Shoreline Vegetation Maps on Herring Spawning Grounds in the Upper West Coast of Vancouver Island

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SHORELINE VEGETATION MAPS ON HERRING SPAWNING GROUNDS IN THE UPPER WEST COAST OF VANCOUVER ISLAND

by

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PREFACE

After the development of methods in 1973 and 1974, a project was initiated at the Pacific Biological Station in Nanaimo to map the shoreline marine vegetation on herring spawning grounds from aerial photographs. Below are listed the geographical areas included in this project, the year of photography and the state of completion of mapping. Completed maps have been published as Canadian Manuscript Reports for Fisheries and Aquatic Sciences and MS numbers are given where applicable.

	Year of photography	Mapping-state of completion
STRAIT OF GEORGIA		
Comox Harbour to Deep Bay	1979	complete (MS 1617)
Denman and Hornby islands	1979	complete (MS 1617)
Deep Bay to Dorcas Point	1979	complete (MS 1485)
Dorcas Point to Departure Bay	1975	complete (MS 1408)
Dodd Narrows to Ladysmith Harbour	1977	complete (MS 1534)
Thetis and Kuper islands	1977	complete (MS 1534)
Ganges and Long harbours	1975	complete (MS 1408)
Prevost Island	1975	complete (MS 1408)
WEST COAST OF VANCOUVER ISLAND		
Forward Inlet	1981	complete (this MS)
Quatsino Sound	1981	complete (this MS)
Holberg Inlet	1981	complete (this MS)
Klaskino and Klaskish inlets	1981	complete (this MS)
Nuchatlitz Inlet	1976	complete (MS 1430)
Nootka Sound	1976	complete (MS 1430)
Hesquiat Harbour	1976	complete (MS 1430)
Clayoquot Sound	1978	complete (MS 1536)
Barkley Sound	1974, 1978	complete (MS 1549)
CENTRAL COAST		
Laredo Sound	1979	complete (MS 1580)
Thompson Bay	1979	complete (MS 1579)
Kildidt Sound	1979	complete (MS 1592)
NORTH COAST		
Port Simpson to Big Bay	1980	complete (MS 1660)
Kitkatla Inlet	1980	complete (MS 1664)
QUEEN CHARLOTTE ISLANDS		
Cumshewa Inlet	1979	complete (MS 1619)
Skincuttle Inlet	1982	In preparation

ABSTRACT

Haegele, C. W. and M. J. Hamey. 1987. Shoreline vegetation maps on herring spawning grounds in the upper west coast of Vancouver Island. Can. MS Rep. Fish. Aquat. Sci. 1921: 43 p.

Shoreline vegetation maps of marine algae and sea grasses were developed for the upper west coast of Vancouver Island from 1:6000 photographic scale 23-cm format colour and colour infrared diapositives. The areas mapped were Quatsino Sound and Forward, Holberg, Klaskino and Klaskish inlets. The observed presence of five vegetation types is presented in 18 detailed figures.

RÉSUMÉ

Haegele, C. W. and M. J. Hamey. 1987. Shoreline vegetation maps on herring spawning grounds in the upper west coast of Vancouver Island. Can. MS Rep. Fish. Aquat. Sci. 1921: 43 p.

Pour la côte ouest supérieure de l'île de Vancouver, les auteurs ont élaboré des cartes de la végétation littorale composée d'algues marines et de zostères à partir de diapositives de 23 cm en couleurs et en couleurs à l'infra-rouge (échelle photographique: 1:6000). Les endroits cartographiés sont la baie Quatsino et les inlets Forward, Holberg, Klaskino et Klaskish. Les cinq types de végétation observés sont présentés dans 18 figures détaillées.

INTRODUCTION

Pacific herring deposit adhesive eggs on rooted algae and sea grasses in the littoral and upper sub-littoral zone. These spawns are surveyed annually to provide estimates of egg deposition and, hence, stock size (Haegele and Schweigert 1987, Haist et al. 1986). Maps of marine vegetation, obtained from aerial photographs, are used by fishery officers to survey and record the spawns, and on diving surveys to determine the area of spawns.

The subject of this report is vegetation maps for the upper west coast of Vancouver Island (50°10'N to 50°38'N and 127°39'W to 128°05'W).

METHODS

Vertical aerial photographs of 23 cm format at a photo scale of 1:6000 were acquired with a Wild RC10 camera with a 152 mm focal length lens mounted in a Cessna 180 fixed wing aircraft flying at an altitude of 914 m. There were 16 flight lines with parallel flight lines at 20% lateral overlap (Fig. 1). Forward overlap between frames was 60%. Photography was with Kodak Ektachrome MS Aerographic No. 2448 (COL) film and Kodak Aerochrome Infrared No. 2443 (CIR) film, both of which are colour positive films. A clear (420 nm) filter was used with the COL film and a medium yellow (525 nm) filter was used with the CIR film.

The shoreline marine vegetation was mapped at the scale of photography. Canadian Hydrographic Service Chart No. 3617 and 3680, at scales of 1:48,662 and 1:38,317 respectively, were used as base maps and enlarged to photo scale with a reflecting projector.

Exposed vegetation was identified from the CIR diapositives by colour and texture, employing criteria developed in earlier work (Haegele 1975). Briefly, grasses appear pinkish red with a smooth to fluffy texture; rockweed is crimson with a rough texture; kelp and other brown algae are bright magenta with a smooth to fluffy texture; and red algae are light red with a rough texture. Submerged vegetation was mapped from the COL diapositives. Texture is the main criterion of recognition because the colour information is confined to the narrow spectral range of dark green to light brown. Against a light background of sand, vegetation can be discerned to depths of 10 m in the absence of surface reflection.

RESULTS AND DISCUSSION

The COL imagery was obtained between 1126 and 1234 PST and the CIR imagery between 1315 and 1413 PST on April 26, 1981, for which day the predicted low tide was 1.2 m at 1136 PST. Both COL and CIR imagery was obtained for Forward Inlet (flight line 1 to 4, 13 and 14), Quatsino Sound (flight line 5), Klaskino Inlet (flight line 8 to 10 and 15), and for flight line 11 in Klaskish Inlet (Fig. 1). Only COL imagery was obtained on flight line 6 in Holberg Inlet and flight line 16 in Klaskish Inlet, and only CIR imagery was obtained on flight line 7 and 12 in Holberg Inlet (Fig. 1). There were 210 COL and 225 CIR photographs obtained.

The study area was segmented into 18 maps of equal size (64 cm by 82 cm), each portraying an area of 18.9 km^2 at a photo scale of 1:6000 (Fig. 2). The vegetation, as mapped from the photographs, is presented in Figures 3 to 20. Each map shows the occurrence of vegetation by type (sea grasses; rockweed; red algae; brown algae, which includes the giant kelps; and green algae) and nearshore depth contours (0, 1, 3, 5, 10, and 20 fm). The published maps have been reduced photographically to a map scale of 1:23,000.

The vegetation has not been field checked with diving surveys, but no discrepancies were apparent between mapped vegetation and observations made on diving surveys of herring spawn in Klaskish Inlet in 1985 and Forward Inlet in 1985 and 1986 (Haegele and Schweigert 1986, 1987).

ACKNOWLEDGMENTS

We would like to thank T. Rutherford and R. Webb of Integrated Resources Photography Ltd. for obtaining the photographs (Contract No. 04GZ.FP712-1-6694). Much of the mapping was made possible through funding by the Fisheries Resource Employment Development (F.R.E.D.) program in 1985.

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Haegele, C. W. 1975. Vegetation mapping of herring spawning grounds in British Columbia. Ocean 75 Record. IEEE Publication 750H0995-10EC. New York, N.Y. pp. 840-844.

Haegele, C. W. and J. F. Schweigert. 1986. Herring stock estimates from diving surveys of spawn on the west coast of Vancouver Island in 1986. Herring Stock Assessment Committee Working Paper H86-3: 35 p.

1987. Herring stock estimates from diving surveys of spawn for the west coast of Vancouver Island in 1985. Can. MS Rep. Fish. Aquat. Sci. (In press).

Haist, V., J. F. Schweigert and M. Stocker. 1986. Stock assessments for British Columbia herring in 1985 and forecasts of the potential catch in 1986. Can. MS Rep. Fish. Aquat. Sci. 1889: 48 p.

Fig. 1. Photographic flight lines for the upper west coast of Vancouver Island.

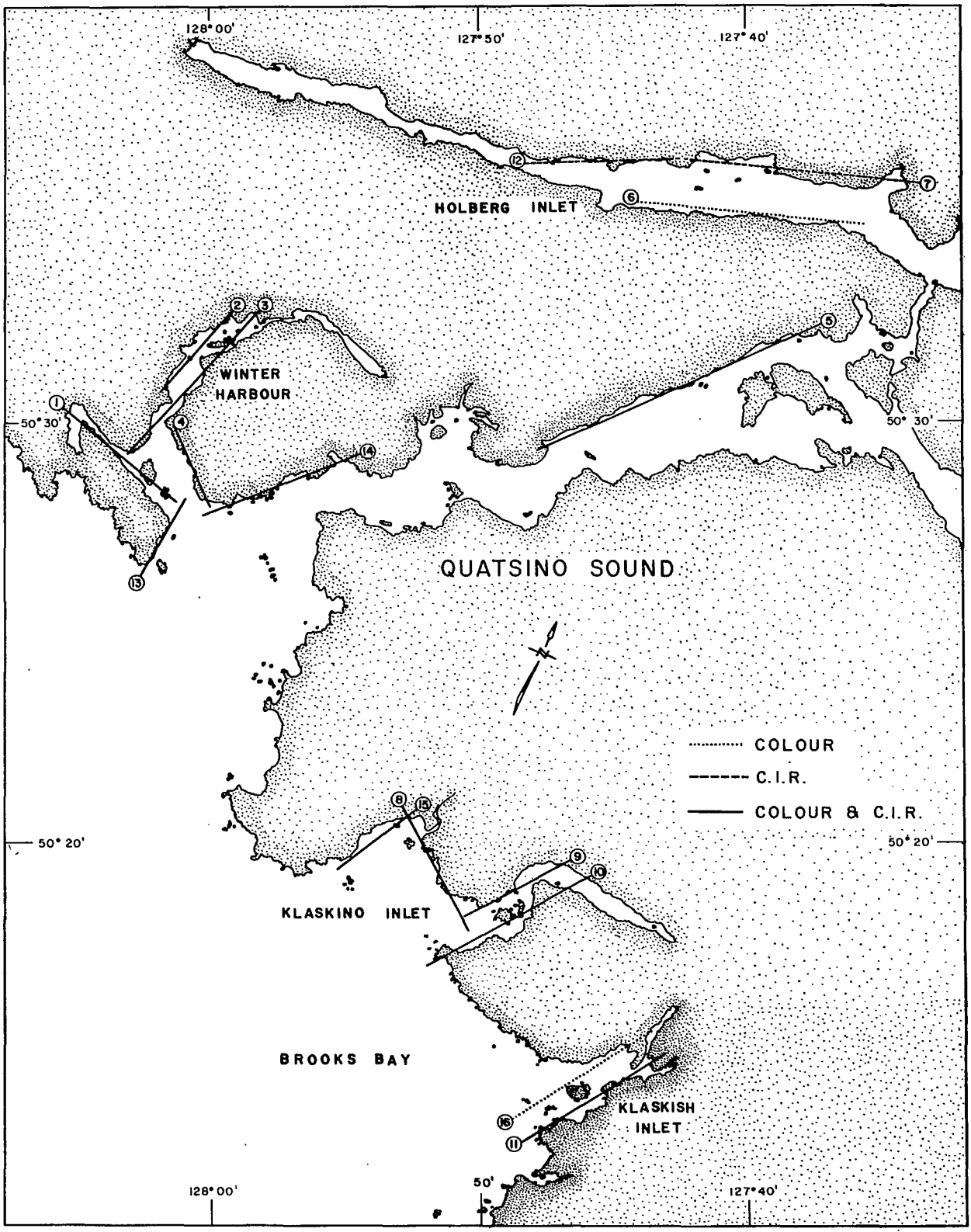

128° 00'
127° 50'
127° 40'
HOLBERG INLET
WINTER HARBOUR
50° 30'
QUATSINO SOUND
COLOUR
C.I.R.
COLOUR & C.I.R.
50° 20'
KLASKINO INLET
BROOKS BAY
KLASKISH INLET
50'

Fig. 2. Upper west coast of Vancouver Island shoreline segmented into large scale maps.

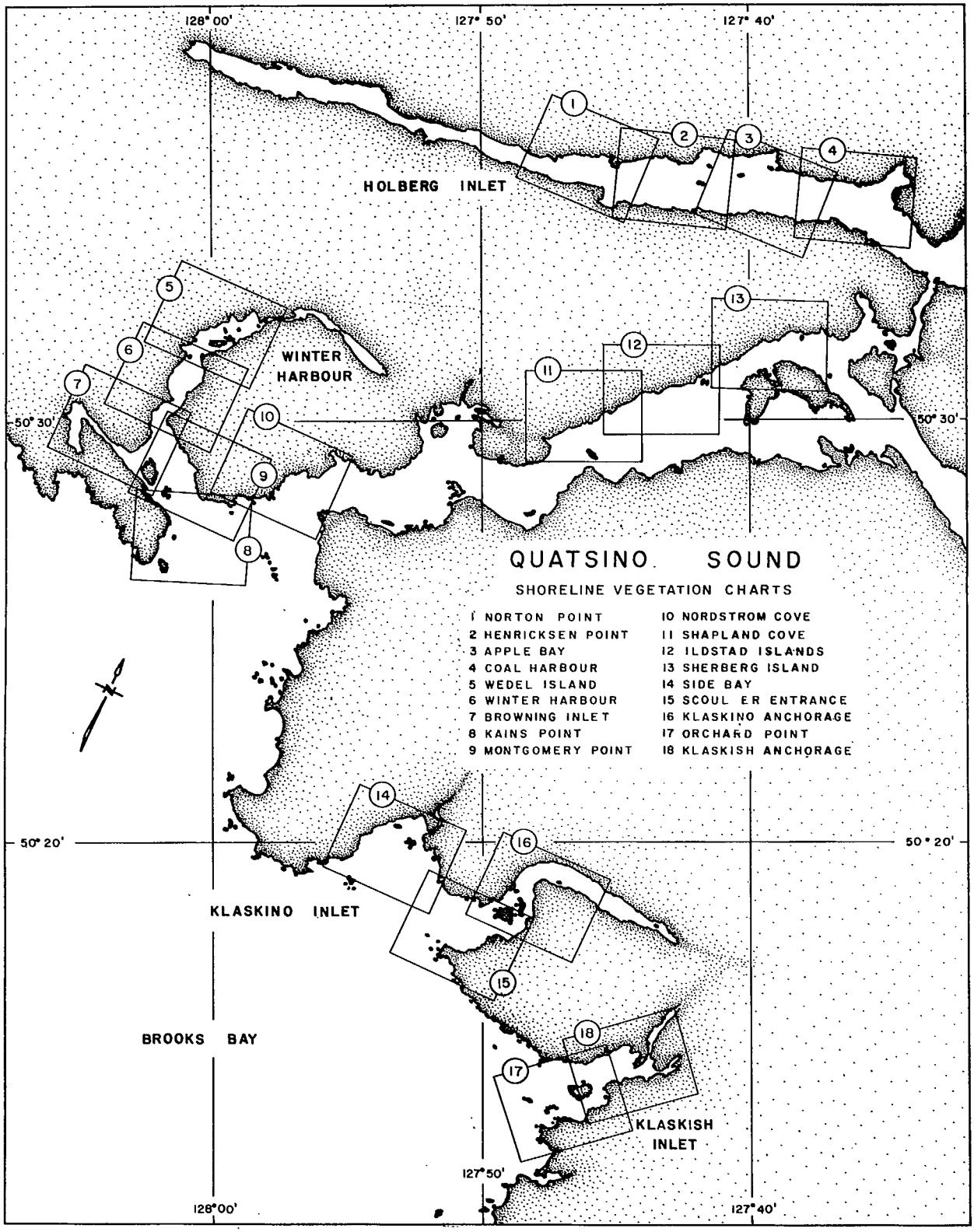

128° 00'
127° 50'
127° 40'
HOLBERG INLET
WINTER HARBOUR
50° 30'
50° 20'
KLASKINO INLET
BROOKS BAY
KLASKISH INLET
QUATSINO SOUND
SHORELINE VEGETATION CHARTS
1 NORTON POINT
2 HENRICKSEN POINT
3 APPLE BAY
4 COAL HARBOUR
5 WEDEL ISLAND
6 WINTER HARBOUR
7 BROWNING INLET
8 KAINS POINT
9 MONTGOMERY POINT
10 NORDSTROM COVE
11 SHAPLAND COVE
12 ILDSTAD ISLANDS
13 SHERBERG ISLAND
14 SIDE BAY
15 SCOUL ER ENTRANCE
16 KLASKINO ANCHORAGE
17 ORCHARD POINT
18 KLASKISH ANCHORAGE

Fig. 3. Shoreline vegetation map from aerial photographs for Norton Point in Holberg Inlet (Map 1 in Fig. 2).

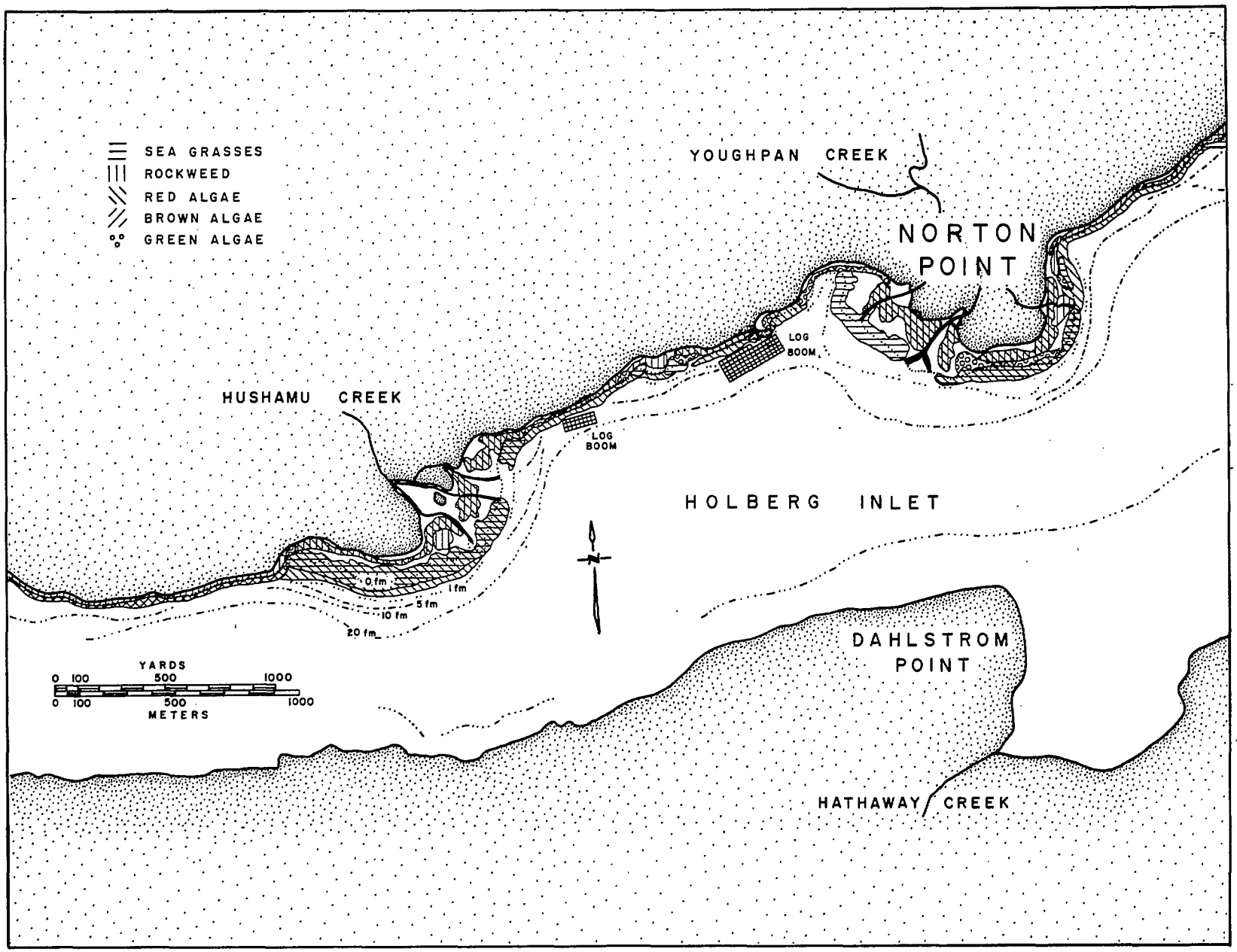

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YOUGHPAN CREEK
NORTON POINT
LOG BOOM
LOG BOOM
HUSHAMU CREEK
HOLBERG INLET
0 fm
1 fm
5 fm
10 fm
20 fm
YARDS
0 100 500 1000
0 100 500 1000
METERS
DAHLSTROM POINT
HATHAWAY CREEK

Fig. 4. Shoreline vegetation map from aerial photographs for Henricksen Point in Holberg Inlet (Map 2 in Fig. 2).

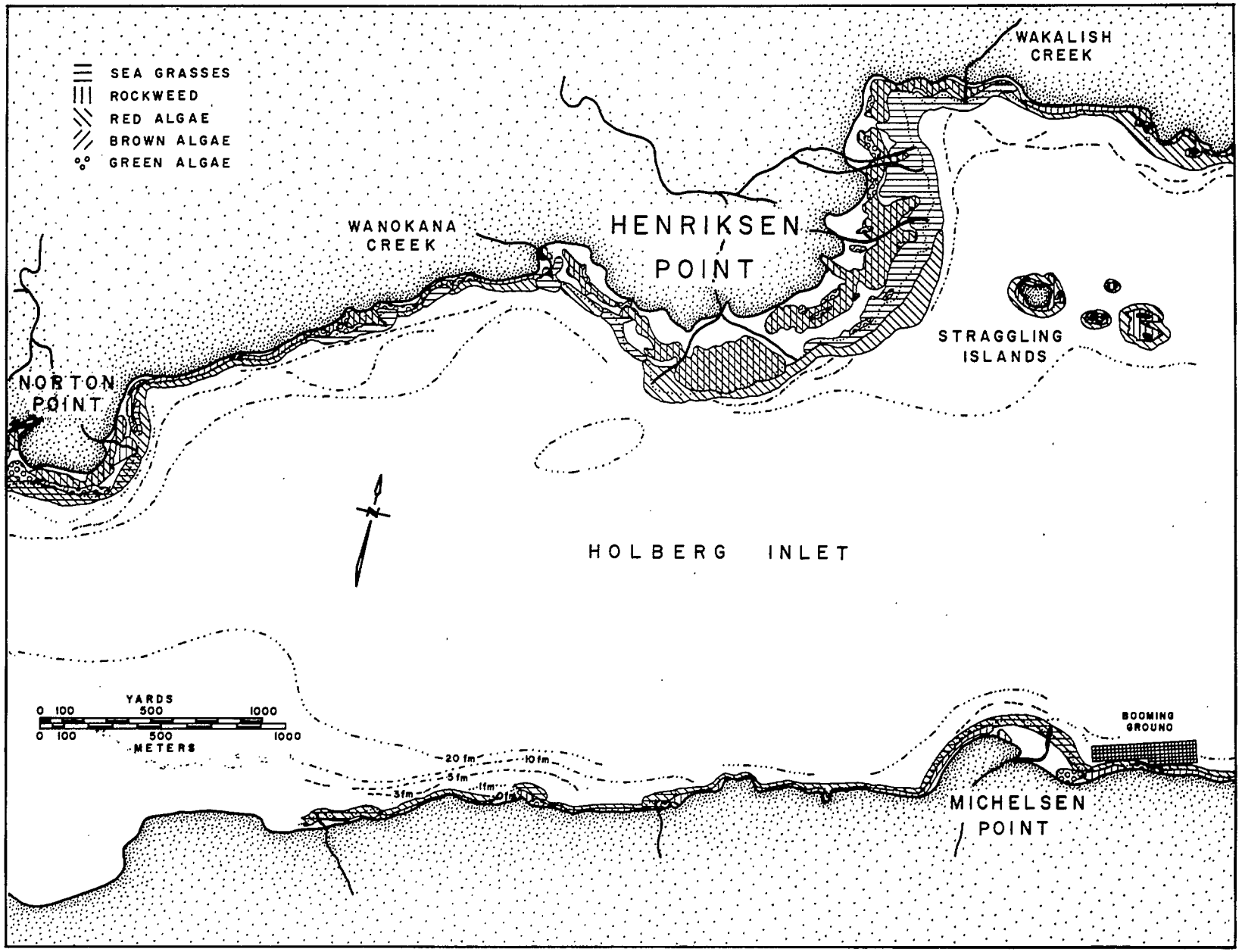

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
WAKALISH CREEK
WANOKANA CREEK
HENRIKSEN POINT
STRAGGLING ISLANDS
NORTON POINT
HOLBERG INLET
YARDS
0 100 500 1000
0 100 500 1000
METERS
20 fm
10 fm
5 fm
3fm
1fm
0fm
BOOMING GROUND
MICHELSEN POINT

Fig. 5. Shoreline vegetation map from aerial photographs for Apple Bay in Holberg Inlet (Map 3 in Fig. 2).

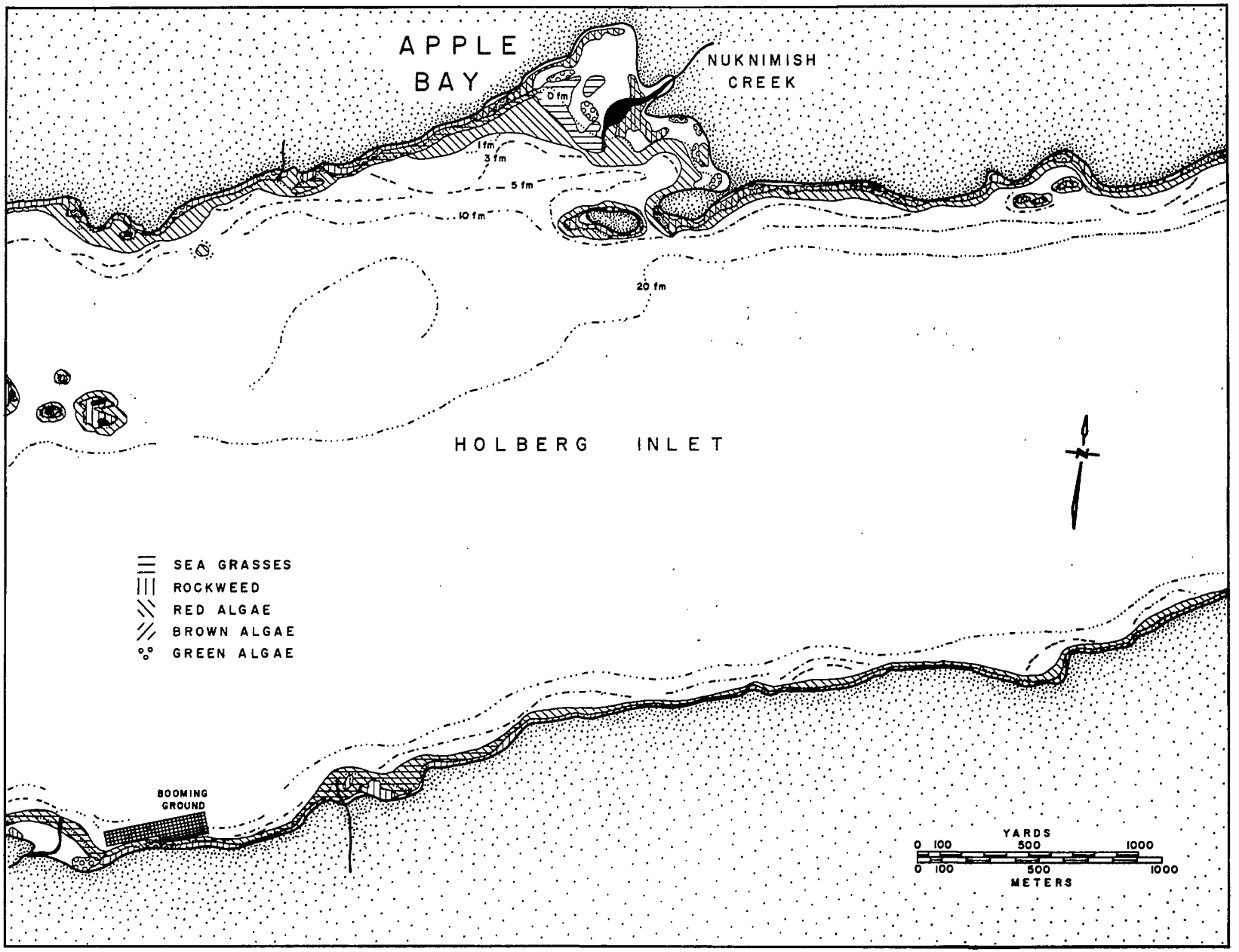
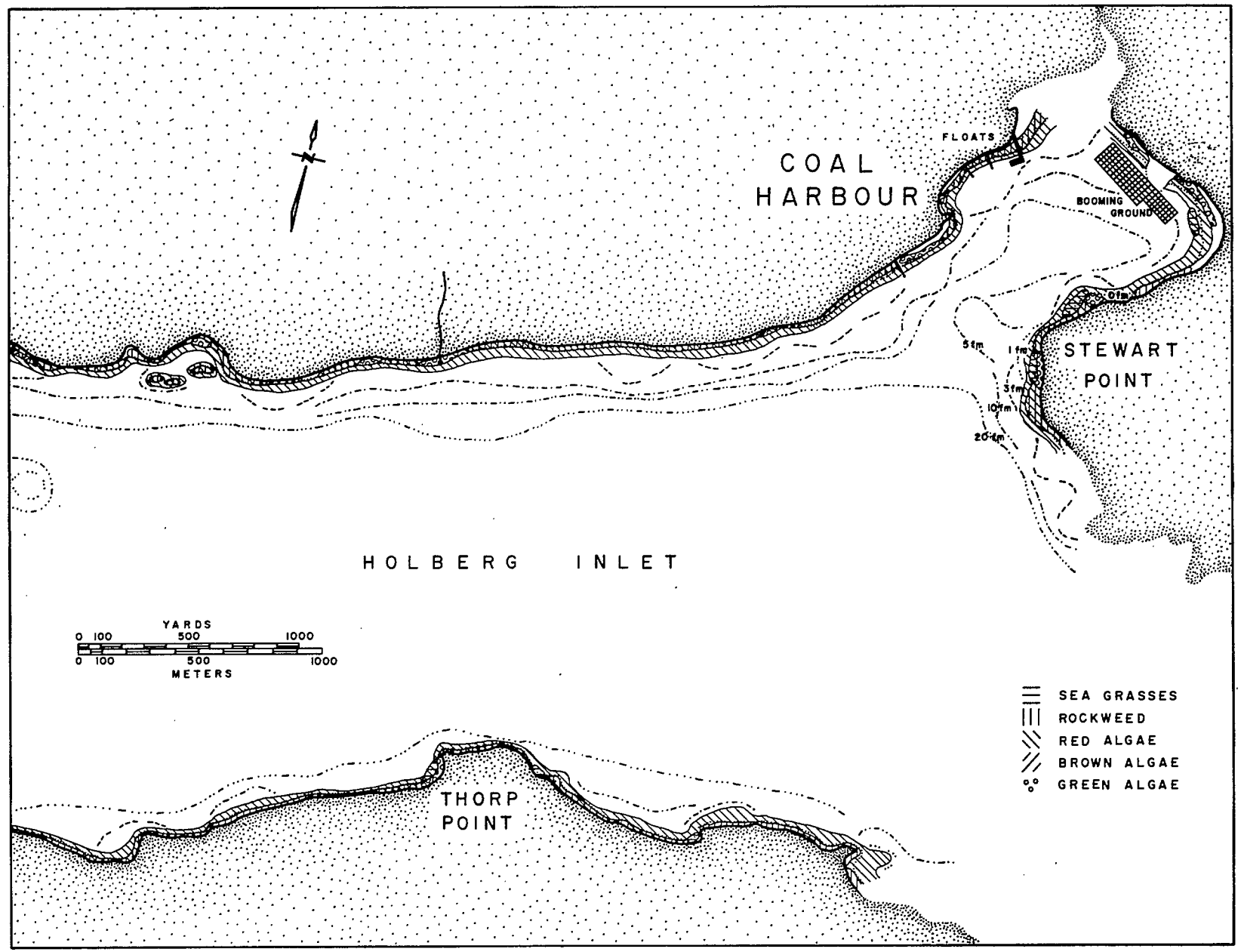

APPLE
BAY
NUKNIMISH
CREEK
0 fm
1 fm
3 fm
5 fm
10 fm
20 fm
HOLBERG INLET
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
BOOMING
GROUND
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 6. Shoreline vegetation map from aerial photographs for Coal Harbour in Holberg Inlet (Map 4 in Fig. 2).


COAL
HARBOUR
FLOATS
BOOMING
GROUND
STEWART
POINT
0fm
1fm
3fm
5fm
10fm
20fm
HOLBERG INLET
YARDS
0 100 500 1000
0 100 500 1000
METERS
THORP
POINT
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE

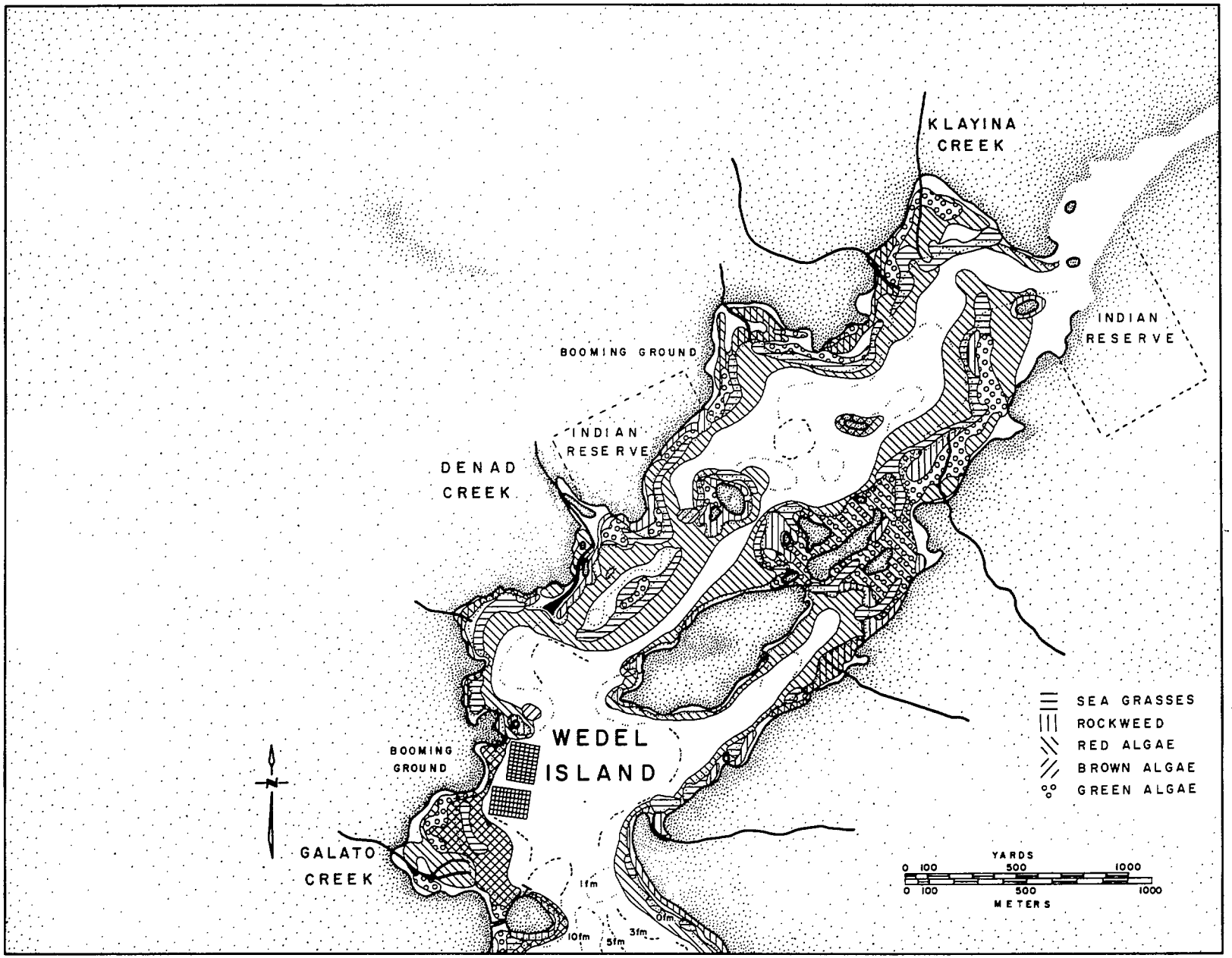

KLAYINA
CREEK
INDIAN
RESERVE
BOOMING GROUND
INDIAN
RESERVE
DENAD
CREEK
WEDEL
ISLAND
BOOMING
GROUND
GALATO
CREEK
1fm
10fm
5fm
3fm
0fm
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 8. Shoreline vegetation map from aerial photographs for Winter Harbour in Forward Inlet (Map 6 in Fig. 2).

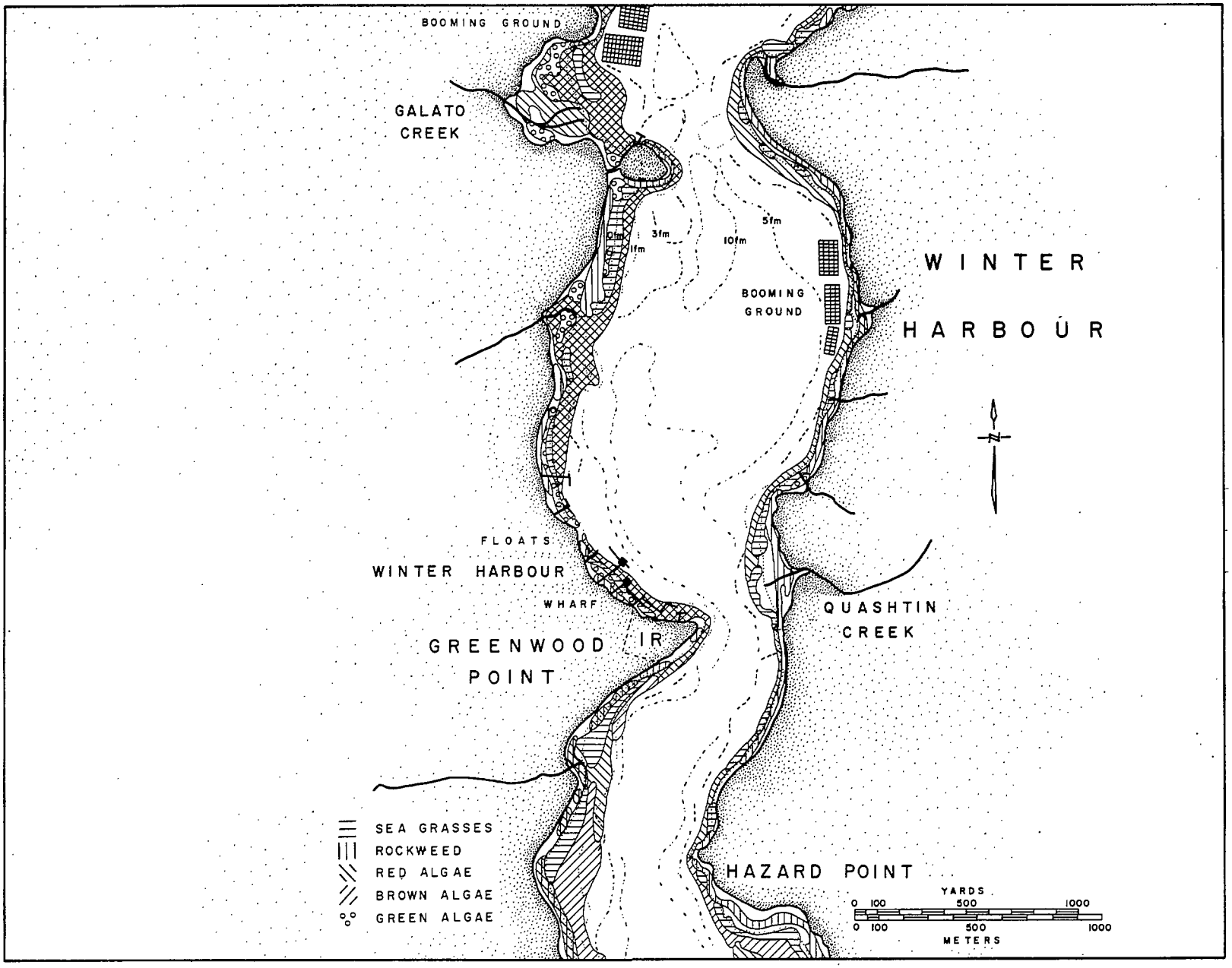

BOOMING GROUND
GALATO CREEK
3fm
1fm
5fm
10fm
BOOMING GROUND
WINTER HARBOUR
FLOATS
WINTER HARBOUR
WHARF
GREENWOOD IR POINT
QUASHTIN CREEK
HAZARD POINT
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 9. Shoreline vegetation map from aerial photographs for Browning Inlet in Forward Inlet (Map 7 in Fig. 2).

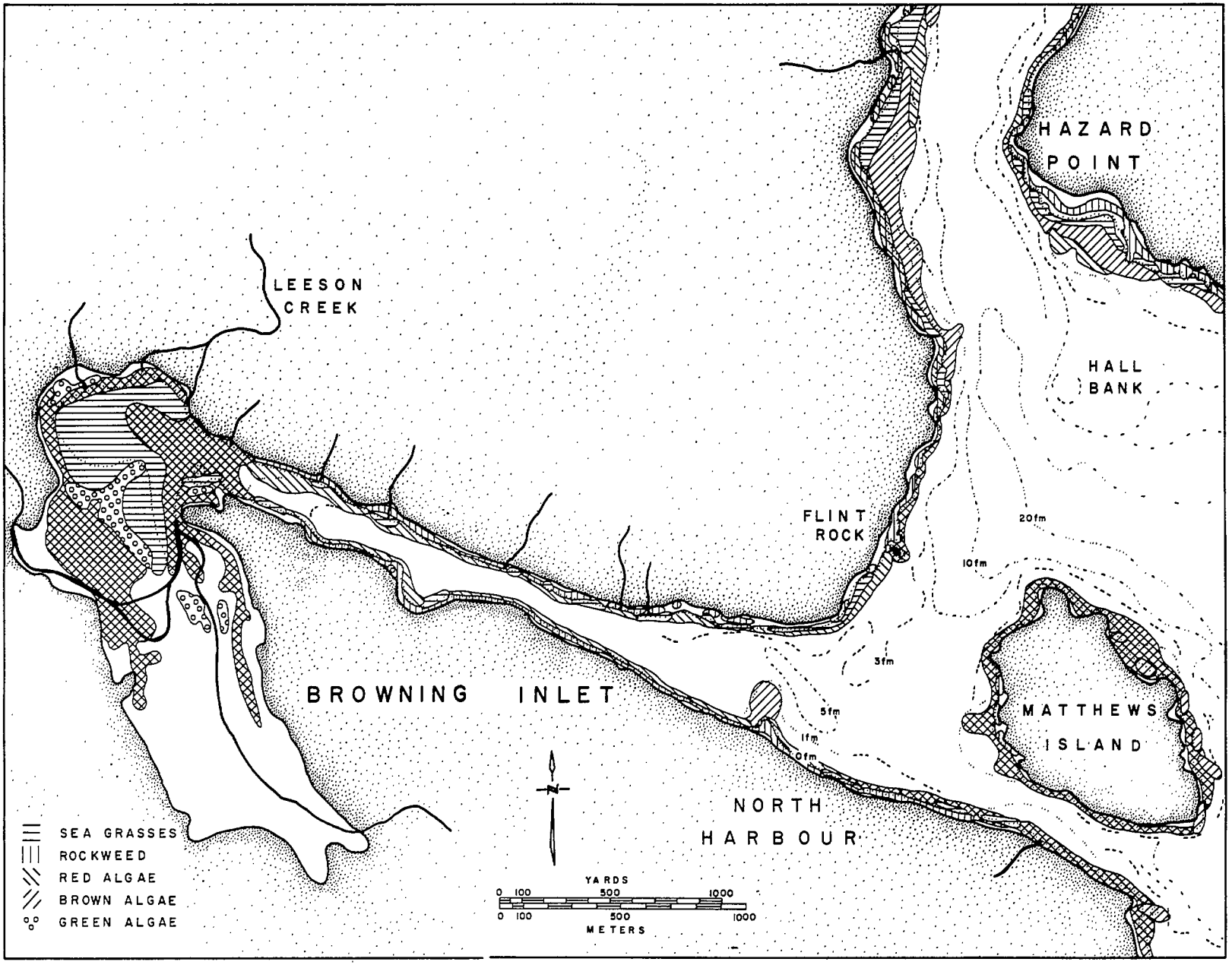

HAZARD
POINT
LEESON
CREEK
HALL
BANK
FLINT
ROCK
20fm
10fm
3fm
5fm
1fm
10fm
BROWNING INLET
MATTHEWS
ISLAND
NORTH
HARBOUR
N
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 10. Shoreline vegetation map from aerial photographs for Kains Point in Forward Inlet (Map 8 in Fig. 2).

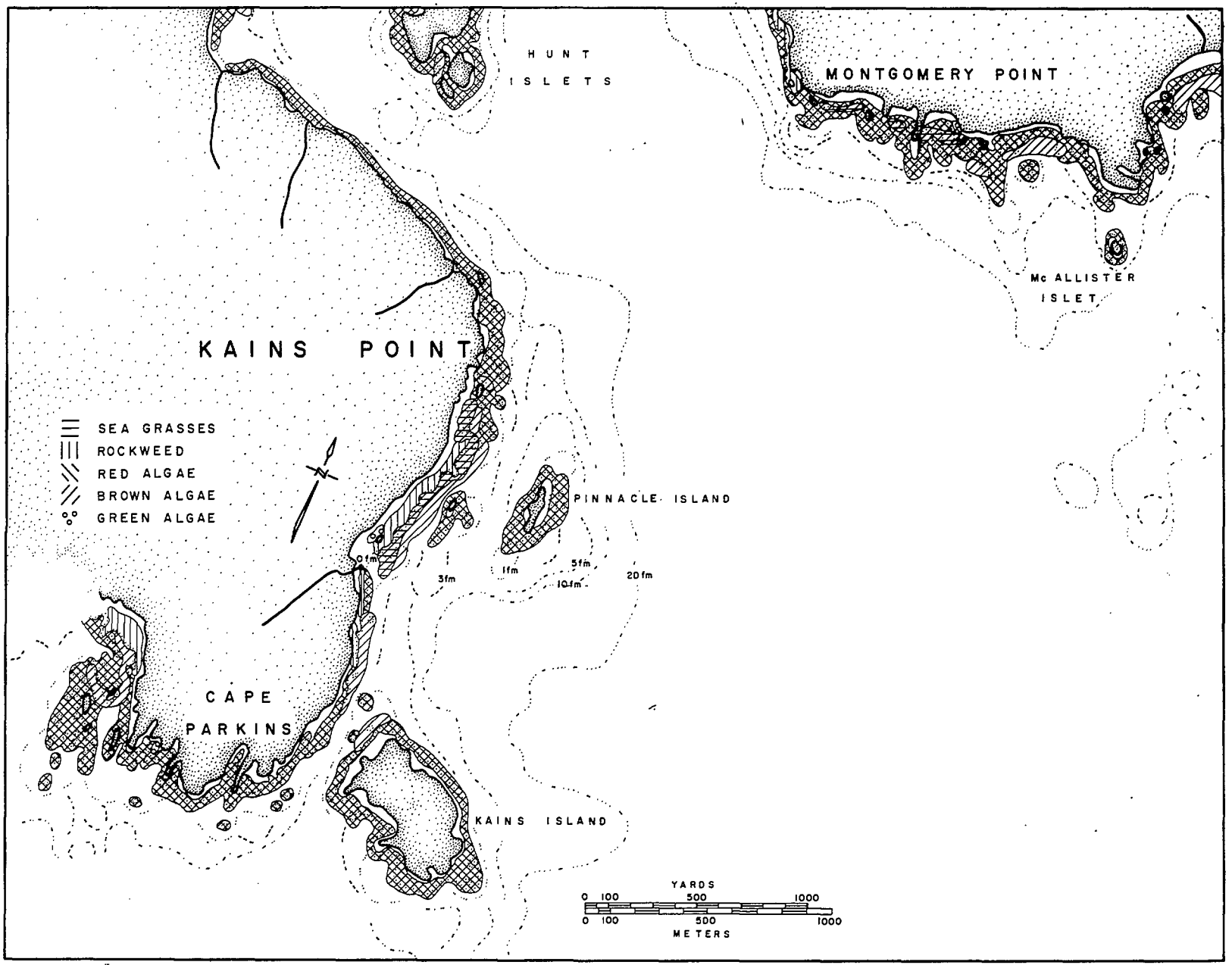

HUNT
ISLETS
MONTGOMERY POINT
Mc ALLISTER
ISLET
KAINS POINT
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
PINNACLE ISLAND
0fm
1fm
3fm
5fm
10fm
20fm
CAPE
PARKINS
KAINS ISLAND
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 11. Shoreline vegetation map from aerial photographs for Montgomery Point in Forward Inlet (Map 9 in Fig. 2).

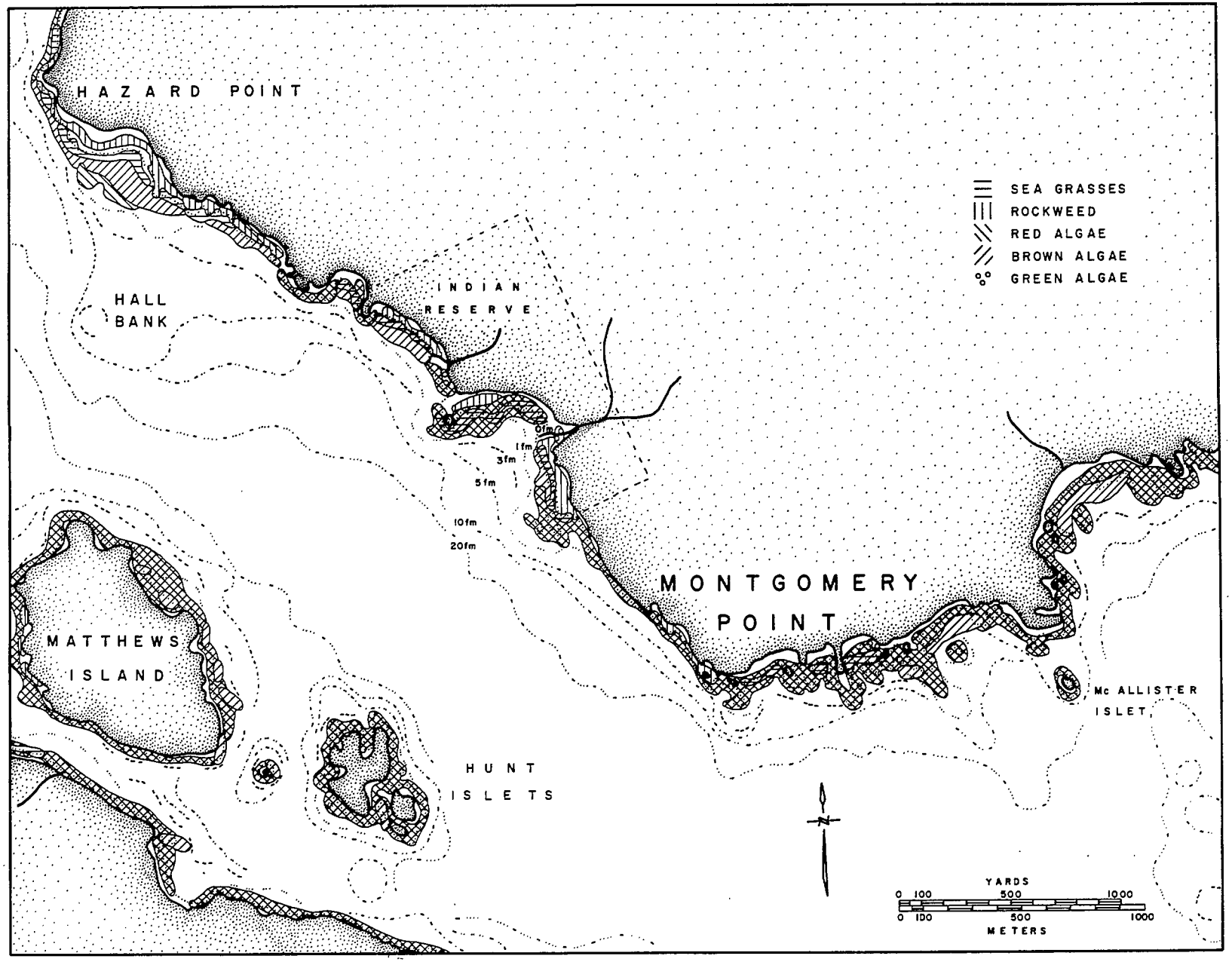

HAZARD POINT
HALL BANK
INDIAN RESERVE
0fm
1fm
3fm
5fm
10fm
20fm
MONTGOMERY POINT
MATTHEWS ISLAND
HUNT ISLETS
Mc ALLISTER ISLET
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
N
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 12. Shoreline vegetation map from aerial photographs for Nordstrom Cove in Forward Inlet (Map 10 in Fig. 2).

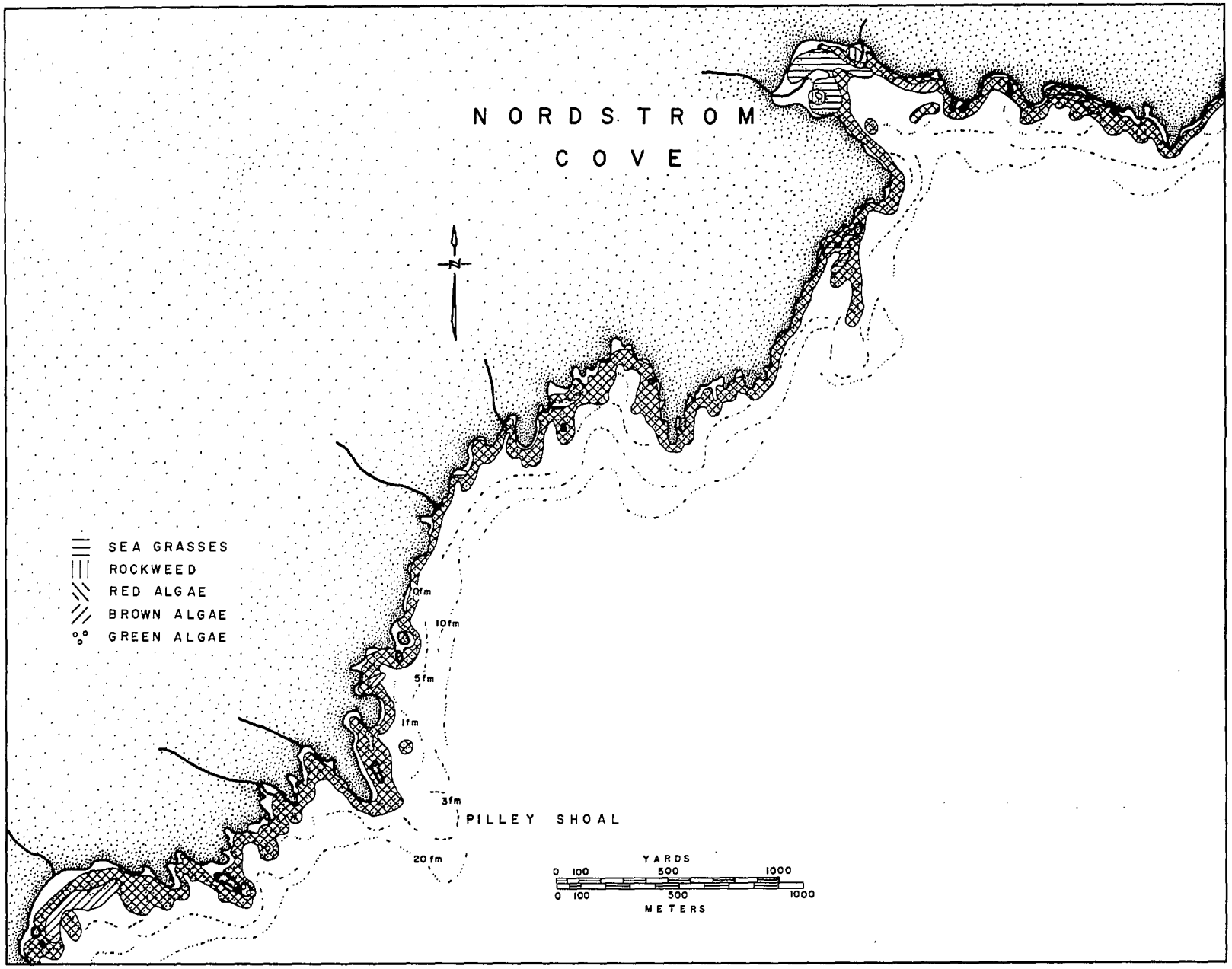

NORDSTROM
COVE
N
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
10fm
10fm
5fm
1fm
3fm
PILLEY SHOAL
20fm
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 13. Shoreline vegetation map from aerial photographs for Shapland Cove in Quatsino Sound (Map 11 in Fig. 2).

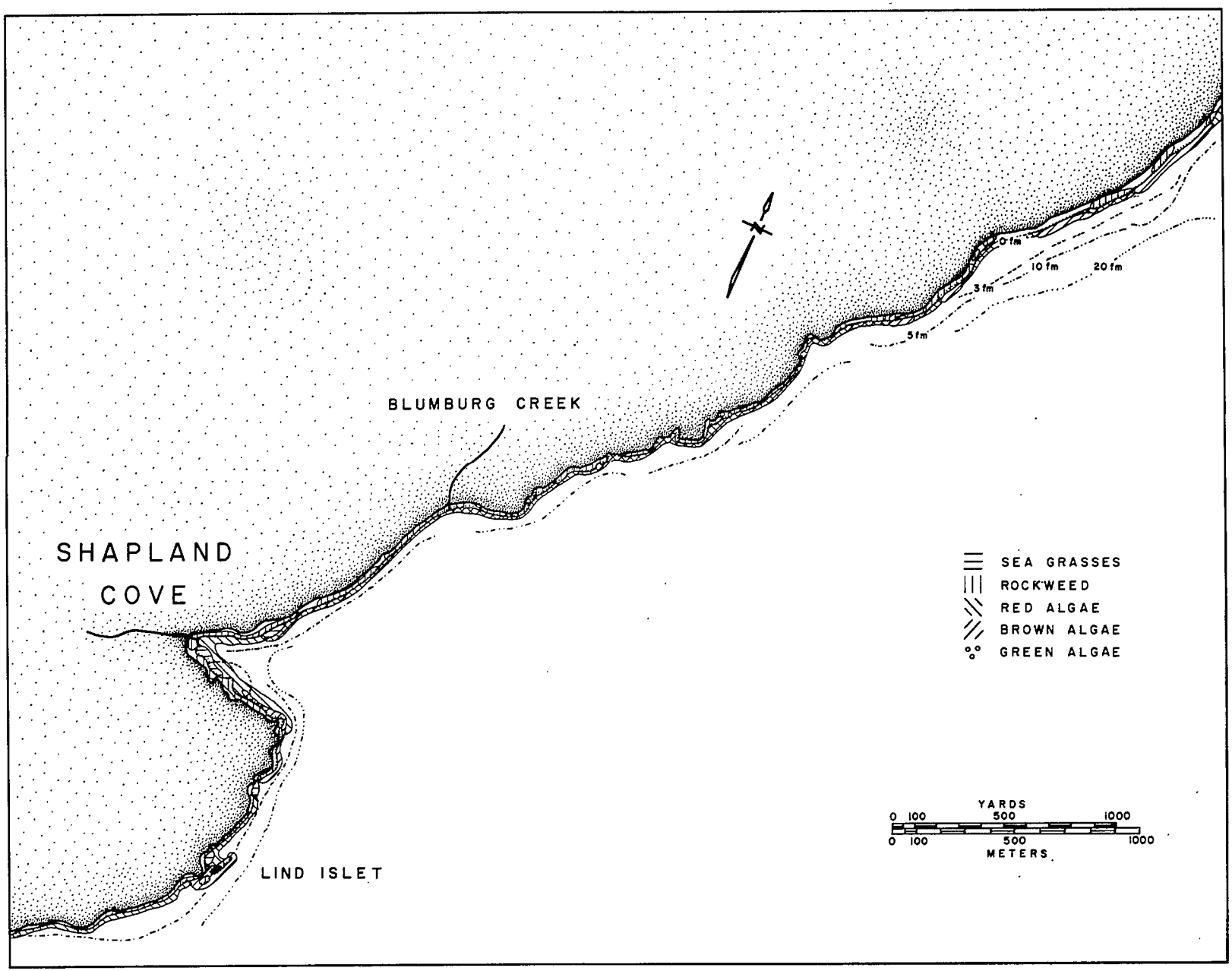

0 fm
10 fm
20 fm
3 fm
5 fm
BLUMBURG CREEK
SHAPLAND
COVE
LIND ISLET
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 14. Shoreline vegetation map from aerial photographs for Ildstad Islands in Quatsino Sound (Map 12 in Fig. 2).

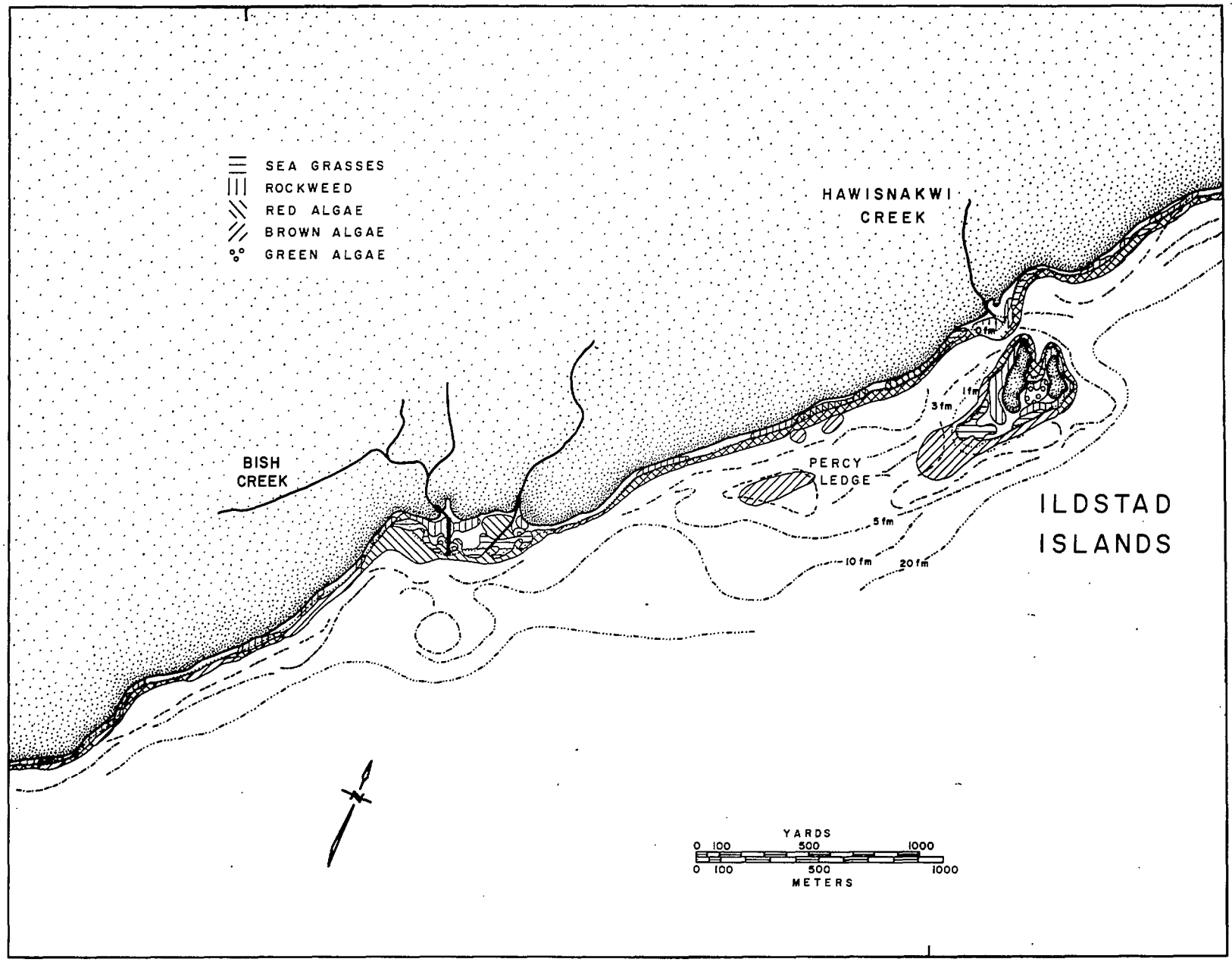

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
HAWISNAKWI CREEK
BISH CREEK
PERCY LEDGE
ILDSTAD ISLANDS
0 fm
1 fm
3 fm
5 fm
10 fm
20 fm
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 15. Shoreline vegetation map from aerial photographs for Sherberg Island in Quatsino Sound (Map 13 in Fig. 2).

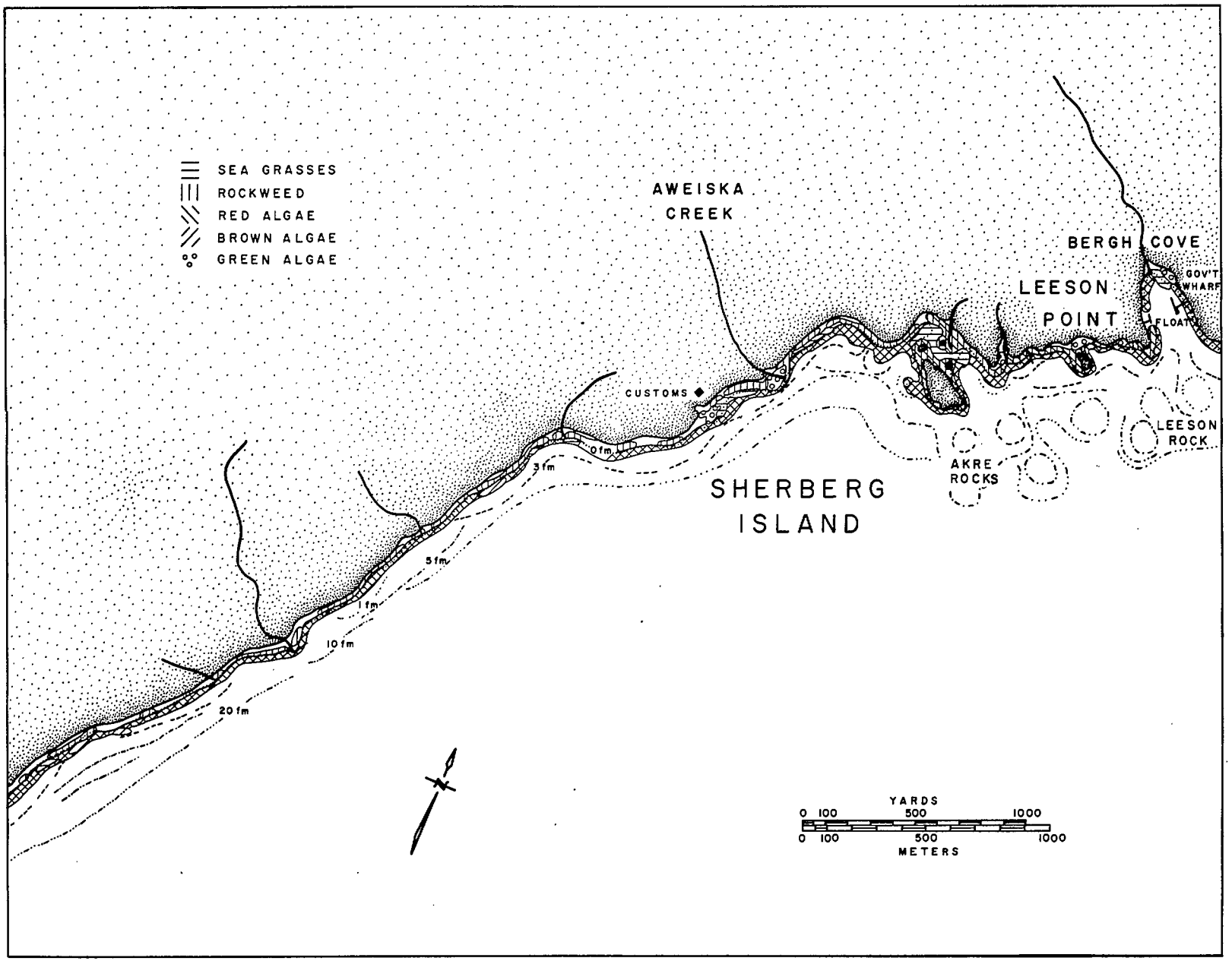

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
AWEISKA CREEK
BERGH COVE
GOV'T WHARF
FLOAT
LEESON POINT
CUSTOMS
LEESON ROCK
AKRE ROCKS
SHERBERG ISLAND
0fm
3fm
5fm
1fm
10fm
20fm
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 16. Shoreline vegetation map from aerial photographs for Side Bay in Klaskino Inlet (Map 14 in Fig. 2).

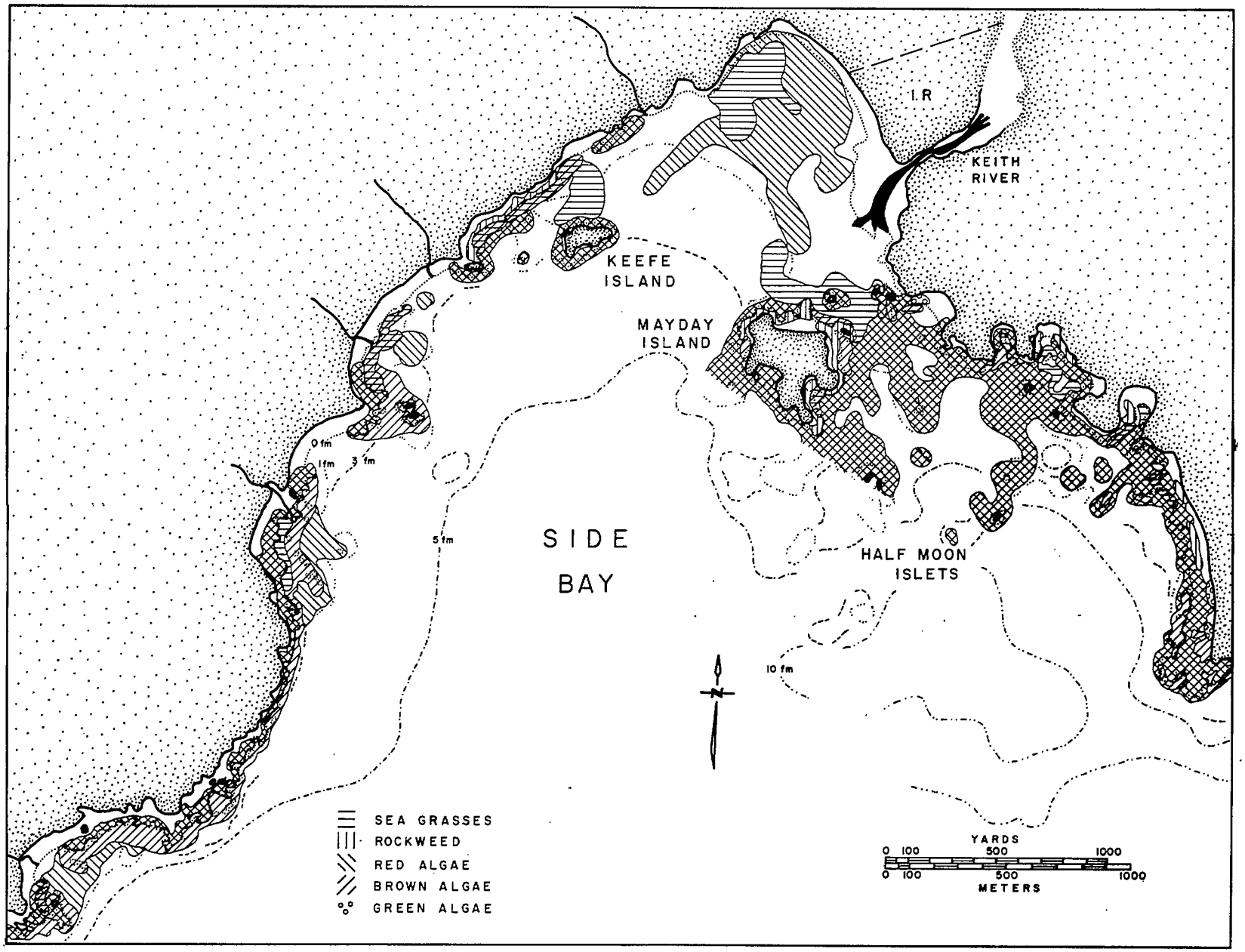

I.R
KEITH RIVER
KEEFE ISLAND
MAYDAY ISLAND
0 fm
1 fm
3 fm
5 fm
SIDE BAY
HALF MOON ISLETS
10 fm
N
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 17. Shoreline vegetation map from aerial photographs for Scouler Entrance in Klaskino Inlet (Map 15 in Fig. 2).

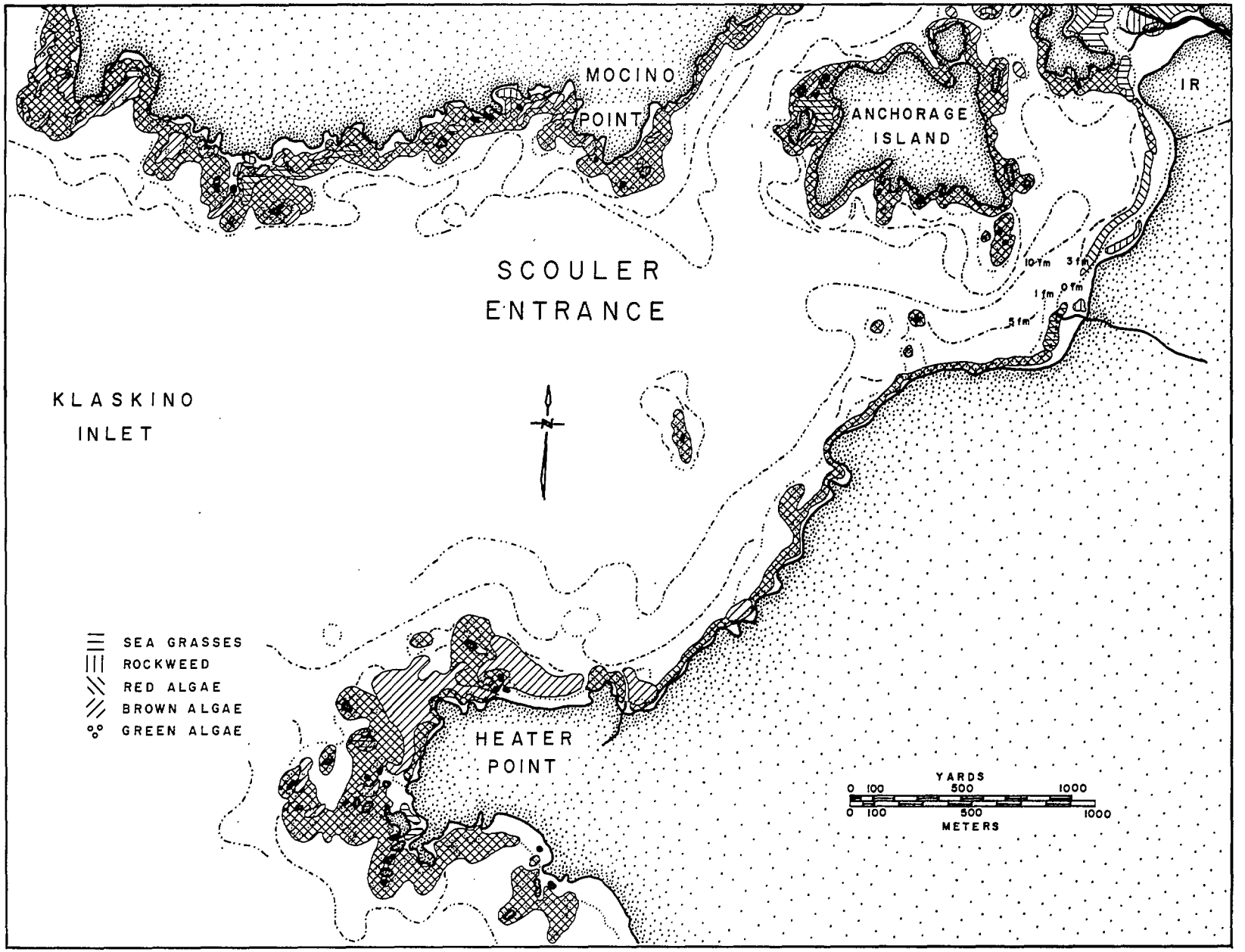

MOCINO
POINT
ANCHORAGE
ISLAND
IR
SCOULER
ENTRANCE
10 fm
3 fm
1 fm
0 fm
3 fm
KLASKINO
INLET
N
SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
HEATER
POINT
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 18. Shoreline vegetation map from aerial photographs for Klaskino Anchorage in Klaskino Inlet (Map 16 in Fig. 2).

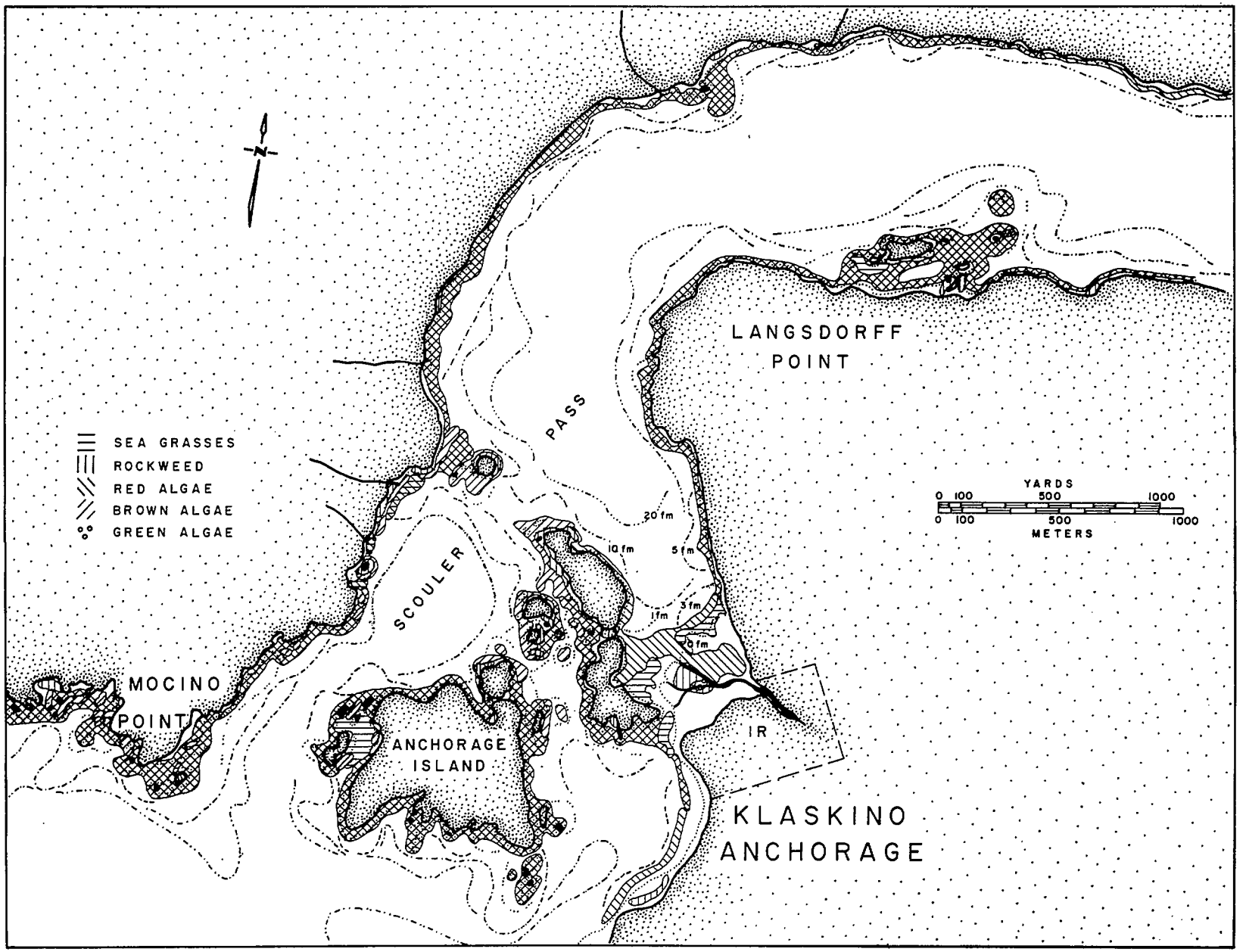

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
N
LANGSDORFF
POINT
PASS
SCOULER
MOCINO
POINT
ANCHORAGE
ISLAND
IR
KLASKINO
ANCHORAGE
20 fm
10 fm
5 fm
3 fm
1 fm
0 fm
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 19. Shoreline vegetation map from aerial photographs for Orchard Point in Klaskish Inlet (Map 17 in Fig. 2).

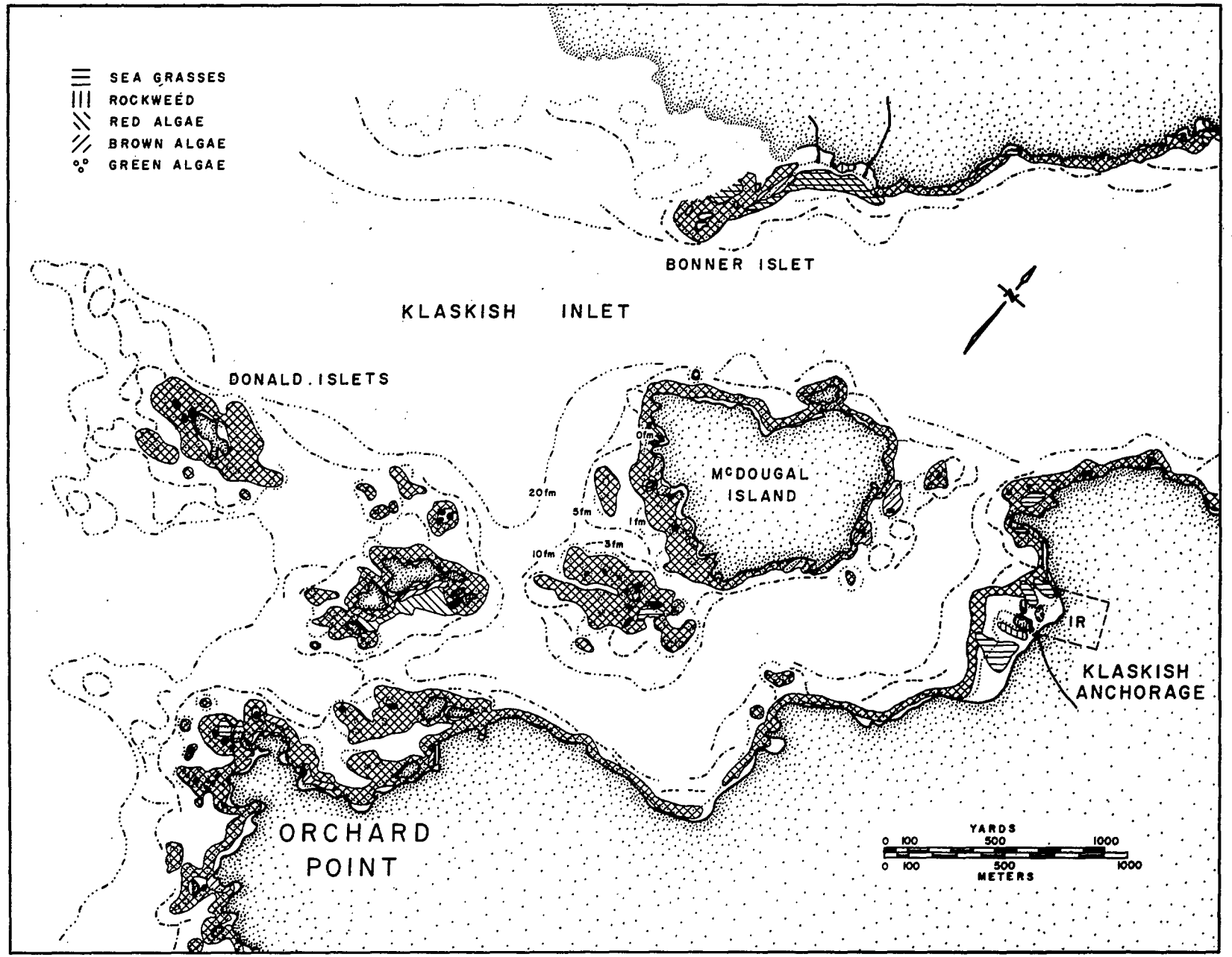
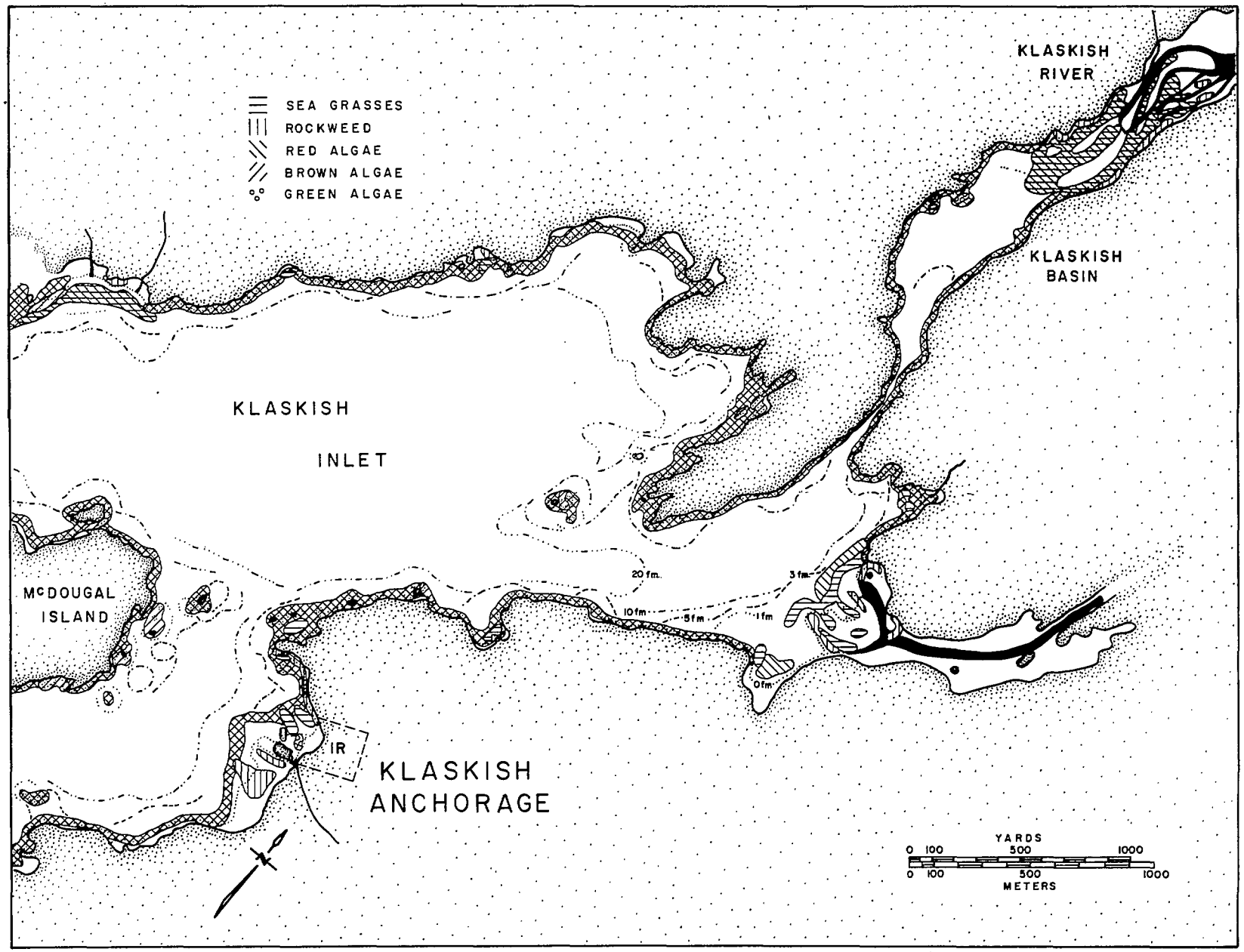

SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
BONNER ISLET
KLASKISH INLET
DONALD ISLETS
0fm
20fm
5fm
1fm
3fm
10fm
McDOUGAL ISLAND
IR
KLASKISH ANCHORAGE
ORCHARD POINT
YARDS
0 100 500 1000
0 100 500 1000
METERS

Fig. 20. Shoreline vegetation map from aerial photographs for Klaskish Anchorage in Klaskish Inlet (Map 18 in Fig. 2).


SEA GRASSES
ROCKWEED
RED ALGAE
BROWN ALGAE
GREEN ALGAE
KLASKISH RIVER
KLASKISH BASIN
KLASKISH INLET
McDOUGAL ISLAND
20 fm.
10 fm
5 fm
3 fm
1 fm
0 fm
IR
KLASKISH ANCHORAGE
YARDS
0 100 500 1000
0 100 500 1000
METERS