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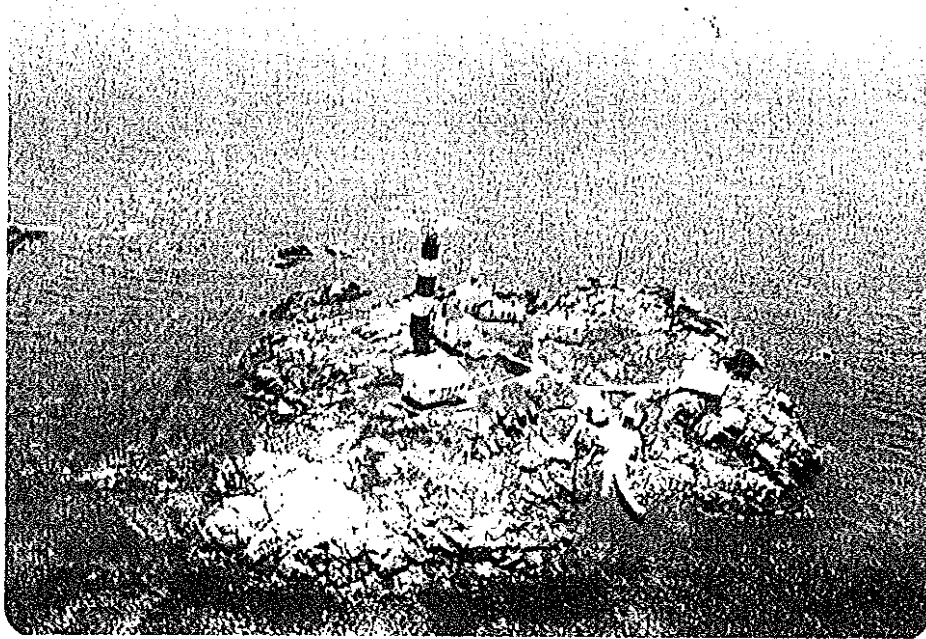


Plate 1. Great Race Rocks - as it was in 1970.

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Workshop on the Race Rocks Ecological Reserve Proposal

Saturday, April 21, 1979, 10:30 a.m.

at Lester B. Pearson College of the Pacific

Chairman: Garry Fletcher, Marine Science Department

The objective of the workshop is to present and discuss a proposal from the students in the diving service and marine science classes that recommends the establishment of the Race Rocks area as an Ecological Reserve.

Program

- 10:30 - 12:00 - Presentation of the proposal by the students of the diving service,
- 12:00 - 1:00 - Lunch, cafeteria
- 1:00 - 2:00 - Slide presentation
Brent Cooke, Provincial Museum, Victoria
- 2:00 - 3:30 - A discussion on the unique organisms of Race Rocks and the Ecological Reserve Concept, with the following resource people:
- Wayne Campbell, Vertebrate Zoology,
Provincial Museum
- Dr. D. Ellis, Biology Department
University of Victoria
- Dr. Hans Romer, Ecological Reserves Branch
British Columbia Lands Service
Ministry of the Environment
- 3:30 - 4:00 - Coffee, cafeteria
- 4:00 - 6:00 - Conclusions and Optional Tour of Race Rocks

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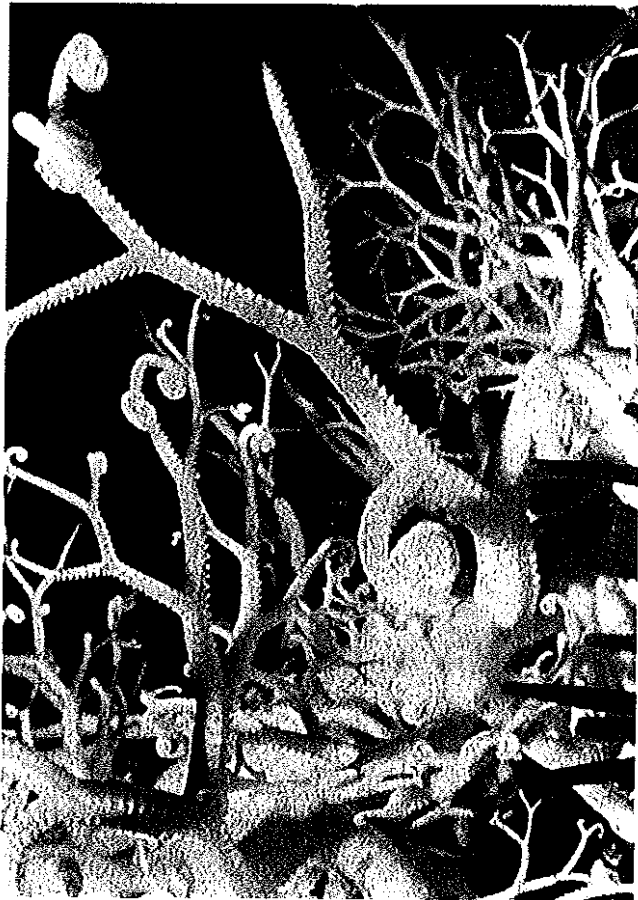


Plate 2. Gorgonocephalus eucnemis. The basket star thrives on plankton in the high current area of Race Rocks.

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PART A. INTRODUCTION TO THE PROPOSAL FOR AN ECOLOGICAL RESERVE AT RACE ROCKS.

The students and teachers of the marine science and diving classes of Lester B. Pearson College of the Pacific recommend that the Government of British Columbia establish, under the Ecological Reserves Act of 1971, an Ecological Reserve in the area of Race Rocks near Victoria, British Columbia.

To be included in the reserve would be the islands and the surrounding subtidal area to a depth of 25 fathoms. It is appreciated that an exemption may be allowed for the land above the high tide level on the main island, Great Race Rock, as this is presently used as a light station by the Canadian Coast Guard.

This proposal outlines the use that has been made of the area by the college for educational purposes, and the plans for the future educational projects that can be carried out in the area.

The proposal is consistent with several of the purposes as stated in the Ecological Reserves Act.

"....to reserve Crown land for ecological purposes, including:

- (a) areas suitable for scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment;
- (b) areas that are representative examples of natural ecosystems within the province.
- (c) areas that contain unique and rare examples of botanical, zoological or geological phenomena."¹

Part C of this report outlines the use made of Race Rocks by Pearson College marine science and diving students in the past few years. In addition, Part F outlines some of the potential of the area for future ecological studies that are observational in character.

The uniqueness of this area has been documented by Dr. Paul Breen of the Pacific Biological Station in Nanaimo (see appendix 1) and by James M. Goddard in a report to the National Parks Branch in 1975:

"The unique feature at Race Rocks is the subtidal flora and fauna inhabiting the high current velocity channels."²

The interest shown by diving photographers recently is also well known.³ Recently, the National Geographic Society has been in the process of preparing a feature article on underwater life at Race Rocks; this also attests to the uniqueness of the area.

As far as being a representative example of natural ecosystems within the province, the area also has merit. It is moreover one of the high current ecosystem areas that has proximity to a population centre and therefore receives more pressure from the public.

It is to be hoped that the acceptance of this proposal will enable the preservation of this area for educational and research purposes, as well as for controlled recreational use by the public.

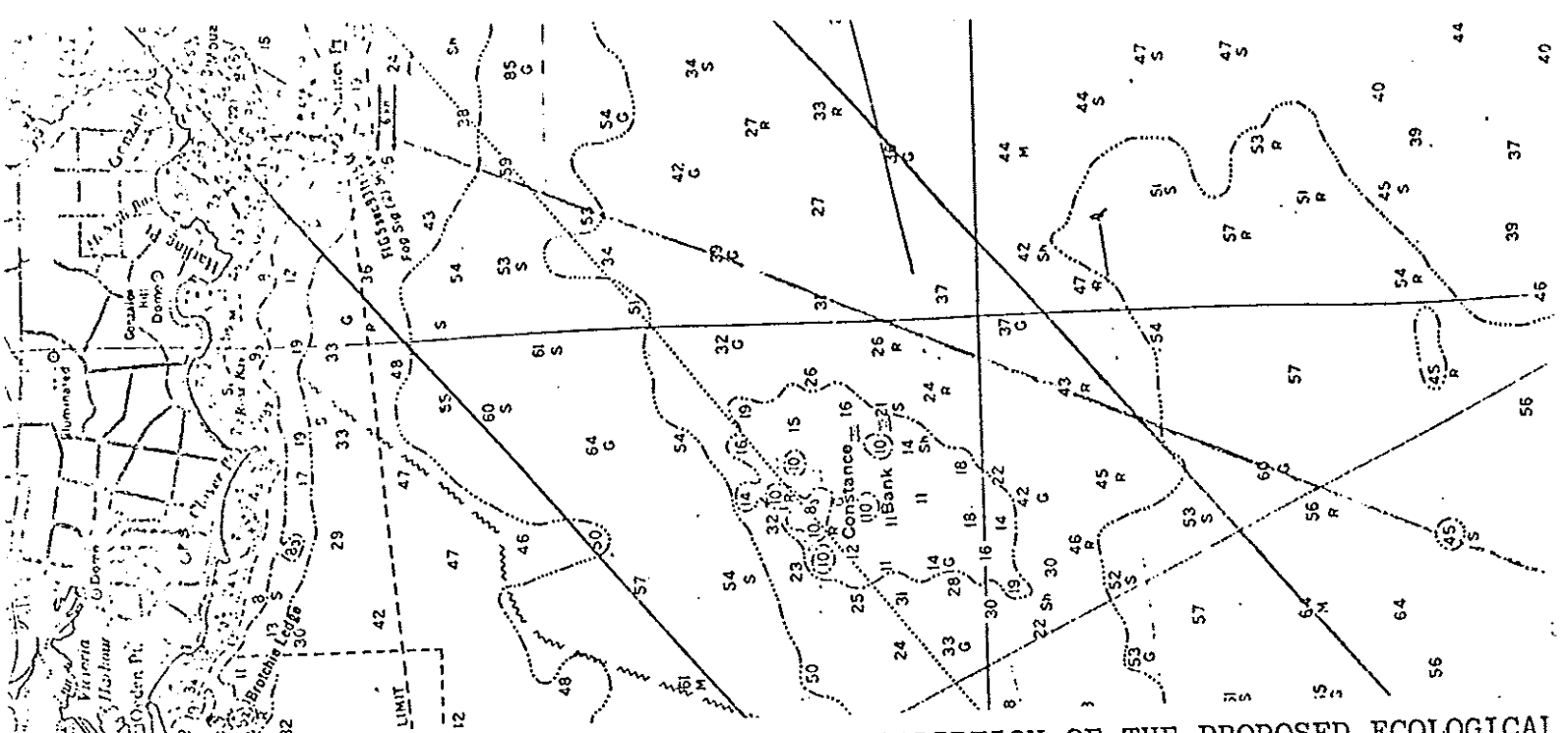
In recent communication with the Coast Guard, evidence has been obtained that could suggest that they would be willing to accept the Ecological Reserve being extended to include the main island, Great Race Rock.

We would highly encourage this, as it would be a more appropriate recognition of the close ecological links of the bird colonies on that island and the rich life in the surrounding area.

We have been advised by Mr. Tom Kew, the Regional Manager for Aids and Waterways in the Vancouver office of the Canadian Coast Guard, that the provincial government could send a letter requesting that the main island should be included in the Ecological Reserve.

He has indicated that he would see no problem with this as long as it did not interfere with the operation of the light station and foghorn. He suggested that the letter be sent to:

Mr. Larry Slaght
District Manager
Department of Transport
1405 Douglas Street
Victoria, B.C.
V8W 2G3



PART B. DELIMITATION AND DESCRIPTION OF THE PROPOSED ECOLOGICAL RESERVE.

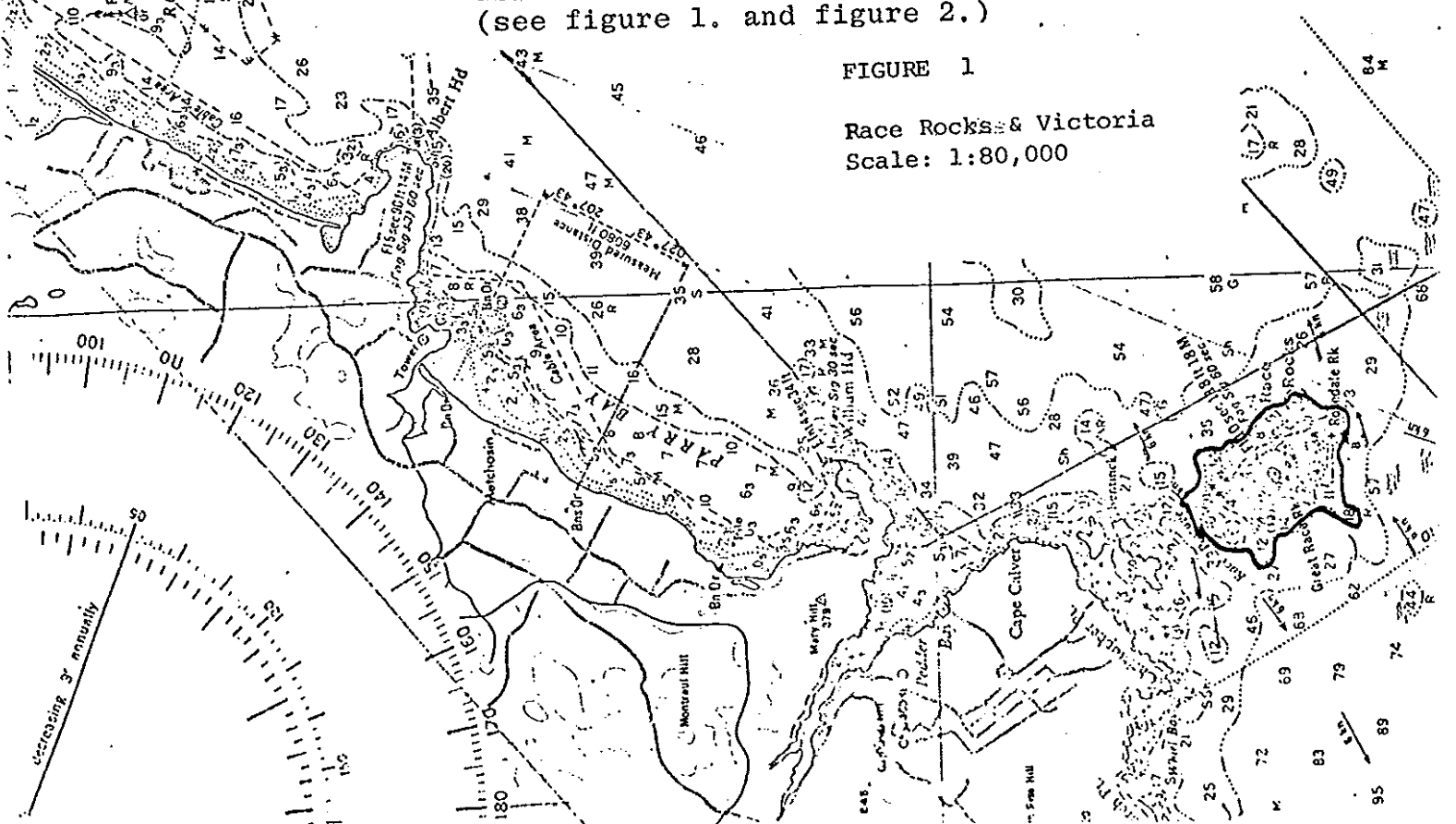
Location: Race Rocks, $48^{\circ} 17.95'$ N. Lat.
 $123^{\circ} 31.85'$ W. Longi;

- All islands, and the surrounding subtidal area to a depth of 25 fathoms.

The area is 1 - 2 km. south of Rocky Point and Bentinck Island on the southernmost tip of Vancouver Island. (see figure 1. and figure 2.)

FIGURE 1

Race Rocks & Victoria
 Scale: 1:80,000



PART C. THE USE MADE OF RACE ROCKS BY PEARSON COLLEGE IN THE PAST

Every year since the college opened in Pedder Bay in 1974, the marine science classes have taken advantage of this area that is rich in marine life as a convenient local laboratory for observational studies. Initially these studies were limited to surface observation of the marine mammals and birds that inhabit the islands. The college has always been welcomed by the Andersons, who manage the light station at Race Rocks. Students regularly receive valuable information on climatological and navigational equipment that is operated there.

For several years some students have been invited to stay with the Andersons for the college project week in the spring term. Included in appendix 2 of this report is part of a report prepared by one student from the Netherlands, outlining the history and geology of the area.

In the 1977 term, with an improvement in facilities for diving and our marine science program, we experienced an increase in the use of the area for high-current underwater habitat observation. Two students did a project near West Race Rock involving analysis of the life in an area 20 meters subtidally. At the end of that college term, the first year marine science class spent a full day at Race Rocks in doing a comprehensive practical exam. It involved:

- (a) a comparison and interpretation of the distribution of barnacles in the intertidal zone in the different exposures of the island;
- (b) a population density study underwater on sea-urchins;
- (c) a transect-line construction through a subtidal area and organism identification;
- (c) a study of current velocities in the waters around the different islands.

PART D.

In the 1978/79 term, extensive observations underwater in a larger variety of areas around Race Rocks was started. Some initial work was done in trying to establish permanent underwater reference points using marker buoys and lead-weighted lines. The aim of the work was to start the accumulation of information that would give a basis for making a proposal to government authorities in Canada in order to get protection for the area. See appendix 3 which is the original project outline prepared by a student from Brazil.

It was in the initial stages of the work this year that we first dived in the Rosedale Reef area to the south of the main island at Race Rocks. That area proved to be a very unique area with abundant invertebrate life, to the extent not seen anywhere else in the area.

As we became more familiar with the area, we realized that the way to benefit most from the diving done at Race Rocks would be to concentrate on doing a general descriptive mapping of a number of areas. By recording current conditions, bottom types, plant and animal communities encountered, we would be able to start a useful record of information on the whole area.

The whole area of Race Rocks that was within reach of diving (i.e. down to 30 meters) was then divided into five areas and maps were made from an enlarged version of Field Sheet No. S1259 of Race Rocks done by the Canadian Hydrographic Service, Department of the Environment, 1974.

After each dive, the pair of divers would enter the information they had gathered, and would trace out a path of their dive on the map, with appropriate notations.

From the information accumulated to date, it has been possible to produce the following series of maps, figures 3 to 9, which represent a start at the documentation of the underwater features of the area.

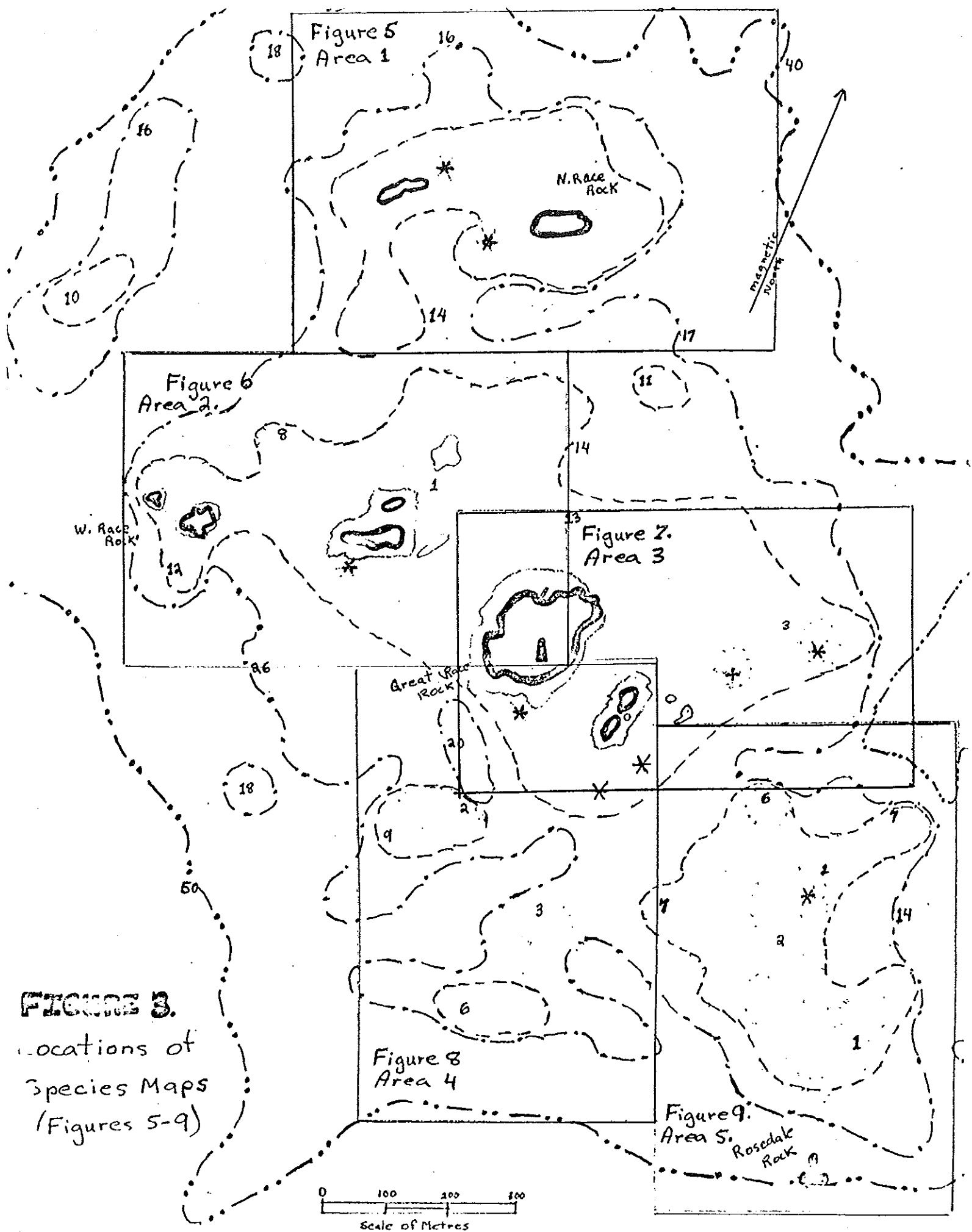

































FIGURE 3.
Locations of
Species Maps
(Figures 5-9)

figure 4.

KEY TO SPECIES MAP (Figures 5-9)

-  CORALLINE ALGAE
-  Pterygophora californica
-  SURF GRASS / Zostera
-  Laminarians
-  Nereocystis leutkana
-  SPONGE
-  Allopore petrograpta
-  yellow hydrocoral
-  Gensemia rubiformis
-  Balanophyllia elegans
(ORANGE CUP CORAL)
-  COLONIAL HYDROID
-  Epizoanthus sp.
-  Epiactus sp.
-  Metridium senile
-  other anemone
-  chitons

-  snail
-  Mytilus californianus
-  octopus
-  Abalone
(Haliotis kamtschatkensis)
-  rock scallop
-  Mitella polymerus
-  Balanus nubilus
-  shrimp
-  crab
-  basket star
(Gorgonocephalus euchenis)
-  STARFISH
-  Strongylocentrotus franciscanus
-  other sea urchins
-  sea cucumbers
-  COLONIAL ASCIDIAN
-  FISH

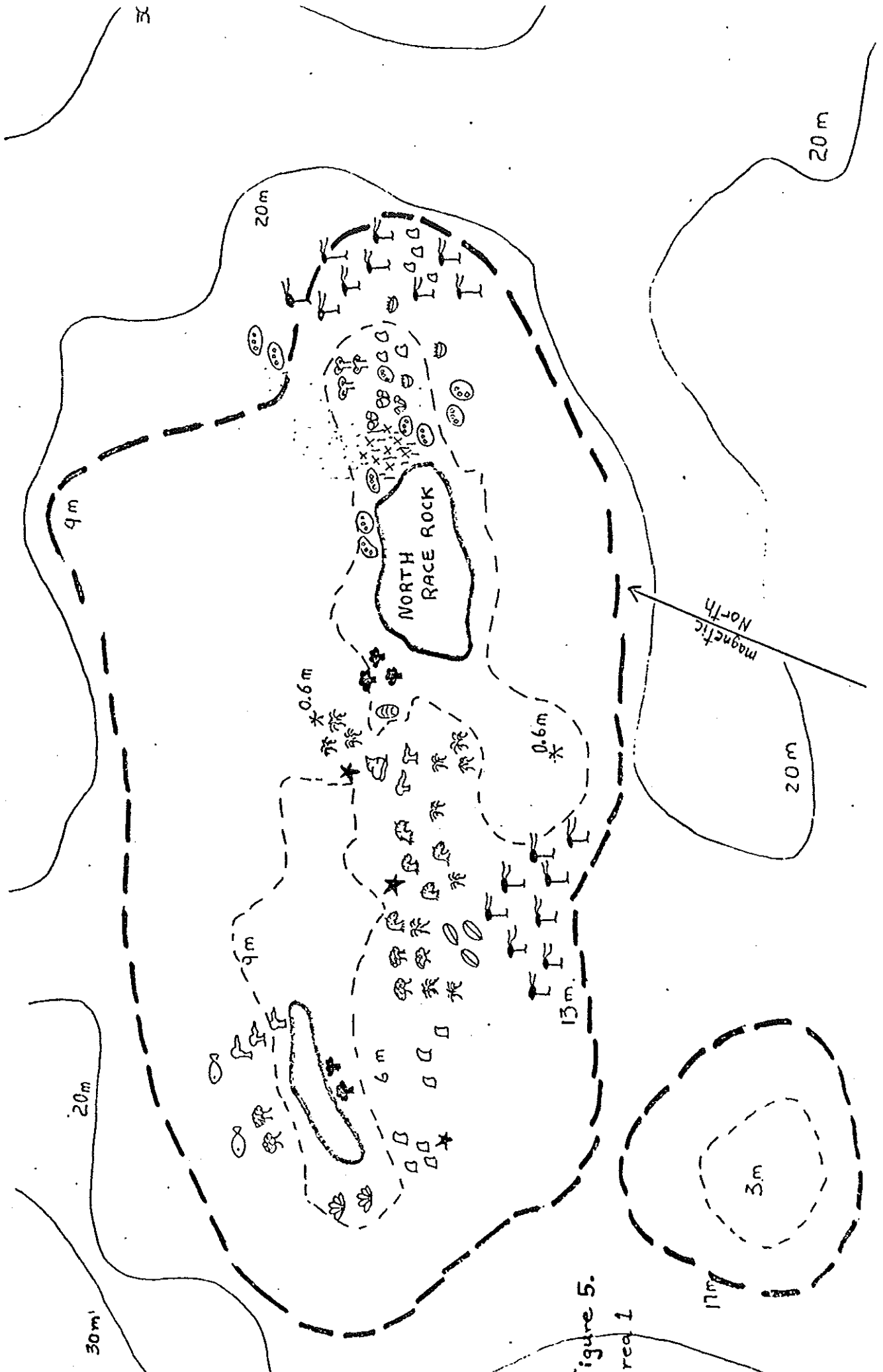


Figure 5.
Area 1

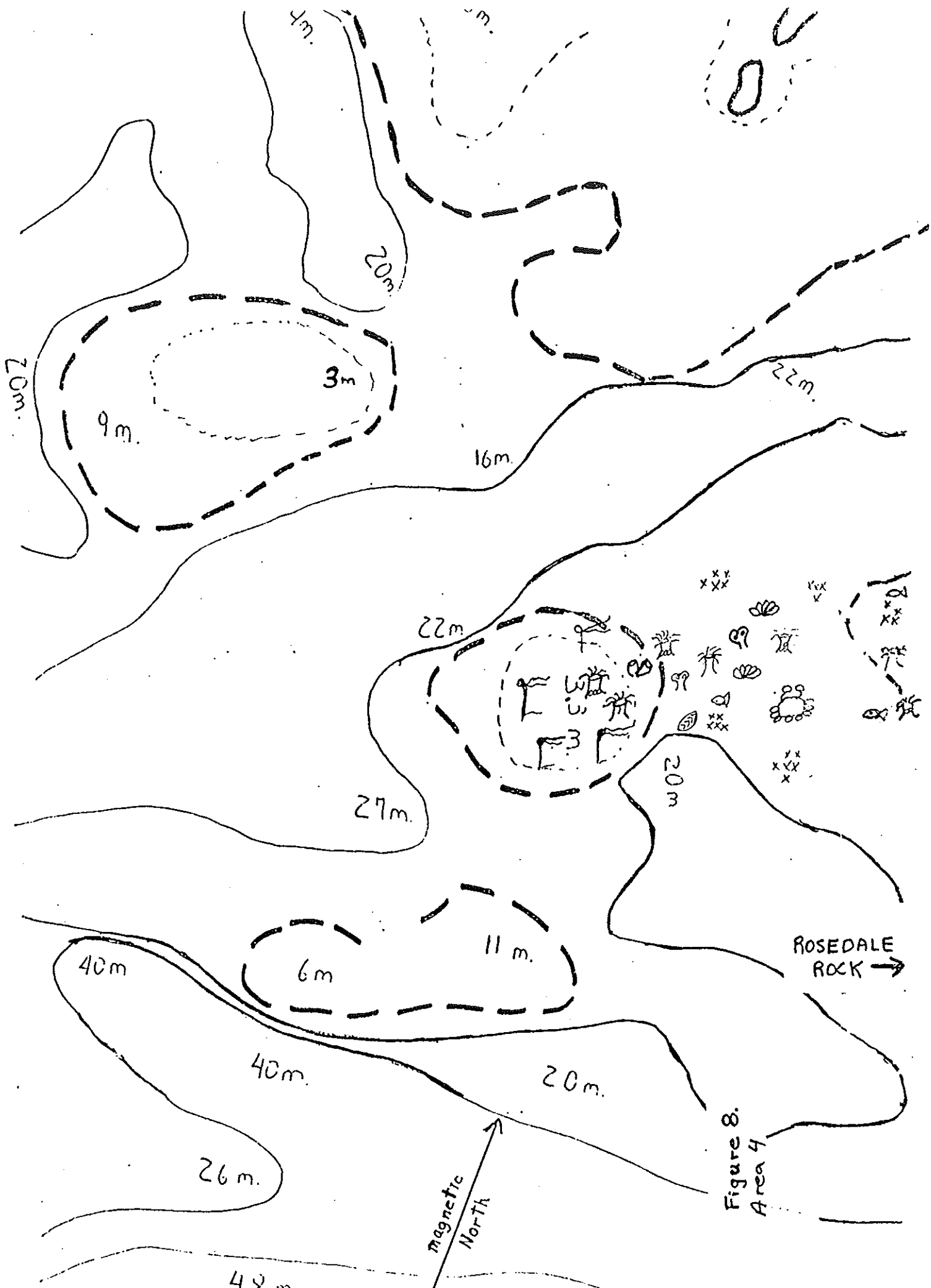


Figure 8.
Area 4

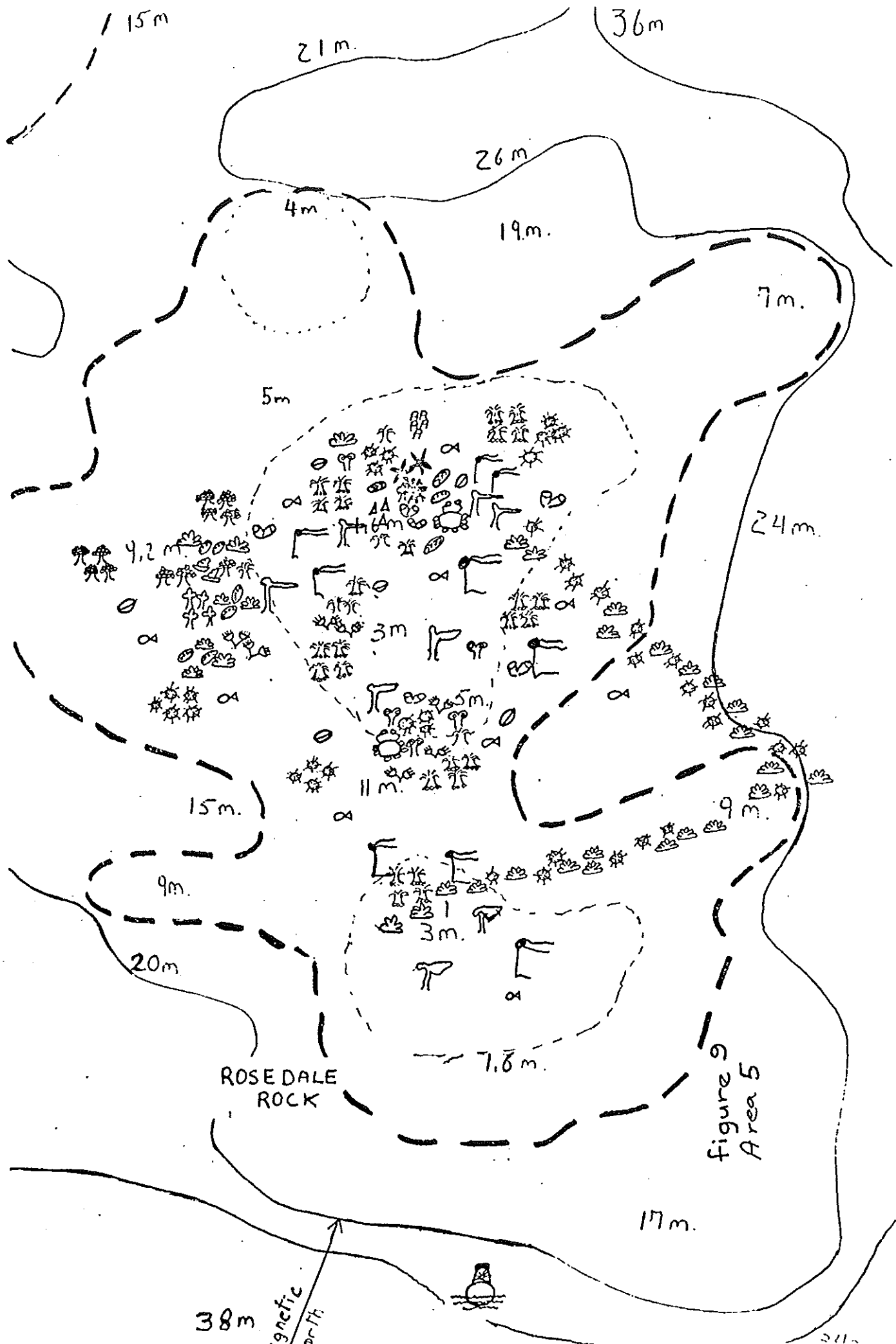


figure 9
Area 5

ROSE DALE
ROCK

38m
igneous
path

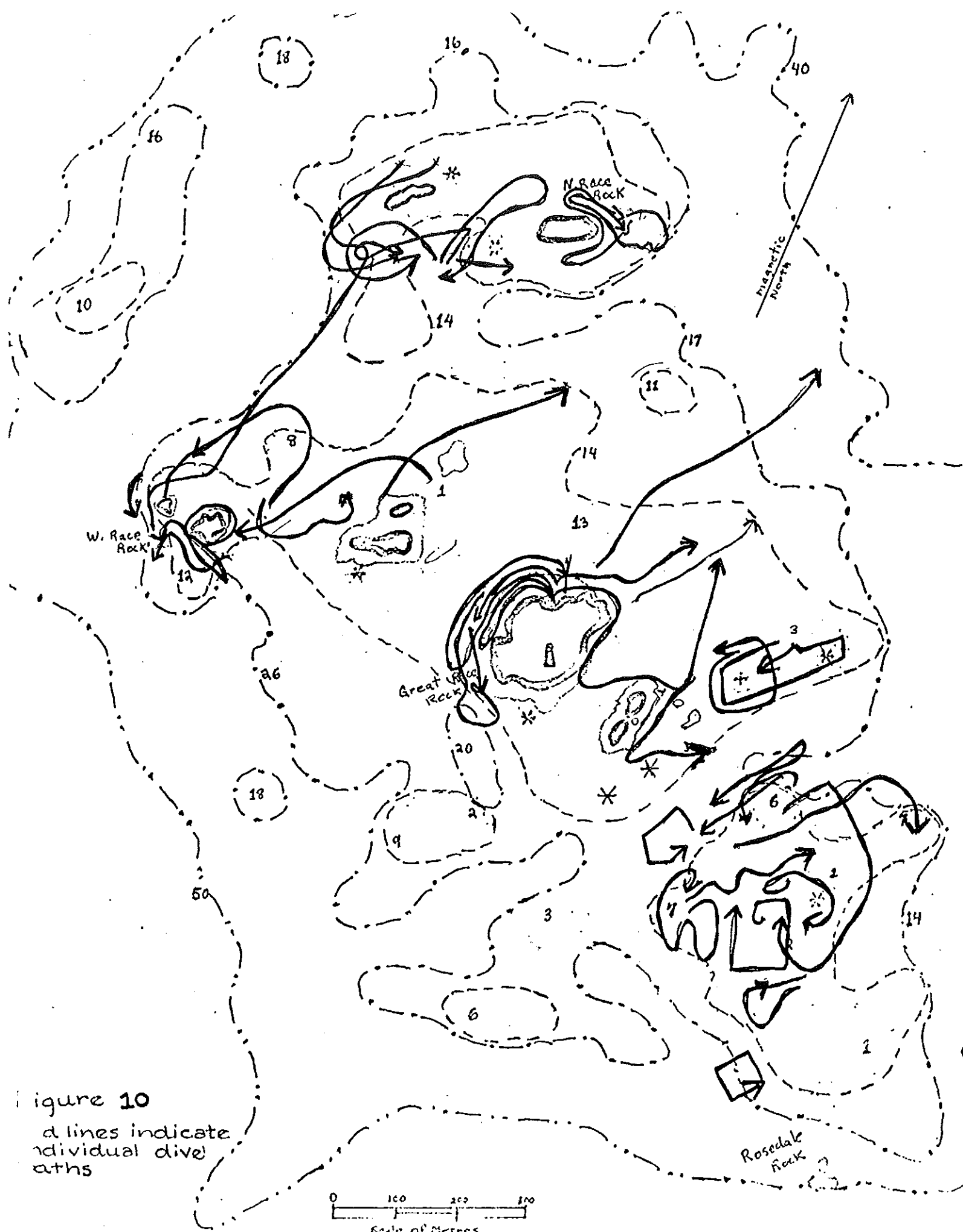


Figure 10
 dashed lines indicate
 individual dive
 paths

0 100 200 300
 Scale of Meters

PROJECT ON ESTABLISHING A SPECIES CHECKLIST IN THE RACE ROCKS
AREA - Johan Ashuvud

For some time we have refrained from taking specimens in the area in order to preserve it intact. Recently, in order to identify some of the more obscure species, small samples have been collected.

At the moment our main efforts are being directed into building a 35 mm. slide collection of the species of the area. With the help recently of Dr. Paul Breen (see appendix 1) we have been able to clarify some of the scientific names of some species.

The present check-list of species (Figure 11) reflects a limited overview of the species that are very obvious. In the future, we hope to improve our identification of organisms by using already existing reference collections at other research institutions in Victoria.

The high species-diversity encountered at Race Rocks within a limited geographic area makes it possible to do intensive studies on particular groups of organisms.

From the results of our overall mapping survey in the area, it is clear that there are several apparent communities.

For example, there are still specific areas that have potential that we have not examined by diving. These can be identified on the maps (figures 5 to 9) as the isolated rises to the depth of 11 meters or less.

One distinct community would be the "Metridium" cliff found off West Race Rock (Figure 6). Another is the central area of Rosedale Rock (Figure 9) with undulating vertical relief, with high species diversity, characterized by an abundance of Epiactus on coralline algae.

The area on the northern fringe of Rosedale Rock is considered to have a large number of sponges, colonial ascidians and long-surviving specimens of mytilus.

The area on the north side of Great Race Rock is similar, but perhaps more established. Characteristic of this area is the soft pink coral which so far has not been found at other locations.

The horizontal rock cobble beds of the high current channels have a distinct absence of many of the species. The east side of North Race Rock has a community that is characteristic of high current impact on ebb tide; with large Balanus nubilus as the dominating species, but with high species diversity restricted to the protected crevasses and undersides of boulders.

It is obvious that further interpretations of the relationship between the physical factors and the communities of organisms need to be done.



Plate 3. Epiactus prolifera of different colours growing in red algae and orange hydroids, Garveia (?).



Plate 4. Clusters of a colonial ascidian, (x2) that occur in at least two areas of the proposed ecological reserve.

Figure 11. contd.

Macrophytes

- Red algae: *Calliarthron tuberculosum*
 Corallina officinalis varchilensis
 Bossiella californica schmittii
 Halosaccion glandiforme (sea sac)
 Porhpyra sp.
 Rhodomela sp.
 Gigartina
 Odonthalia floccosa
 Membranoptera dimorpha
 Fauchea sp.
 Lithothamnium pacificum
- Brown algae: *Alaria*
 Cymathere triplicata
 Desmarestia viridis
 Desmarestia ligulata var. *ligulata*
 Costaria costata
 Laminaria setchellii
 Laminaria sp.
 Pterygophora californica
 Nereocystis luetkanna (bull kelp)
 Cystoseira geminata
 Pleurophycus gardneri
- Non algal seaweed: *Phyllospadix scouleri (surf grass)*

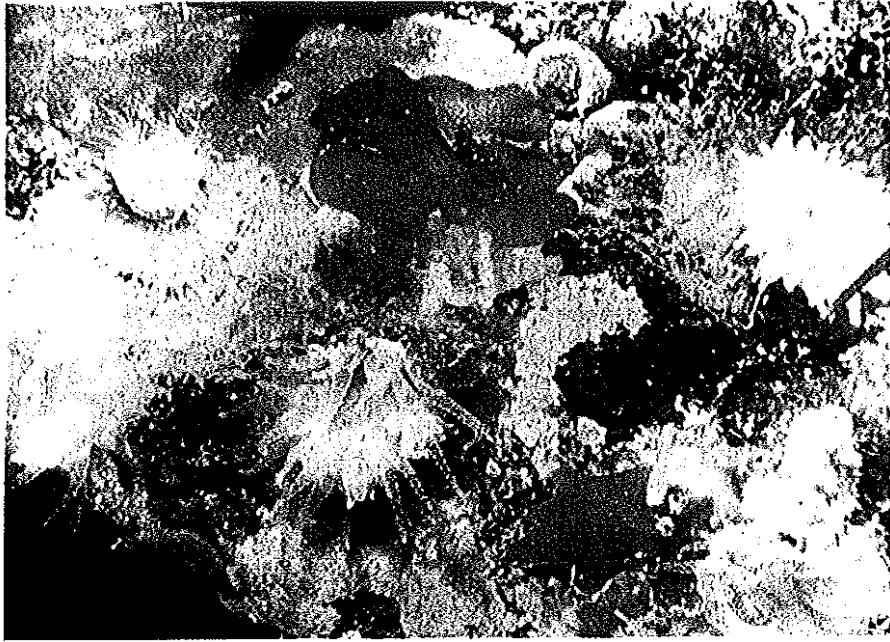


Plate 5. The solitary cup coral Balanophyllia elegans growing with the iridescent algae Fauchea sp.



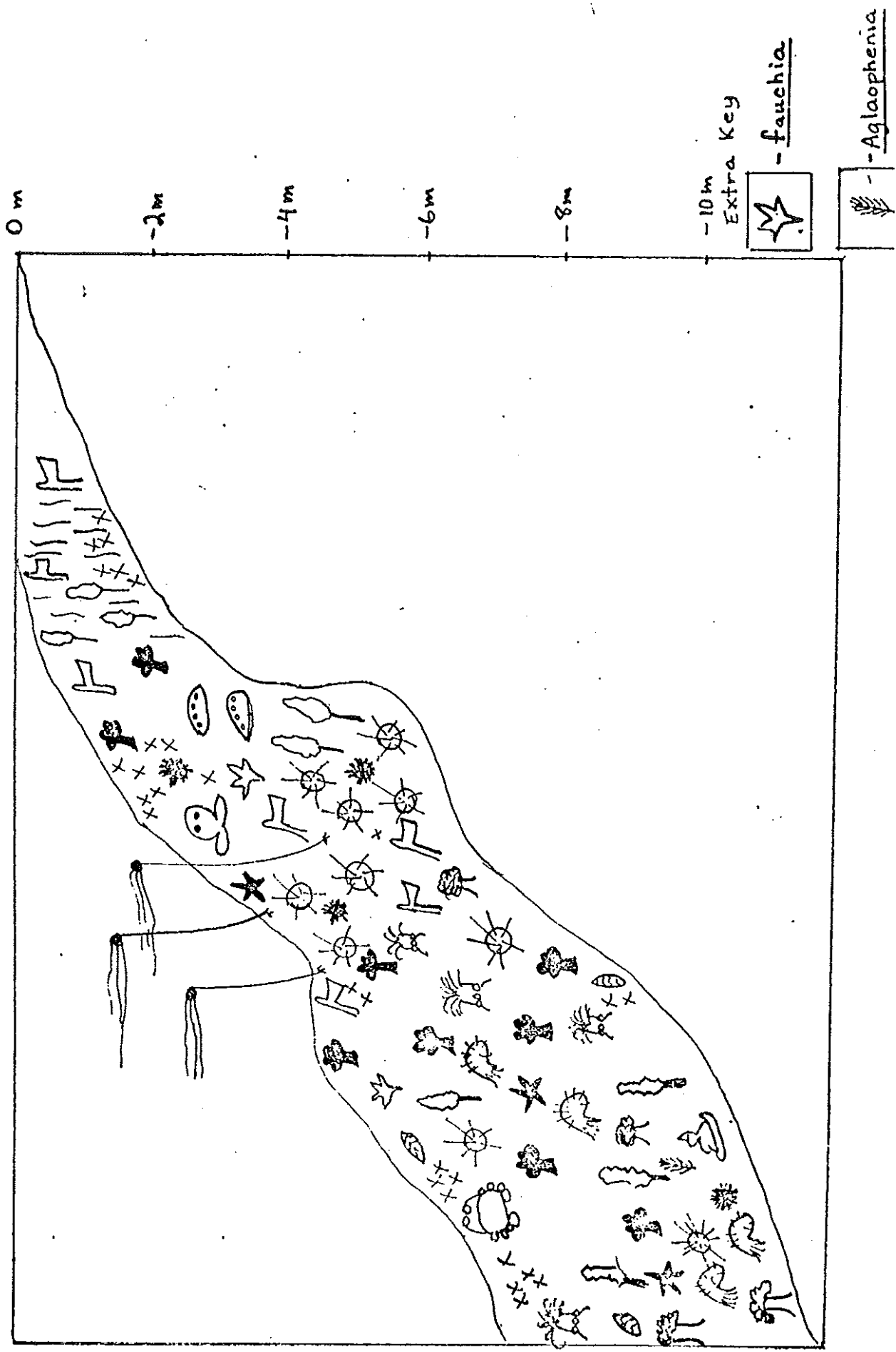
Plate 6. One of the many species of sponge (that we have not yet classified) growing subtidally.

figure #12

Vertical Section of Northeast
corner of Great Race Rock.
(bearing 0° magnetic)

- Aurelie Magon 15/4/79

depth (metres)



BIRDS AND MAMMALS OF THE ISLANDS

The following project was done recently by two marine science students. The Provincial Museum made available to us their record cards of observations taken in several different years. From all the data available, graphs have been constructed to give a visual representation of the life there. It is obvious to us that this data is very limited but hopefully is a start at long term recording of bird and mammal life.

PRELIMINARY ANALYSIS OF PROVINCIAL MUSEUM DATA - IINA HAKALAHTI

Each island at Race Rocks has been given a number for the location of the bird colonies. These island numbers can be found in Figure 13.

From the year 1974 to 1977 there has been a significant increase in the total number of nests at Race Rocks. (Note the big change in scale when comparing figures 15 and 18). The number of the nests has increased from 1974 to 1977 on all the islands, except the islands of #3 and #4. The biggest increases can be found on the islands #2, #3 and #6. The number of the nests on the island #1 has remained almost the same. The total number of the nests of Pelagic cormorants has increased a lot and the total number of the nests of Glaucous-winged gull has had a little decrease.

Referring to the increased number of nests, there has also been a great increase in the number of eggs from the year 1974 to 1977. (Note the change of scale when comparing figures 16 and 19). The total number of eggs has increased on all the islands, except the islands #1 and #4. The biggest increases do occur on the islands #2, #3 and #6. The number of eggs has remained almost the same on the island #3a. There is a great increase in the total number of eggs of Pelagic cormorants and a small decrease in the total number of eggs of Glaucous-winged gull when comparing the year 1974 with 1977.

In the total number of young birds at Race Rocks in the 4th of July in 1974 (figure 17) the number of the young Pelagic cormorants is noticeably bigger than the number of young Glaucous-winged gulls.

In 1974-75 there was 160 breeding Pelagic cormorant pairs. The next biggest group was 141 pairs of Glaucous-winged gulls and the smallest group of Pigeon Guillemots was 80 pairs (figure 14).

The distribution of sea lions during the first four months in 1977 can easily be seen to be very variable (figure 20). There are big fluctuations even between two months. During January and February the species *Eumetopias Jubata* has been dominating.

Further sampling is to be made in order to consider the number of the birds and its changing at Race Rocks. It would be nice to be able to get new information continuously, so that a possible pattern in the number of birds could be found. This would be possible by getting new data continuously and putting it in a clear form in diagrams and maps.

It is obvious that there is a considerable fluctuation in the number of sea lions during different months at Race Rocks. This needs to be considered by a long-term counting and observing the sea lions. Our further interest is to count the number of the sea lions during different months and see if there is a regular pattern for the changing of the number of individuals and the distribution of the two species Eumetopias jubata and Zalophus californianus.

Our future plan is to get new data continuously both in the number of the birds and the number of the sea lions at Race Rocks and to observe the figures in order to find possible patterns. The collected data could also be put then in a map form, to represent the changes more clearly and to make the observing of the figures easier.



Plate 7. Part of the colony of Stellar Sea-lions. Over 200 of these huge mammals haul up on the small islands around Great Race Rock in the period from September to May of each year.

Figure 13
 ISLAND NUMBERS FOR THE LOCATION OF THE BIRD COLONIES

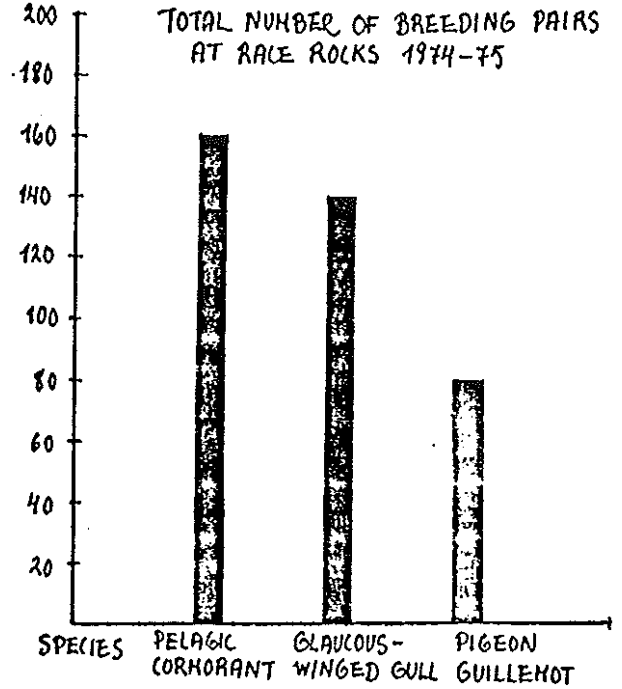
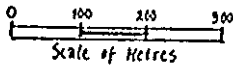
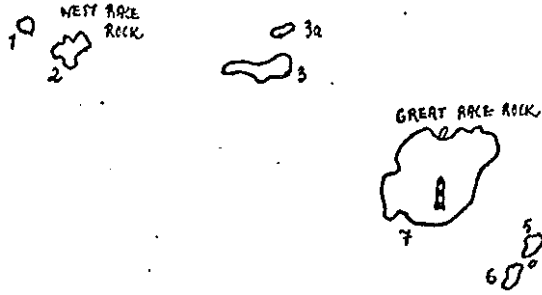


Figure 14

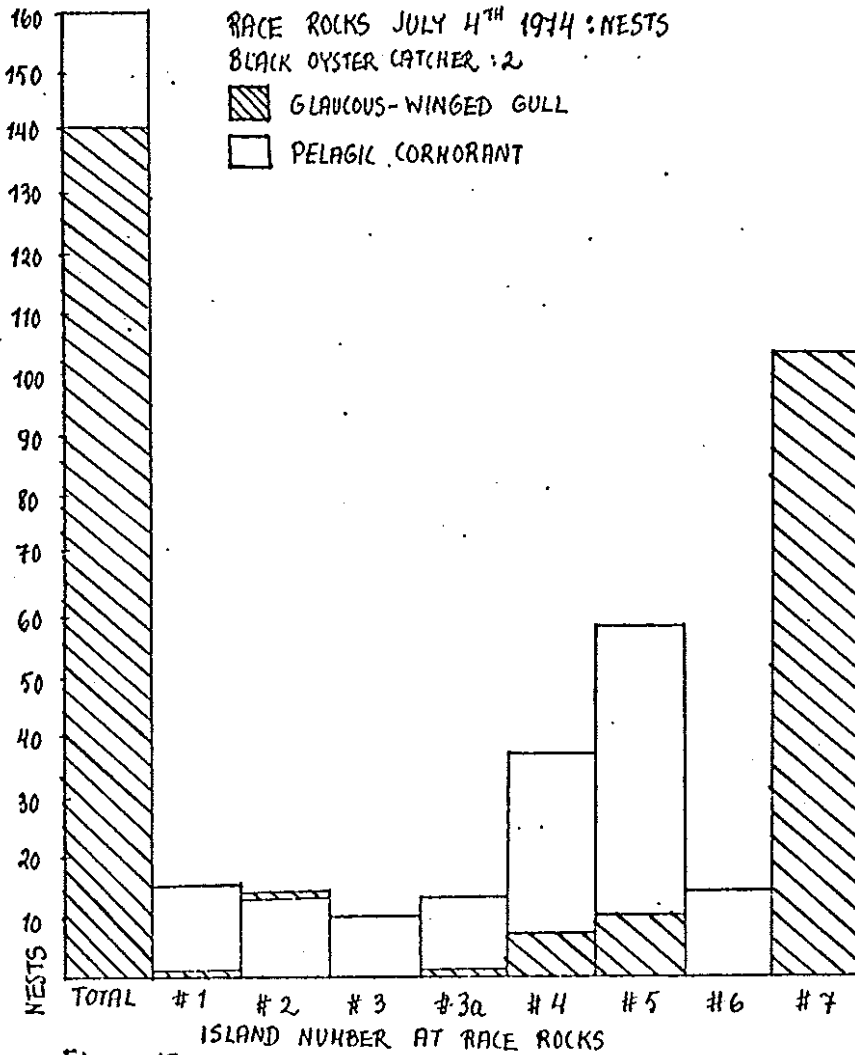


Figure 15

RAVE ROCKS JULY 4TH 1974: EGGS
 BLACK OYSTER CATCHER #4

GLAUCOUS-WINGED GULL
 PELAGIC CORHORANT

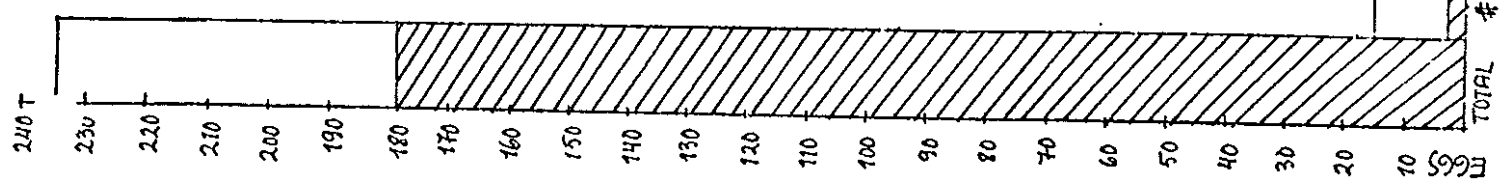


Figure 16
 ISLAND NUMBER AT RACE ROCKS

RAVE ROCKS JULY 4TH 1974: YOUNG
 GLAUCOUS-WINGED GULL
 PELAGIC CORHORANT

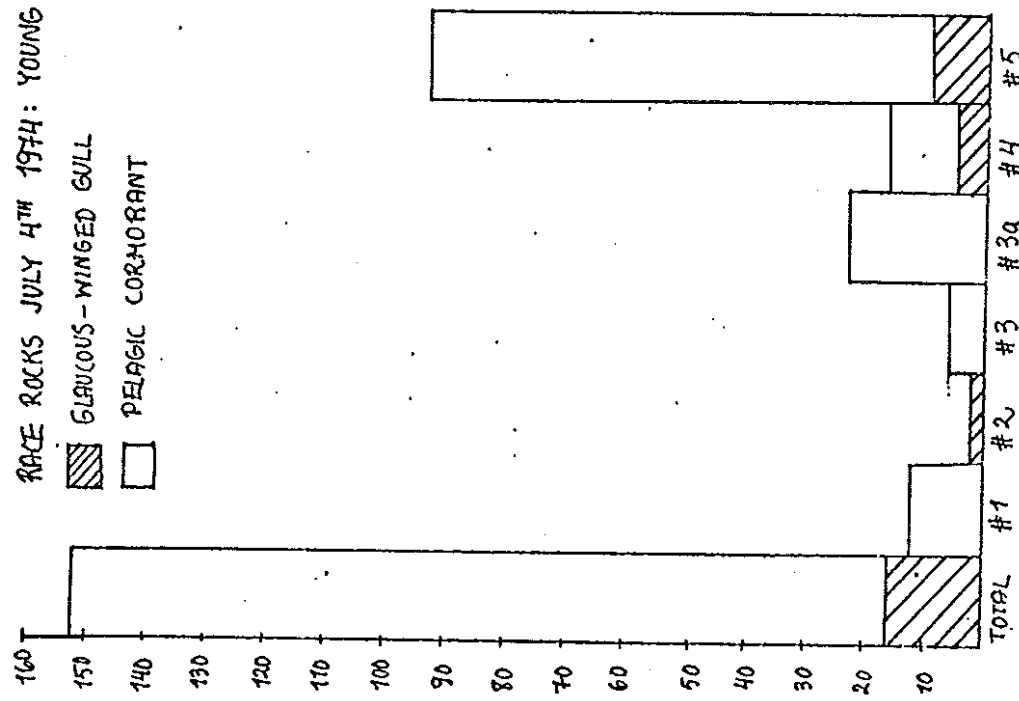


Figure 17
 ISLAND NUMBER AT RACE ROCKS

TRAIL ROCKS JUNE 21ST 1977: NESTS

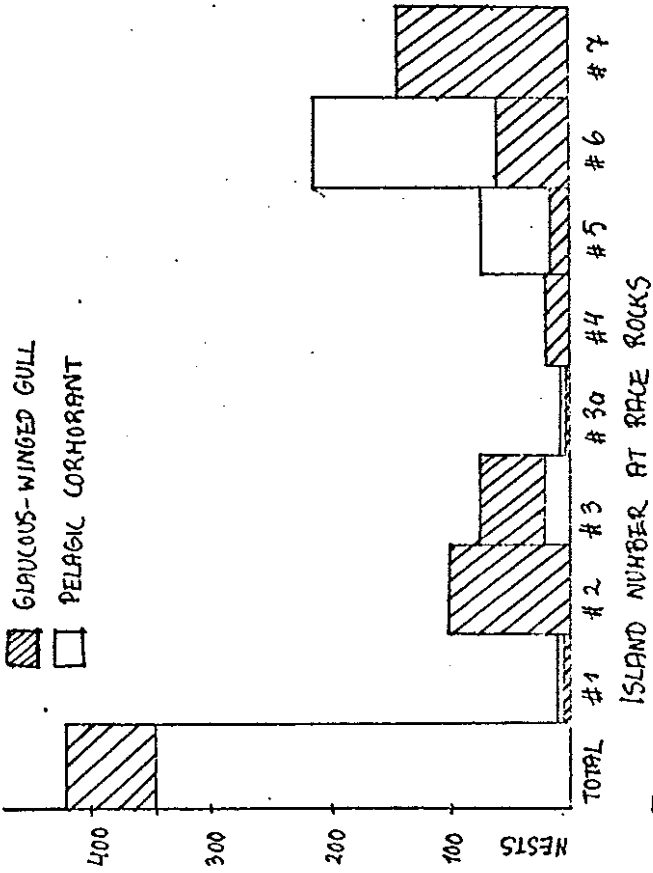


Figure 18

RACE ROCKS JUNE 21ST 1977: EGGS

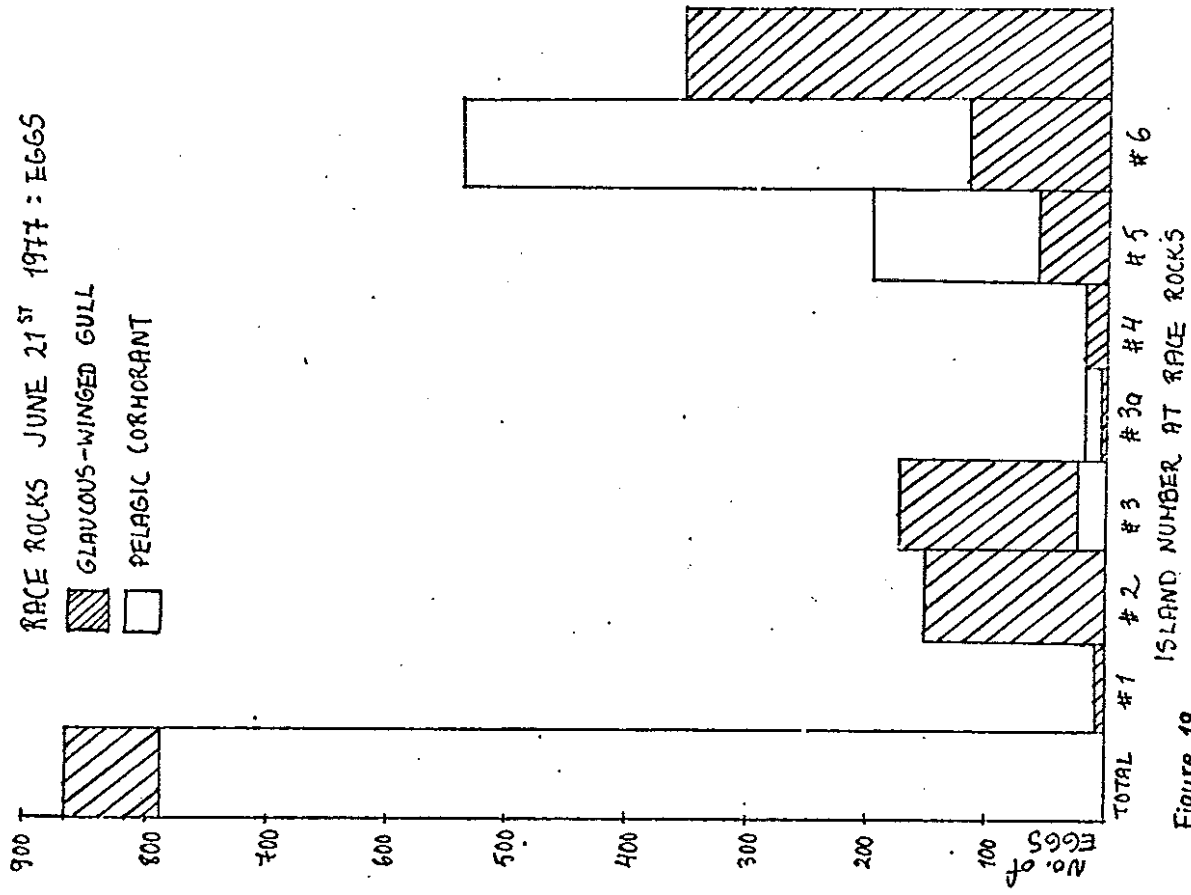


Figure 19

DISTRIBUTION OF SEA LIONS AT RACE ROCKS 1977

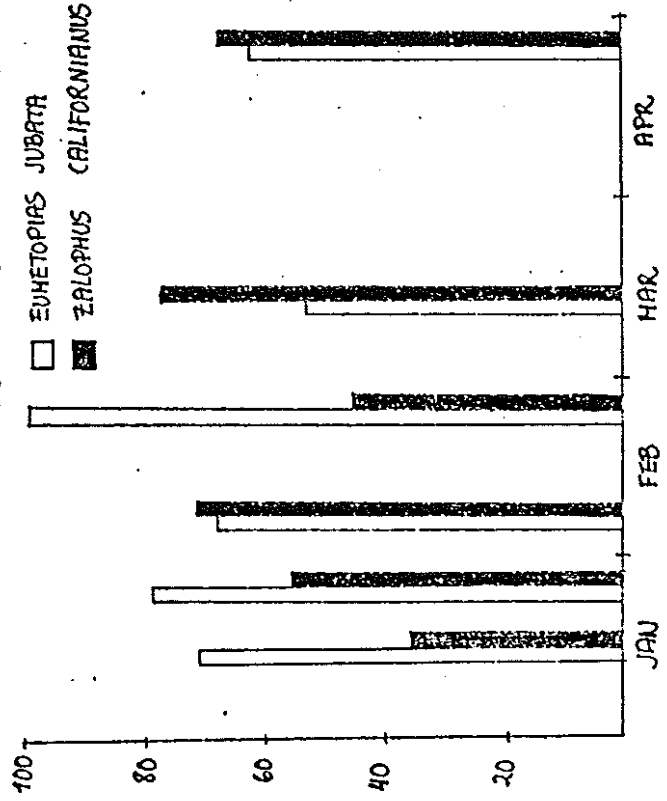


Figure 20

In a telephone conversation with Dr. Michael Bigg of the Pacific Biological Research Station at Nanaimo, the following information on marine mammals was given:

Killer Whales

There are a total of 80 killer whales that go past the rocks. 60 are regular visitors, going very close to the rocks, feeding to some extent on the harbour seals. An additional 20 occur on an irregular basis. The 60 comprise two to three family groups. The remaining 20 comprise three family groups.

Gray Whale

The gray whale has been spotted occasionally.

Harbour Seals

Based on a photographic census taken on August 14th, 1974, 304 were reported. Dr. Bigg expects that this was a high figure for the year. Harbour seals are found on the islands throughout the year.

Stellers Sea Lions

These mammals are present from September through to April. The highest number recorded was on December 13th, 1976, at 115.

California Sea Lions

From records submitted by Trevor Anderson on November 27th, 1977, there were 232 by a visual count.

Elephant Seals

An occasional occurrence of elephant seals has been noted.

Alaskan Fur Seal

One fur seal has been there for the last three years.

Sea Otter

The Andersons reported one individual in 1969.

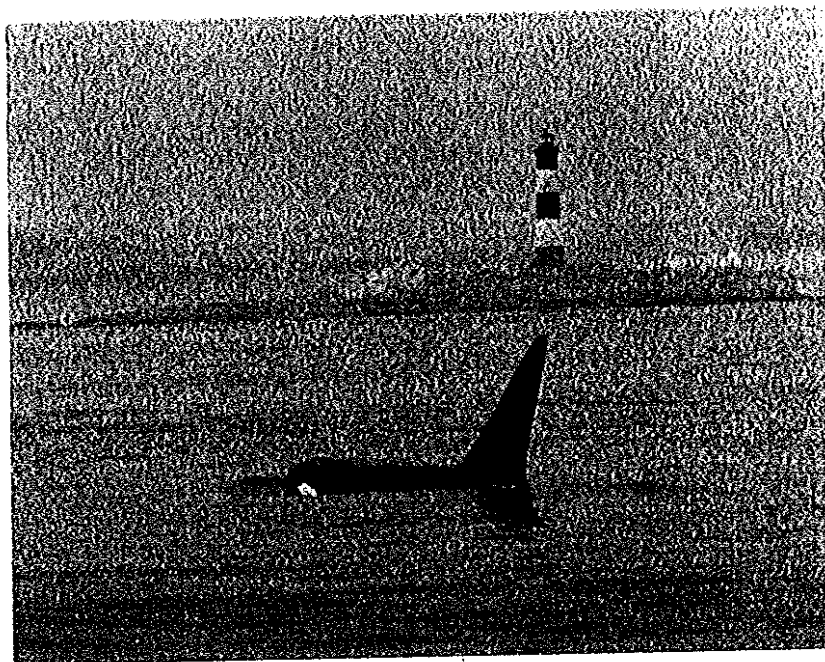


Plate 8. One scheduled dive on Rosedale Rock was delayed by the presence of this "killer whale", Orcinus orca. (Picture taken looking north from Rosedale Rock.)

SONAR DEPTH SOUNDING PROFILES

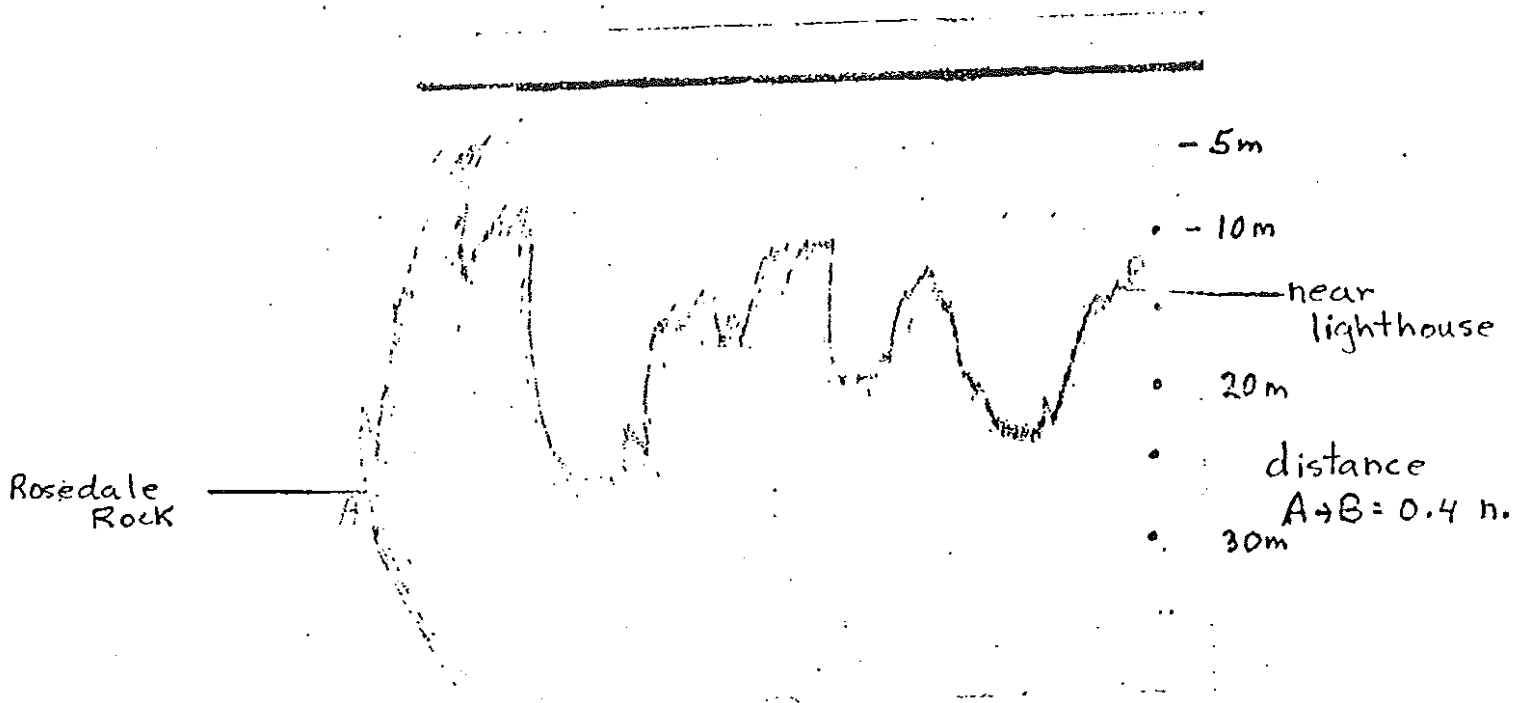


FIGURE 21a. ROSEDALE ROCK to LIGHTHOUSE (335°)

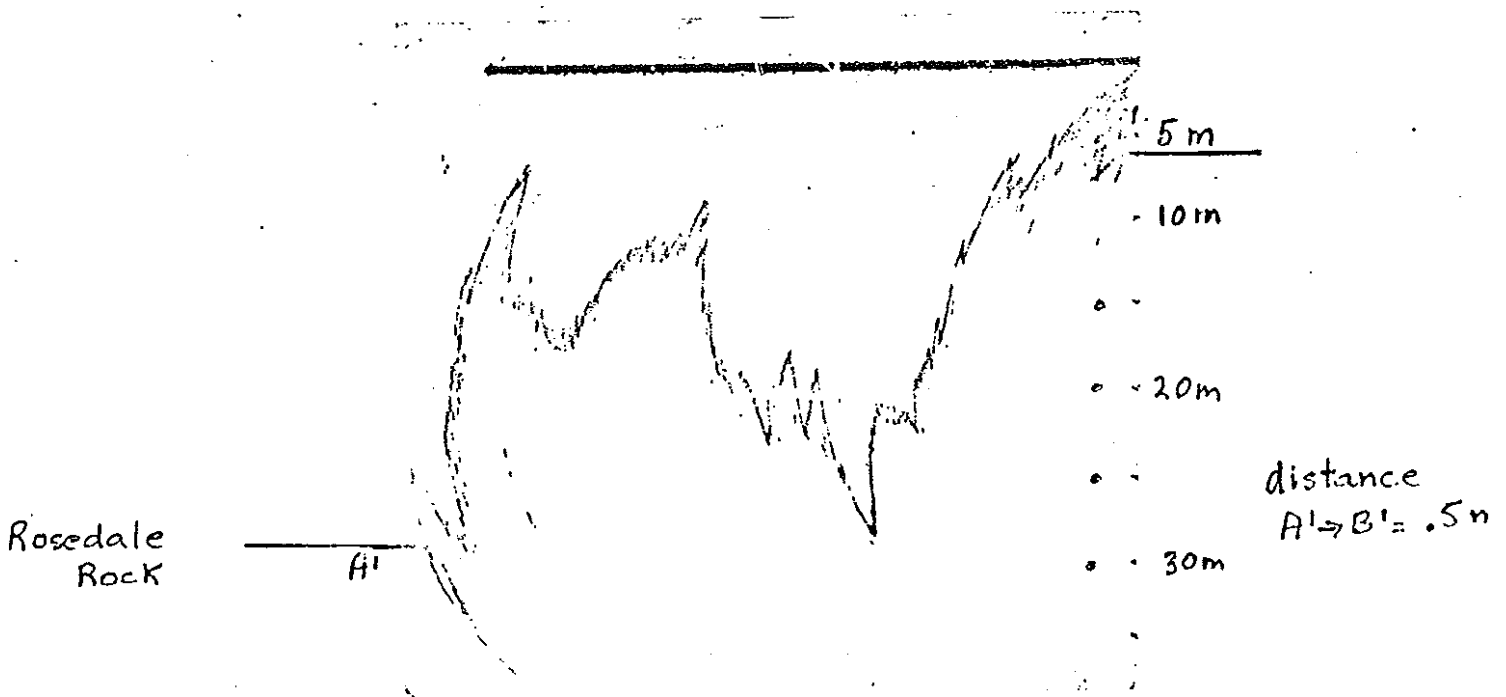


FIGURE 21b. ROSEDALE ROCK to EAST SOUTH-EAST CORNER (358°)

18/4/77

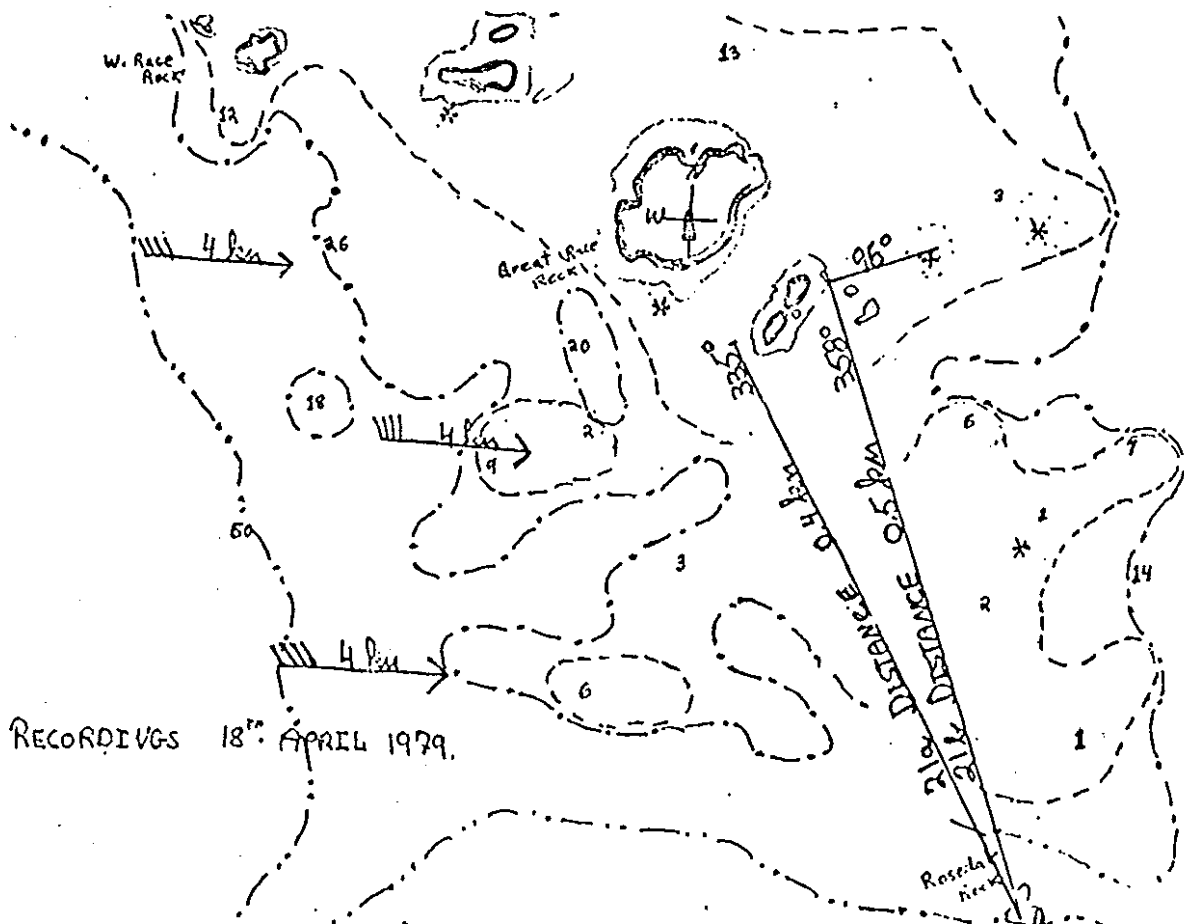
BOTTOM PROFILES USING SONAR - Jens Jensen, James Stringham
João Luis de Castro

Rosedale Reef is an outstanding area south of the main island at Race Rocks. It's southern limit is marked by a large signal buoy. The topography of the reef varies significantly, with a high vertical relief providing protection for many species of fauna and flora. We have found that the existing charts are insufficient for our purposes. Figures 21A and 21B are depth recordings made with the Marlin-1100 MVS operated from the Pearson College Marine Science/Diving boat. The recordings were made on a day when there was a heavy flood tide and heavy chop. This may have affected the readings slightly, therefore leading to questionable accuracy of the distances. Two sweeps of the area were completed, the courses of these appear in figure 22.

It is our intention to do a complete series of soundings which will provide further recordings in order to make an accurate profile of the area.

Using the same technique we hope to cover other areas in order to find those with equivalent relief that could lead us to other productive locations.

Figure 22 Map of Sonar Profiles



PHYSICAL FACTORS AT RACE ROCKS - Hans Jørgen Thon

The environmental factors in the proposed ecological reserve have been described in several publications, (2, 4, and 5). Information from our diving at Race Rocks has led to some useful material on tidal currents. Figure 23 and 24 show the current flow patterns at ebb and flow tide, with arrows representing direction. This information was compiled from the records of divers and the boat tenders on dives made in the last few months. We intend to make this information more accurate by measuring the current speed at different locations and by recording the path of drifting floats.

It should be noted that even at flood tide, there are several locations in which diving is possible. At ebb tide, a large back-current east of West Race Rock provides calm water for diving also. It is also obvious that the current direction at Rosedale Rock is at a deviating angle necessitating an able boat pick-up crew on any dive in that area.

Slack Tide Times

For determining the time of slack water at Race Rocks a close estimate can be made by following the Juan de Fuca Strait current table 8. At high tide, the slack is the same as Juan de Fuca; at low tide, subtract 50 minutes from the Juan de Fuca table. These times have been found to be approximate and very dependent on weather conditions. It also helps to dive in the area when there is minimum tidal range, in the neap part of the cycle.

TEMPERATURE AND SALINITY

A study of temperature and salinity in the Race Rocks area in a ten-year period, 1948-57 and for the years 1974 and 1976 is shown in figures 25 and 26. The information for the ten-year period was taken from the report by Goddard². The 1974 and 1976 information comes from Giovando^{6,7}.

An interesting finding is the contrast in levels of salinity in the two years, 1974 and 1976.

The lines for temperature in figure 25 show the peaking in August due to the accumulated effect of the warm summer atmospheric temperature. Additional useful interpretations can be made of data such as this.

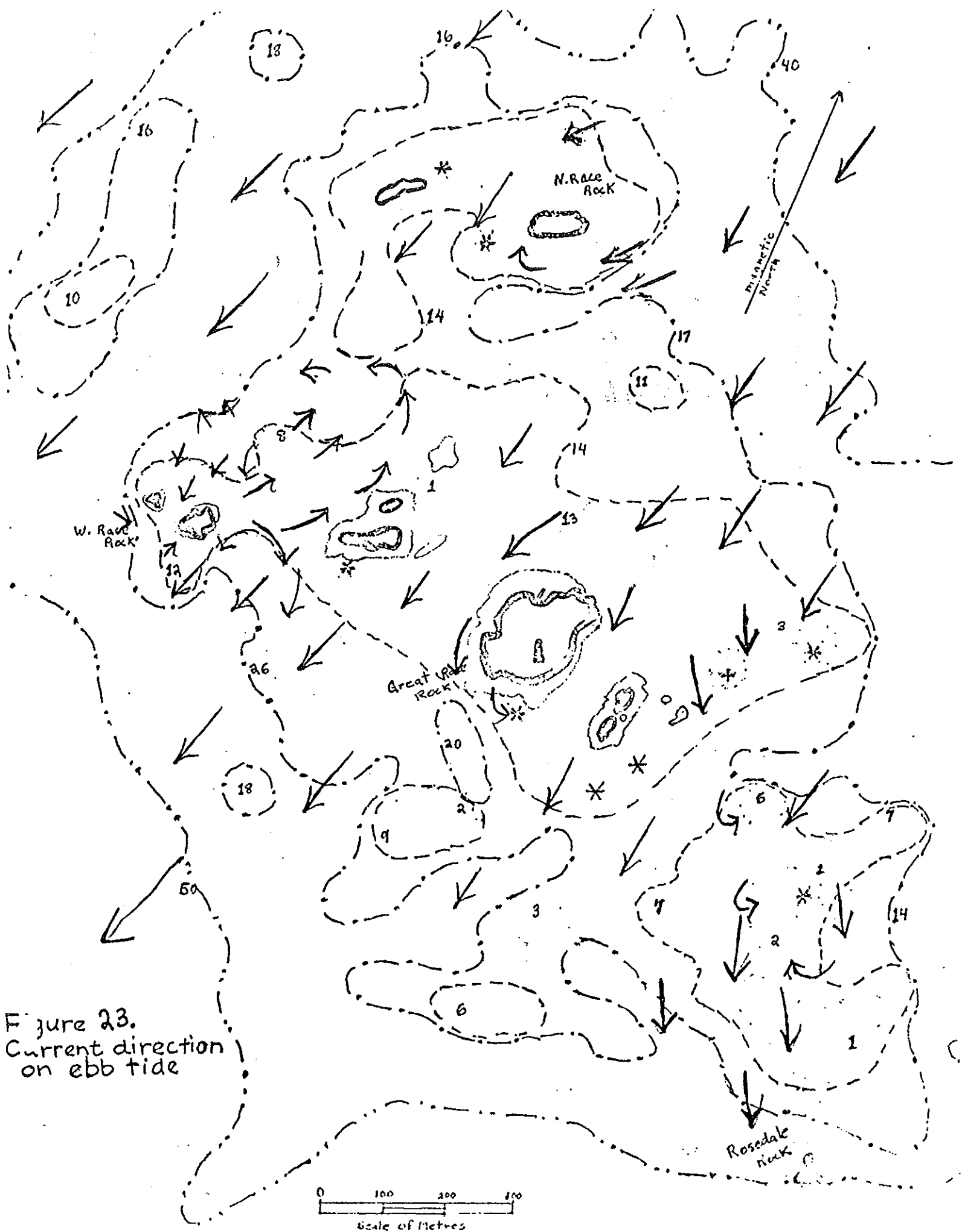


Figure 23.
Current direction
on ebb tide

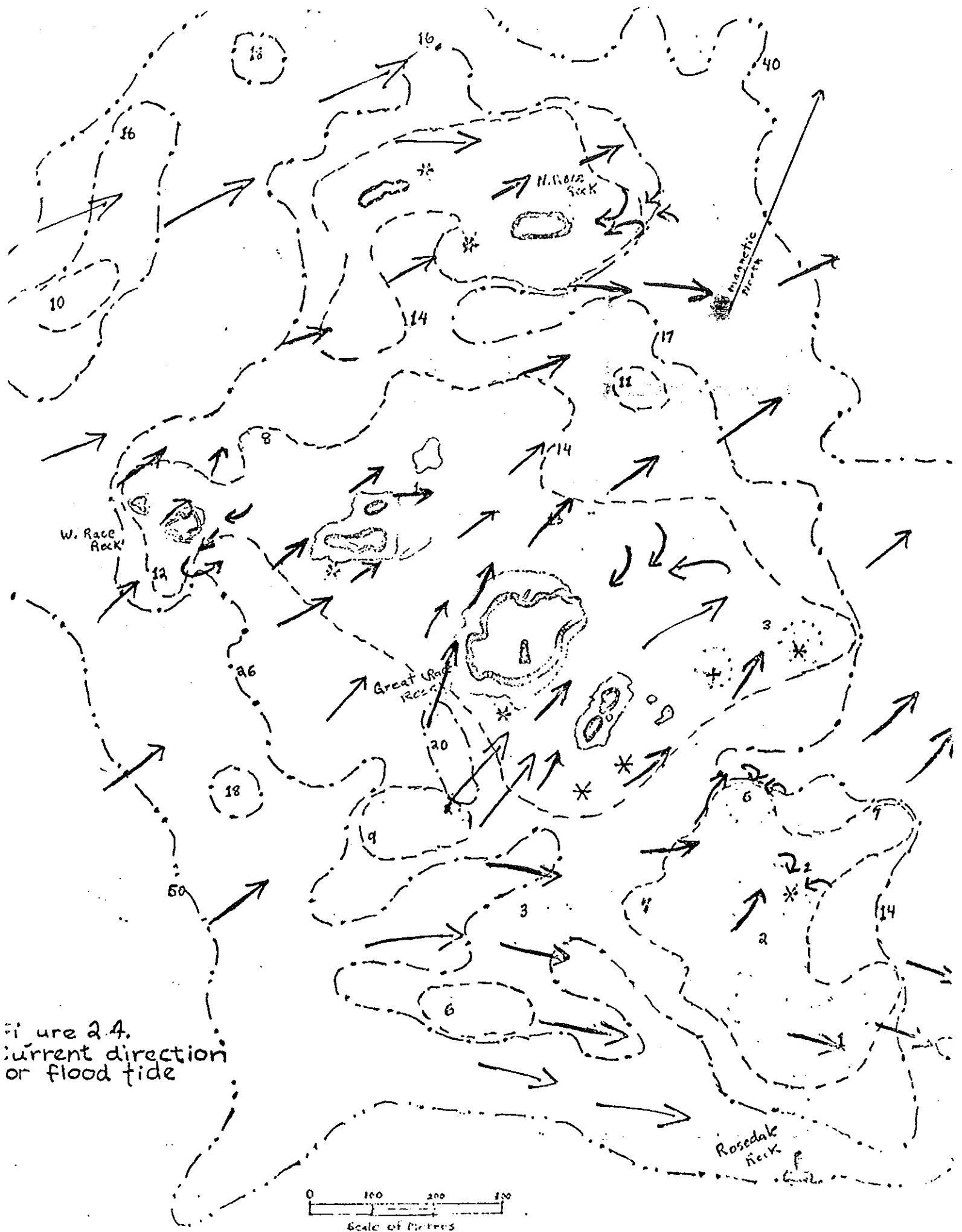


Figure 24.
 Current direction
 or flood tide

0 100 200 300
 Scale of Feet

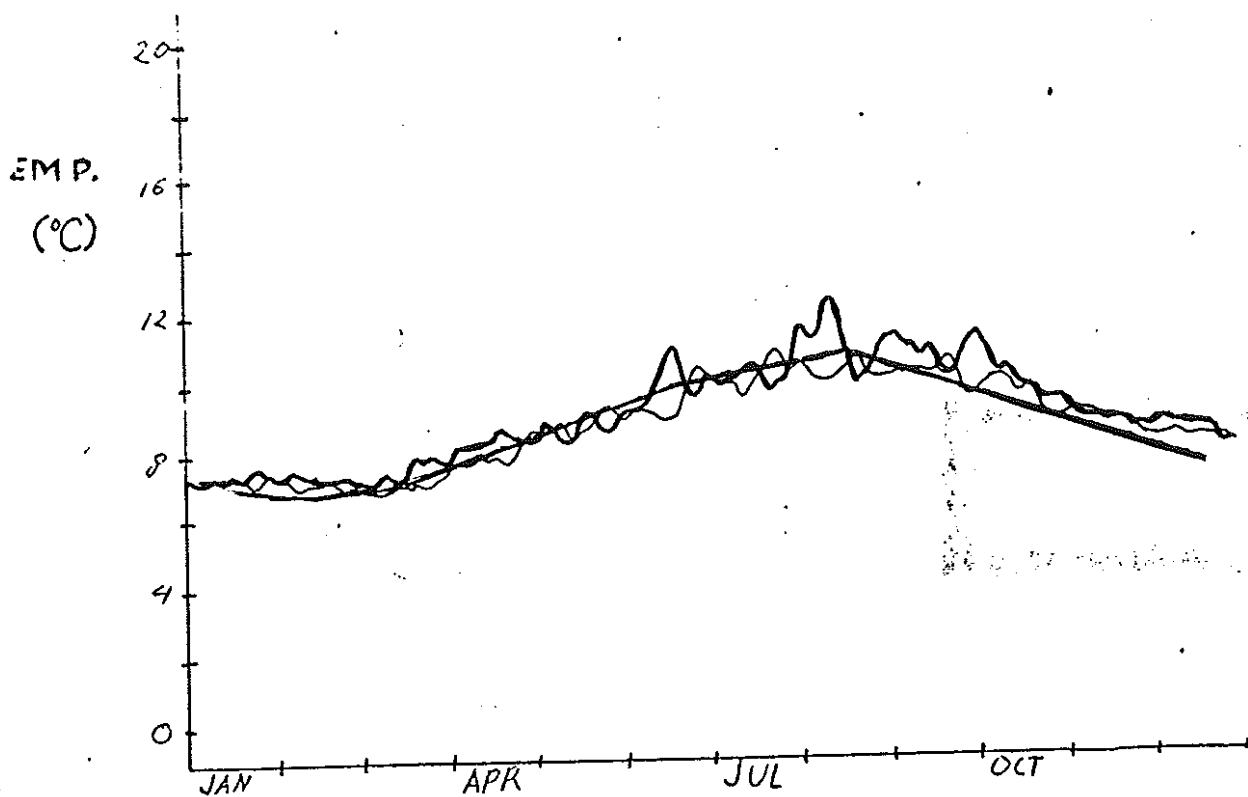


FIGURE 25: TEMPERATURE - RACE ROCKS
 1948-57 - blue line
 1974 - red line
 1976 - black line

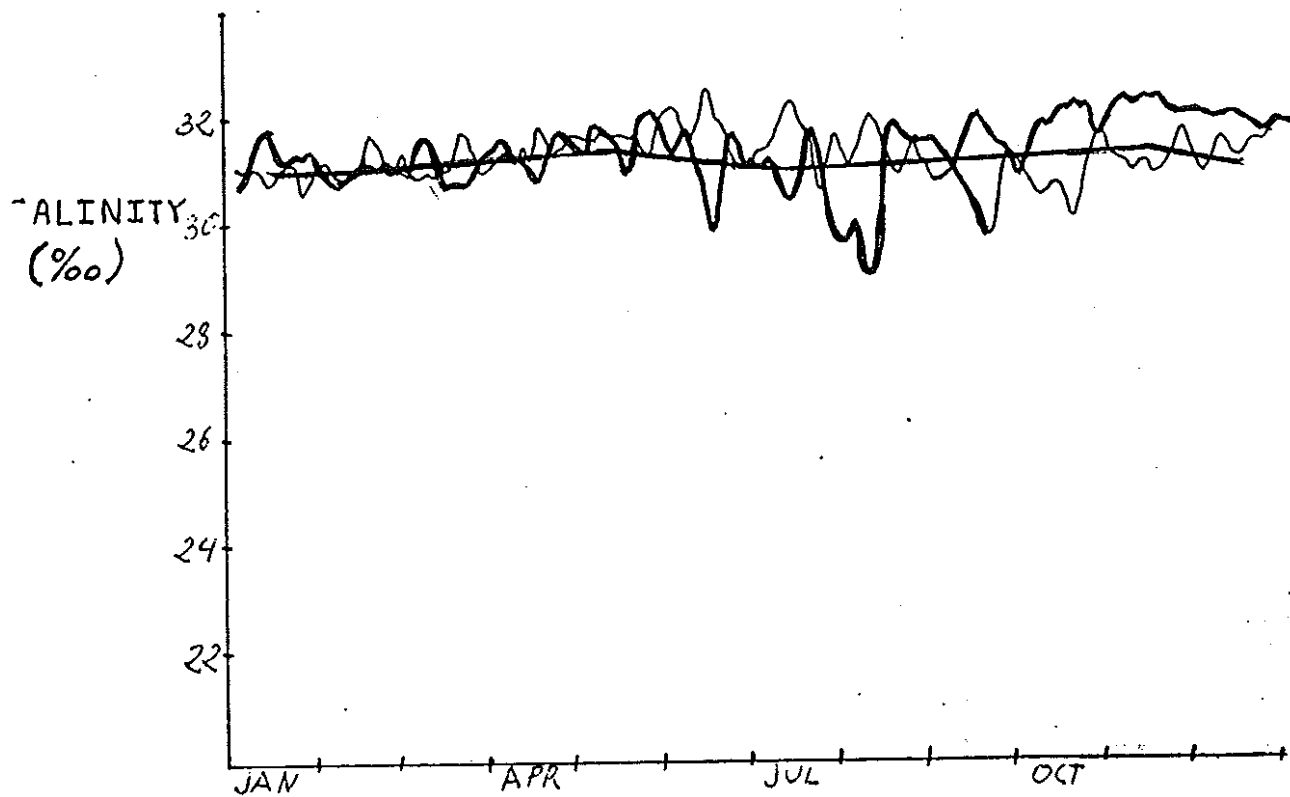


FIGURE 26: SALINITY - RACE ROCKS, 1948-57 - blue line
 1974 - red line
 1976 - black line

PART F. FUTURE PROJECTS AT RACE ROCKS

Several projects that should be done in the future have been referred to in previous sections of this report. The following is an outline of the projects that we plan to work on in marine science and diving over the next few years. It is imperative that many base-line studies of the organisms in the area be done as soon as possible, in order to have a reliable system for measuring change. As the increase in tanker traffic in the Strait of Juan de Fuca increases over the next few years, the risk of exposure to the island necessarily increases. Good base-line studies done now may serve as a valuable measuring-stick for damage from this and other possible influences of man. The following are studies planned for the future:

1. A study of current velocities at different tidal flow times in order to correlate them to local tide tables.
2. A detailed sonar mapping of the whole proposed reserve area.
3. A more detailed study of current flow patterns by charting the path of floats in the current.
4. A continuous Secchi disc monitoring for turbidity readings and correlation of these with plankton blooms.
5. The preparation of baseline photographic transects in the intertidal and subtidal areas of different waves and current exposures.
6. The collection of information relating to the area that has historic significance or is from recent research in the area in order to create a Race Rocks archives that would be available for public use.
7. Population level studies of the following invertebrates:
 - sea urchin, three species
 - basket stars (Gorgonocephalus sp.)
 - mussels (M. californianus)
 - brooding anemone (Epiactus prolifera)
8. A study of the many varieties of colonial tunicates in the area.
9. Rock-fish study.
10. Deep-water grab-samples taken to sample the areas below suitable diving depths for a species comparison at different depths.

11. Preparation of a guidebook for divers using the area.
12. Preparation of an interpretive display of photographs, and preserved specimens to be kept at Race Rocks to aid visiting divers.
13. Hydrophone recordings of underwater sounds.
14. Records on pinniped populations on the islands to be made on a regular basis.
15. Tabulation of bird colony statistics yearly.
16. Turbidity readings and correlation of plankton blooms.
17. Establish an inventory of all the kelp (Macrophyte) species that live near the islands and plot their locations on maps.

PART G. OUR CONCERNS FOR THE FUTURE OF THE RACE ROCKS AREA

At the present, the only protection is provided by the Andersons themselves, because of their own interest in conservation of the area. By getting to know divers that use the area they have managed to persuade most of them to only take pictures. They have even had to advise commercial shellfish operators to stay away and therefore the last decade has seen a great increase in divers with relatively little harm done to natural populations of organisms that exist there. Their vigilance was not enough, however, to prevent a thoughtless individual last year from taking rifle shots at the colony of sea lions on the islands.. Neither are we assured that the next lightkeepers that inhabit the island will take the same interest in conserving the underwater life, and with the increase in divers that is happening every year, the rare forms of life that are found there now could rapidly disappear.

Diving at Race Rocks is possibly more dangerous than other areas because of the high current velocities, rapidly changing weather conditions, irregularity of tidal changes, and the presence of sea-lions. It is, however, possible to dive safely when information is known about the area and adequate boat cover is available, but extreme caution is always necessary.

We believe that the best way to ensure long term preservation of the area is through legislation as an ecological reserve, and we feel that the significance of the life forms there merit immediate action towards this end.

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