaged $10.0/m^2$. Length measurements from 102 abalone ranged between 37 and 101 mm, with a mean of 70 mm (Fig. 10). None of the abalone measured were above the legal size limit.

DISCUSSION

Abalone populations in Cumshewa Inlet and Juan Perez Sound were variable in size structure and population density. Abalone were larger but less dense in the semi-protected areas in Cumshewa Inlet than in the moderately exposed areas in Juan Perez Sound. In the most exposed areas, from Cumshewa Head to Grey Point, we found almost no abalone.

Sea urchin density was higher in the moderately exposed areas than in the semi-protected areas. In the semi-protected areas abalone were found only within the extensive Macrocystis and Nereocystis beds. Sea urchins did not occur within these beds, as the lower limit of the kelp bed is bounded by the upper distribution of sea urchins. In the more exposed areas sea urchins occurred in shallower water and abalone occurred in both the kelp and sea urchin zones.

Abalone and sea urchins are potentially competitive species. At one site, Bischof Island, abalone and sea urchins were actively grazing on Pterygophora and Eisenia plants in the lower limits of the kelp zone. Food limitation as a result of heavy grazing pressure may account for the small abalone in the exposed areas where sea urchins are abundant, and large abalone in the semi-protected kelp beds where sea urchins are scarce.

It is not possible to see any change in average size within a population as a result of fishing. The heaviest fishing has taken place where abalone are largest and no fishing occurs where all are below legal size as in very exposed places.

Fairbairn Shoals had the largest abalone and was most intensively fished. After being fished this area had an abalone density of $1.3/m^2$. Haans Islet, a similar area near Fairbairn Shoals was not commercially fished and had a density of $5.7/m^2$. Other areas which had not been recently fished had abalone densities of $4.4/m^2$, $6.9/m^2$, and $10.0/m^2$. So generally fishing reduced abalone density from its original levels of $5\text{-}10/m^2$ to about $1/m^2$ in this area.

ACKNOWLEDGMENTS

We would like to thank Brian Allen, who dived with us and helped with data collection; Gerry Buxton, our diving tender; the skipper, C. A. Casey, and the crew of the KITIMAT II for their invaluable assistance; and those fishermen who provided us with records of fishing locations and catches.

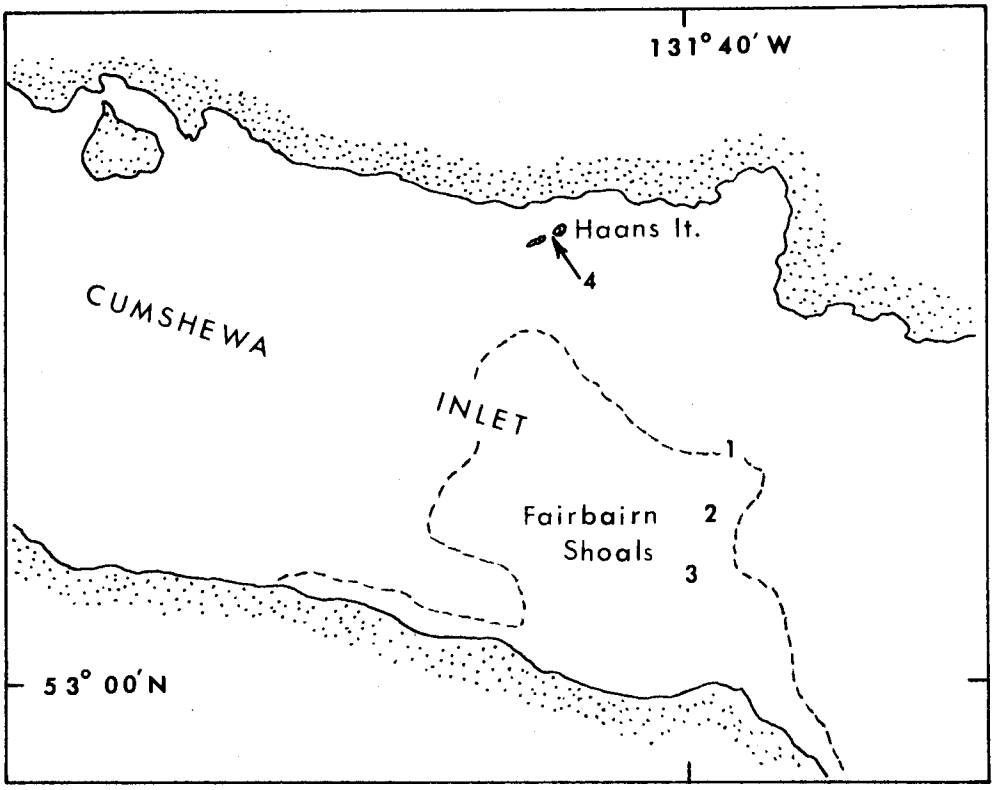

Fig. 1. Sites 1, 2, 3, and 4.

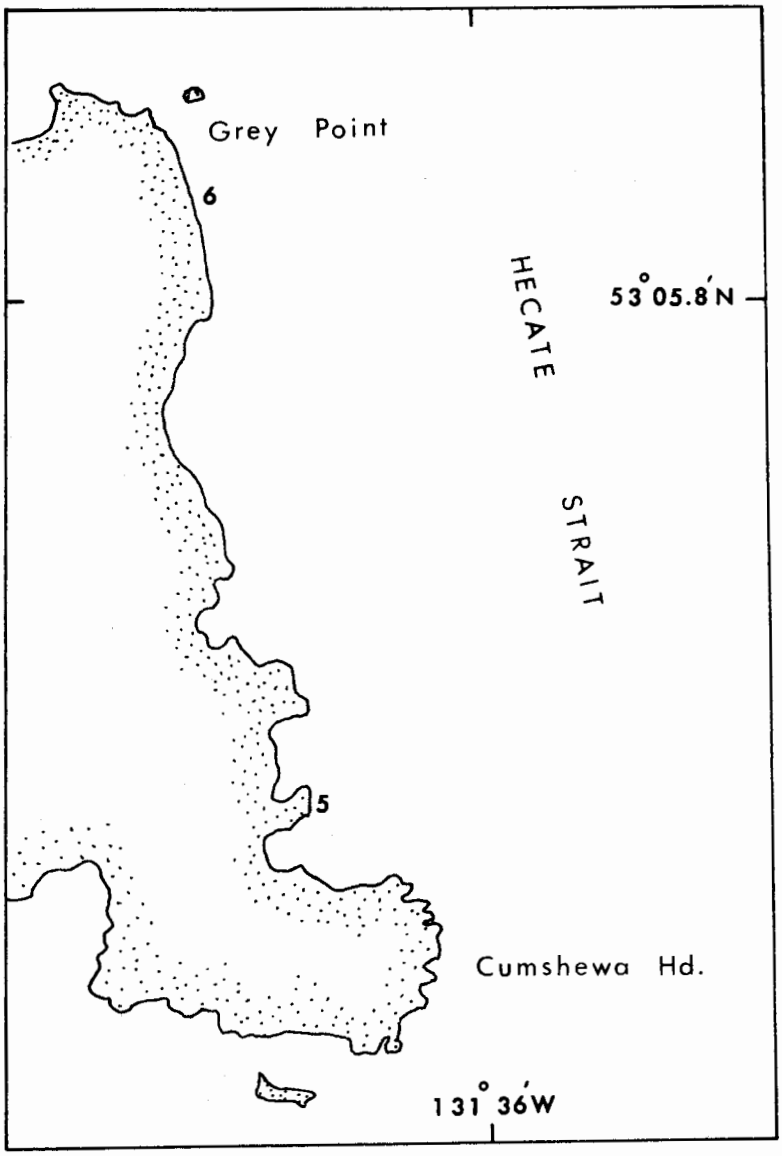

Fig. 2. Sites 5 and 6.

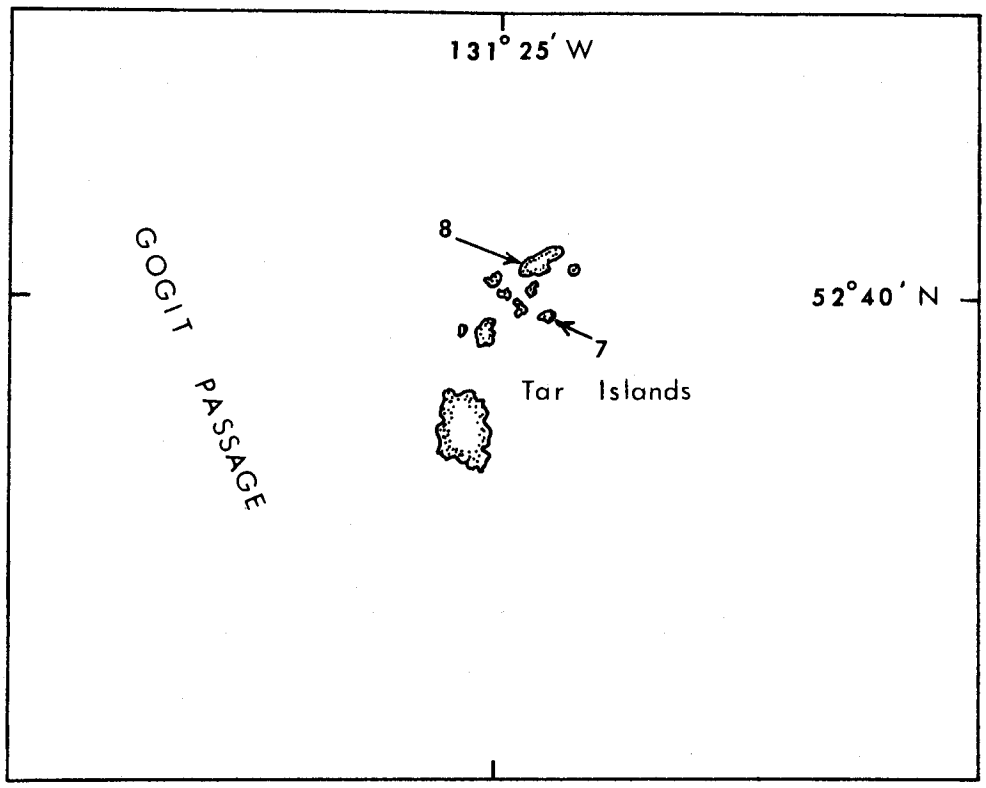

Fig. 3. Sites 7 and 8.

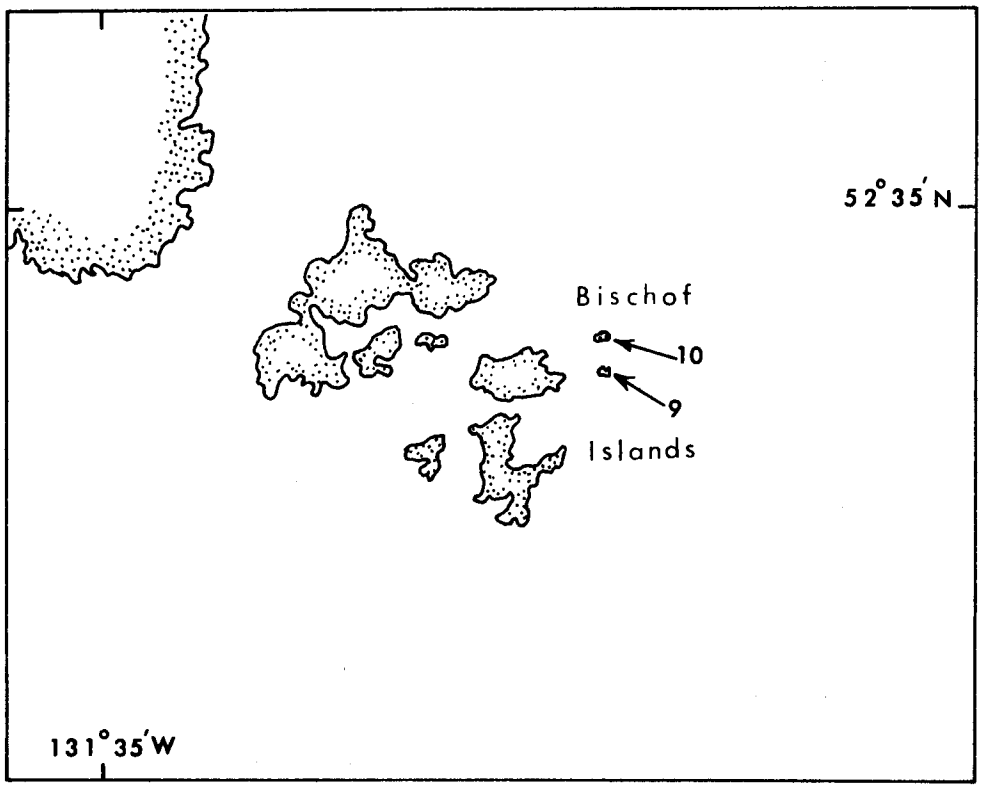

Fig. 4. Sites 9 and 10.

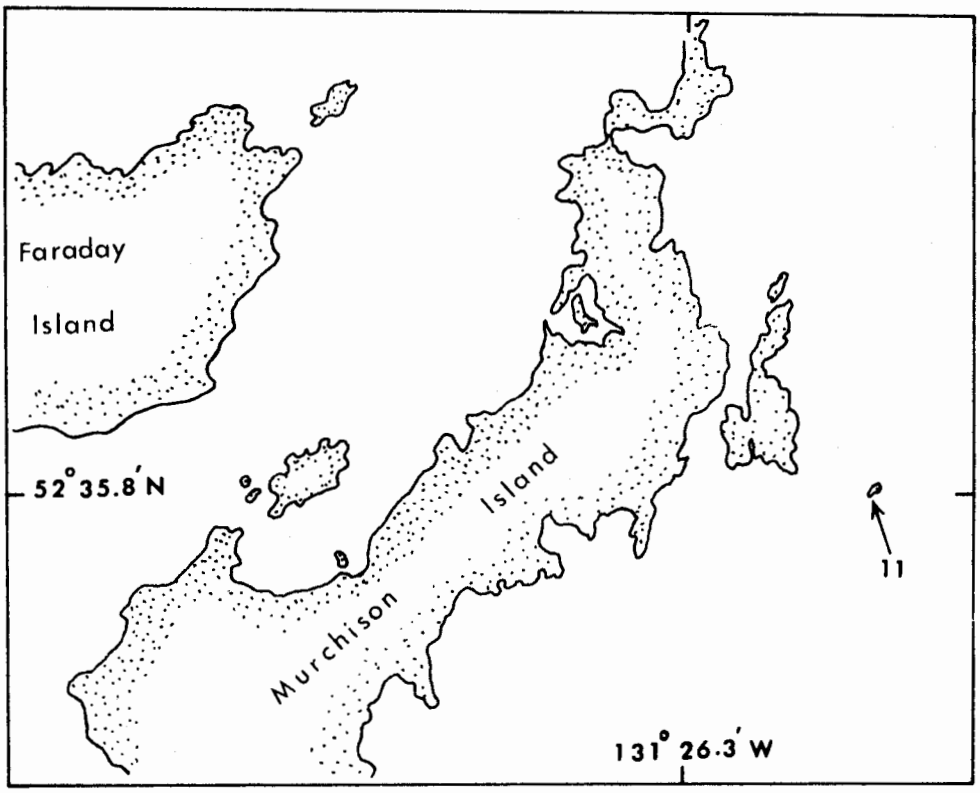

Fig. 5. Site 11.

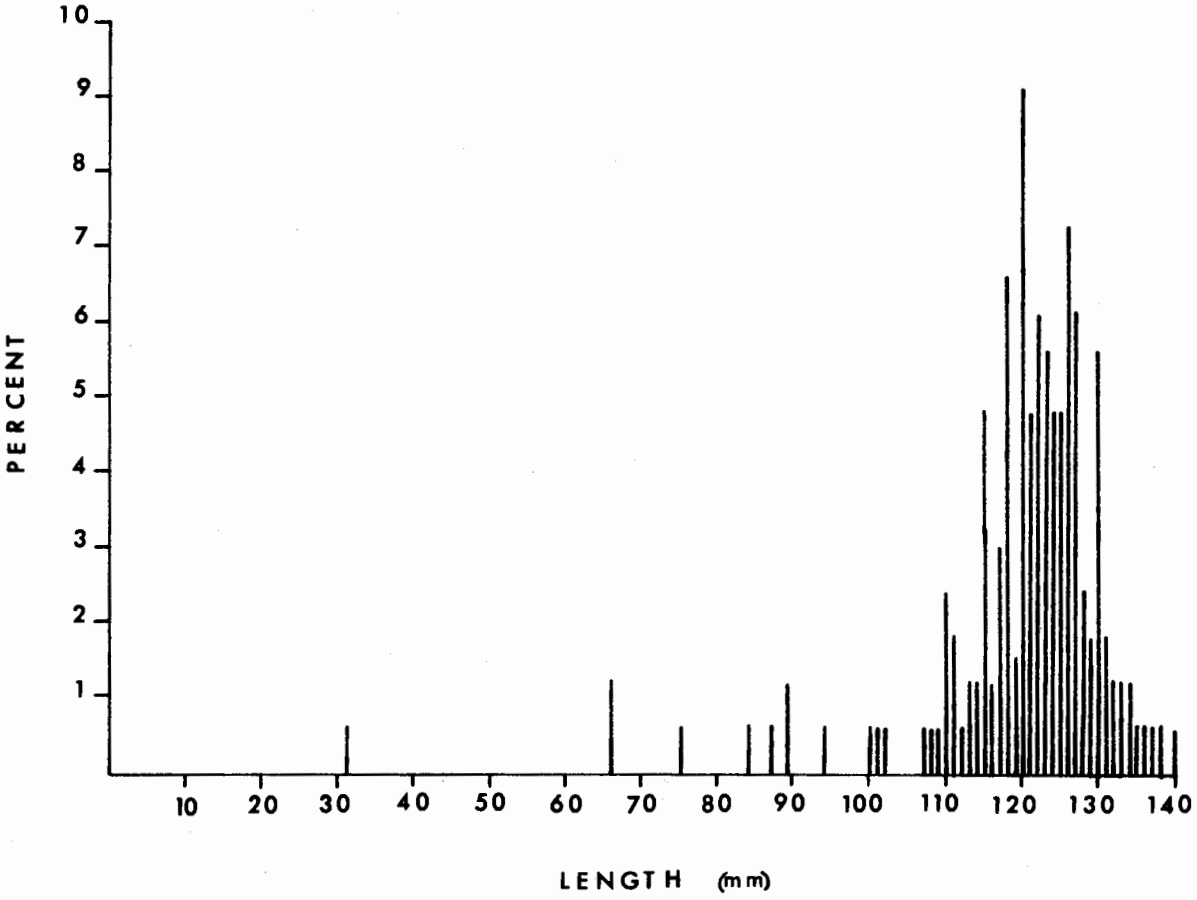

Fig. 6. Length frequencies of abalone from three sites of most intense fishing on Fairbairn Shoals.
N = 165

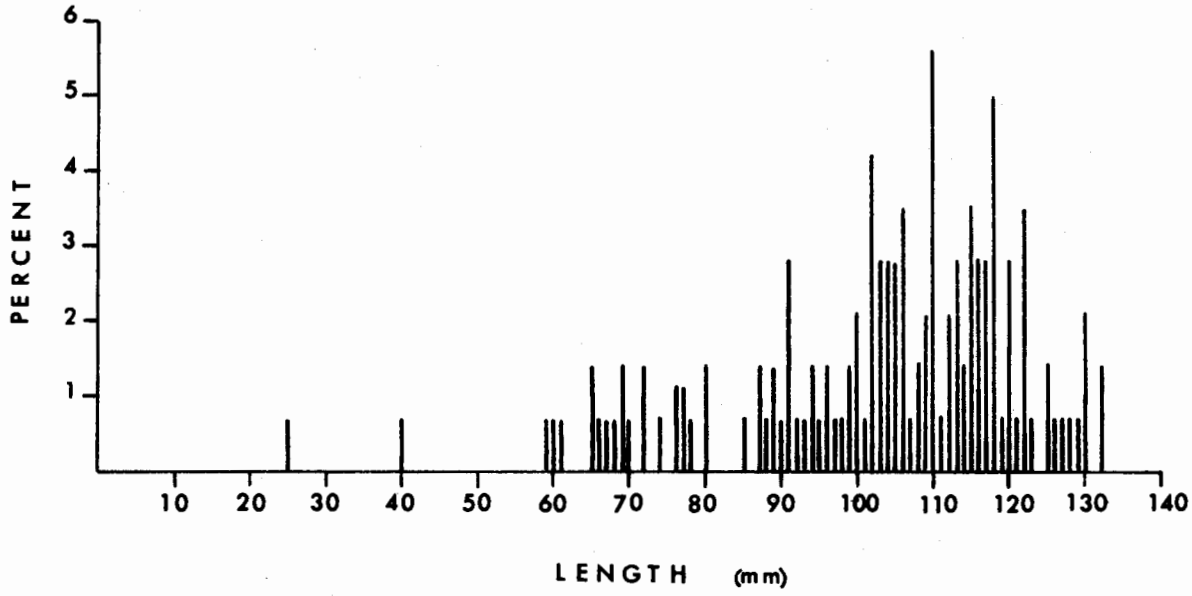

Fig. 7. Length frequencies of abalone from a site on Haans Islet.
N = 139

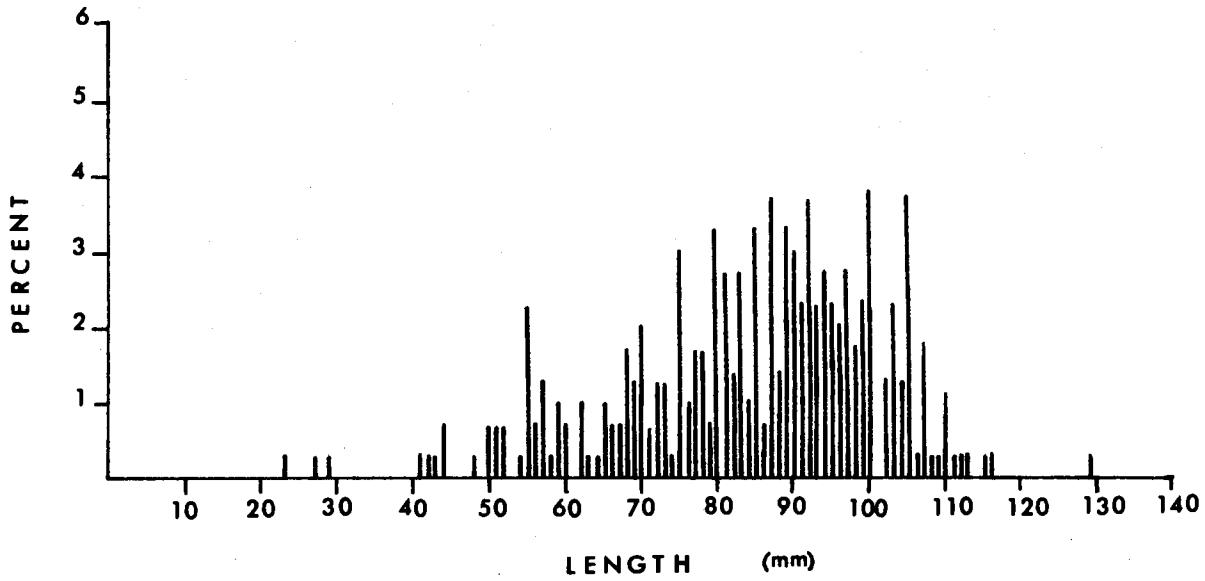

Fig. 8. Length frequencies of abalone from two sites on the Tar Islands. N = 299

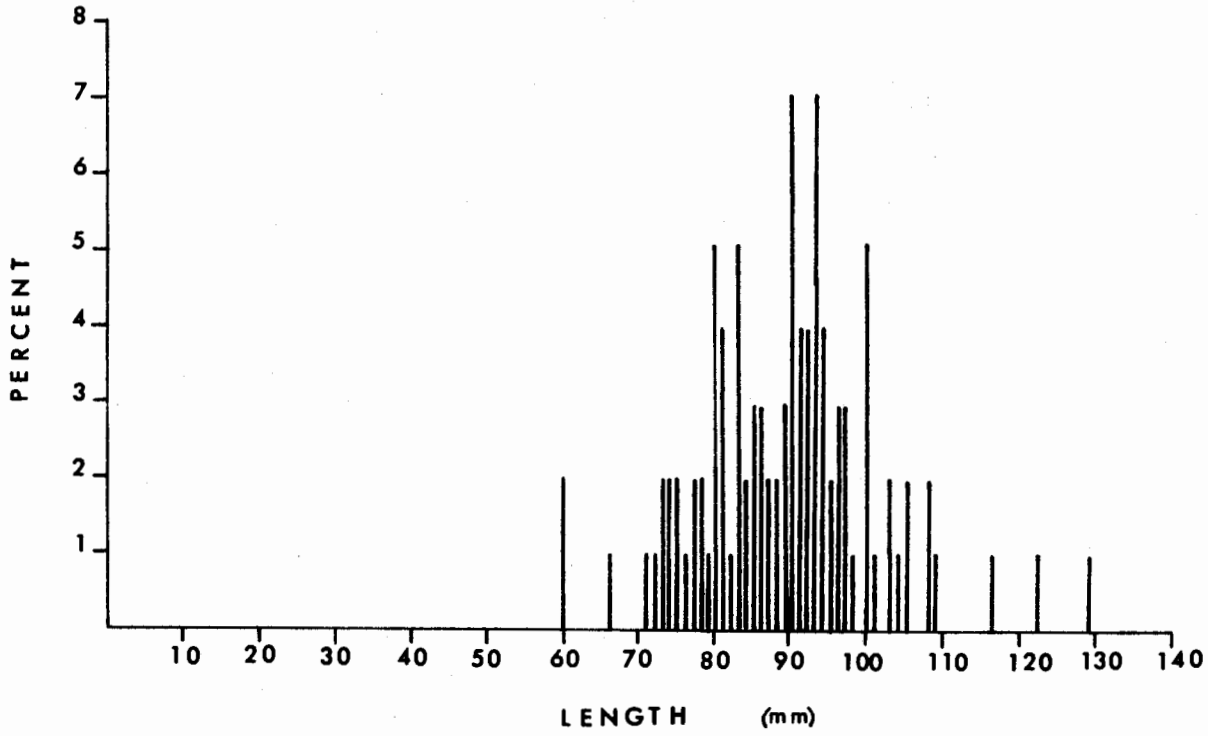

Fig. 9. Length frequencies of abalone from two sites on the Bischof Islands. N = 99

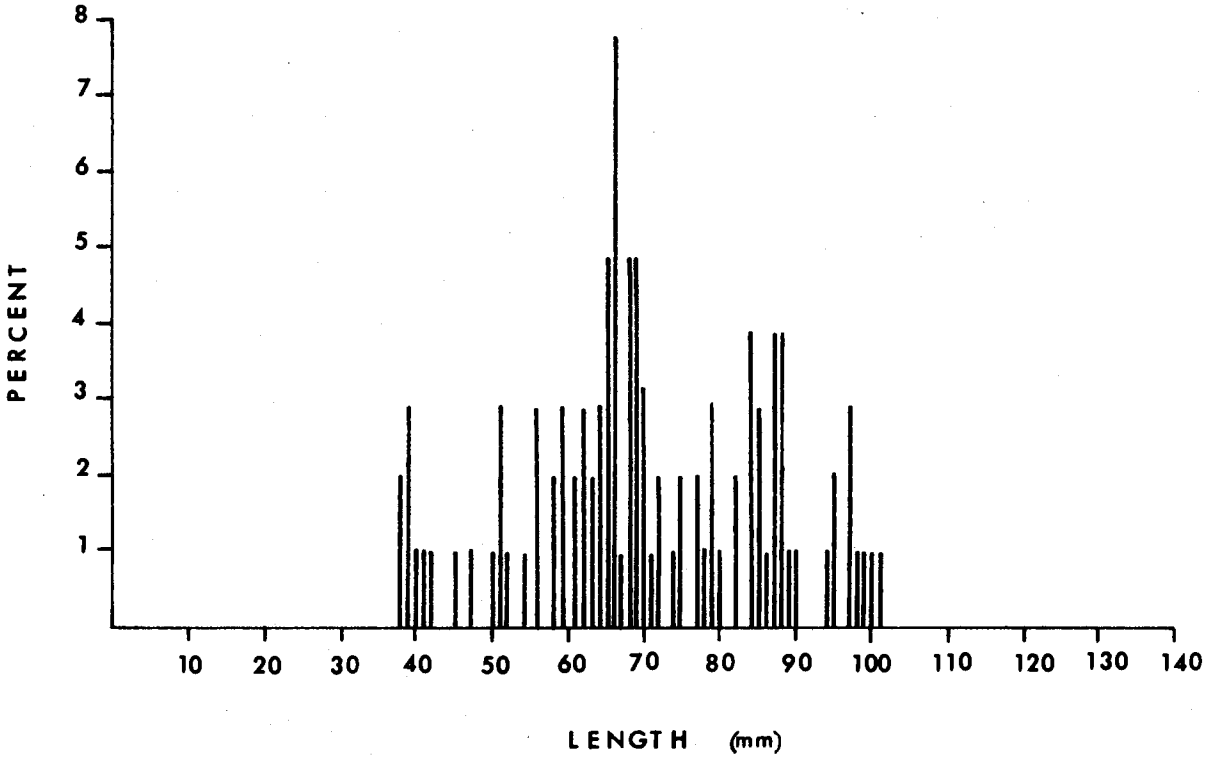

Fig. 10. Length frequencies of abalone from a small islet on the northwest side of Murchison Island.
N = 102