Estuarine Intertidal and Subtidal Wetland Habitat Types in Klag Bay, Chichagof Island, Alaska

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Exvenco Resources Inc. of Spokane, Washington, is proposing to develop a mining operation at Klag Bay on Chichagof Island in Southeastern Alaska (Figure 1). Proposed developments would be in the area of the old Chichagof Mine which was the site of one of the richest gold mines in the State of Alaska. Before the mine was closed by War Order in 1942, over 600,000 oz of gold and over 2,000,000 oz of silver had been extracted from the area.(2) Mineral exploration in the area has continued sporadically since the mine's closure. However, in 1980, exploratory activities increased and Exvenco began conducting planning and feasibility studies for mine development.

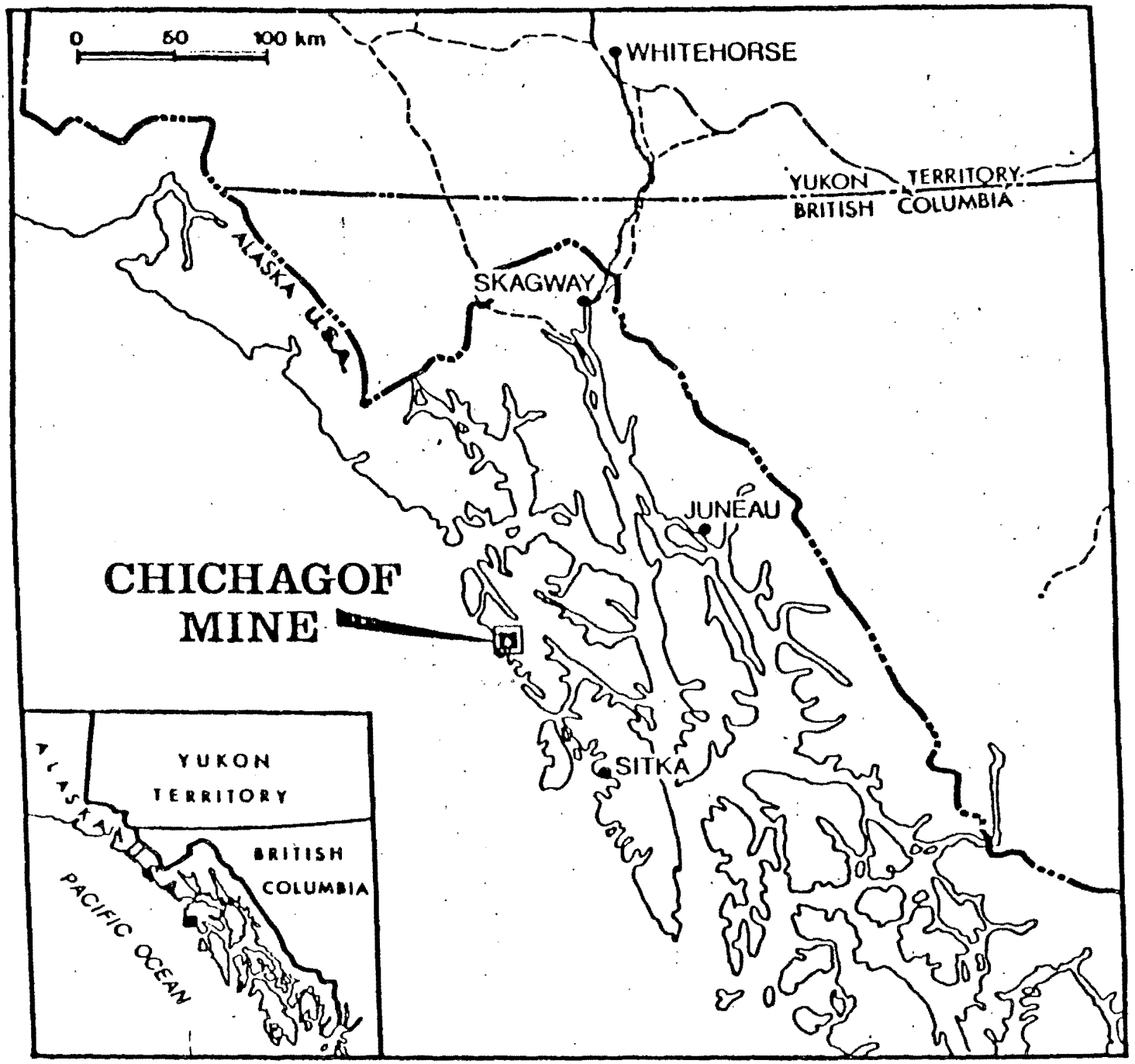
Exvenco's mining venture would involve both hardrock adit mining and dredging of tailings which were discharged into Klag by during previous operations. The upland mineral deposits are located on patented claims which are inholdings within the West Chichagof-Yakobi Wilderness Area. The Wilderness Area is part of the Tongass National Forest managed by the U. S. Forest Service. The intertidal and subtidal tailings deposits are located on State tidelands.

Exvenco has prepared a general project description report(2) and has contracted for preliminary biological assessment work with several consulting firms. However, no formal biological reports or impact assessments have been prepared to date. Additional information, including a description of the area, land status, fish and wildlife resources, and a general reconnaissance of the intertidal and subtidal biological resources in Klag Bay were prepared by the Fish and Wildlife Service in 1980 (3).

The purpose of the present investigations is to identify and map the intertidal and subtidal estuarine habitat types within the inner basin of Klag Bay. This preproject habitat survey will provide baseline information upon which to evaluate impacts to estuarine resources from alternative development plans and to assist in formulating appropriate mitigation for any habitat loses which may result from the project.

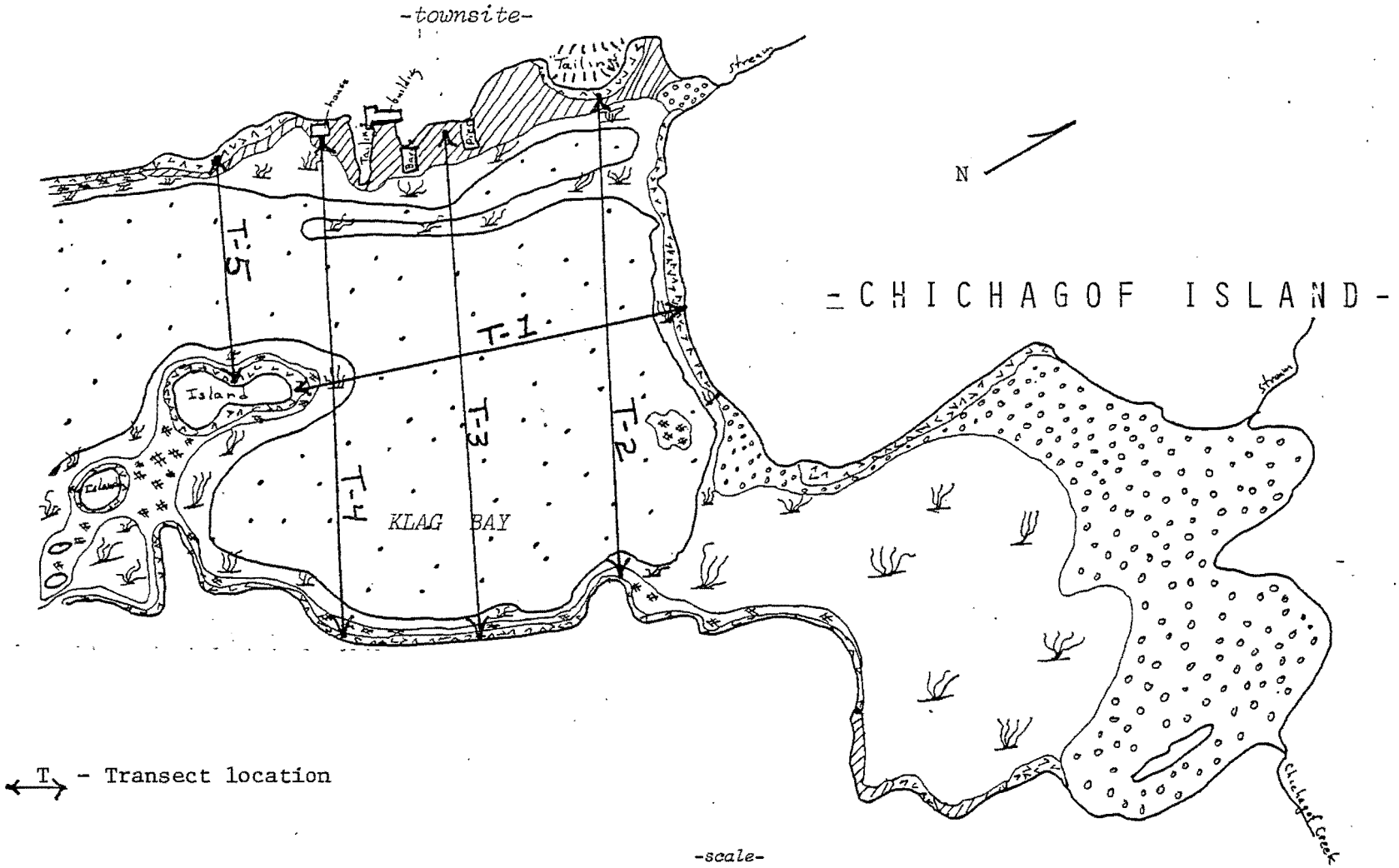
METHODS: The habitat mapping study was conducted from 1 - 7 August 1985. Subtidal observations on substrate type and characteristic macrobenthic assemblages were made along five transects set across the inner basin of Klag Bay. Fiberglass transect tapes were oriented perpendicular to the shore and stretched completely across the bay (Figure 2). Divers, using standard sportdiving SCUBA gear, swam along each transect and qualitatively described the nature of the substrate, the percentage of vegetative cover, and the macrobenthic assemblages present. Observations were recorded on waterproof paper every 5 to 10 meters depending on the variability of the habitat along the transect. Intertidal areas were surveyed by walking along the shoreline during low tidal stages. Habitat and substrate observations were recorded and sketched onto base maps of the area.

FIGURE 1



Reproduced from "Chichagof Mining Project Overview," Prepared by Exvenco Resources, In
Spokane, WA, December 1985.

Figure 2. Subtidal SCUBA Survey Transect Locations in Klag Bay, Chichagof Island, Alaska.



Note - See Figure 3 for Habitat Type Legend.

Several techniques were used to determine the infaunal species components. The intertidal areas were selectively sampled with a hand shovel. Hand dug samples were spread out on the beach and major macroinfaunal species identified. Subtidal infaunal assemblages were sampled with a diver operated venturi action suction dredge and with an Ekman grab sampler. Samples were washed and sorted aboard the support vessel and macroinvertebrates were identified to the nearest taxa by the field crew.

Habitat types were identified according to the wetland classification system developed by Cowardin et al.(1) The descriptive information obtained from the transect surveys and the infaunal samples were used to classify and map the different habitat types. The amount of each habitat type was measured with a K&E model 4242 planimeter. The area of the narrow intertidal habitat zones was estimated by determining the average width of the zone (from the transect surveys) and multiplying by the length of shoreline characterized by the habitat type.

RESULTS

Six major estuarine intertidal and subtidal wetland habitat types were identified within the inner basin of Klag Bay. These habitat types are mapped in Fig. 3. The area of each habitat type and the relative percentages of the total area typed are listed in Table 1. A depth-distance cross sectional profile showing the distribution of habitat types along Transect 2 is given in Figure 4. Although there was no attempt to catalog or make an exhaustive survey of all plant and animal species present in each habitat type, the species observed or collected during the surveys are listed in Table II. The general description, as excerpted from Cowardin et al (1), of each habitat type and the site specific habitat characteristics observed in Klag Bay are described below.

I. Rocky Shore, Rubble: Rocky shore habitat includes all wetlands and deepwater areas with substrates having an areal cover of stones, boulders, or bedrock of 75% or greater and vegetative cover of less than 30%.(1) The habitat is characteristic of the upper intertidal zone surrounding Klag Bay, exclusive of the tailings disposal areas and alluvial tidal flats. The zone is exposed to wind, waves, ice and extended periods of drying during tidal cycles. The macrobenthic assemblage is composed of sparsely scattered patches of Fucus, balanoid barnacles, and blue mussels, (Mytilus edulis).

II. Aquatic Bed, Algal: This habitat types has greater than 30% areal coverage of algae.(1) This vegetated rocky shore habitat is characterized by a Fucus—Mytilus assemblage in the mid to lower intertidal zone covering a boulder-cobble substrate. Associated species include littorine snails, limpets, shorecrabs, small seastars (Evasterias and Leptasterias), and seacucumber (Cucumaria). A exceptionally rich Fucus-Mytilus community surrounds the small island complex separating the inner and outer basins of Klag Bay. Although the substrate in this area is primarily sand and gravel, the dense Mytilus beds apparently provide sufficient substrate stability so that the development of a thick layer (15 - 25 cm deep) of Fucus covers the entire area. Although the substrate is not typical of a boulder-cobble rocky shore, this community is included with the Aquatic Bed, Algal habitat type because of the profuse and apparently stable vegetative cover.

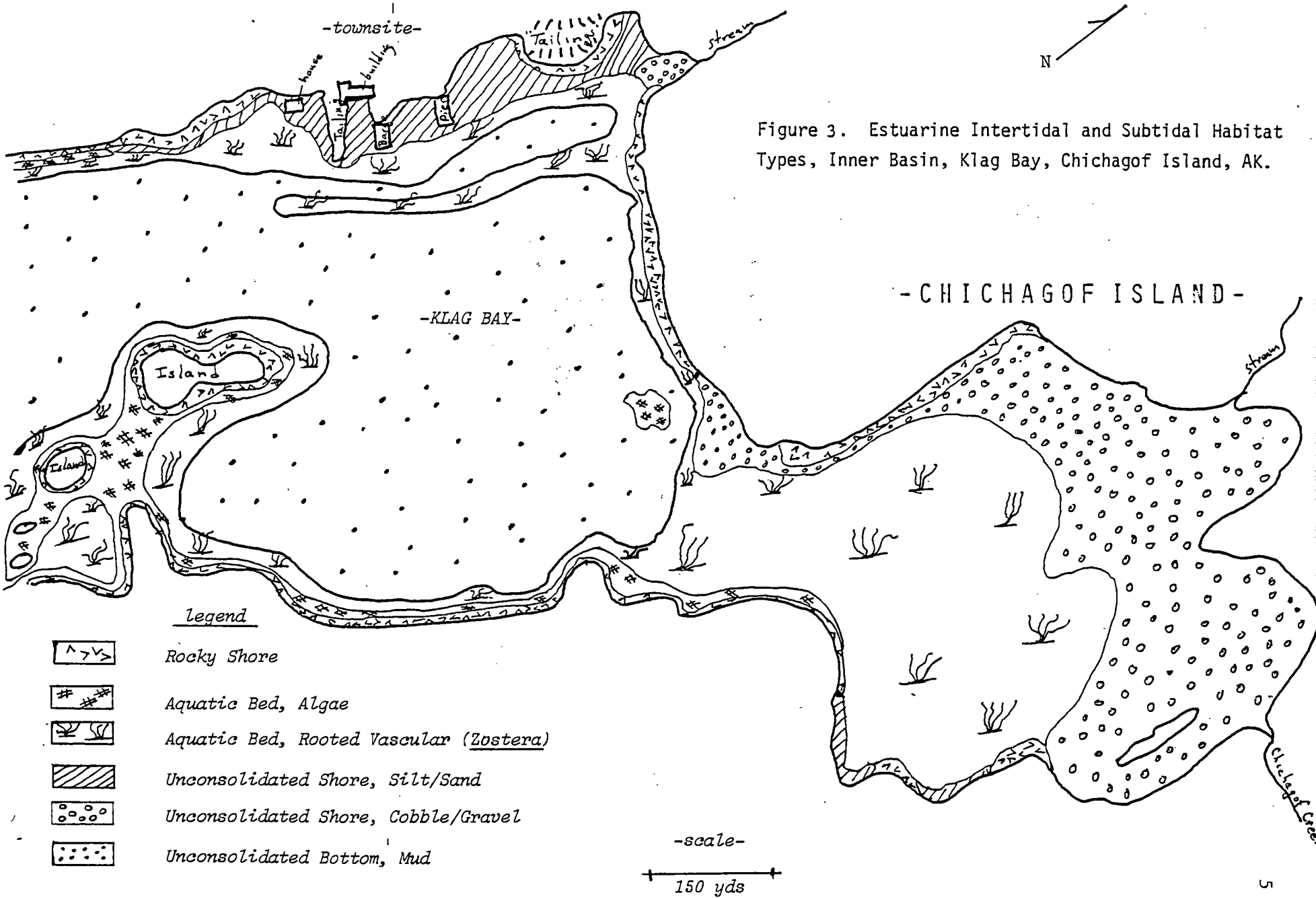
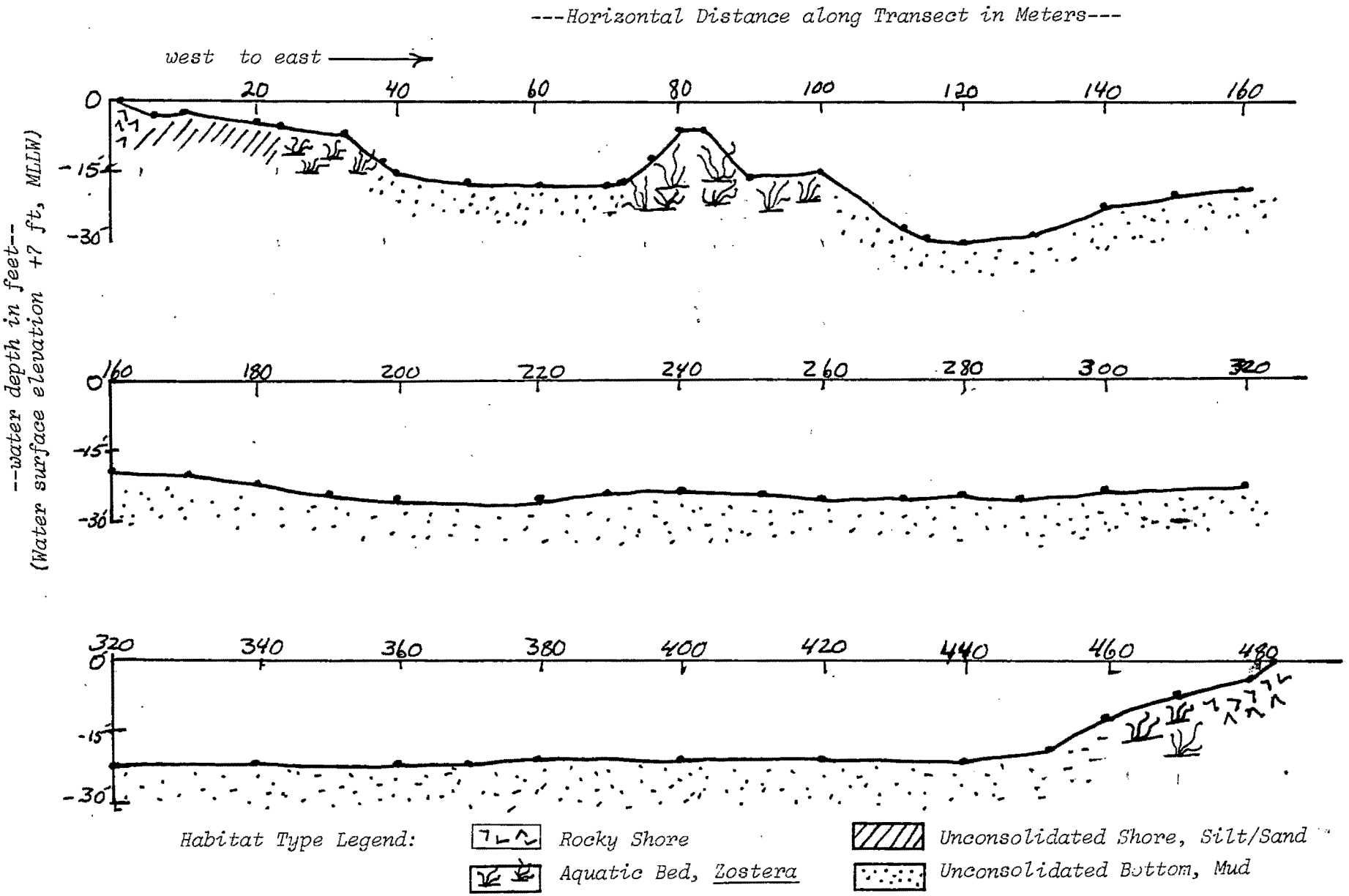


Figure 3. Estuarine Intertidal and Subtidal Habitat Types, Inner Basin, Klag Bay, Chichagof Island, AK.

Figure 4. Depth-Distance and Habitat Type along Transect 2 in the Inner Basin of Klag Bay, Chichagof Island, Alaska.



III. Aquatic Bed, Rooted Vascular: Rooted vascular plants comprise greater than 30% coverage of the substrate.(1) In Klag Bay the habitat is represented by a relatively narrow band (about 10 meters wide) of eelgrass (Zostera marina) near the mean low water isobath. This band of eelgrass completely encircles the inner basin. Additionally, the small embayment just seaward of the mouth of Chichagof Creek (Figure 1) has nearly 100% coverage (13.7 hectares) of eelgrass below the mean low water isobath. Substrate is primarily sand and silt, which appears to be derived from the disposal of mine tailings. Infaunal species include littleneck clam (Protothaca staminea, bentnose clam (Macoma nasuta), heart cockle (Clinocardium nuttallii), echiurid peanut worms, neried and other polychaete worms. Demersal and pelagic species, including rockfish, greenling, starfish, juvenile salmonids, and the pelagic nudibranch, Melibe leonina, were observed on or about the eelgrass beds. In comparison to the other habitat types identified, the rooted vascular habitat appeared to have the most abundant and diverse assemblages of marine life within the inner basin of Klag Bay.

IV. Unconsolidated Shore, Sand and Mud: Habitat type is sparsely vegetated with a substrate consisting of sand, silts and clay.(1) The substrate was densely packed a few centimeters below the surface and appeared to be anerobic. The habitat is found in the intertidal areas adjacent to the large upland tailings and waste rock disposal area near the townsite. Infaunal species assemblage include echiurid peanut worms and clams (C. nuttallii, Mya arenaria, and P. staminea). Vegetative cover is sparse. Macroinfauna appeared to be less diverse and abundant than observed in the following Unconsolidated Shore, Cobble-Gravel habitat.

V. Unconsolidated Shore, Cobble-Gravel: This habitat includes wetland areas having unconsolidated substrate with less than 75% coverage of stones, boulders, or bedrock and less than 30% cover of vegetation other than pioneering plants.(1) In Klag Bay the unconsolidated substrate materials are primarily cobble-gravel, with shell fragments, sand, and silts filling the spaces between the larger particles. The habitat zone is quite variable and is found on the alluvial tidal flats of Chichagof Creek and in the mid to lower intertidal areas seaward of the rocky shore zone. Although much of the surface area is characterized by a Fucus-Mytilus community, with greater than 30% vegetative cover, Cowardin's classification system considers the Fucus growth on unstable substrate as a seasonal pioneer species. Although the habitat is classified as unvegetated, the season coverage of algae (primarily Fucus) probably represents a significant source of primary production and organic detritus in Klag Bay. Infaunal species include littleneck clams (P. staminea), heart cockle (C. nuttallii), soft-shelled clam (Mya arenaria), peanut worm (Echiurus sp.) and various nemertean and polychaete worms.

VI. Subtidal Unconsolidated Bottom, Mud: The substrate is predominantly unconsolidated silt and clay particles, although coarser sediments and organics may be intermixed. Algal cover is less than 30%.(1) This is the dominant habitat type within the project area, comprising nearly the entire subtidal inner basin of Klag Bay. The sediments appear to be derived from tailings disposal. The area is essentially unvegetated, however, algal fronds of Laminaria and Agarum were observed attached to large shell fragments or cobbles projecting through the silt substrate. Infauna is composed of tube dwelling polychaete worms (Pectinaria sp.), various clam species (Macoma, Diplodonta, Clinocardium, Saxidomus, and Protothaca). Seastars (Pycnopodia helianthoides), Dungeness crab (Cancer magister), and ophioroid brittle stars inhabit the seafloor surface.

Table I. Intertidal and Subtidal Wetland Habitat Types Identified in the Inner Basin of Klag Bay on Chichagof Island, Alaska.

Habitat Type	Area (hectares)	Percentage of Total Area
Rocky Shore	5.2	7%
Aquatic Bed, Algae	2.1	3%
Aquatic Bed, Rooted Vascular	20.1	29%
Unconsolidated Shore, Silt/Sand	1.9	3%
Unconsolidated Shore, Cobble/Gravel	12.4	18%
Unconsolidated Bottom, Mud	27.3	40%
Total Area	69.0	100%

Table II. List of benthic plant and animal species and their relative abundance* in Wetland habitat types identified in Klag Bay, Chichagof Island, Alaska.

Taxa / Common Name	Habitat Type** I	II	III	IV	V	VI
Chlorophyceae, filamentous green algae		C				
Agarum sp., brown algae					C	
Fucus sp., rockweed	R	A		R	A	C
Laminaria sp., brown algae						C
Zostera marina, eelgrass			A			
Metridium senile, white-plumed anemone						C
Clinocardium nuttallii, heart cockle			C	R	C	C
Littorina sp., periwinkle		A			A	
Macoma nasuta, bentnose clam			C	R	R	R
Macoma sp., clam					C	C
Melibe leonina, hooded nudibranch			C			
Mya arenaria, soft-shelled clam				C	R	
Mya truncata, truncated mya						R
Mytilus edulis, blue mussel	C	A			A	
Protothaca staminea, littleneck clam			C	C	A	C
Saxidomus giganteus, butter clam		C			C	C
Diplodonta sp, clam						C
Yoldia sp., clam						R
unidentified nereid worms			C			
unidentified chaetopterid worm						
Pectinaria sp., cone worm						A
balanoid barnacles	R	A			C	
Cancer magister, Dungeness crab						C
Cucumaria miniata, seacucumber		C				
Dermasterias imbricata, leather star		C				R
Evasterias troschelii, mottled seastar		C				R
Ophioroid brittle star						C
Pycnopodia helianthoides, sunflower seastar						C
Halocynthia aurantium, sea peach						R
Echiurus sp., peanut worm			A	A	A	C

*Relative Abundance: Abundant (A); Common (C); Rare (R).

**Habitat Types: (I) Rocky Shore; (II) Aquatic Bed, Algae; (III) Aquatic Bed, Rooted Vascular Plants; (IV) Unconsolidated Shore, Silt/Sand; (V) Unconsolidated Shore, Cobble/Gravel; (VI) Unconsolidated Bottom, Mud.

Note: Habitat types did not receive equal sampling effort.

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