

(D R A F T)

RESEARCH PRIORITIES
and
MANAGEMENT RECOMMENDATIONS
for the
ROCKY INTERTIDAL and SUBTIDAL RESOURCES
of the
POINT REYES NATIONAL SEASHORES

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by

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Abstract

The Point Reyes National Seashore Peninsula has some eighty kilometers of coastline which encompasses some of the most diverse rocky intertidal and subtidal marine habitats found anywhere along the entire Pacific Coast. Within these littoral habitats are species-specific resources which require high research priorities and management decisions by the National Park Service.

(Note to NPS: References of figures and authors pertain to previous bibliography papers published by Dr. G.L. Chan, 1983, under Contract No. CX-8000-3-0002. See Appendix, pages 12-31, and list of figures, page iv.)

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I. RESEARCH PRIORITIES for the ROCKY INTERTIDAL and SUBTIDAL RESOURCES of the POINT REYES NATIONAL SEASHORE, February 1984.

A. Research Monitoring of High Priority Areas

1. Duxbury Reef Complex, Areas A, B, and C (Figures 5 through 9)

122°41'W; 37°53'N
to
122°44'W; 37°56'N

The large platform rocks at Duxbury Reef encompass one of the most species diverse intertidal reefs in California. Key species include:

Mytilus californianus, vast beds of the sea mussel (Chan, 1977)

Tegula funebris, the endemic giant black turban snail
(Stohler, 1965, 1969; Chan, 1969)

Mesoglossus sp., the rare endemic acorn worm (Blake, 1979)

Human impact is considerable, from reef fishermen and school group tidepool walkers.

2. Drakes Estero Intertidal (Figures 1 and 10)

122°51'30"W; 38°02'30"N

The intertidal transect at the mouth of Drakes Estero acts as a sentry to the health of this large estero system. Key species are:

Collisella spp., limpets

Pachygrapsus sp., purple shore crab

Pisaster spp., starfish

Human impact is negligible.

3. Point Reyes Headland, Chimney Rock (Figures 1, 12, 13)

122°57'22"W; 37°59'22"N

a. The intertidal granitic reef contains a diverse fauna:

Anthopleura spp., the sea anemone

Cancer sp., rock crab

Pagurus spp., hermit crab

Patiria sp., bat starfish

Haliotis rufescens, red abalone (small)

Lottia sp., owl limpet

Human impact is considered to be moderate; sufficient number of tidepoolers visit this area to make an impact.

- b. The subtidal transect at Chimney Rock provides a treatment comparison to the control subtidal transect at Split Rock, about 2.2 km west of Chimney Rock.

Key subtidal species is the red abalone, Haliotis rufescens.

Human impact is moderate. The area is open to skin divers seeking abalones, but access is difficult due to steep cliffs; high energy waves also limit the visibility for these divers.

4. Point Reyes Headland, Split Rock (Figures 1, 12, 14)

122°58'55"W; 37°59'30"N

The subtidal transect is located in an alcove of granitic rocks where many large size red abalones, H. rufescens, are located. The area is within the Point Reyes Headland Marine Reserve and is therefore off limits to divers. This subtidal site serves as a control in contrast to the treatment subtidal study site at Chimney Rock.

Human impact should be sparse since no visitors are allowed in this area.

5. Tomales Point, Bird Rock (Figures 15, 18)

122°59'29"W; 38°14'48"N

In the subtidal transects located here at Q-1 and Q-2 exist the key resource of the area, the red abalone, Haliotis rufescens.

The area is severely impacted by human divers. Legal size abalones located here will not have much chance of survival from the predatory hands of the seasonal divers.

From my past experiences at Bird Rock, the density of abalones within similar transects was significantly lower after a period of three to five years (Chan, 1961, 1980).

B. Research Monitoring of Moderate Priority Areas

1. Tomales Point, McDonald's Beach (Figures 15, 16, 17)

122°58'40"W; 38°13'22"N

The intertidal transect at MB, T-2 represents the reef organisms at this northern section of the Point Reyes National Seashores. The organisms within the transect are mussels, chitons, and sea anemones, all of which are common throughout Northern California. The ranking of moderate priority is based on the transect having species representative of organisms along the northern shores of the seashore sanctuary.

Human impact is moderate, mostly from reef walkers.

2. Estero de San Antonio (Figures 19, 20)

122°58'36"W; 38°16'02"N

The intertidal transect at the south section of this estero beach has the common species of sea anemones, starfish, mussels, limpets, whelks, and the purple shore crab.

Human impact is likely to be minimal, mostly from reef walkers traversing north from the Dillon Beach area. It is unlikely that the sediment disturbance at the Estero Americano, 2 km. north from the salmon hatchery project, will affect this site.

C. Research Monitoring of Low Priority Areas

1. Rocky Point, Steep Ravine Beach (Figures 2, 3)

122°37'32"W; 37°52'49"N

The geothermal vent and the sediment erosion from Webb Creek at the Steep Ravine Beach cause great natural fluctuations in the faunal ecosystem. Intertidal species here are common throughout the seashores of the marine sanctuary.

The human impact from visitors living in the restored cabins and fishermen and sightseers from the headland shores will probably be moderate.

2. Stinson Beach, Calle Del Sierra (Figures 2, 4)

122°38'40"W; 37°53'45"N

The intertidal transect recording the beach species of worms and mole crabs undergoes great natural fluctuations from offshore waves and currents.

Human impact from beach walkers is moderate in comparison to the cyclical changes due to natural long shore wave erosion.

3. Drakes Beach (Figures 1, 11)

122°57'30"W; 38°01'50"N

The intertidal transect just east of the Patrick Visitor Center is greatly influenced throughout the year by long shore currents. The movement of sand from winter to summer creates much fluctuation in the sand fauna densities.

Human impact from beach walkers is minimal.

4. Tomales Point, McDonald's Beach (Figures 15, 16, 17)

122°58'40"W; 38°13'22"N

The species found at the intertidal transect at MB, T-1, are common throughout the coastal scene. The intertidal transect at MB, T-2, with less human access, is a higher priority site.

D. Summary of Research Monitoring Priorities

The most important rocky intertidal resource community in the Point Reyes Seashore Sanctuary is the large shale reef complex at Duxbury Reef (Figures 5). Two endemic species-specific organisms are located in Area C of this immense platform reef. These two organisms are the giant black turban snail Tegula funebris and the red acorn worm Mesoglossus sp. Add to these organisms the large beds of the sea mussel, Mytilus californianus, and the other arrays of sea anemones, seastars, and boring organisms. The uniqueness and formation of these solitary and aggregating species make this reef a precious resource to monitor each year.

Throughout the other rocky intertidal and subtidal locations exist common marine organisms which are indigenous throughout the temperate regions of the Pacific Coast. These marine species have been relatively stable in their population densities throughout the years (Chan, 1973, 1974, 1975, 1977; Castenholz, 1967; Osman, 1978; Sousa, 1979). Because of the stability and common speciation of the marine organisms in the lesser ranked priority areas, continuous population monitoring may not be necessary.

However, one of the important marine species within the subtidal waters is the large populations of the red abalone, Haliotis rufescens. Throughout all of California this mollusk is under severe pressure from sports and commercial efforts to fish this gastropod as a food source. Within the Point Reyes seashore area, the abalone is an important marine resource with high priority ranking.

II. MANAGEMENT RECOMMENDATIONS for the ROCKY INTERTIDAL and SUBTIDAL RESOURCES of the POINT REYES NATIONAL SEASHORE HABITATS

A. Introduction

The Point Reyes rocky intertidal and subtidal marine populations contain mostly common marine species which generally maintain stable population densities year in and year out. However, within these seashores are rare endemic organisms which need close monitoring research studies. Also, there are key marine habitats which need population monitoring because of their locations and their importance as a source of marine food. In review, the seashore's rocky intertidal and subtidal sites have been prioritized into the following categories:

Research Monitoring of High Priority

1. Duxbury Reef, Areas A,B,C Transects
2. Drakes Estero Intertidal Transect
3. Point Reyes Headland, Chimney Rock Intertidal and Subtidal Transects
4. Point Reyes Headland, Split Rock Subtidal Transect
5. Tomales Point, Bird Rock Subtidal Transect

Research Monitoring of Moderate Priority

1. Tomales Point, McDonald's Beach (MB, T-2) Transect
2. Estero de San Antonio Transect

Research Monitoring of Low Priority

1. Rocky Point, Steep Ravine Beach Transects
2. Stinson Beach, Calle Del Sierra Transect
3. Drakes Beach Transect
4. Tomales Point, McDonald's Beach (MB, T-1) Transect

B. Justifications for Areas Designated for Research Monitoring of High Priority

1. Duxbury Reef Complex

This platform reef is one of the largest reefs in California and is subjected to hundreds of visitors--fishermen, reef walkers, school personnel, etc. The invertebrate resources are under severe pressure from these visitors. Moreover, the northwesterly counter currents exit from Golden Gate Bridge and deposit much tidal debris from San Francisco Bay

and thus, pollutants may affect these organisms, e.g., the 1971 San Francisco oil spill (Chan, 1973, 1975, 1977).

2. The Other Intertidal Transects at Drakes Estero, Chimney Rock, and Tomales Point-McDonald's Beach

Each of these transects are located at key intersections of the Point Reyes Seashore habitats. They act as sentries for monitoring the effects of onshore as well as offshore contaminants on these marine communities. The impact of visitation from man to these sites is moderate in intensity.

3. The Subtidal Transects for Monitoring the populations of the red abalone, *Haliotis rufescens*

The red abalone, *H. rufescens*, is under great pressure as a seafood resource. Throughout the state, nearly all populations of this mollusk are under the threat of decreasing densities. Fortunately, at the Point Reyes Headland Marine Reserve, the area is off limits to fishermen and visitors; thus, the subtidal population at the Split Rock transect can serve as a control site comparison to the subtidal treatment site populations at Chimney Rock.

On Tomales Point, during low tide fishing days, hundreds of divers and intertidal hunters fish for the legal-sized red abalones from McClure's Beach to the tip of Tomales Point. From my previous transect studies in these areas, the population of legal size abalones continues a decreasing trend. Fortunately, the recruitment of young red abalones is an important cog in maintaining a visible population. Severe coastal waves also provide some manner of protection by inhibiting the more timid fishermen.

C. Management Responsibilities and Recommendations

1. Monitoring the Rocky Intertidal Resources

At least twice a year, the Point Reyes National Park personnel ^{should} ~~must~~ monitor by counting the marine populations within the transects at Duxbury Reef, the opening of Drakes Estero, Chimney Rock, at McDonald's Beach (transect MB, T-2).

The sampling time schedule:

- a. Summer-Fall population growth: June through September
- b. Winter effects: January through April

The time spent at Duxbury Reef will be at least twice the allotment of time for Drakes Estero, Chimney Rock, and McDonald's Beach. For example, three low-minus tide days are needed to sample the populations at Drakes Estero, Chimney Rock, and McDonald's Beach. However, at the Duxbury Reef complex, at least six low-minus tide days are needed to properly sample the transects on this large shale reef.

Thus, throughout each year, the low-minus tide days (preferably in close proximity) would sum up to be:

6 days (3 winter and 3 summer) for Drakes, Chimney, Tomales
Point sites

12 days (6 winter and 6 summer) for Duxbury Reef complex

18 days per year total for intertidal sampling

2. Subtidal Monitoring of the Abalone Transects

Favorable weather to allow for diving on the subtidal transects at Chimney Rock, Split Rock, and Bird Rock, can vary over a wide-time span.

4 days (2 winter and 2 summer) to sample the two Point Reyes
Headland subtidal transects

2 days (1 winter and 1 summer) to sample the Bird Rock subtidal
transects

6 days per year total for diving

3. Summary of work days per year

24 total sampling days: 18 days for intertidal work,
6 days for subtidal work

24 days needed for preparation of equipment

48 days total (plus or minus) to work in the Field

72 days to work up data, input data for the computer,
analyze results, and write up summary reports for
future reference

120 TOTAL days for field, lab and data reduction

More than four months' time, spread throughout the year, is needed to account for field, lab, data reduction and analysis of the intertidal and subtidal sampling work. It is recommended that a microcomputer be used to analyze data input and store analyses and reports for comparison with information of previous years' samplings.

4. NPS and NOAA Personnel with Options

a. Use of NPS-NOAA Biologists

The personnel to monitor the research at the Point Reyes seashore rocky intertidal and subtidal transects should be marine biologists familiar with the local ecosystems. It is possible to train general biologists to perform the work of examining key species in the transects. However, untrained field persons may not recognize abnormalities when such occur in the ecosystem and would not be able to relate the experience to the dynamics of the intertidal or subtidal environment.

Contract guy,
not professional
biologists

b. Optional Contract Biologist(s)

An alternative to the use of NPS-NOAA biologists would be to contract out the rocky intertidal-subtidal work to qualified and experienced marine biologist(s) on a small contract basis.

OK

5. Resource Management Considerations

When the Point Reyes National Seashore Park was being formulated, the marine resources were not delineated. After some of my studies (Chan, 1971), the Limantour Marine Reserve was established to protect the bivalve-bird-marine mammal populations and the Point Reyes Headland Reserve was set aside to conserve the red abalone and other marine organisms associated with the bird-marine pinniped populations.

Now consider the Tomales Point ecosystem of the marine environment. The upland fauna contains mammals (Tule elk) and birds, including the white pelican which inhabits Bird Rock in the late fall months. The lee side of Bird Rock is a haulout area for a large population of harbor seals. Finally, the marine invertebrates

in the intertidal and subtidal zones are as diverse as any along the north coast. The key invertebrate resource is the red abalone Haliotis rufescens. The Tomales Point-Bird Rock marine ecosystem is thus very similar to the Point Reyes Headland Marine Reserve, except that the upland peninsula mammal population of Tomales Point is much more diverse. But, Tomales Point is NOT a marine reserve. On low tide days between May through August, hundreds of people traverse over from Lawsons Landing to fish the red abalone out of the coastal waters between McDonald's Beach to Bird Rock. The human pressure is sufficient enough to impact the adult populations of red abalones within previous subtidal transects in the Bird Rock waters. The abalone poaching is reported to be severe during those low tide days (verbal communication by Ron Hess, California Fish & Game Warden, July 1983).

In the final analysis, the NPS must give consideration to making a request that the State Department of Fish and Game close the Bird Rock Area of Special Biological Significance (ASBS) site to fishermen by declaring it a marine reserve. In my opinion the total marine resources of the Bird Rock ASBS location are valuable enough to warrant protection as a designated state marine reserve.

OK
with review

D. Summary of NPS-NOAA Management Responsibilities

Key rocky intertidal and subtidal resources are located at Duxbury Reef, Point Reyes Headland, and Tomales Point. NPS-NOAA biologists should expect to spend at least a total of four months' time in each year for sampling the transect sites at the various marine habitats and collating the information for computer analysis of correlation to past data from these same transects. The work can also be contracted out to knowledgeable marine scientists.

NPS-NOAA needs to consider asking the California Department of Fish and Game to establish the entire Bird Rock ASBS at Tomales Point as a marine reserve. The current human pressure of fishermen crossing the peninsula from Lawson's Landing will continue to downgrade the abalone resources of the Bird Rock area.

III. REFERENCES

Chan, G.L. 1983. Annotated bibliography on the visitor impact on intertidal and subtidal communities at the Point Reyes National Seashore Park and Point Reyes/Farallon Island National Marine Sanctuary. NPS Contract No. CX 8000-3-0002. College of Marin, Kentfield, CA 94904.

_____. 1983. Biographical analysis of the annotated bibliography on the visitor impact on intertidal and subtidal communities at Point Reyes National Seashore. NPS Contract No. CX 8000-3-0002. College of Marin, Kentfield, CA 94904.

_____. 1983. Monitoring analysis, intertidal and subtidal Point Reyes National Seashore. NPS Contract CX 8000-3-0002. College of Marin, Kentfield, CA 94904

APPENDICES

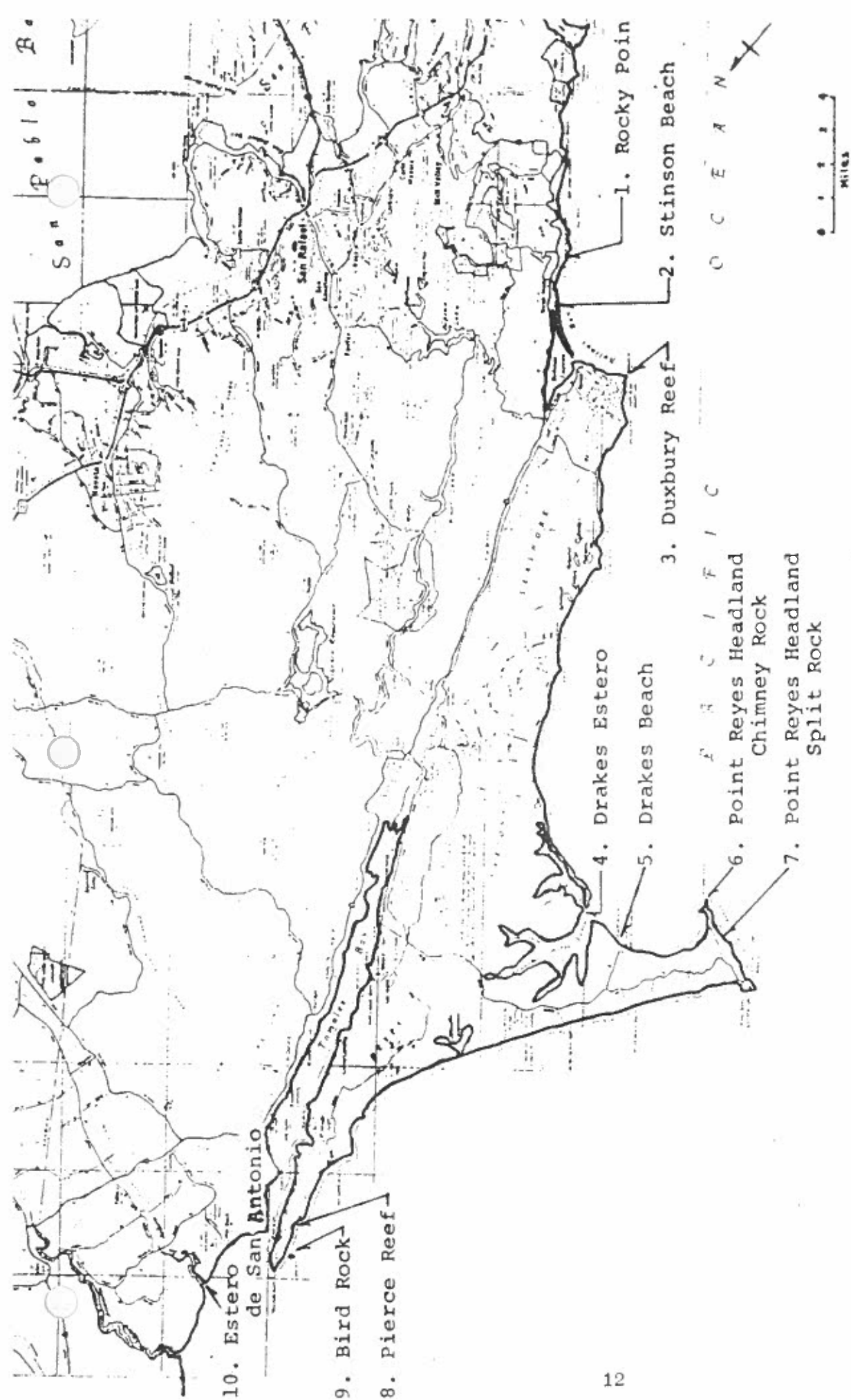


Figure 1. POINT REYES NATIONAL SEASHORE, MONITORING SAMPLING SITES

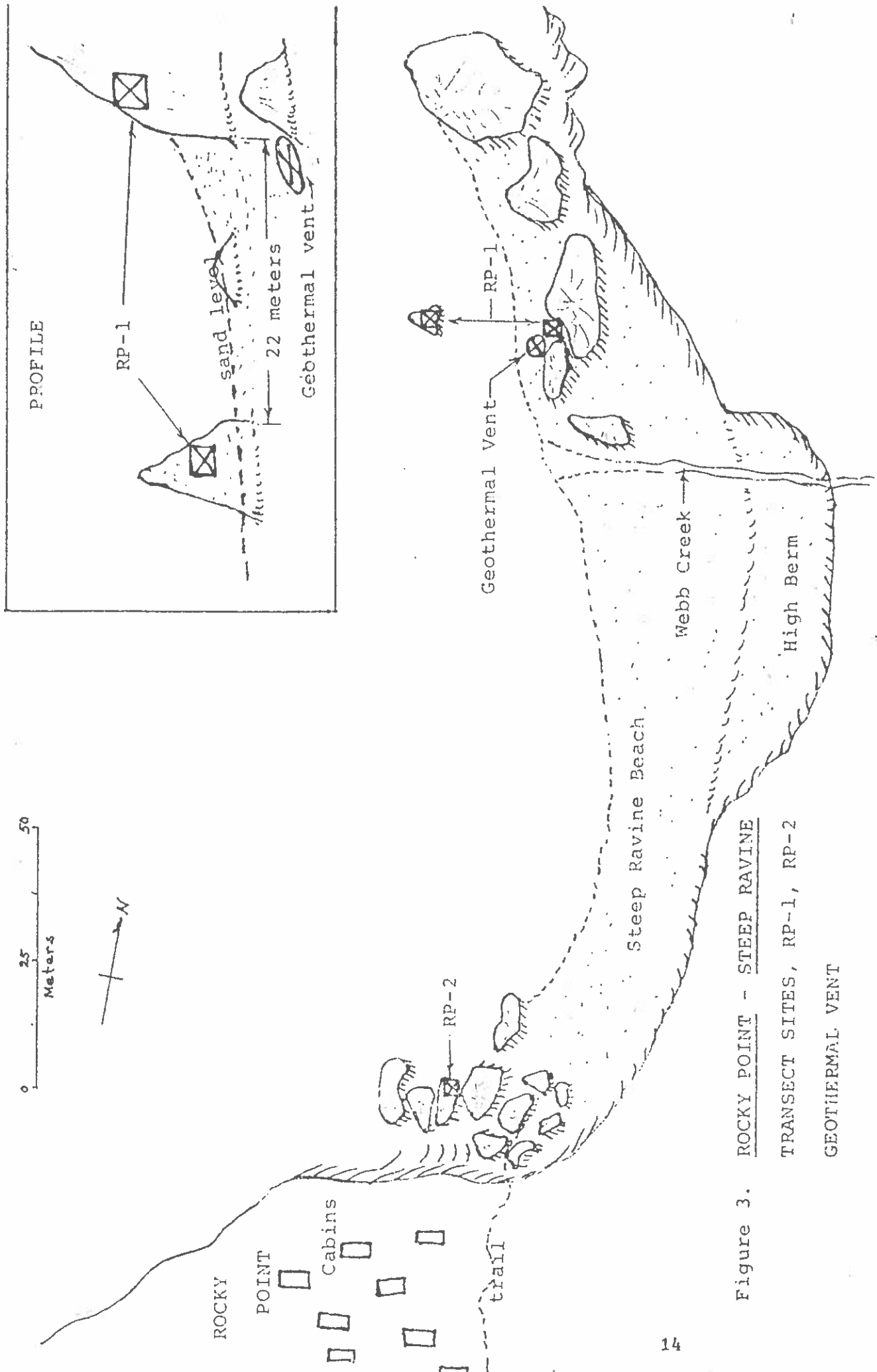
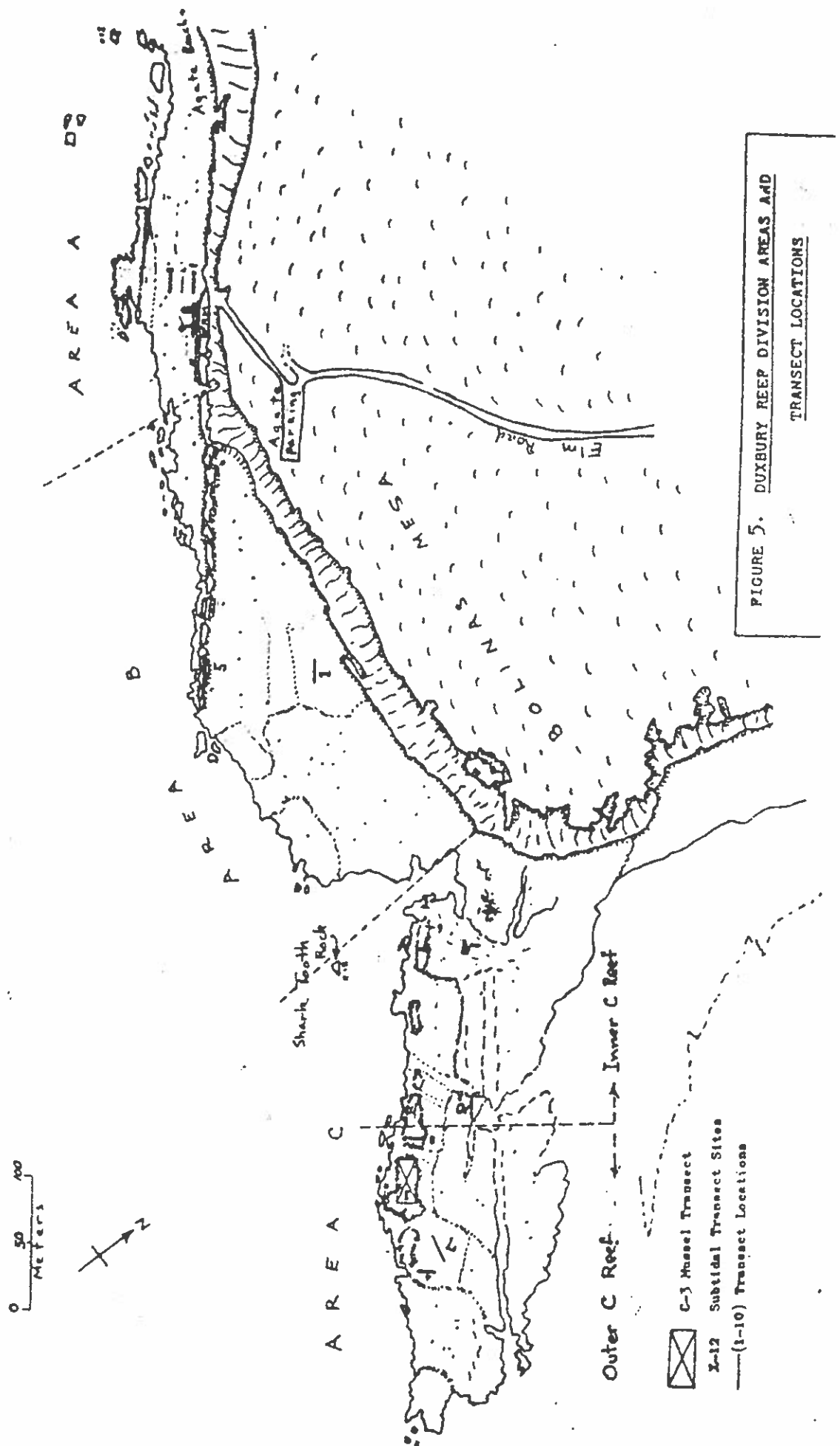


Figure 3. ROCKY POINT - STEEP RAVINE
 TRANSECT SITES, RP-1, RP-2
 GEOTHERMAL VENT



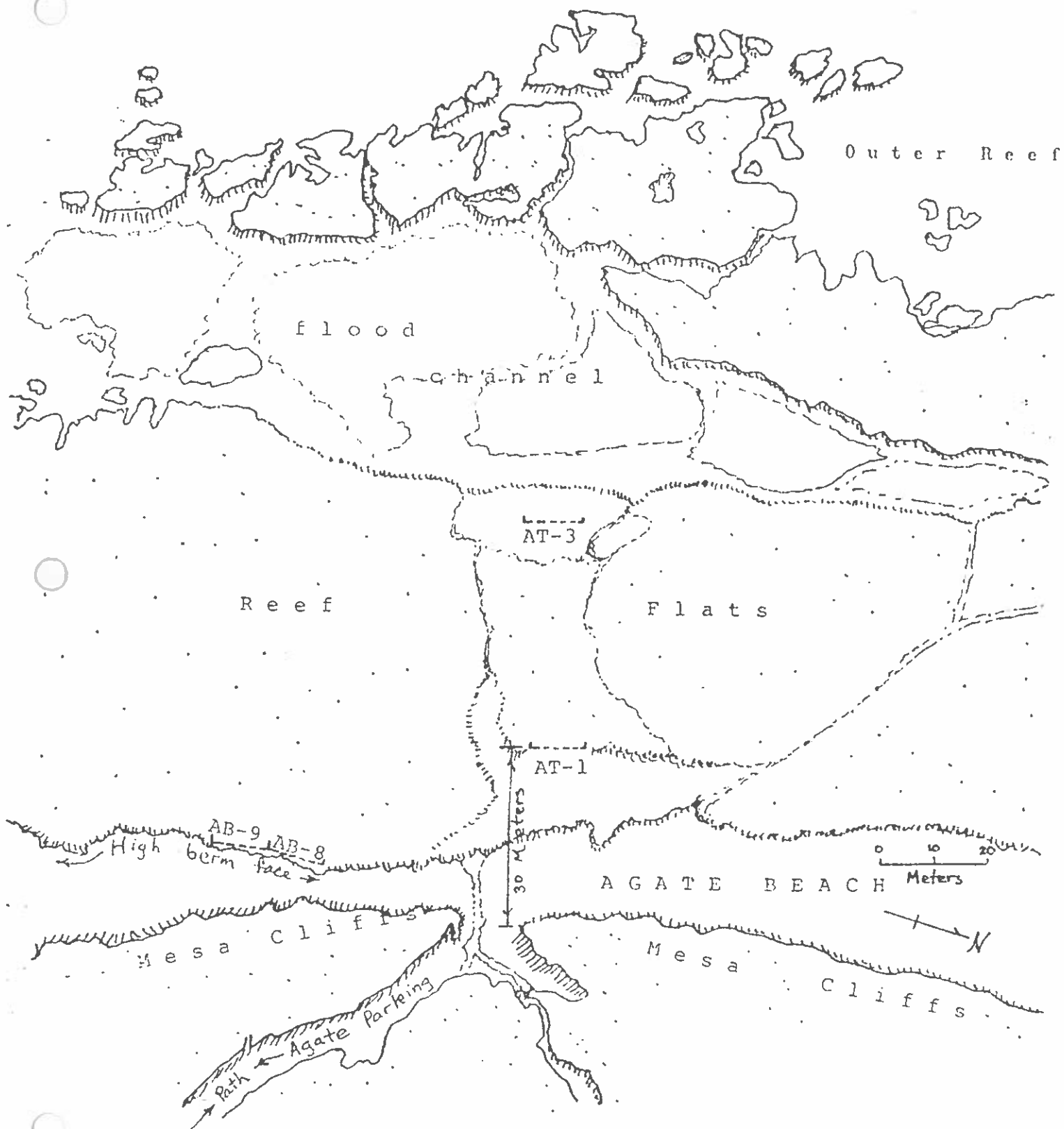


Figure 6. DUXBURY REEF, AREA A

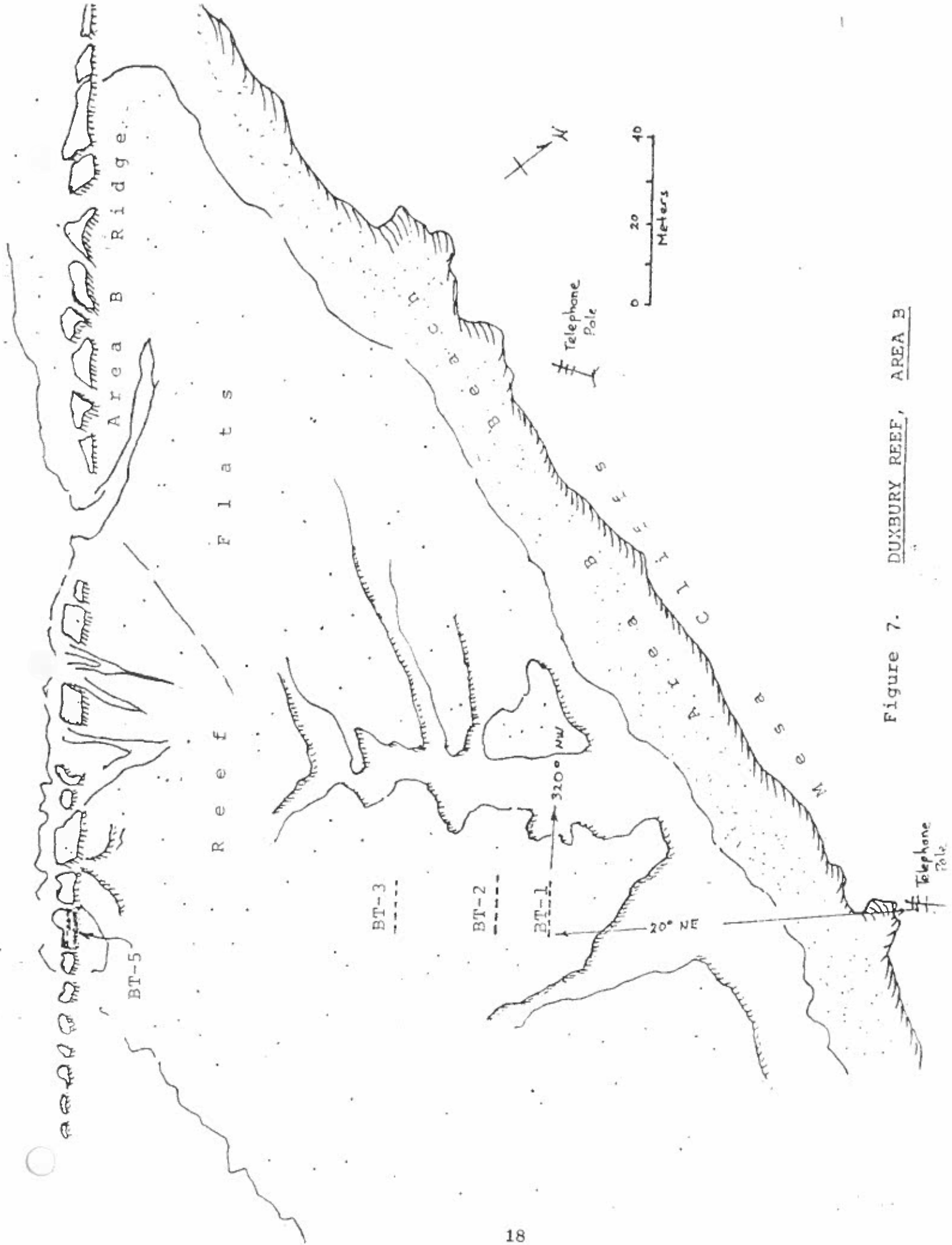


Figure 7. DUXBURY REEF, AREA B

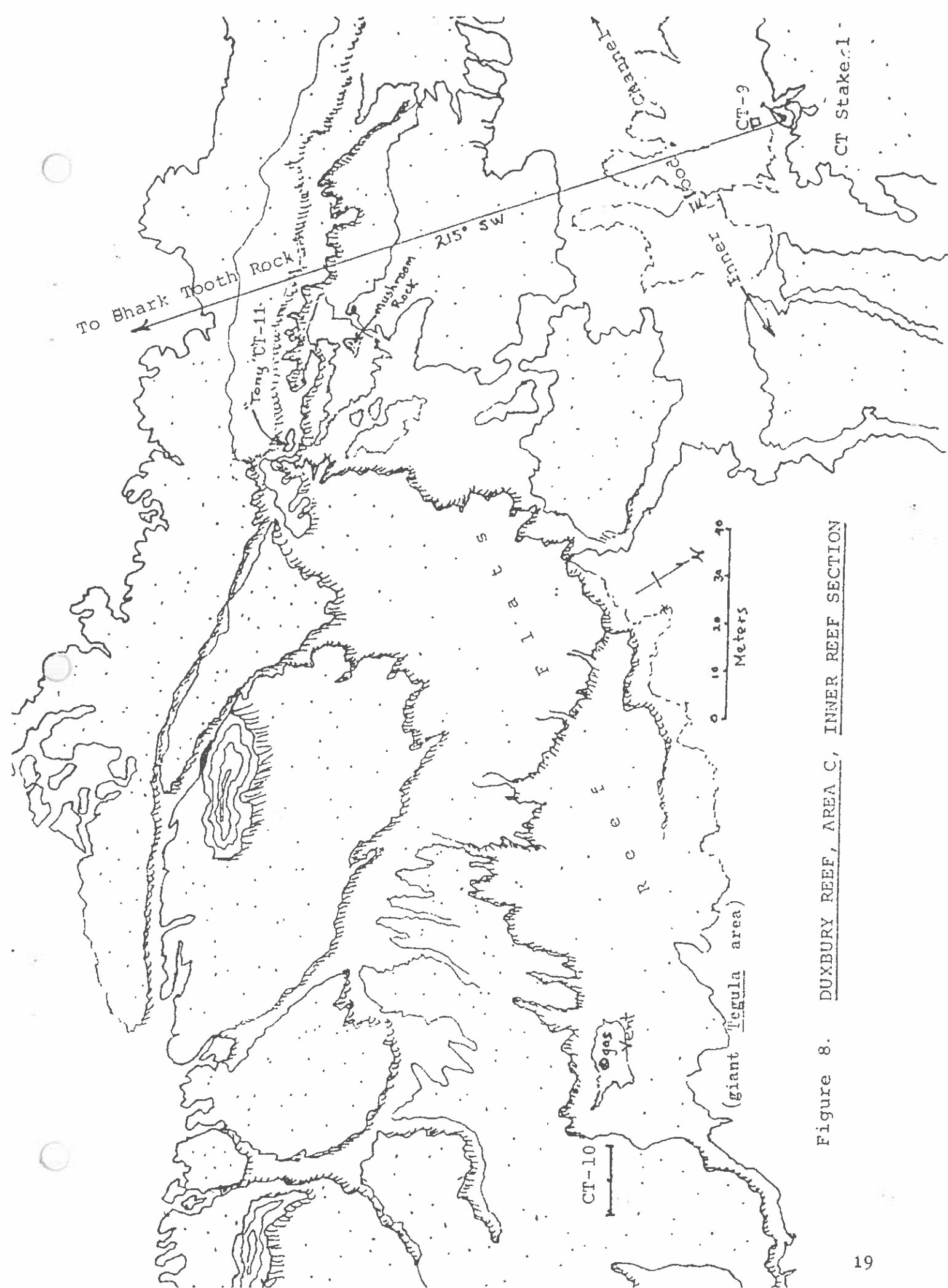


Figure 8. DUXBURY REEF, AREA C, INNER REEF SECTION

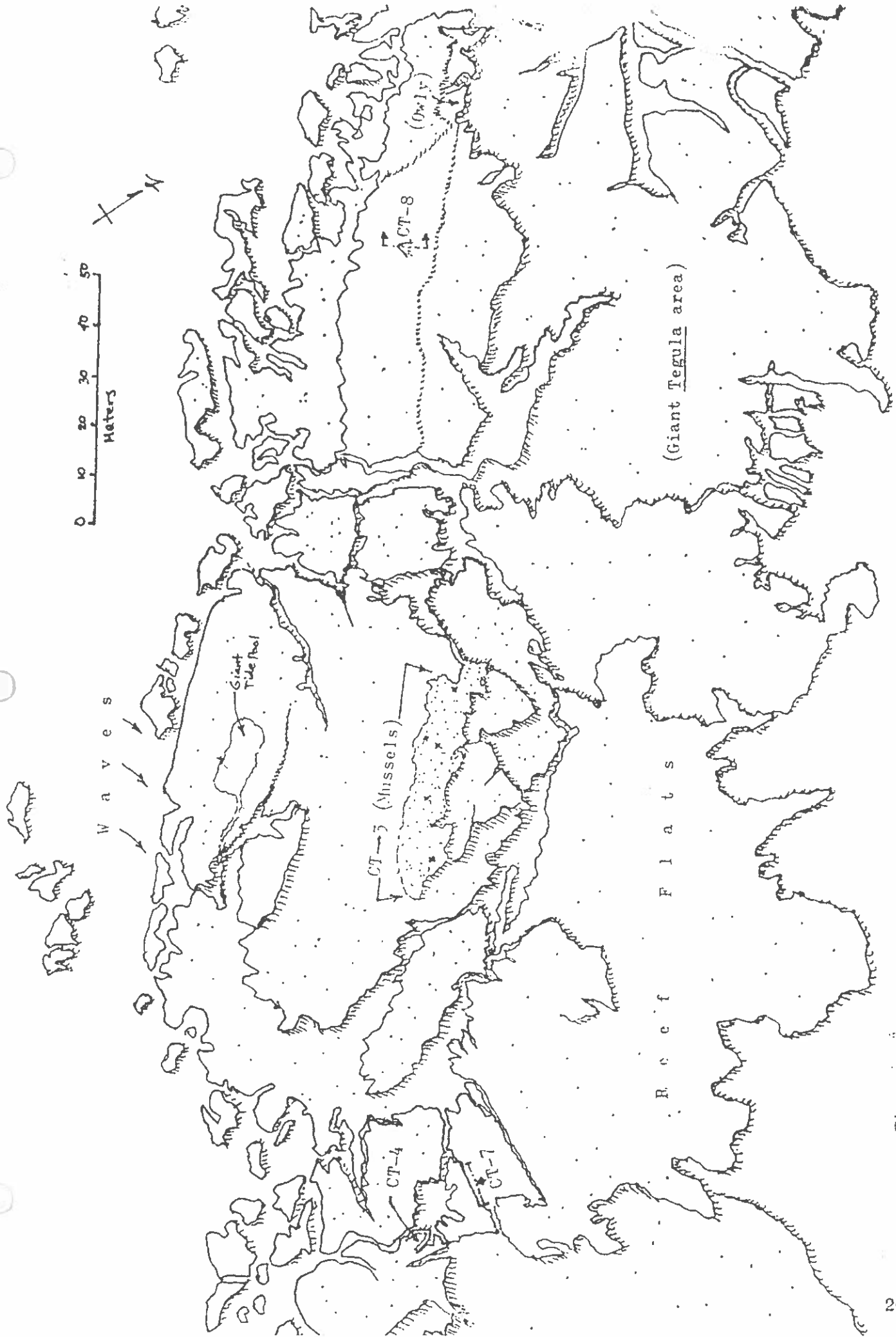


Figure 9. DUXBURY REEF, AREA C, OUTER REEF SECTION

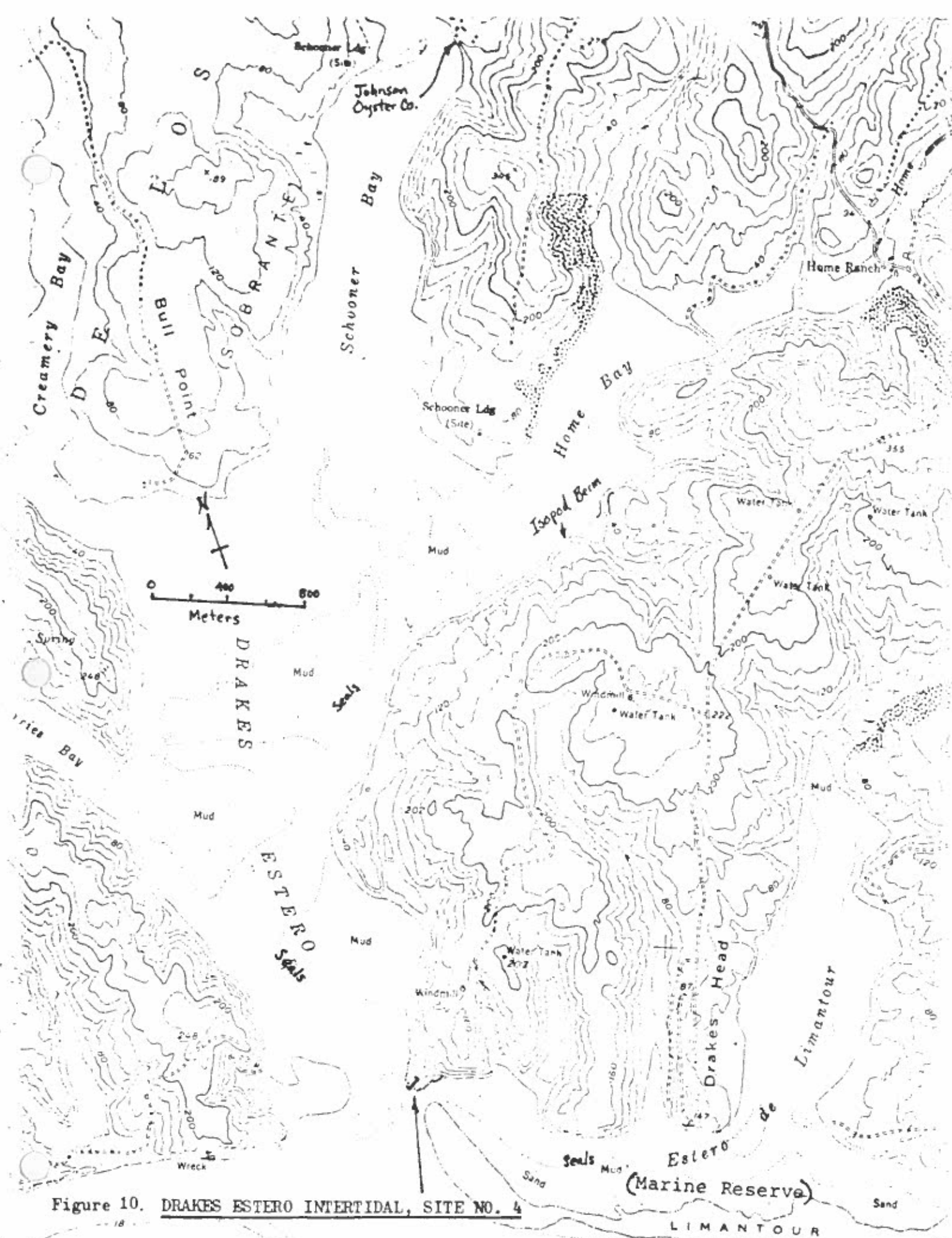


Figure 10. DRAKES ESTERO INTERTIDAL, SITE NO. 4

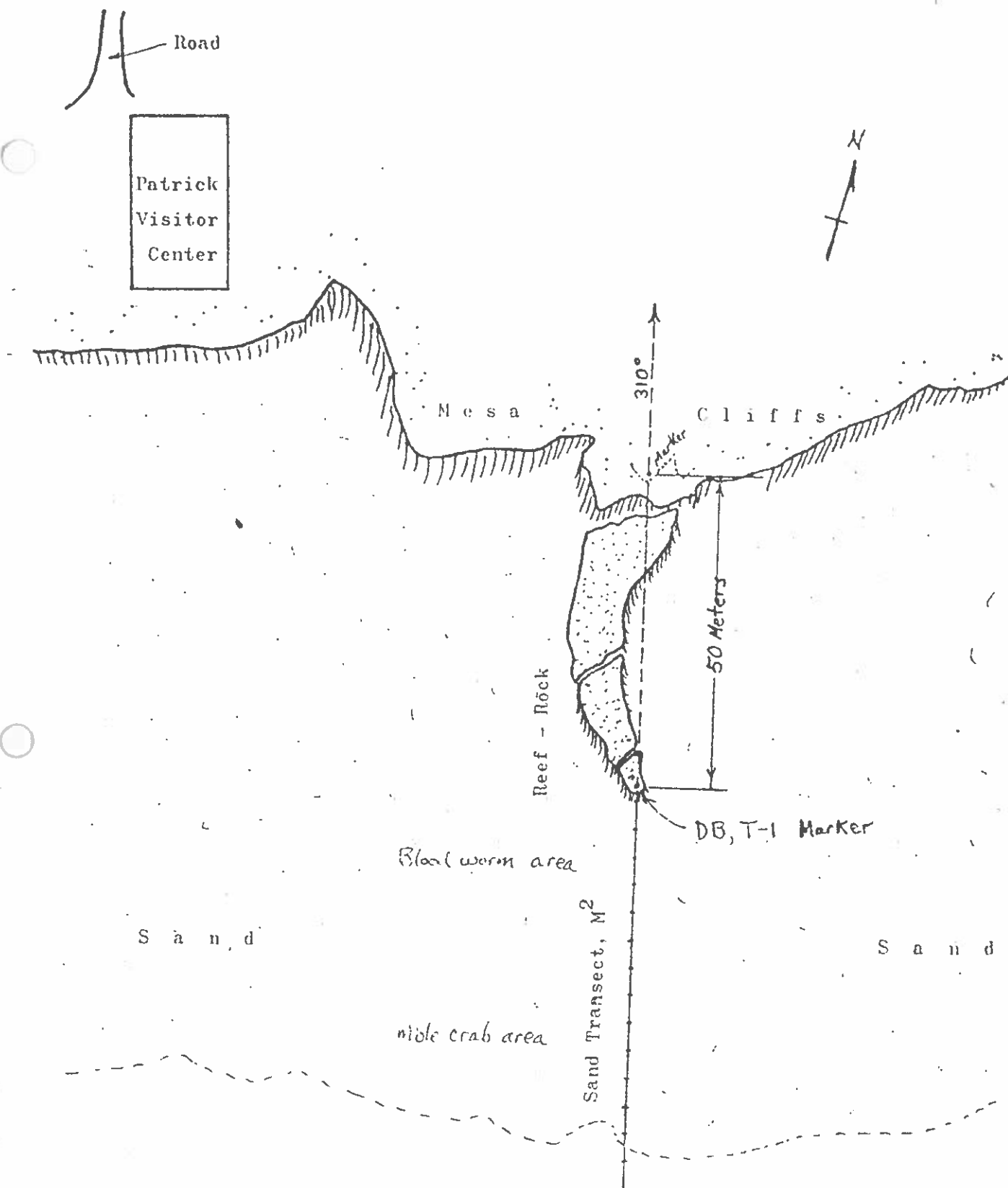
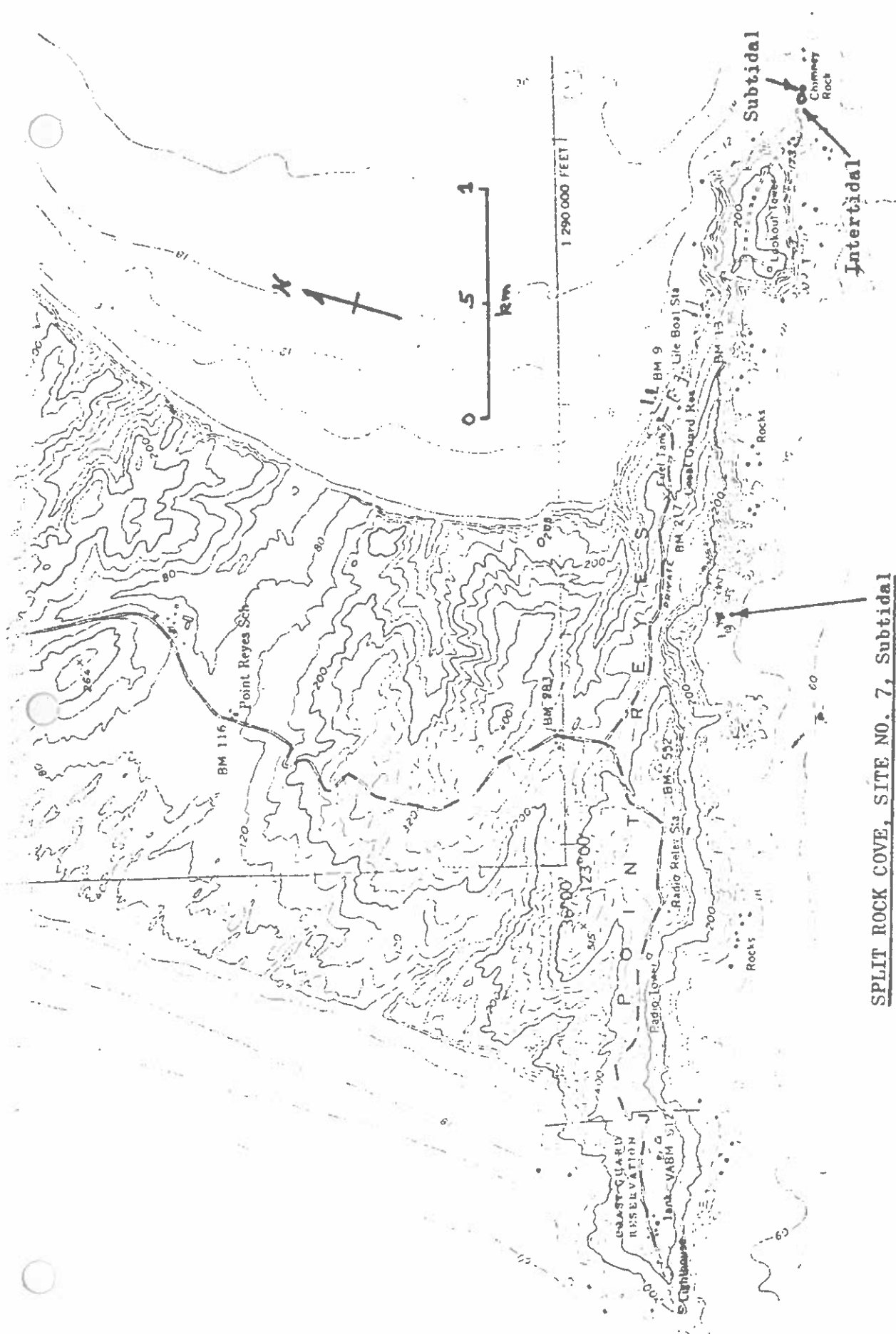


Figure 11. DRAKES BEACH TRANSECT, SITE NO. 5
 (not drawn to scale)



SPLIT ROCK COVE, SITE NO. 7, Subtidal

CHIMNEY ROCK, SITE NO. 6

Figure 12. POINT REYES HEADLAND

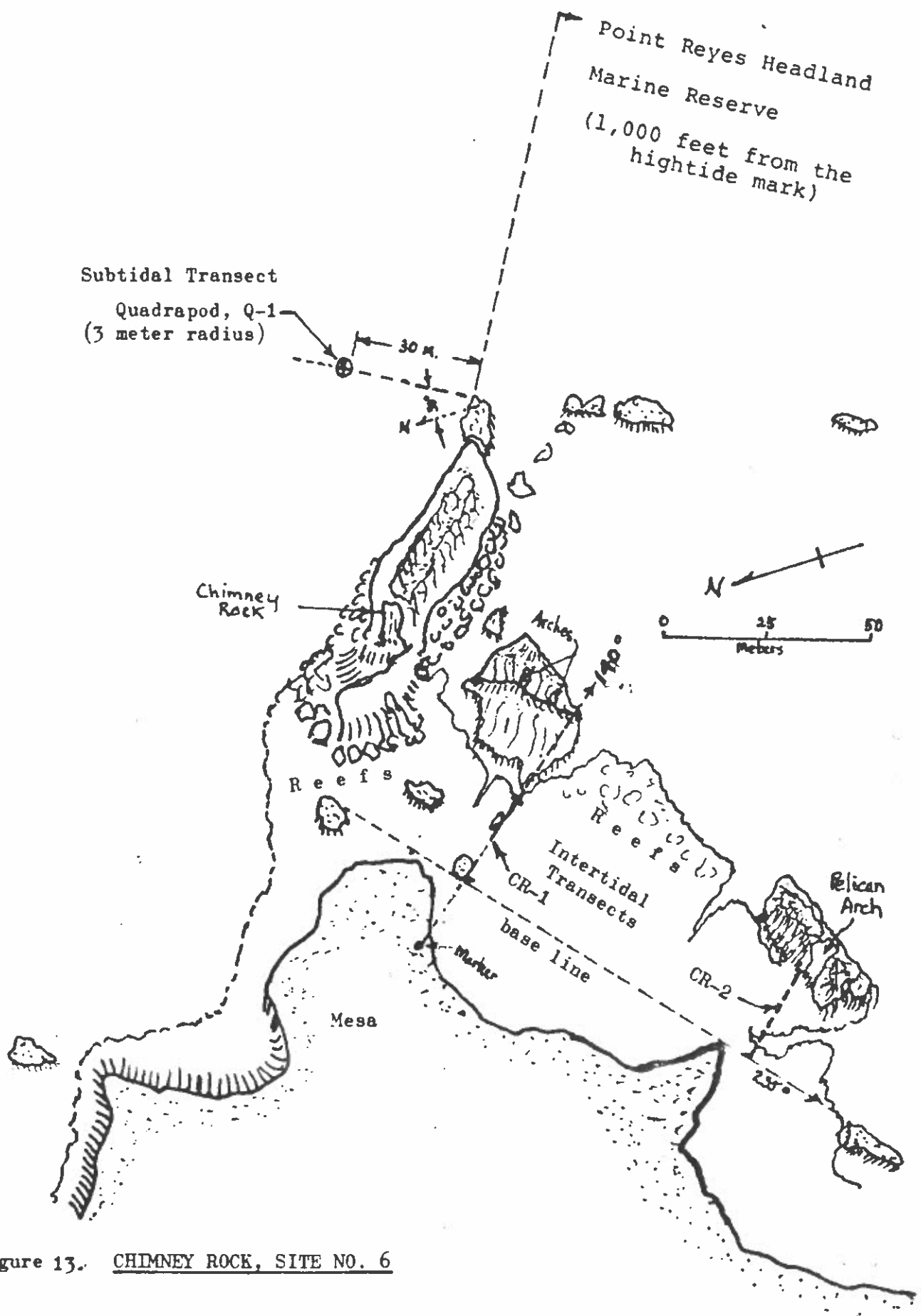


Figure 13. CHIMNEY ROCK, SITE NO. 6

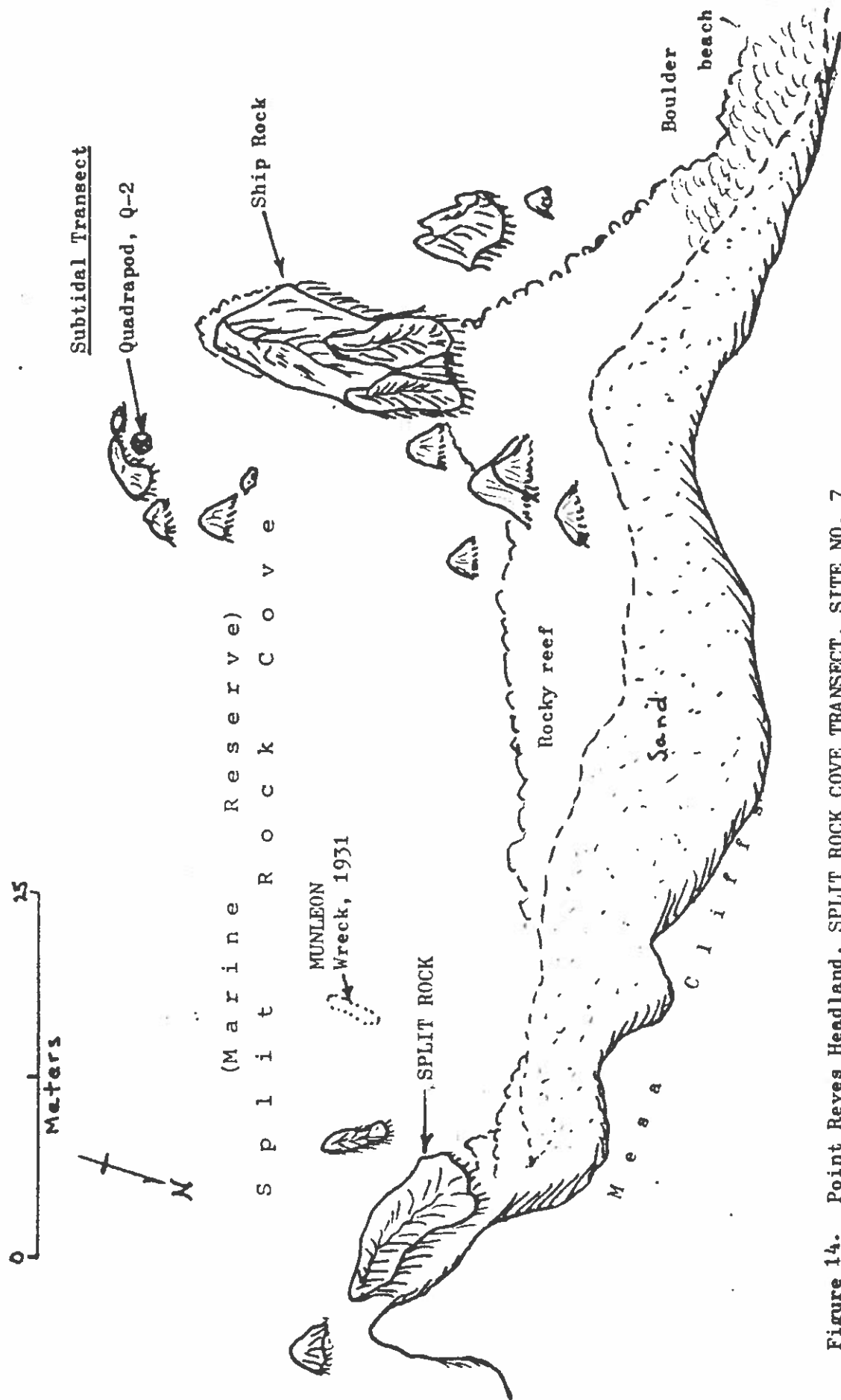
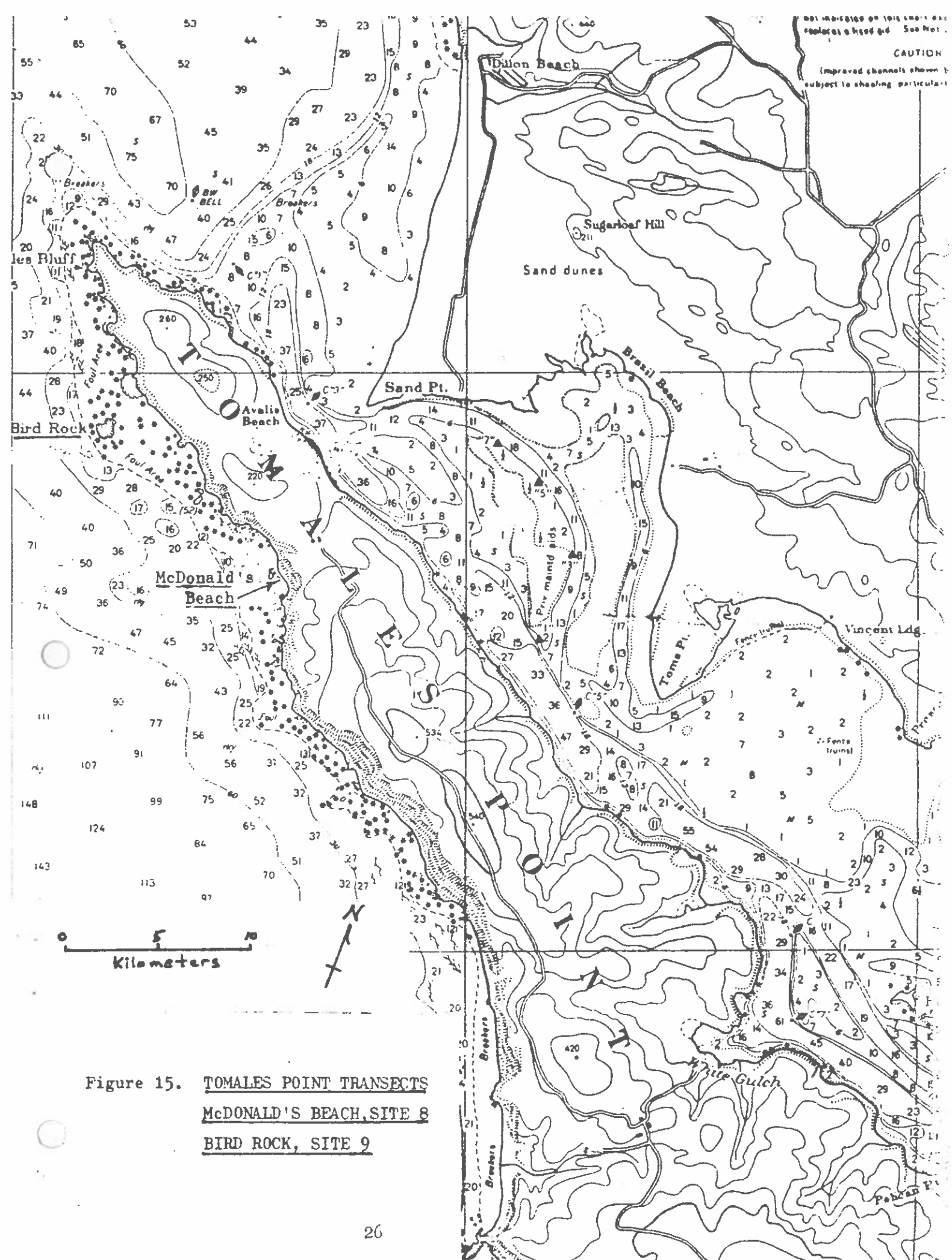


Figure 14. Point Reyes Headland, SPLIT ROCK COVE TRANSECT, SITE NO. 7



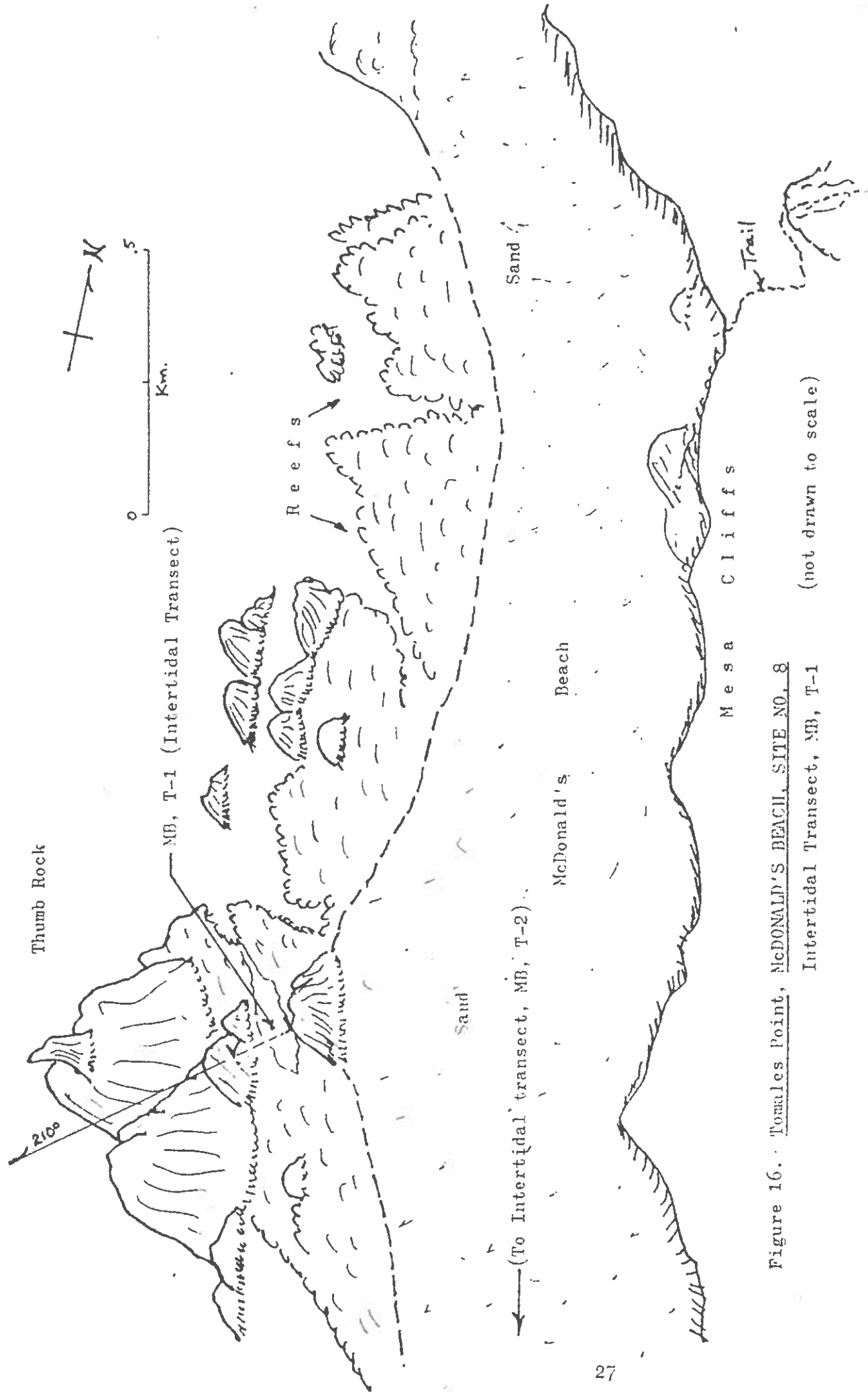


Figure 16. Tomales Point, McDonald's Beach, SITE NO. 8

0 .5
km.



(former Big Pipe casing)

Surveys of abalone, Haliotis rufescens
(in channels)

Window Rock Arch

a. b. c.

Cap Rock
w/ ice plants

to MB, T-1

Channel

Reefs

Intertidal
Transect MB, T-2

Saddle Rock Trail

Sand
Mesa
Cliffs

Figure 17. TORRELES POINT, McDONALD'S BEACH, SITE NO. 8 (not drawn to scale)

Intertidal Transect, MB, T-2

Surveys of Haliotis rufescens in channels

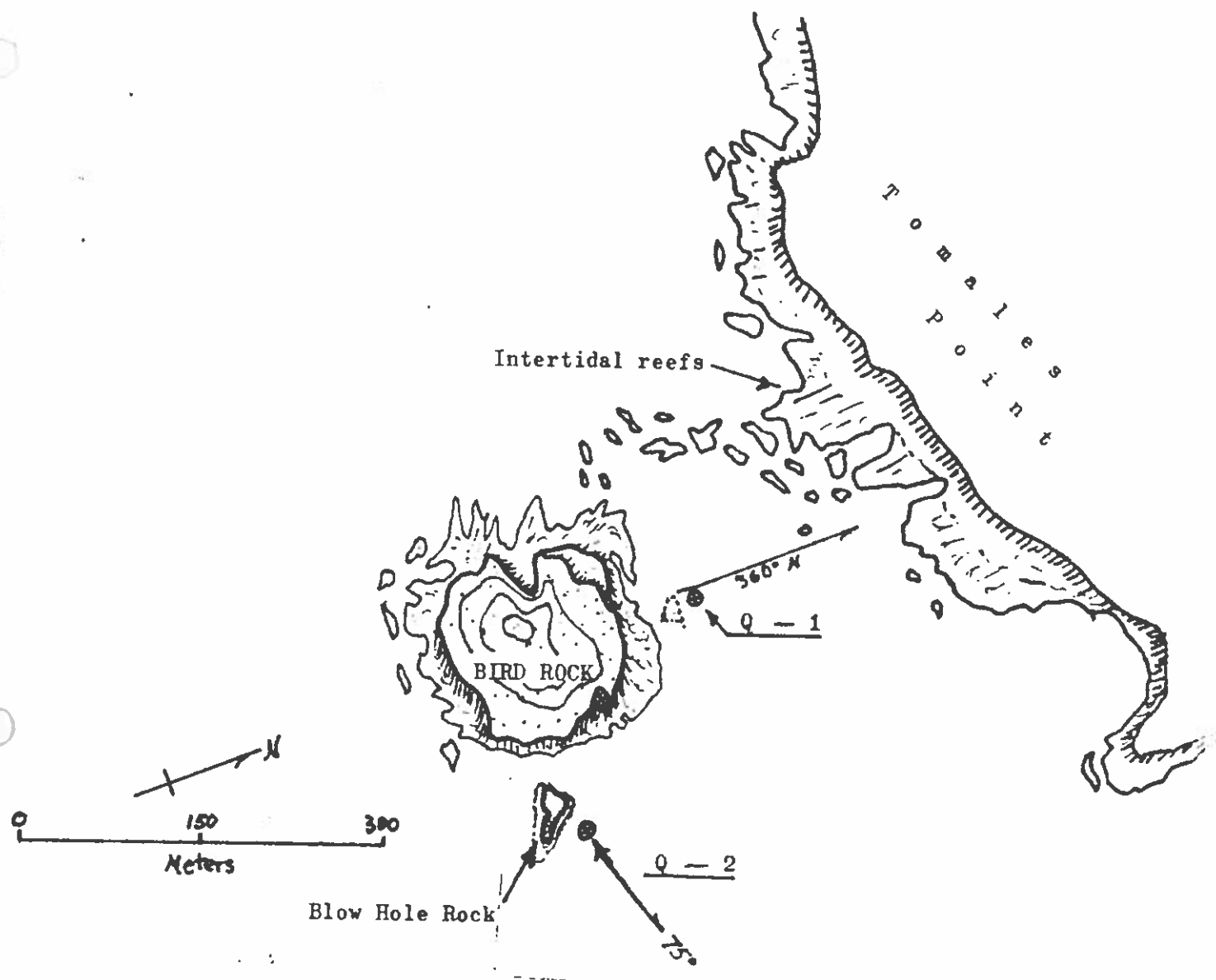


Figure 18. Tomales Point, BIRD ROCK, SITE NO. 9

Subtidal transect, Quadrapod, Q -1

Quadrapod, Q -2

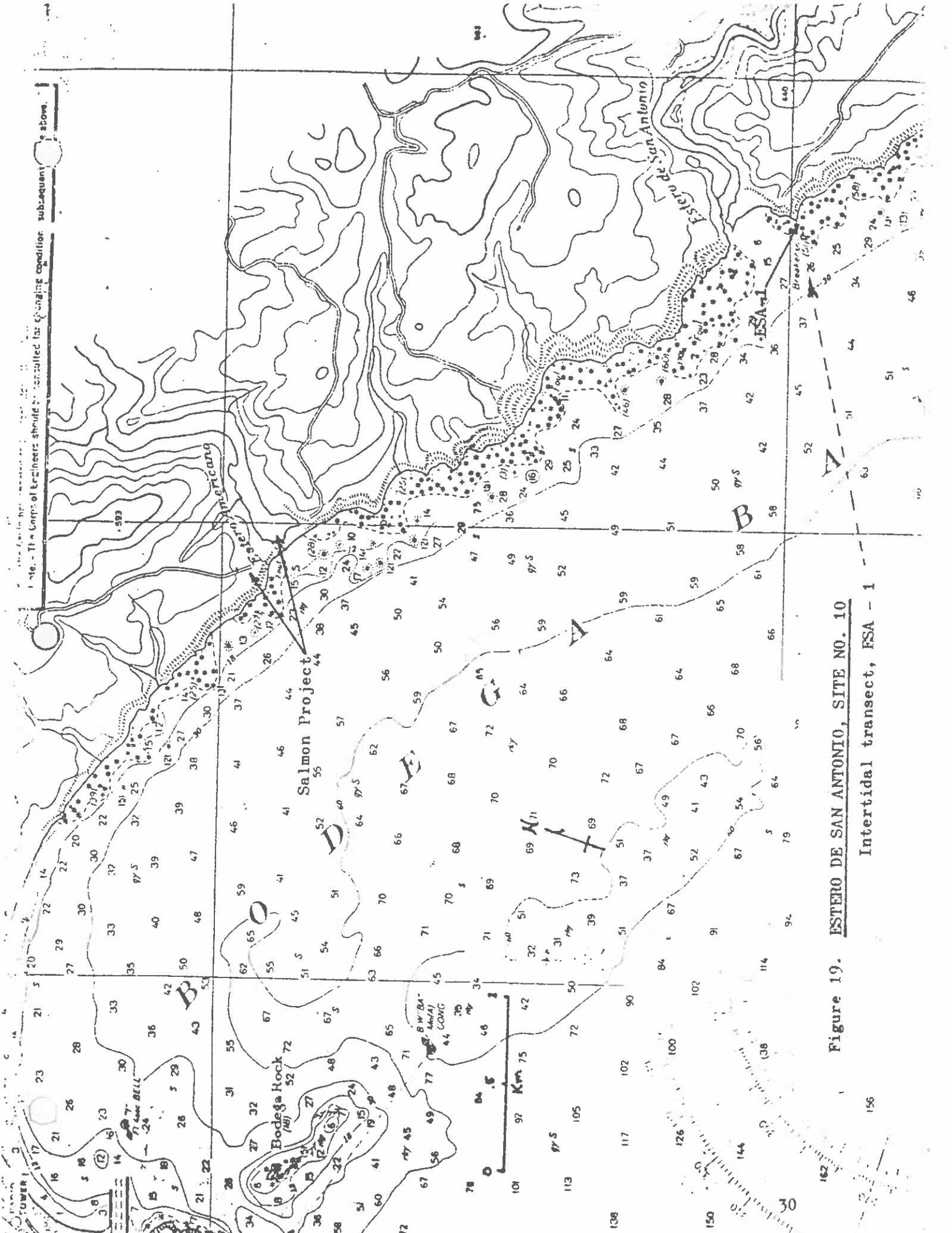


Figure 19. ESTERO DE SAN ANTONIO, SITE NO. 10
Intertidal transect, FSA - 1

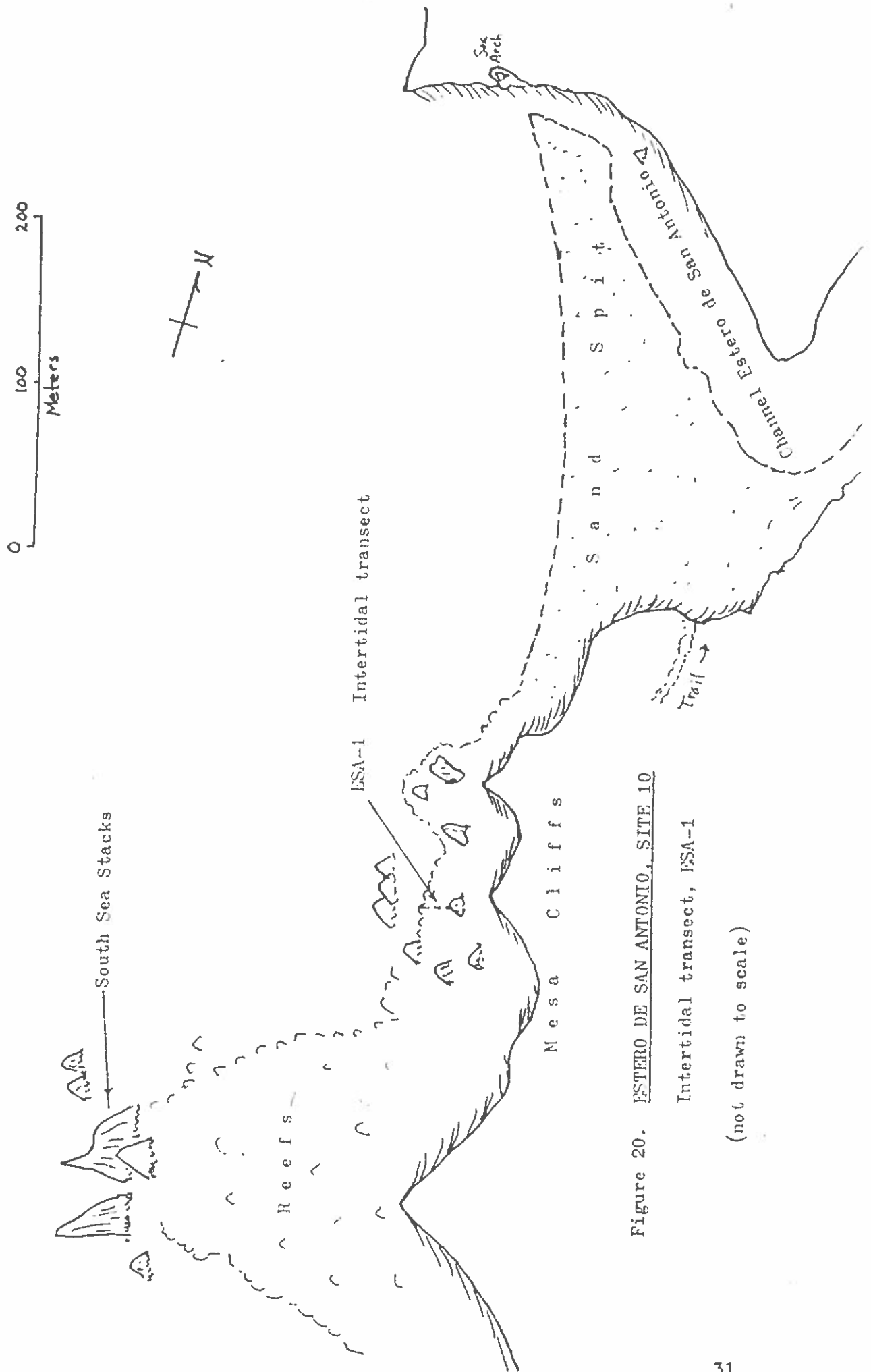


Figure 20. ESTERO DE SAN ANTONIO, SITE 10

Intertidal transect, ESA-1

(not drawn to scale)