ECOLOGICAL RESERVES COLLECTION GOVERNMENT OF BRITISH COLUMBIA VICTORIA, B.C. V8V 1X4

Assessment of the B.C. Sea Otter Transplants, 1978; including data on stocks of invertebrates and macrophytic algae

by

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# TABLE OF CONTENTS

Pa	age
INTRODUCTION	1
PROCEDURES AND LOGISTICS	2
RESULTS	5
SUMMARY AND CONCLUSIONS	2
REFERENCES CITED	5
APPENDICES	
1. Personnel on Site	6
2. Notes on Checleset Bay Ecological Reserve Proposal # 279 18	8
3. Veterinarian's Verbal Report on Sea Otter Pup Morality 23	3
TABLES	
1. Population Assessments	Δ.
2. Population Age Structure According to Head Coloration	
3. Behaviours Logged Against Time	
4. Travel Logged versus Time	
5. Feeding Activity Logged versus Time	
6. Extended Behavioural Observations on Specific Otters 5	
7. Timing of Food Dives	
8. Weather Conditions during Observation Periods 6	
9. Notes from SCUBA Dive of Invertebrate Food Stocks 60	
10. Algal Inventory Transect Data	
FIGURES	
1. Location Map 1. Vancouver Island	Ω
2. Location Map 2. Checleset Bay and Bajo Reef	
3. Location Map 3. Bunsby Islands, Checleset Bay	
4. Diurnal Travel	
5. Diurnal Feeding Activity	
6 Location of Algal Inventory	

#### Introduction:

In July of 1969, 1970 and 1972 sea otters (Enhydra lutris) from Alaskan waters were transplanted to the Bunsby Islands in Checleset Bay on the west coast of Vancouver Island (Bigg and McAskie, 1978) (See Figures 1 and 2). A total of 89 otters were released through co-operative action by the Alaskan Department of Fish and Game, the British Columbia Fish and Wildlife Branch, and the Arctic Biological Station of Fisheries and Environment Canada.

The sea otter had been virtually extinct the length of the British Columbia coast since the early 1900's, the result of steady exploitation by the fur trade established along the west coast of North America in the 18th century. The transplants were to determine whether this marine mammal, highly specialized to exist in exposed coastal waters within the 30-fathom curve, could be reintroduced to the previously occupied habitat.

An aerial survey by the Pacific Biological Station in September of 1977 located 70 otters at two locations; 55 at Checleset Bay, and 15 at Bajo Reef near Nootka Sound. Previously, a May, 1977 aerial survey had located several individuals—two at the Cuttle Islets, three at the Bunsby Islands, one at the southern tip of the Brooks Peninsula and a mother with pup at Kyuquot Sound (Figures 1, 2, and 3).

In June and July, 1978, the first intensive investigation of the Checleset Bay sea otters and their behaviour was carried out by marine biologists from the University of Victoria, and the Ecological Reserves

Unit of the B.C. Department of the Environment.

The investigation, which included population censuses, habitat assessments and behaviour studies was conducted adjacent to the Checleset Bay original

Bunsby Island release sites, and throughout the Checleset Bay area. Checleset Bay comprises B.C. Ecological Reserve Proposal #279, the primary objective of which is the protection of the sea otters and their habitat. Two observers, R. Morris and B. Emerson, were maintained at a Checkaklis Island basecamp (Figure 3) from June 1-July 4 and July 12-August 2. They were joined by additional observers from interested government agencies. From June 18-26, Scuba surveys of kelp beds and the associated invertebrate fauna adjacent to the Bunsby Islands were conducted by the Marine Resources Branch of the B.C. Department of the Environment.

This report provides summarised data to support future assessments and a paper being prepared for professional journal publication. It encompasses population and behavioural data on the otters, and relevant data on the environment, and stocks of invertebrates and algae.

# Procedures and Logistics:

Initial observations (June 1-3) of otters were carried out at locations in Checleset Bay (Figure 3), using 4.6 m. Canova and 3.6 m. Avon inflatable boats (outboard motor powered) and the University of Victoria 17 meter oceanographic vessel, the MSSV John Strickland.

It was not known how otters would react to approach by boat, and the initial mobile surveys proved to disturb the animals, e.g. on the second day of preliminary reconnaissance of Checleset Bay, the John Strickland moved inadvertently to within 100 metres of a raft, causing a dispersal of the otters. The vessel was subsequently used only to transport scientists and inflatables to the perimeter of the observation areas. Observation from inflatable boat was restricted to no closer than 100 metres to avoid dispersal of otters, and thus was rendered difficult by wave motion and low angle of observation. Consequently, the strategy of landing on exposed reefs and islets from a 4.0 m aluminum skiff was adopted, especially near the main rafting areas at Gull Island and Humpback Island. Observations at a third main rafting area, Farout Reefs, and the Open Water Position (Figure

which prevented safe landing on these furthest seaward and more exposed reefs. When rough weather made inflatable travel to outlying observation areas hazardous, observations of the inner reef areas (i.e., Gull and Burial Cave Islands, and (when visibility was good), Mid Rocks and Humpback Island areas) were made by spotting scope from lookout points on Cautious and Checkaklis Islands (Figure 3) accessible by boat and overland. An overnighting blind was constructed on Gull Island which enabled repeated observations of otters at dawn and dusk in July.

Observations were initially spaced irregularly through the day, but were subsequently narrowed to mainly the early morning to noon and evening periods of increased otter activity, and concentrated at locations where such activity was repeatedly observed. Observation equipment included 25% spotting scope, 10%50 binoculars and 35 mm camera equipped with 400 mm telescopic lens.

Inflatable boat surveys for otters covered Checleset Bay including the south coast of the Brooks Peninsula south west to Quineex Reef, the Cuttle Islets, the Bunsby Islands, the Mission Group, the Barrier Islands and the coast of Vancouver Island between the Bunsbys and the Mission Group (Figure 2).

An aerial survey for sea otters by the Pacific Biological Station,
Nanaimo, on June 14 covered Checleset Bay and the coastline of Vancouver
Island southeast of Nootka Sound.

Two SCUBA dive surveys (B. Emerson, R. Morris) assessed invertebrate food stocks at the southeast side of Gull Island, and the south side of Dozing Rock (Figure 3). Both dives were along transects approx. 3 m - 14 m depth. A  $1 \text{ m}^2$  quadrat was placed randomly along the transects, and invertebrate fauna within the quadrat recorded on underwater slates. These locations were sampled by similar methods in 1972 by the Pacific Biological Station. In

June, two divers from B.C. Marine Resources, S. Norton and K. Spence, did SCUBA inventories (June 18-26) of kelp beds (Nereocystis luetkeana and Macrocystis integrifolia) in the Bunsby Islands and the outlying reefs to the south and south west, including Gull Island, Humpback Island, and Burial Cave Islands. They also recorded invertebrate fauna associated with the kelp beds. Transect lines (25m) were laid through eight kelp beds (Figure 6), and five quadrats (1 m<sup>2</sup>) were sampled along each transect. All fauna and flora within the transect was collected, identified, counted and weighed.

On June 15, at two locations (Humpback Island and Gull Island) snorkeling gear was used to approach rafts and make surface and subsurface observations of sea otter behaviour from approximately 10 m.

On February 19, 1979, an aerial survey by the B.C. Fish and Wildlife Branch, Nanaimo, covered Checleset Bay, including the Bunsby Islands, the Cuttle Islets, and the Barrier Islands, as well as Bajo Reef. This survey was to observe possible local winter movements by the Checleset Bay and Bajo Reef sea otters.

Assistance was received from a number of participating agencies and scientists, and these are listed in Appendix 1.

#### Results:

The results of sea otter investigations and the algal inventory are recorded in tabular form and accompanying figures. Each table and figure has explanatory notes following.

# Table 1. Population assessments

Otters frequented certain locales repeatedly and in varying numbers. Larger rafts (>10 otters) aggregated at the southeast corner of Gull Island (Figure 3) for overnight periods, and during the days of a storm period, June 6-13 (See Table 8, Weather Conditions). A maximum count of 45 otters was recorded on June 12 at Gull Island. Occasionally, individuals and pairs were recorded at Gull Island during the day in July. Larger rafts were also observed consistently at the east side of Humpback Island, and the north side of Farout Reefs with the adjacent Open Water Position (Figure 3), with maximum raft counts at these locations of 38 (June 20, 21), and 40-50 (June 13) respectively. Smaller rafts ( $\langle$ 10 otters), pairs and individuals were also observed frequently during the day near these three main rafting locations, plus other locations recorded in Table 1 and shown in Figure 3. Gull Island is 1.5 km seaward from the Bunsby Islands, with surrounding reefs, shallows, and abundant kelp beds. Humpback Is. and Farout Reefs are further seaward (3.5 km and 6 km from the Bunsby Islands respectively) and are more exposed to wind and wave action, particularly the latter location. Both had kelp beds adjacent in June and July 1978.

The boat surveys located no sea otters along the south coast of the Brooks Peninsula as far southwest as Quineex Reef, in the Barrier Islands, or the Mission group. An individual otter was observed east of Acous Island, (Figure 3).

The aerial survey on June 14 censused 51 otters--27 at Farout Reefs and the Open Water Position and 24 at Humpback Island. In addition, 16 individuals were located at Bajo Reef. An aerial survey on February 19, 1979, located 15 individuals midway between Gull and Cautious Islands. None were sighted at Bajo Reef.

# Table 2. Raft breakdowns according to head colouration

As an aid to age structure assessment in rafts, rafts from which a head colouration count could be made are shown in Table 2. The combined totals for these 18 raft counts are 29 white, 115 grey, 99 brown heads, yielding an approximate ratio of one white head: four grey heads: three brown heads per raft. These raft counts were made on separate days, but would include otters counted more than once because of the animals' repeated use of and mobility between rafting areas. Of the grey-head total, 44 were mothers with young. Using the whitening of the pelage as an indication of ageing in otters (see Kenyon, 1969), the above ratio indicates nearly equal proportions of the subadult (slim-bodied animals, brown pelage) and adult females (grey-headed animals, many with young) age classes with fewer older adult females (whiteheaded) in the Checleset Bay rafts. A maximum count of ten breeding females seven with pups, three with dependent young was recorded at Gull Island on June 12 (Table 1). A maximum subadult count of ten individuals was recorded on June 9 also at Gull Island. On June 20, a maximum of five white headed adults (one with pup) was recorded.

Solitary adult males were regularly recorded at Burial Cave Island (1) Cautious Island (1) and Deer Island (2) (Figure 3). Individual adult males were also occasionally seen in the vicinity of rafting areas. Separate identity of males was not obtained through individual colouration, as much as by their frequenting of these habitual locations.

# Table 3. Behaviour Logged Against Time

All behaviour was recorded and is tabulated against time and location under six categories of behaviour in Table 3.

Resting: Otters were seen resting individually and in rafts at the locations recorded in Table 3, at all times of day. Early morning (0530-0600) observations at both SE Gull and Humpback Islands within 15 minutes (July 24, 25) revealed otters rested at both locales. Although Farout Reef was not observed in early morning, it is assumed that otters remained there overnight also. Rest was the main activity in rafts, was often punctuated with grooming bouts, and usually took place among, or near, kelp plants (Nereocystis luetkeana and Macrocystis integrifolia.) Otters invariably rested with head oriented up into any existing wind and rafts were often more closely packed and rest sessions longer during strong winds and choppy sea conditions. This was particularly evidenced when otters rested at Gull Is. through the day during a stormy period (June 6-13). No hauling-out onto land was observed. Some timing of rest periods is recorded in Table 6, Extended Behavioural Observations of Sea Otters.

Feeding: Individuals, pairs or small groups of otters departed raft locations to feed, although feeding occasionally took place only several metres away from a raft. Instances of mothers nursing, or passing food to young were observed.

Feeding activities observed are detailed and quantified in Table 5, Feeding Activity Logged Against Time; Figure 5, Dirunal Feeding Activity; and Table 7, Timing of Food Dives.

<u>Grooming</u>: Grooming of the pelage occurred at all times of day, especially after feeding activity and travel swimming, before and after resting sessions, and was most vigorous at nightfall and daybreak.

Some timing of grooming sessions are recorded in Table 3, (July 28, July 31, and August 1), and in Table 6, Extended Behavioural Observations of Specific Otters.

Swimming: Swimming behaviour was either flight (escape) or travel.

Rafts dispersed by the sight, sound or smell of a disturbance (e.g. boats, the observers, floating logs, noise) often swam off short distances or escaped underwater to shelter of nearby reefs and then returned or left areas completely. Females with dependents were especially prone to disturbance, but solitary males were less so and seemed unwilling to leave habitual areas.

The consistent and repetitious occurrence of otters performing behaviours within a roughly triangular area (9 km²), apices at Farout Reefs, Humpback Island, and Gull Island (Figure 3), indicates the area was functioning as a home range in June and July. The predominance of females with dependent young and pups and subadults within this home range and several solitary (adult) male animals habituating areas peripheral to the range, reflects a segregation of the sexes well documented for the sea otter (See Kenyon, 1969).

# Table 4. Travel Logged Versus Time

Individuals, pairs, and small groups of otters, arrived and departed rafting areas and feeding locations at all times of day, but travel was concentrated in early morning (0530-0800) and late evening (2000-2200) time periods. Particularly at Gull Island otters consistently arrived at dusk and departed at following dawn. On June 25 and July 2 decreases in raft totals at Gull Island occurred between dusk (2200) and following dawn (0530). On July 15, 17, 18, 24, and 30 increases in Gull Island raft totals occurred between these two times. This indicates movement to and from the Gull Island raft area during the darkness hours. Repeated use of travel paths within the home range area is shown in Figure 4, Diurnal Travel.

# Table 5. Feeding Activity Logged Versus Time

Feeding activity was observed in the home range area at all times of day, but appeared to occur mainly in the 0500-0800 (early morning) and 2000-2200 (late evening) time periods. The prevalent food item sea otters retrieved by diving was a large white clam, tentatively identified through the spotting scope as the butterclam, <u>Saxidomus giganteus</u>), with other benthic invertebrates also being taken. Clams were pounded open against a stone or another clam held on the chest as an anvil.

Repeated utilization of feeding locations is shown in Figure 5,

Diurnal Feeding Activity. All locations occur within the 20 fathom curve,
the majority in less than 6 fathoms.

# Table 6. Extended Behavioural Observations of Specific Otters

On July 20 three otters (male and female with dependent young) were observed at Gull Island for a full daylight period (0600-2117), and exhibited a wide range of behaviour. Similarly, on July 31 (0715-1315), and August 1 (1020-1645), observations were made of two (male and female) and three otters (male and female with dependent young), respectively.

# Table 7. Timing of Food Dives

Durations of food dives and intervals on the surface between dives were recorded during several feeding sessions (Table 7). The longest feeding session recorded was two hours on white clams, in an area NE of Gull Island (depth: 5-13 fathoms). The longest food dive recorded was 127 seconds; the shortest, 45 seconds. Longest interval between food dives was 180 seconds.

# Table 8. Weather Conditions During Observation Periods

Atmospheric and sea surface conditions were recorded during each observation period and are shown in Table 8. In general, fair weather,

with prevailing west to northwest winds persisted for the duration of the otter survey. A significant exception to this weather was June 6-13, when high SE winds, choppy seas, and rain occurred.

# Table 9. SCUBA Dive Surveys of Invertebrates

Two areas surveyed within the home range area, the southeast side of Gull Island, and the south side of Dozing Rock (Figure 3) notably lacked an invertebrate macro-fauna (Table 9). These two areas had been surveyed by the Pacific Biological Station (Miller, 1972). Concentrations of urchins and abalone were then recorded. None of the predominant food items (Table 5) were recorded in the diver surveys. However, otters were seen feeding adjacent to both these depauperated locations on the predominant food item, the white clam, and occasionally, on sea urchins (Table 5 and Figure 5).

# Table 10. Algal Inventory Transect Data

Algal inventory divers recorded algal growth and invertebrate fauna located along sampling transects (See Table 10; Figure 6). In general, little macrobenthos was found. Abundances of topsnails (<u>Tegula spp</u> and <u>Turbo spp</u>) on kelp plants were recorded.

In general, large beds of Macrocystis integrifolia occurred in the more sheltered waters in the Bunsby Islands and at Gull and Burial Cave Islands. Otters utilized these Macrocystis spp. beds for rafting. Beds of new annual growth of Nereocystis luetkeana were not present in the areas inventoried. Sea otters used small beds of N. luetkeana in June near Humpback Island and Farout Reefs which were second year growth, as were larger beds near Gull Island. M. integrifolia was used by rafting otters at Gull, Cautious, Burial Cave and Deer Islands. There was an increase in growth and extent of N. leutkeana beds observed in July due to new annual growth (R. Morris,

field notes). The aerial survey on February 19, 1979 revealed most of the kelp beds noted above were still intact, although Humphack Island and Farout Reef beds appeared reduced in size relative to July, 1978.

# Additional Results:

Predation: No predation on otters was observed. Potential predators were seen near rafting areas—a killer whale (Orcinus orca) circled Gull Island on June 15 (see Appendix 2), and bald eagles (Haliaeetus leucocephalus) were seen individually perched on Mid Rocks, on a reef to the south of Farout Reefs and flying over Humpback Island. A sea lion (Eumetopias stelleri) was sighted 400 m south of Humpback Island. Two sea lion haulouts are located near to otter rafting areas (3 km to the southeast of Farout Reefs and 6 km to the northwest of Humpback Island). Sea lions will predate on fur seal pups in the Pribilof Islands (Gentry and Johnson, 1976). The possibility of predation on sea otters exists.

Mortality: One mortality--an abandoned female pup--was recorded on June 27 (See Appendix 3). On June 26 (approx. 1530 hr) it was found water-logged, screaming, and with congested breathing, east of Deer Island. No mother was evident after ½ hr. observation. At basecamp it took small quantities of warm milk from an eyedropper. It issued cries through the night, was voiding black, tarry faeces the next morning, and died at approximately 0830.

# Summary and Conclusions:

- Approximately 50 sea otters were censused near the Bunsby Islands in Checleset Bay during June and July, 1978. An aerial census on June 14 located 51 sea otters in Checleset Bay, and 16 at Bajo Reef. On February 19, 1979, an aerial census located 15 individuals in Checleset Bay.
- 2. Raft aggregations contained adult females, mothers with dependent young or pups, and subadults (both sexes). These rafts occupied a home range area of approximately 9  $\rm km^2$  in reefs to the southwest of the Bunsby Islands. Solitary adult males habituated locales on the periphery of the home range and closer inshore to the Bunsby Islands.
- 3. Three main rafting areas in kelp beds east of Humpback Island, southeast of Gull Island, and north of Farout Reefs were used. Travel to and from raft locales was recorded, generally in the early to mid-morning and evening. Rafts rested at Humpback Island and Farout Reefs during the day, and apparently at night also, but usually formed at Gull Island for overnight periods only. There was evidence of nocturnal travel to and from Gull Island.
- 4. A brief storm period resulted in large rafts resting at Gull Island during the day. Movement inshore to more sheltered reefs and kelp beds may represent a response to storm activity in the summer, but more particularly to winter storms. Similarly, persistently fair weather in June and July, 1978, may have enabled otters to use more exposed rafting areas (i.e. Humpback Island and Farout Reefs). The movements of otters inshore to more sheltered waters in response to storms has been reported in Alaska (Kenyon, 1967) and California (Shimek and Monk, 1977).

- 5. The winter aerial survey (February 19, 1979) located 15 individuals, all midway between Gull and Cautious Islands (approx. 1430 h). None of the approximately 35 remaining otters were located by this brief survey. Scagel (1947) reports extensive reduction of annual Nereocystis luetkeana and perennial Macrocystis integrifolia kelp beds due to winter storm activity at Vancouver Island, but as of February, kelp beds utilized by rafting sea otters in June and July, 1978, appeared largely intact with the exception of reductions in N. luetkeana beds at Humpback Island and Farout Reefs. Possibly these, and further, reductions over the winter may also induce movement inshore to kelp beds in more sheltered locations.
- 6. Mating activity was observed. This activity and the recording of mothers with young in rafts indicates the Bunsby population is breeding. This is an indication of transplant success.
- 7. The 1978 census total is an apparent decrease from the transplanted total (89 individuals), and there does not appear to have been the 10% annual population increase reported for Alaskan sea otters in newly occupied habitat (see Kenyon, 1969) for 1977 or 1978. Breeding females and subadults are predominantly in the population currently. Possibly this breeding is not yet counter-balancing mortality in the largely adult stock originally introduced and the annual rate of increase may vary until a normal age distribution develops and eliminates any effect from these adult animals (Bigg and McAskie, 1978). The large portion of subadults may be contributing to a low productivity in the population.
- 8. Foraging activity was generally during early-mid morning and evening and on the predominant food item, a white clam. The apparent reductions in urchin and abalone concentrations since 1972 are probably due largely to commercial urchin and abalone harvests at the Bunsby Islands around 1975

(Dave Smith, B.C. Marine Resources Branch, personal communication). Most foraging activity observed was in less than 10 fathoms depth. Since sea otters are known to forage to 30 fathoms depth in California and Alaska (see Kenyon, 1969), this indicates that full use of the Bunsby habitat is not occurring.

9. The concentration of the small Bunsby population in the home range area makes it particularly vulnerable to catastrophic loss (e.g. oil spillage, a known hazard on the west coast of B.C.) and local disturbance. There is increasing local disturbance in the form of tourist and fishing boat traffic, and also proposed log-booming operations. Protection of this population, its habitat and food stocks (particularly in light of previous commercial harvest in the area) while it increases, and attains a normal age distribution, is strongly recommended. Ecological Reserve status in Checleset Bay would provide a necessary protection and delineate further habitat for a spreading population. Also, additional transplants of sea otters to B.C. would reduce the likelihood of a total loss of stock through catastrophic disturbance.

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Appendix 1

List of Participating Scientists

## APPENDIX 1

# List of Participating Scientists

#### Name

- R. Morris
- B. Emerson
- D. Ellis
- B. Foster
- T. Carson
- M. Bigg
- I. McAskie
- G. Ellis
- G. Smith
- D. Hebert
- S. Norton
- K. Spence

# <u>Agency</u>

- B. C. Ecological Reserves
- B. C. Ecological Reserves

University of Victoria

- B. C. Ecological Reserves
- B. C. Ecological Reserves

Pacific Biological Station Fisheries and Environment Canada

Pacific Biological Station Fisheries and Environment Canada

Pacific Biological Station Fisheries and Environment Canada

- B. C. Fish and Wildlife Branch
- B. C. Fish and Wildlife Branch
- B. C. Marine Resources (Algal Inventory)
- B. C. Marine Resources (Algal Inventory)

# Appendix 2

Notes and Observations

Checleset Bay Ecological Reserve Proposal #279

June 13-16, July 25-26, 1978

T. Carson

Notes and Observations Checleset Bay Ecological Reserve Proposal #279 June 13-16, July 25-26, 1978

# Sea-Otters

June 13th - 2100 hours - Dusk

Fourteen sea otters were spotted rafting near kelp off the east side of "Gull Island". As we approached the otters with the zodiac most of the otters dispersed eastward away from the island; however, one subadult approached our boat within 20 metres of the boat—he swam on his back, vertically "bobbed" in the water, looking in our direction, then rejoined the sea-otters in the kelp. Three sea-otters remained in the kelp bed while 10 otters swam eastward 20 metres off the rock off southeast Gull Island and maintained this distance.

At Clara Reef one otter was seen swimming near a rock about 18 metres away.

June 14th - partially cloudy - breezy

During the census flight with Graham Ellis, Bud Smith, Trudy Carson and Bristol Foster, a total of 67 sea-otters were counted. The location and size of groups is marked on Figure 2 Marine Chart #'s 3666 and 3683. Fifteen sea-otters were counted in the vicinity of Bajo Reef and 52 were counted all together in the Checleset Bay area.

Hauled-out Northern sea-lions were photographed for census purposes. Graham Ellis of Nanaimo Fisheries Office has the results of this work.

At 1700 hours Graham Ellis, Bob, Bristol and myself landed on a small rock in Clara Reef. The otters were observed and photographed from this point. Three sea-otters were observed eating shellfish and sea urchin. The otters were swimming on their backs, handling the food with their forepaws and passing the food between themselves. Much contact between the otters was observed. Occasionally the otters would become alert and bob up, then would dive. The otters would dive for 45 seconds to 2 minutes, then surface again. We observed this feeding routine for 20 minutes until the otters were out of sight.

Two mothers with pups clasped to their stomach were seen about 30 metres east off Clara Reef. Then 6 more otters were observed swimming in a northeasterly direction through the shallow reef waters. Sometimes the otters were in pairs, sometimes in threes. They appeared to be feeding on chitons (Katharina tunicata), urchin, and small abalone (Haliotis kamtchatkana). In one instance two seatotters were feeding while 2 to 6 Gulls "mobbed" and dove at the otters trying for scraps of food.

June 15th - partially cloudy, breezy from north, tide rising 0615 hours

On this morning we took the Zodiac out to Gull Island dressed in wet suits prepared to snorkel with the sea-otters. East of Gull Island three sea-otters were observed swimming on their backs, 15 metres from me. Two otters were also seen southeast off Guli Island. I entered the ocean quietly, draped with kelp. Two subadult otters approached me, apparently curious. One other otter approached from the south. He bobbed in the water, looking in my direction, rose, then porpoised and descended 15 feet away from me. The otter was seen swimming below me. This group of otters moved away from me and I swam to the north end of the island. Bristol entered the water and I saw him with two otters, fairly close to him. From a distance he appeared to resemble a seal, except for the orange snorkel tip. The otters stayed with him for 10 minutes, then as I rejoined him, the otters disappeared. We decided to walk west across the island to look for otters by starting from a cove on the northeast of Gull Rock. As we swam for the cove, Bristol dove ahead and I watched for otters. Then, 6 metres behind me, I spotted a large black dorsal fin. Unbelieving, I looked again and saw a Killer Whale surface closer to me. I swam rapidly for shore. Reaching shore, I looked for Bristol. The whale or Bristol could not be seen for 30 seconds. Bristol surfaced, the Killer Whale 3 metres behind him. I shouted and pointed. Bristol turned around looking for otters and saw the whale instead. He lowered his head underwater for a better view. The whale moved away to Bristol's right. Bristol swam furiously towards shore. Once Bristol was ashore, the whale surfaced close behind him showing his white, then swam off in a northwest direction. We walked across the inlet and observed the whale continuing his shoreline circle around the island.

We took the boat to Clara Reef and there were 2 sea-otters outside the Reef. Three otters were seen on the inside of the reef. We tied the boat and swam through tumultous surges and shallows in the Reef. The otters were west about 100-200 metres away. Bristol filmed the otters. I swam towards an otter, and at 12 metres it bobbed and submerged; another otter was seen and exhibited the same behaviour. I came ashore on the rock. While sitting at the surf line, a sea-otter surfaced only 3 metres away, saw us, and dove down in alarm. Two more otters were observed 12 metres off shore to the east.

Bristol and I both entered the water and swam towards a group of 6 otters, including 2 mothers with largish pubs. The swell was increasing and the otters didn't seem to notice our approach. They swam on their backs, unalarmed, grooming and "muzzling" each other. As we came closer the otters saw us and swam with just their heads out of water. After about 5 minutes of observation the otters began dispersing. Four adults swam out to the southeast. An adult female clasped her pup to her chest and swam directly beneath us. The others stayed approximately 100 metres offshore for some time, then swam off.

June 16th, clear, sunny

Only 1 sea-otter was seen off Checkaklis Island at 2130 hours. None were seen in our exploration of the area northwest of Bunsby Island during the day.

Again a raft of approximately 20 sea-otters were seen at Gull Island at dusk.

July 25th - 2200 hours

While camping at Gull Island we saw 2 sea-otters rafted in the kelp.

July 26th 0630 hours

Only 1 sea-otter was observed in the kelp at Gull Island.

At 0900 hours we boated to Clara Reef and filmed 5-6 otters, swimming and grooming.

At 1000 hours 4 sea-otters were observed.

# Additional Observations - while diving with sea-otters

June 15th

- Otters were fairly curious of us, but reasonably "cautious".

- It seemed as though the otters would allow us to approach closer when they were in groups of 2 or 3 than when alone.

- Juveniles seemed more curious of us than mothers with pups.

- The otters were not feeding when observed from 0615 - 1100 hours.

# Underwater Observations - while snorkeling July 15th morning, Gull Island.

- No sea urchins or abalone at this site.

- Entire rocky bottom covered with various species of algae.

- Particularly abundant was an unknown brown sheet algae (Desmarestia toliacea)

 Some Iridaea sp, <u>Ulva lactuca</u> and <u>Codium fragile</u> was observed.
 Large (3 metres) <u>Phyllospadi scouleri</u> with small dots? were seen.
 <u>Katharina tunicata</u> were seen in crevices but were not abundant (perhaps every 100 metre area).

- Corallina vancouverensis was observed.

Many small fishes, including needlefish observed.
 The water was very shallow (3-4 metres deep) and fairly turbid.

- Only the white gravelly bottom was free from vegetation

- With the exception of Starfish, Chitons, Mussels, Barnacles and Tunicates, very few invertebrates were seen.

## Clara Reef

- Very similar to Gull Island habitat except that there was abundance of small turbans (<u>Tegula funebralis</u>) top shells (<u>Calliostoma ligatum</u>?)
- Katharina tunicata and Corallina was more abundant here.
- More yellow (unknown) sponges.

# North Sea-Lions

Sea-lions were photographed and censused during the July 14th flight. Locations of sightings are marked on Figure 1. The Pacific Biological Station has the results of the census.

On July 16th we visited the O'Leary Inlets. Over 40 sea-lions were counted. All sea-lions could not be seen from our vantage point.

No pups were seen but it appears that the O'Leary Islets are a major sealion haul out site.

# Sea-Bird Colonies

Significant marine-bird nesting colonies exist on:

- a) Thomas Island Leach's Storm Petrel and Fork Tailed Storm Petrel and Pigeon Guillemot. This area is nearing final stages of Ecological Reserve Status for its significance as a sea-bird nest site.
- b) Gull Island Glaucous Winged Gull and Black-Oyster Catcher.
- c) O'Leary Islets Pelagic Cormorants and Glaucous Winged Gulls.

Further documentation of these colonies is written up in the Provincial Museum Sea-bird Record File.

# Appendix 3. Veterinarian's Verbal Report on Sea Otter Pup Mortality

Autopsy performed on July 13, 1978, by Drs. James and Judith McBain, Veterinarians, Nanaimo, B. C.

Pup was thin, with very little body fat. Lungs were congested, but no transudate in the bronchioles. The liver showed some cloudy swelling; probably due to malnutrition. Congested appearance of lungs was probably due to blood pooling after death. Pup died as a result of losing its mother.

Otherwise everything appeared normal--the pup was a female, 2.9 kg. standard length  $65.4\ cm$ .

Table 1. Population Assessments

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TABLE

POPULATION ASSESSMENTS

POPULATION ASSESSMENTS

TABLE 1 (Page 2)

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TABLE 1 (PAGE 5) POPULATION ASSESSMENTS	TIME	0745 - 0845	1205 1935 - 2010 2030 - 2150	1030 - 1)30 1230 1925 - 2050	0505 ~ 0530 0555 ~ 0800	2130 1015 - 1325 2105 - 2200	į i	0530 - 0830 0945 - 1045 2050 - 2215	0530 - 0900 0330 2030 2030 2045 + 2215	0535 - 1115 1940 1950 - 2015 2040 - 2125 2140
·	LACATION OF OTHERS	SW Gull Is E Numpback Is	I Nomphack Is I Bumpaack Is SE Gull Is	Midway Gull Is & Farout Reef E Rumpback Is Farout Reef SE Gull Is	SE Coil Is E Humpback Is	SE Goll In F Rumpback Is SE Gull Is		SE Gull Is E Humphack Is SE Gull Is	SE Cull Is SW Open Water Pos Burial Cave Is SE Call Is	SK Gell Is SW Dering Rock E Humphack Is SE Gell Is NE Derial Cave Is
	DATE	July 1		М	4478	12	S) Prid	<u>r~</u>	ಣ	Ži.

TABLE 1 (Page 7)

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SEX AND AGE CLASSES

DATE	LOCATION OF OTTERS	TIME	MAXINUM \$ OF OTTERS	XOF#BBX0	ಜವಧನ	o si	0 2 4 4 4 4 4 6 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	E S S C L S C C C S C C C S C C C S C C C C C S C		1. TIME (PDT)  2. MAXIMUM # OF OT  3. MOTHERS
July 27	N Door Is SE Gall Is	1950 2100 - 2145	H 74							
52	SE Gull Is	0500 - 0730	<b>(</b> 13 ≠~4	•				gang gang	bred bred	4. <u>PUPS</u>
29	Between Farout Reaf 5 E Humphack Is Kid Rocks Acous Peninsula	1100 1230 2000 - 2115	0 0 0	कर्ल		p-m²			64	5. DEPENDENTS
\$6	8. 10.0000000000000000000000000000000000	1930 - 2200	64					F.		1.
EL.?	SE cull Is	0545 - 0615	CT.	<b>511</b> 3		<b>m</b>			۵,	
Aug 1	SE Gull Is E Humphack Is Cautious Triangle	0545 - 0615 0625 - 0700 0850 - 1645	10 10 3	404		चिलाल		a—†	14 0	6. SUB-ADULIS

# TABLE 1 NOTES (PART 1)

# POPULATION ASSESSMENTS

Tine periods show extended observations; single times are bri sightings of otters; overlapping times represent an observation at 2nd or 3rd location during extended observation of a first locati (Pacific Daylight Time).	This is the maximum number of otters counted for the tirecorded. The abbreviation R.P. is Raft Present (Sur no condition). Approximations (App.) if distance, weather or surficenditions precluded counts.	Identified by constant accompaniment of a dependent young pup. Mammaries were frequently visible, as were nursing roung.  Numbers of nothers corresponds to number of pups or depends young observed. More mothers with dependent young in a raft wolfen not readily detectable because of separation of a mother viyoung pair, or the observation being obscurred by kelp, wave actificals kane.	Small, with fuzzy, usually light brown pelage. Usually rid on mother's chest, and nursing, unable to swim or dive confident or retrieve food. Totally dependent on mother for well-baing.	Alstinction between dependent young, or larger, darker jups. The distinction between dependent young and pups was recorded in field and is retained in this report. The term "young" used in treport refers to any animals) still in care of the mother, start to acquire an adult pelage, still obviously associated and depend on mother, but she frequently discourages its chast riding and attempts to mirse, eat food items retrieved through diving by and and mother.	Adult build, but slimmer, usually with dark brown pela Maintain independence from mothers and other otters in rafts. Gro of sub-adults were observed within rafts, containing females males. No sexual activity observed.	Could be definitely identified in adult and sub-adult stationly by the presence of the two lower abdominal mammaries. mammaries not in view adult sized animals were tentatividentified as females by a slimmer build through the head and not then adult males plus palage colouration (See Table 2, Notes).
1. TIME (PDT)	2. MAXIMUM # OF OTTERS	3. MOTHERS	4. PUPS	5. <u>peperdents</u>	6. SUB-ADULIS	7. FEMALES
e4	<i>c</i> ;	61	4	·		en

Could be definitely identified in sub-adult and adult stages presence of a penile ridge on the lower abdomen. If penile ridge in view, adult males were tentatively identified as such by pel colouration, and a thicker heavier build through the head and n region than adult females.

S. MALES

# TABLE 1 NOTES (PART 2) - continued

# POPULATION ASSESSMENTS

Wave action, dim lighting, or distance frequently preverted the identification of the sex or age class of otters. In these cases, only a total count of otters was possible.

9. UNIDENTIFIED

TABLE 2
POPULATION AGE STRUCTURE ACCORDING TO HEAD COLORATION

E	LOCATION	TIME	WHITE	GREY	BROWN
e 20	Humpback Is	1030 - 1200	5(1)	16(6)	9(1)
une 21	Humpback Is	1010 - 1050	3(1)	14(5)	3
e 25	Humpback Is	0625 - 0645	2(1)	9(5)	3
€ 26	Gull Is	2115 - 2200	1	5	5
une 27	Gull Is	<b>07</b> 50 - 0830	1	2	4
€ 28	Gull Is	2050 - 2150	3(1)	8(3)	9(1)
2021	Humpback Is	1030 - 1045	3(1)	8(2)	8(1)
tune 29		1915 - 2120	1	5(3)	2
1€%e 30	Humpback Is	2105 - 2145	1	2	3(1)
and the second s	Gull Is	<b>2</b> 005 - 2020	1	4(1)	5
)	Humpback Is	0900 - 1215	3(1)	7(2)	12(2)
	Humpback Is	1935 - 2010	0	3(1)	3
	Gull Is	<b>2</b> 030 - 2105		4(2)	3
	Humpback Is	1045 - 1145	0	8(5)	8
July 3	Humpback Is	0555 - 0800	2(1)	7(4)	8(1)
	Humpback Is	0945 - 1045	]	6(3)	6
J∭y 17	·	0615 - 1130	1(1)	5(1)	5(1)
July 24	Humpback Is	0815 - 1100	0	2(1)	3(1)
July 26	Humpback Is	0010 - 1100	29	115	99

Totals

Bracketed figures indicate females with pups.

#### NOTES ON TABLE 2

### RAFT BREAKDOWNS ACCORDING TO HEAD COLOURATION

- 1. Pelage colouration and relative body size was noted during field observations as a tentative indication of age, and sex in rafts. Both sexes tend to become white-headed with age. Lighter coloured heads among juveniles are usually males, and this difference tends to prevail in older animals (Kenyon, 1969).
- 2. White refers to a head predominantly, and obviously white, or silvery.
- 3. Grey refers to a head with mixed white and brown, neither predominant.
- 4. Brown refers to a head, dark brown, or sometimes (when wet) almost black, with very little or no white showing.

Bracketed numbers within the table are females with young. Otherwise animals were assumed to be independent within the raft aggregation.

#### NOTE ON RECOGNITION OF INDIVIDUALS

Over the 60 day observation period, several individuals were recognizable in the field on repeated occasions because of colouration or marking in their pelage, or their association with other otters.

"White-haired Grandmother" - a large, mature-looking female with a white head, and white through her pelage. Absence of a dependent young, lack of prominent mammaries (and penile bulge), led to identification as an older female.

"Silver-haired Mother" (and pup) - a slim female with prominent mammaries, a whitesilver pelage (head and body). Accompanied always by a small, dark brown nursing pup.

"The Trio" - an association of 3 animals which were consistently seen together in July. The Trio was comprised of:

- a medium-sized male with a brown head and body. Concluded to be a young male.
- a medium-sized female, grey-headed, with black ears.
- a larger tan-brown coloured pup, nursing, but able to food dive and retrieve food for itself.

"The Male-Female Pair" - seen consistently together through the month of July. The female had a dark brown patch in the back of her head; the male was brown, with a gold-yellow tint through the pelage.

Table 3. Behaviours Logged Against Time.

# TABLE 3 (Page 1)

#### TABLE OF BERAVIOURS LOCKED ACAINST TIME

ATE	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING4	GROOMING <sup>5</sup>	swin hing <sup>6</sup>	INTERACTION ?	BEHAVIOUR. UNKROWN
in the second	SE Burisl Cave Is	1715	2	In kelp					
2	SE Gull Is	1025	3						brief sighting
And the second of the second o	E Humpback Is	1145 - 1610	35	Kajority prior to dispersal	Ho/D Ho passes food to D	Hany	Dispersal to N from noise of approaching ves- sel. Regrouped		
	Farout Reef	1315	25	Kajority prior to dispersal			Flight from noise of ap- proaching ves- sel		
2000 3	E Coll Is	6920	2		,				Brief sighting
	E Humpback Is	1000 - 1400	15	Hajority prior to dispersal			Dispersal into recis by sight of approaching 2 odisc. Re-		
September of the second							grouping over 2 hr.		
and the second	SE Burial Cave Is	2130	2				,		In kelp Brief sighting
<b>&amp;</b> 4	E Humpback Is	1220 - 1320	R.P.	In kelp			Dispersal by sight of Zodiac, then re-raited	•	
6840	Cautious Triangle	1430	1						Brief Sighting
	SE Burial Cave Is	2200	2	In kelp			•		

## TABLE 3 (Page 2)

# TABLE OF SEHAVIOURS LOGGED AGAINST TIME

				1 V D I'L C. C. C.	THE REST CALL	1101.17 1111.17.101			
D E	LOCATION	TIME OBSERVED !	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	reeding4	GROOMING <sup>5</sup>	Swin hing 6	INTERACTION <sup>7</sup>	BEHAVIOUR <sub>8</sub> UHEROUR
J. 5	E Humpback Is	1030 - 1350	15	In keip	The second secon	Højarity	Scent of ob- servers upwind causes dispersal into reefs. Re- ratting after 1 hr.		
Windowski Albatom (hall)	SV Humpback Is	1229	2				2 travel southeast		
***	E Burial Cave Is	1950	ì	In kelp					
2. Y. Y.	SE Cull Is	2000	2	both		Both			
Science Control of the Control of th	E Hompback Is	1030 - 1130	19	Majority in tightly packed raft	2 P Nursing	\$ටකළ			
Year and the contract of the c	Nidway Cautious Triangle & Humpback Is	1200	ì						Brief Sighting
883	SE Burial Cove Is	1710	1	In kelp					
South of the Beauty and the State of the Sta	SE Cull is	1745 - 1830	10	In kelp, in tightly packed raft					
Superina de la constante de la	E Humpback Is	1743 - 1830	K.F.						Distance of observation ob- acured count
<b>7</b>	Midway Beer & Thomas is	1145	Bear						Brief Sighting

### TABLE 3 (Page 3)

# TABLE OF BEHAVIOURS LOCCED AGAINST TIME

TΕ	LOCATION	TIME OBSERVED!	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING <sup>4</sup>	GROOMING <sup>5</sup>	swih hing <sup>6</sup>	INTERACTION?	BERAVIOUR 8 UNKNOWN
7	SE Cull Is	1510	R.F.	In kelp					Due to distance of observation
***	E Humpback Is	1510	R.P.				•		Due to distance, wave action, vision obscured
	SE Gull Is	1920 - 2140	12	Hajority		Some	Travel - 2 Ko/P pairs		
	Cautious Triangle	1920 - 2140	7	2	Ko/P - Ho passes food to P				
. е	Cautious Triangle	0830	1	In kelp					
	R Pozing Rock	0940	1		Individual foraging				
ntr :	N Burial Cave Is	1755	1	Sleeping in kelp					
) : 25 9	Cautious Triangle	1905 - 2040	1			In kelp			
866	E Humpback Is	1925 - 2040	3						Mave Action obscured
	SE Gulf Is	1925 - 2040	26	In kelp		Some		Play + 2 SA play diving, rolling	•
10	E Humpback Is	1450 - 1510	6	In kelp			Flight north 100 a upon sighting obser- ver's boat		

#### TABLE 3 (Page 4)

w. 11.11	TABLE OF BEHAVIOURS LOGGED AGAINST TIME								a
u Š k	LOCATION	TIME OBSERVED	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	reeding 4	CROOMING <sup>5</sup>	swih hinc <sup>6</sup>	INTERACTION 7	BEBANIOUR UNENOWN
J& 10	SE Gull ls	1635 - 1730	28	Hajority in kelp	Individual, adjacent to raft	Several			
Charles core	E Rumpback Is	1730	R.F.						Vision obscured by wave action, distance
1004	Cautious Triangle	1230	3	In kelp		Ho grooms self & P			
did the a	SE Gull Is	1230 - 1340	20	In kelp			Travel		
Production of the Control of the Con	SE Gulf ls	1510	3						Vieu obscured by wave action, distance
The second of th	E of Acous Peninsula	1530	1						Bus to distance of observation
Sphrighten shall be	SE Gull Is	1910 - 2105	45	Majority, wrapped in kelp, sleep ing	9 feeding on muscle adjacent to raft. No feeding D. 2 nursing P	Напу	2 downwind catch scent of observers, Travel to rafi	Play = 2 SA rolling, chasing	
Ay Bankhydağı	SE Burist Cave Is	2120	*	In kelp					
6. * 4 .	HE Burial Cave Is	2125	2	In kelp					

### TABLE 3 (Page 5)

### TABLE OF BEHAVIOURS LOGGED AGAIN. I TIME

				1 6 5 1.1. 0	1 1:20:11	a de la companya ya <del>aligungan a Manderse ya mana ya da kana ka a mana a mana da a mana da a mana ka a man</del> a a ma			REBAVIOUR
	LOCATION	TIME ORSERVED!	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING4	GROOMING <sup>5</sup>	SWIK HING 6	INTERACTION?	BEHAVIOUR 8 UNKNOWN 8
- 34.	100 veters se of Gull la	1030	App. 35		•				Brief sighting from distance
	E Rumphack Is	1040 - 1130	14	In kelp			•		Wave action
	Open Vater Pos	1305	App. 50				Up and out smiffing, then dispersal tor- wards Farout Reefs, on and below surface		enabled only an estimate of numbers
	SE Gull Is	2100	14	In kelp					Indirect report
L,	E Humpback Is	1600 - 1800	14	Several in kelp	l in reefs adjacent to Runpback Is		H approached Zodiac up and out scenting all the vay. Fhight - 2 Mo/P pails to Mid Rocks on ap- proach of vessel		
5	SE Gull Is	0700	15		· ·		Flight into reefs due to presence of predator (killer whale)		Indirect report
10 m v v v v v v v v v v v v v v v v v v	S Humpback Is	1400 ~ 1700	22	Hajority	,	3 Mo/P pairs especially Mo grooms P on chest	Flight upon near approach (10m) of obser- vers in snorkel gear		

### TABLE 3 (Page 6)

800			•	manan a dasah da ih					
	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING <sup>4</sup>	CROOHING <sup>5</sup>	SWIMHING <sup>6</sup>	INTERACTION?	BEHAVIOUR'S
u 16	SE Gull Is	2030 - 2100	25						Indirect observacion
	SE Burisl Cave Is	2200	2	In kelp					
pp 17	SE Cull is	<b>0</b> 900	Û						indirect observation
600 <b>1</b> 7	E Humpback Is	0910	R.P.		•				THREE CE CONTRACTOR
18	RE Burist Cave Is	0550	1	In kelp		•			brief Sighting
Mary Control	SK Gull is	<b>0</b> 600	į			•			Pave action ob-
	E Humpback Is	0630	5						scured highling
value de la companya	SE Cull Is	2015 - 2120	12			Grooming on arrival as raft forms	Travel around \$ end Gull is		
and the second s	Cautious Triangle	2015 - 2120	2			M, F groom after copulation		Copulation (pos- sibly attempted, intromission not observed)	
19	SE Coll to	0610 - 0733	ŷ	In kelp	4 - Open awakening app. 50% from raft		Travel around 5 and of Gull Is	602011000	
A production of the state of th	Cautious Triangle	0630 - 1115	2	Following copulation	position	Pallowing copulation		Copulation (possibly after upfed), K bites F nose, underweath F	
Schich Authorites	k Romphack is	0940	App. 15						pistance obscured class obscivation

### TABLE 3 (Page 7)

### TABLE OF BEHAVIOURS LOGGED AGAINST TIME

LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL	RESTING 3	FEE DING4	GROOMING <sup>5</sup>	svikhing <sup>6</sup>	INTERACTION 7	BEHAVIOUR 8 UNKKOWN
Cautious Triangle	2230	2	In kelp	,				
Cautious Triangle	0645 1000	2		In kelp	Occasional		•	
se cull is	0700	0						
SE Gull Is	0915	2				2 Travel		
Cautious Triangle	1930	2	In kelp	2 S of Dozing Rock		Flight to SE when observers scented upwind		
E Humpback Is	1030 ~ 1209	38	Hajority in and out of kelp. Tightly packed raft in kelp		Increase in grooming ac- tivity appeared induced by rise of strong NW wind	Travel - west- ward toward reefs		
SE Gull Is	0745 - 0815	4	In kelp		Occasional			•
Midway Farout Reefs & Humpback Is	0745	4				Travel		
E Húmpback Is	0905 - 1000	38	Majority		Occasional	Flight - dis- persal appar- ently due to log drifting into widet of raft. Raft re- grouped, but 5 travelled SS	Ho rolls small P off her chest swem slovly im ahead of P - perhaps a swim min lesson. P progress slowly on chest	

### TABLE 3 (Page 8)

### TABLE OF BEHAVIOURS LOGGED AGAINST TIME

				IABUG, UT	BEHAVIOURS EOU	CEU KURIKSI II.	The Fig.		
A S	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	RESTING 3	FEEDING <sup>4</sup>	GROOMING <sup>5</sup>	Swim hing <sup>6</sup>	INTERACTION 7	BEHAVIOUR 8
long 21	SE Cull Is	2030 - 2145	8	In kelp		On arrivatia	Travel to Gull Is forming raft	·	
	Cautious Triangle	2200	2	In kelp					
gryns	R Burial Cave 1s	2215	1	In kelp					
72	SE Burial Cave Is	0555	ì	In kelp					
L.C.	SE Gull Is	0555 - 0730	0				Travel away from		
STATE THE PROPERTY OF THE PROP	Hidway Gull Is & Dozing Rock	0555 ~ 0730	2	,	H and F food diving			N and F pair – brief bouts of tumbling and	
· · · · · · · · · · · · · · · · · · ·		,						biting before feeding	•
A CONTRACTOR OF THE CONTRACTOR	Cautious Triangle	0740	ę.	In kelp					
and a second sec	E Humpback Is	1130 - 1300	20	la kelp			Dispersed by ob- server's boat SE. Did not re-raft while Zodise pres- ent with Sculia divers conducting algae survey		
A Carlindry Carlindry of	E Humphack is	2000	App. 25	în kelp					Wave setion obscured accurate count observation

### TABLE 3 (Page 9)

### TABLE OF BEHAVIOURS LOGGED AGAINST TIME

			,	***************************************					BUNG WAR
	LOCATION	TIME OBSERVED 1	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING4	GROOMING <sup>5</sup>	SMIM HING 6	INTERACTION	BEHAVIOUR 8
2	K Hid Rock	2000	1		1 food diving				
	n Gull Is	2015	2						Brief sighting
	W Burist Cave Is	2200	2				Travel	•	
4	f. Humpback Is	1240 - 1445	15	In kelp	Ho/P - she dives retriev- ing food for both, NE of Humpback	Occasional	Flight - raft disperses to S as wind shift leaves observers upwind. Regrouped		
	Farout Reefs	1240 - 1445	R.F.						Distance obscure accurate count, observation
5	Hidway Cull 6 Burial Cave Is	0545	3		•				Brief sighting
	E Hompback Is	-0625 - 0945	20	50m off kelp to east. With exposure of kelp by ebbing tide, all moved in-	1-SW of Hid Rocks	Nuch grooming activity with move into kelp	Travel		ı
				to kelp				•	
	SE Gull Is	2035	5						Brief eighting
	E Humpback Is	2100 - 2145	5	In kelp				-	
	Kidway Goll & Rumptack Is	2145	3				Travel NE		

### TABLE 3 (Page 10)

\$00%				TABLE OF B	EHAVIOUES LOC	GED AGAINST TIM	E		
ALA	LOCATION	TIME OBSERVED 1	TOTAL	RESTING <sup>3</sup>	FEEDING4	CROONING <sup>5</sup>	SWIN HING 6	INTERACTION	BERAVIOUR <sub>S</sub> UBEROUR
u 25	SE Gull is	2145 ~ 2200	19	In kelp. Closely packed raft		Occasional			
A Company of the Comp	SE Gull is	<b>05</b> 30 - 0720	8	Sleeping	0600 - on awakening		Travel	Individual jostles, awakens 3 others	
	E Humpback is	0713	R.P.						Distance obscured sighting
Salukahahaharat.Na	N Eurial Cave Is	2010	2	In kelp					
\$5.0	SE Gull Is	2115 - 2200	11	In kelp	-				
**************************************	SE Gull ls	<b>0750 -</b> 0830	7	în keîp	,	Geessional - upon moving away from raft position	Travel		
Commence of the commence of th	SE Cull is	<b>0540</b> ~ 0605	R.P.		Ro feeding passing food to D		Flight - 4 to 5 dispersed northward from raft position probably coused by observed's approach in boat		
earnite install of	L Humpback Is	0630	r.P.	Rait motion-					Observation from distance
£ · · ·	R Burial Cave Is	2010	1	In kelp					
ng) penandanian	SE Gull Is	2050 - 2150	25	In kelp	1 - NE of raft area	Prior to sleep			

### TABLE 3 (Page 11)

### TABLE OF BEHAVIOURS LOGGED AGAIN: ! TIME

T	FOCKTION	TIME OBSERVED 1	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING4	CROOMING <sup>5</sup>	swih ming <sup>6</sup>	INTERACTION <sup>7</sup>	BEHAVIOUR 8 UNKNOWN 8
re 29	Cull Is	0530 - 0600	0		•		Travel		
	E Humpback In	0710 - 0740	R.P.						Observation from distance
No. of the control of	f. Humpback Is	1030 - 1045	23	In kelp			Plight - Dis- persal as wind shift left obser- vers upwind.		
A	•						Raft regrouped		
\$17.5	E Humpback Is	1915 - 2120	ìì	In kelp	2 adjacent to raft area		Travel		
Playsoballed	SE Gull Is	2145	15	In kelp					
30	Farout Reef	0950	3						Observation over distance
Authorist Lutural Arrivo	E Humpback Is	1035	3						Observation over distance
<b>8</b> (3)	E Humpback Is	2005- 2020	11	In kelp		Occasional			
	SE Cult Is	2105 - 2145	8	In kelp		Some		Individual nips another, which swims off short distance. Re- turns. 2 sleep side by side	
888					÷			and of post	

### TABLE 3 (Page 12)

TARIW	0.0	12 P 13	a vii a ii	8.8	LOGGED	ACAINST TIME
TABLE	61.5	E E 11	a viv u	RO	27 / C (1 1 12 12	14 62 47 2 14 17 17 17 17 17 17 17 17 17 17 17 17 17

277	TABLE OF BEHAVIOURS LOGGED AUXINST LIGHT								
	FOCYLION	TIME OBSERVED <sup>1</sup>	TOTAL.2	RESTING 3	FEEDING4	GROOMING <sup>5</sup>	swih ming 6	INTERACTION	BEHAVIOUR S UNENORN S
1	Gull is	0745 - 0845	5				Travel		
No. of the second secon	K Humpback is	. <b>0</b> 960	27	Hajority in kelp		Some .	Flight - observer's scent caught, 2 continue to trav- el SE, 2 trav- cl NE	An individual which sighted observers first, appeared to justle others into dispersal	
	E Humpback Is	1205	15	Hajority in kelp	l SSW of Mid Rock	Some			
الم مداد المداد	B Humpback Is	2003	7	In kelp			Travel	2 tombling, nip- ping while on route towards Cull Is	
Anthony with danks in	SE Cull la	2030 - 2150	10	in keip	l E of raft area, l P nursing	Prior to sleeping	Travel into rait erea	2 seen rolling, tumbling together V of Dozing Rock	
2	Ridway Gull Is & Farout Recf	0700	5						Observation from distance
المائن المائمة	t Hungback la	1030 - 1130	22	In kelp		Oceasional & especially upon regrouping	Up and looking, dispersal. Cause unknown. Regroup		

### TABLE 3 (Page 13) TABLE OF BEHAVIOURS LOGGED AGAINST TIME

E	FOCULION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING <sup>4</sup>	crooning <sup>5</sup>	swik king <sup>6</sup>	INTERACTION?	BEHAVIOURS
. 2	Farout Reef	1230	Арр. 35						Ocean swell hin- dered accurate count
	SE Cull Is	1925 - 2050	14	Upon arrival in rafting area	4 near Bleeding Rock	Upon arrival, prior to rest- ing	Travel into raft area. Disper- sol - by log drifting into raft area. Re- grouped	D seizing food from No	
3	SE Gull Is	0505 - 0530	2	Asleep in kelp				-	
	E Humpback Is	0555 - 0800	22	In kelp	4 betveen Humpback raft area & Hid Rock	Occasional	Travel - from SE Flight to SE. Up and sniffing be- haviour. Cause unknown	I brown-headed If seen to saiff ano-genital region of sev- eral otters in raft	
3 2	SE Gull Is	2130	4	In kelp					,
15	E Humpback Is	1015 - 1325	17	Kajority in kelp	4 N of raft, 1 nursing D	Hany	Flight - dispersed when observers scent detected. Regrouped		
) (3)	SE Gull Is	0515 - 0815	19	In kelp	2 V of Bleeding Rock	Upon waking	Travel away from raft area		
		2000 - 2200	8	Some in kelp Some drifting	1 D nursing	Prior to rest			

### TABLE 3 (Page 14)

	TABLE OF BEHAVIOURS LOGGED AGAINST THE										
	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	KESTING <sup>3</sup>	reeding*	groomine <sup>5</sup>	skin king <sup>6</sup>	INTERACTIOR 7	BEHAVIOUR 8 UNKROUN		
7	SE Gull Is	0530 - 0830	11	All, nost in kelp, notion- less	3 E of raft. D dives, also scizes food from No	Upon waking and after feeding	Travel away from tast area	A trio, consisting of M and Mo/D - identifiable as a unit on basis of frequent sightings, subsequently, M, Mo tumble, mip together			
Section and the section and th	E Rumpback Is	0945 ~ 1045	27	In kelp		Occasional	Flight - by un- known cause. 16 regroup				
	SE Gull is	2050 - 2215	3	In kelp	Attempted nursing by D; Horesists	Prior to rest					
Walter Committee	SE Cull is	0530 - 0900	8	Hotionless in kelp	3 KE of raft. D soizes food from Ho	Upon awakening and while trav- elling away from roll area	Travel away from raft area	Trio interaction - H and Froll to- gether. M nips nose of D			
9.0	SK hurial Cave is	2030	1						Brief sighting		
Stray of a final stray of the s	SE Gull Is	2045 - 2215	3	In kelp		Prior to rest					
Esta Companya Company	SK Gull Is	0535 ~ 1}15	10	în kelp. trio – siter feeding	Trio - NE of rait area. D nurses, scines food from No	After leeding	Travel away from				
5	SW Boring Rock	1940	1						Arief sighting		
	E humphark is	1950 - 2015	12	Hajority, in kelp		Occasional					

### TABLE 3 (Page 15)

### TABLE OF BEHAVIOURS LOGGED AGAINST TIME

£.,.,									BEHAVIOUR
	FOCKHOR	OBSERVED 1	TOTAL <sup>2</sup>	RESTING <sup>3</sup>	FEEDING <sup>4</sup>	GROOHING <sup>5</sup>	SMIM KING &	INTERACTION	UNKKOYN 8
, 19	Gull Is	2040 - 2125	3		Trio - NE of reft area	After feeding			
ab Companies of the Com	NE Burisl Cave la	2140	1	Sleeping in kelp			If upon a vokening wavims a full semi circle around ob- servers (mostly under vater) to leave then upwind		
A Control of the Cont		0530	2	In kelp					
(i,j)	W Burial Cave Is	05.50					m 1 f	Trio - H attempts	
611	SE Gull Is	0600 - 2130	21	18 in kelp	7 E of Guli Is - nursing P	P grooms back of Ho's head	Travel away from raft area	biting of Mo nose, b interferes	
a part	KE Borial Cave Is	0600	ì	Sleeping in kelp					
	Guli Is	0615 - 0630	0						•
o Berthado de vitado do	E Humpback is	0700 - 0745	16	Kajority, in kelp		Occasional			
	Hidway Deer 6 Thomas Is	0810	ì		Otter abandoned food item as obscivers approached				
	Ferout Reefs	App 1100	App. 25						Indirect observation
<b>(</b> %)	SW Cautious Is	2025 - 2100	1	in kelp	Food dives	Occasional		•	
-2									

### TABLE 1 (Page 16)

				TABLE OF	BEHAVIOURS LOC	CED ACAINST TIM	<u>E</u>		
a Carlo	LOCATION	TIME OBSERVED	TOTAL <sup>2</sup>	RESTING 3	FEEDING <sup>4</sup>	GROONING 5	swin hing 6	INTERACTION <sup>7</sup>	BEHAVIOUR <sub>8</sub> UNKROUR
.(%2)	Cull Is	1140 - 1300	Ž		RE of Gull Is	Occasional * after feeding	Plight; possibly due to passing fish boat		
de la constante de la constant	SE Gull Is	1950 - 2200	5	In kelp		Prior to rest		He/D arrive in raft position, nose to nose sniffing with 2 resting offers	
<b>2</b> 4	SE Guil le	0530 - 0600	6	In kelp	l nursing P				•
Statement Statem	E Humpback Is	0615 - 1130	15	Hajority, outside of kelp	1- W Mid Rocks, 1 P norsing	Occasional by majority	Travel into raft area. Flight in- to reafs, due to fish boar passage between Bumphack Is and Kid Rock. Regrouped		
	E Humpback Is	1950 - 2040	11	Approx. half		Remainder,	• • • • • • • • • • • • • • • • • • • •		
B.A.				of raft		prior to rest			
Transfer of Contract of Contra	SE Cull is	2050 - 2200	2	H and F, after grooming. F stayed very a looking shoot while H wrap in kelp appearance.	lore , ped	Opon strival in taft ates. (H - 17 min.) (F - 40 min.)	Travelinto raft ares	M arrived 15 min. after F; rolling, touching noses; alpping upon meeting	
25	SU Gull Is	0530 - 0615	3	2 steeping in kelp		e e e e e e e e e e e e e e e e e e e			

BESTATIONS

### TABLE 3 (Page 17) TABLE OF BEHAVIOURS LOGGED AGAINST TIME

E.	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	resting <sup>3</sup>	FEEDING <sup>4</sup>	GROOMING <sup>5</sup>	svin hing <sup>6</sup>	INTERACTION 7	BEHAVIOUR 8
	E Bumpback Is	0630 - 0730	9	2 in kelp	1 nursing D	5 grooming			
	Perout Reels	1210 - 1245	App. 35	Majority, in kelp		Some	Flight into reefs. Wind shift leaves observers upwind		,
N. Kalbuck	E Rumpback Is	1320 - 1400	13	In kelp	I'NE of raft	Occasional			
A.	Between Bonial Cave & Gold Is	1800	1						Brief sighting
	E Humphack Is	2000 - 2130	9	In kelp	5 leave raft to feed		Travel to talt position		•
Audinbrokelturbythelt	SE Gull 14	2140 - 2200	3				Travel into raft area		
26	1200ca SSW of Cull Is	0710	1				Flight as observer's boat approached		Brief eighting
	Farout RecEs	0720 - 0745	λpp. 35				Flight, many moved into reefs as obser- ver's boat approach		Wave action obscured sighting
600 800	E Humpback Is	0815 - 1100	R.P.	In kelp		Occasional		•	
	Forout Reefs	1145 - 1245	15	Some	1 adjacent to RW reof. 2 nursing P in	Kajority	Travel - off raft eres		
	E Hompback is	. 1245	9	In kelp	raft				

### TABLE 3 (Page 18) TABLE OF BEHAVIOUES LOGGED AGAINST TIME

62	LOCATION	TIME OBSERVED <sup>1</sup>	TOTAL.2	RESTING <sup>3</sup>	refuinc <sub>r</sub>	GROOMING <sup>5</sup>	swin hing <sup>6</sup>	INTERACTIOR?	AKKHONK BEHAVIORE
10826	Deer Is	2050 - 2115	2	I wrapped in kelp, sleeping			Travel - 1		
<b>8</b> 8	SW Castious is	2140	1						Obscured by derkness
27	N Deer is	1950	1			Khile svim ming			Bricf eighting
Action 2	SE Gull Is	2100 - 2145	2	In kelp	•	Prior to sleep			
E 28	se coll k	0500 - 0730	3	In kelp		Upon vaking	Travel away from rait area		
25	SE Collis	2100	ì						Observation over distance
29	Ridway Humpback le & Ferout Reels	1100	2				Travel	•	
B. Itali	Hid Rocks	1230	2		Both food diving				
Section made	E Coll Ix	1930 - 2200	ż	While drifting M and F. RW pest B tip of Cull Is		H occasionally	H and P drifted approx. I mi due to SE wind. Then awar back to E Gull Is		

In vicinity of

2 norsing D

Gull Is

In kelp, at

Hajority, in

outset

kelp

0500 - 1615

1930 - 2200

10

31 SE Gold is

SE Collin

Upon waking (2 for 15 min.), be-fore rest periods (1 for 25 min., on

two separate oc-

Occoasional

Travel away from raft area; around Gull ls

H and F pair roll and tamble

together

### TABLE OF BEHAVIOURS LOGGED AGAINST TIME

100				****					
E	FOCULION	TIME OBSERVED <sup>1</sup>	TOTAL <sup>2</sup>	RESTIRG	FEEDING 6	GROOKING <sup>5</sup>	Shik Hirc <sub>e</sub>	INTERACTION <sup>7</sup>	NNKRONN BEHAVIOUR
Samuel Control	E Humpback Is	0625 - 0700	10	Kajority, in kelp	1 norsing D	Occasional			
Section 1997 Secti	Cautious Triangle	0850 - 1645		After feeding, in kelp	3 food dive to- gother (2 ses- mions). D curses	After feeding (2 sessions - 38 min. and 20 min.)		The trio (see July 17 - Inter- sction) - Mo dis- courages D from climbing on her chest; play - 3 roll together; mating sctivity - M biting F nose, vigourous play, H sniffing F zno- genital region. Interference is mating activity by D. possibly attempts copulation. Wher	
Chinadalala								frequently, f. ter	nde
		,				•		to B. as D. atter to climb on her	

### E E SERAVIOURS LOGGED ACAINST

The state of the s

Time spans represent observation for a sustained length of time. Single times are brief sightings.

Time Observed

Resting Toral

~ m

- Maximum number of offers sees for the time observed.
- Rest if an otter was lying quietly in the water on its back in or out of kelp. Rest was often interspareed with casual grooming. Sleep was assumed only if otters were motionless (no grooming) and wrapped in kelp, ususilly at daybreak or nightfall. Description of rest behaviour as "in kelp" indicates orters position in a kelp bed, though not necessarily wrapped in Melp. 8 designated
- Zehaviour was designated as feeding if an otter was seen, paws to mouth, consuming a foed item, diving repeatedly in an area to retrieve food items, or using a rock anvil to pound open food items.

Feeding

\*\*

For breakdown of feeding times and items see Table 5, Feeding Activity Logged Versus Time.

- Behaviour was designated as grooming if individual otters were seen to engage in the care of their pelage. This is achieved by rubbing, squeezing, licking, and blowing air into the pelage. Also includes mutual grooming between mothers and young.
- Jehaviour was designated as swimming if an otter moved over a distance along the surface or under the surface without pausing to engage in other activity. Swimming behaviour had two apparent purposes:

Swimming

S

Greening

'n

- Iravel an otter usually on the surface traversing a distance apparantly between two geographic locales (eg. takting areas). Usually in a straight path. (3)
- Flight or Dispersal Otters ware seen to move off in response to an apparent threat detected by sense of small, sight, or hearing. Often into the shelter of nearby reefs, and frequently underwater (especially if rapid escape necessary). (ii)

For detail of travel observed see Table 4, Travel Logged Versus Time.

Behaviour Unknown

copulation.

Dehaviour was recorded as unknown if otters were sighted was obscured by wave action or distance, thus not enabling an accurate monitoring of behaviour. Indirect reports or observations were by other observers.

Begranding versity ignacedangs Intermition (TOTA) of the certa calling activity is used to denote behaviours associated with mating (See Kenyon 1969), but doesn't imply subsequent

Resting and grooming in rafts of otters are recorded as activities relative to each other, since both activities can occur concorrently.

# Abbreviations used in Table 3

- Female
- %3 le
- Raft present, but no count of otters obtained O.
  - Mother
    - Dependent
- Mother/Dependent pair Mo/D
  - Mother/Pup pair Sub-adult Mo/P

Numbers appearing in table refer to otters (not sexed).

Table 4. Travel Logged versus Time

### TABLE 4 (Page 1)

### TRAVEL LOGGED VERSUS TIME

S.				1 KAVEG DOOD				
Mr Sis	IN TRANSIT	0530 - 0800	0800 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2200	2700 - 0530
·	2 (Mo/P)	en variante in materiale de la companya de la constitución de la const	and the second	SV Humpback Is to S				
	4 (2 Ho/P)						S then SW eround Gull Is from raft pos.	•
							E then N back to rait pos.	
	4 (2 Ko/P)						Cautious Tri- angle to Gull	
							is rait	
	Hajority of 20						tip Cull ls N to raft pos.	
	4 (2 Ho/P)		NW into Humpback le					
			raft pos. 1049 - 0 tot. 1130 - 14 tot.				1.0	
.5	Majority of 12						NE around S tip of Gull Is, N to raft pos.	
\$ \$ \$ \$	3	\$ then SV						
		around S tip Gull Is				·		
0	2 (Mo/P)		SW from Guil Is raft pos. to Humpback Is					
, is			reft		-			
*								
y.		· ·	4					
, <u></u>	and the second of the second o	The second of the second of the second of	The second secon	and the second second				
É	•	·		TABLE 4	. (rage 2)			
ÇA :				TRAVEL LOGGE				
i Si Te	fin Transit	<b>0530 -</b> 08 <b>0</b> 0	0800 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2200	2200 - 0530
<b>2</b> 0	) Hajority of		Andrew Control of Cont	yangan adala dan sakel sakelahin dan sakelahin dan sakelah sakelah sakelah sakelah sakelah sakelah sakelah sak			NE then N around S tip	
Ž	15						Cull is to raft pos.	
	Majority of 38			Move westward into Humphack Roofs				
<b>2</b>	1 4 (7 Ho/P)	NW from Farou Rouls to Hump back is raft		•	-	·		
	5	SE from Homp- back is valu						
v.F		. towards Parou Reefs	it ,				E than K	
	Several of	8	•				eround S tip of Gull is forming raft	
i Ser	B	8 present (Gali is) st					•	
		2145 Jene 21 departed by 0555 June 22						
	22 2 (Ho/D)	υργε ματια 44					W Burial Cavo Is towards Cull Is	:
					•	•	out: 12	

### TABLE 4 (Page 3)

### TRAVEL LOGGED VERSUS TIME

Action to the second	# IN TRANSIT	0530 - 0800	0800 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2200	2200 - 0530
25	3 (Ho/P + 1)	HW to Humpback Is reft pos.						
m k k	2 (Ka/P)	SE from Hump- back is towards Farout Recis				·		
	3 (Ho/P + 1)						NE from Bopp- back is towards Gull is	
26 26	3	5 then SW around 5 tip Gull 1s from raft pos.						June 25, 2200 ~ 19 in raft SE Cull 1s, June 26, 0530 ~ 8
<i>27</i> 27 ∴	7	S then SW around S tip Gull Is, pro- ceeded toward Humpback Is					,	
28 	2				•		NE from Hump- • back is past Hid Rock (e- ward Gull is	June 28, 2150 ~ 25 in raft SE Gull Is. June 29, 0350 ~ 0 at SE Gull 1*
	4 (Mo/P +2)						S to Humpback 18 reft pos.	
							•	•
				. ·				•
				<u></u>	5 1.7			
				TASLE 4 () TRAVEL LOGGED				
	# IN TRANSIT	0530 - 0800	0800 - 1100	1100 - 1400	1400 - 1700	1700 ~ 2000	2000 - 2200	2200 - 0530
% 1	S	S then SW eround S tip of Cull Is	- Composition of the Composition					
	1	Sw from Call						
		is rait to Humphack is rait pos.						
	2	is raft to Humphack la	SE from Hump- back is rafi towards Ferout Roefs					
997. 191. 191. 191. 191.	2 2 (Mo/F)	is raft to Humphack la	back is rafi towards Ferout	ME-from Homp- back is raft towards Gelt is				v
Voti Vil Voti Vote		is raft to Humphack la	back is rafi towards Ferout	back le raft			NE from Dunp- back in towards Oull in	¥
	2 (Mo/F)	is raft to Humphack la	back is rafi towards Ferout	back læ raft towarda Geli Is			back is towards	

SW to Bumpback ls reft from Bid Rocks

### TABLE 4 (Page 5)

### TRAVEL LOGGED VERSUS TIME

				TRAVEL LOGGED	VERSUS TIME			
175	# IN Transit	0530 - 0800	0800 - 1100	1100 - 1406	1400 - 1700	1700 - 2000	2000 - 2200	2200 - 0530
ly )	3 (Mo/P + 1)	From SE to Humpback Is telt pos.						
S. S	3 (Mo/D + 1)						N from S tip of Cull Is in- to raft pos.	July 15, 2200 - 3 at 5% Gull 1s, July 1b, 0515 - 19 at 5% Gull 1s
and the second	Majority of	S then SW around S tip of Guil Is						
The state of the s	2 (Ho/D)	From Cull Is raft pos. S toward Farout Reefs						٠.
17	11	S then SW ground S Guil Is		•			,	July 17, 2215 - 3 at SE Gull Is, July 18, 3530 - 8 at SE Gull Is
18	4 (Mo/P + 2)	S then SW around S Gull Is						July 18 - 2215 - 3 at 80 Golf Is, July 19, 0538 - 10 at 80 Golf 18
	3 (40/8 +1)	Prom SE Gull Is raft pos. to Open Water raft pos.						
Track substantians of the					*			
Spanners Australia	and the second s	·	and the second s					
					•			
		•		TABLE	4 (Page 6)			
Parket Market Name				TRAVEL LOGG	OD VERSUS TIME			
DATE.	¢in Transit	0530 - 0800	0800 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 + 2200	2200 + 0530
J 19	6	S then SW around S Cull ls	·	•				
20	Majority of 21	S then SW around S Cull Is						
2 2	3 (Mo/2 + 1)	RW into Hump- back is raft pos. from vicinity of						July 24, 2200 - 2 at 88 Gall is: July 25, 0530 - 4 at 88 Guli ls
Autigrafia	ů,	Open Water pos- SW to Humphack is raft from vicinity of						
And trade in a first trade in the state of t	2	Cull is					NE then F eround S Gull Is into reft position	
Secretary Secretary	) 2 (Ho/B)						Www.to Bumpback Is raft from Or. Rock	
£ ' :	_							*

### TABLE 4 (Page 7)

### TRAVEL LOGGED VERSUS TIME

				E B A V LO				
	FIN TRANSIT	0530 - 0800	0800 - 1100	1100 - 1406	1400 - 1700	1700 - 2000	2000 - 2200	2200 - 0530
25	3						H from S tip of Gull 1s into raft pos.	
90 3. 91 <b>6</b> 4.5	App. 15			NW slowly from Parout Reefs raft pos. for approx. 200 s.				
	1						WSW to Burish Cave Is from Deer Is	
78	3	S then SW eround S tip of Gull Is						
29	2 .		NW to Numpback Is from vicin- ity of Parout Reefs					July 30, 2200 -
31	11	S then SW ground S Gull Is from raft position						2 at SE Gull Is July 34, 0500 - 15 at SE Gull I
	1 M	N from reft pos., to pos. off ME corner of Gull		S then SW ground S end of Gull is	NW then N around N end of Gull Is			
		is in kelp						
		and the second second					·	
4,4, .5			and the second s			:	,	and the second s
55 	en and a second second		ne -					
				TABLE 4 ()	Page 8)			
KO:				TRAVEL LOCCED	VERSUS TIME			
e e	# IN TRANSIT	0530 - 0800	0800 - 1100	1100 ~ 1400	1400 - 1700	1700 - 2000	2000 - 2200	2200 - 0530
31	1 \$*			From position with R off NS corner Gall Is. S then SW around Gall Is. From W side Gall Is. SW	Mid Rocks to 2			
d d d d d d d d d d d d d d d d d d d				past Rid Rocks				

### NOTES ON TABLE 4

### TRAVEL LOGGED VERSUS TIME

- # IN TRANSIT Describes number of otters observed travelling a straight path.
   Origins and destinations of travel recorded if observed.
- 2. TIME PERIODS Cover a full 24-hour period (PDT). 0530 represents first light, 2200 last light, of day. Therefore 2200 0530 represents darkness, and observation not possible.

### Abbreviations

Mo - Mother
P - Pup
D - Dependent

M - Male

F - Female tot. - total

pos. - position

Table 5. Feeding Activity Logged versus Time

### TABLE 5 (Page 1)

### FEEDING ACTIVITY LOCGED VERSUS TIME

	FOCULION	FORAGE METHOD AND FOOD ITEM	0500 - 0800	0800 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2200
y y included the state of the s	N Bumpback Is	pounding white class			Но/Ð			
7	Botween Burial Cave and Cautious Is	pounding						No/P
e de la companya de l	N bozing Rock	pounding		Individual			•	
10	SE Gull Is	pounding mussels				Individual		
1 designation	SE Gull Is	pounding mussels				•	3 Indiv.	2 indiv, 2 Ho/B
14	100m SE Humpback Is in Reefs	chewing, possibly chiton				Individual		
1 magazina	App. 50m E Gull Is Raft Position	pounding	4 Indiv.					
20	S Dozing Rock	pounding white clams					KEF	
Tally, Physical Act	200m off SE Cull Is	pounding white class						Individual
22	Kidway between Gull ls, Dozing Rock	pounding	M & F					
	R Rid Rock	pounding						Individual
2	NE Humpback la	pounding			Mo/P	•		
25 	SP Kid Rocks	chewing orange starfish	lndividual					

### TABLE 5 (Page 7)

FEEDING	ACTIVITY	DECCEO-	VERSUS	3,1555

8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	LOCATION	FORAGE METHOD AND FOOD ITEM	<b>0</b> 500 - <b>0</b> 800	0300 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 + 2200
e 88	Few meters from SE Gull Is Raft Pos.	chewing, possibly	3 ladiv.					
c 28	E Cull Is	pounding	но/Р			•		Individual
	NE Hompback la	pounding white clams						No/P
ykr	SSW Mid Rock	purple urchia	•		Individual			
No promotion	E Cull la	pounding						ladividusl
y Eu	100s V Bleeding Rock	pounding					2 Indiv.	
	400m W Bleeding Rock	pounding					-	Ha/0
Salari i	5 Mid Rock	pounding	2 India.					
Č,	E Humpback Is	pounding	l Indiv.		,			
i governing	Unrecorded position near Humpback Is	pounding	Individual					
1 × ×	200m N Homphack Is Raft Position	pounding white clams	ко/р					
No of the same and	In N Humpback Is Raft Position	pounding white clams			7 Ko/D			
ž;	E Cult ls	pounding						ladividual

### TABLE 5 (Page 3)

			FEEDING ACTIVITY	LONGED VERSUS T	INE			
r.	POCYLIGA	FORACE METHOD AND FOOD ITEM	0500 - 0800	0300 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2700
\$77 16	W Bleeding Rock	pounding	Ho/D					
17	E Cull Is	pounding white clams (for 60 minutes)	Trio					
<b>3</b>	500m NE Cull Is Raft Position	pounding white clams (125 minutes)	Trio					
July 19	500a NE Gull Is Raft Position	pounding white class, chewing small objects	Trio (140 min.)	Trio (95 min.)		·	•	Tria ~ feeding well past sunset (App. 2115)
July 20	300m NE Cull Is Raft Position	pounding white clams	Trie					
Viganor Administrative	NE Gali Is	pounding white clams 3 large red urchins 1 green erchin	3 Indiv. Trio (120 mîn.)		Trio (no time avail- able)	Trio (55 min.)		
	150m SW Bleeding Rock				Trio (no timo avail- able)			Trio - (3rd feeding sess.)
BSS July 22	Halfvay between Deer & Thomas Is	red urchin		Individual				
	S Cautious Is	no pounding, items unknown						Individuat - 3 food dives ob- served
abusing development of the second of the sec								
	Andrew Communication of the Andrews	****	TABLE	5 (Page 4)	*	AP SPC V (A. 100)	aman militar sa a seeda y e e e e e estimatado	
			FEEDING ACTIVIT	Y LOGGED VERSUS	TIME			
DATE	POCYLION	FORAGE METHOD AND FOOD ITEM	0500 - 0800	0300 - 1100	1100 - 1400	1400 - 1700	1700 - 2000	2000 - 2203
y 23	NE Gull Is	pounding white clams one red urchin (25 minutes)			2 Indiv.			
Josep 24	W Hid Rocks	pounding		Individual				
∭y 25	NE Humpback Is	pounding white class			Individual			
87V77	N to E Dr. Rock	pounding						Yo/0
ghangaineas	Several m off Humpback Roofs	chewing						Ko/0
in the second	E Dr. Rock	pounding						Individual
j. y 26	N Farout Roefs	urchín		,	Individual			
Sec. 29	S Mid Rocke	pounding			Ho/D			
July 31	NE Cull Is	pounding	3 Mo/D					
· ·	E Gull lz	pounding	2 8					
Š.A., or a	SW Cull Is	red or purple wichin			1 8			
Sign of the State	From SW to NE Golf In ground W side	large red archin, fleshy object, while class				łĸ		
Aug. 1	St Bosing Rock	pounding white class, chowing small objects, I crab		,	Trio (75 minutes)	Trèa		

### NOTES ON TABLE 5

### FEEDING ACTIVITY LOGGED VERSUS TIME

 Forage Method and Food Item

- Forage method includes an initial diving to the bottom to retrieve food item in all cases. Food items named where known.
  - Pounding refers to the action of placing a stone anvil on the chest, and pounding food items against it to break them open for consumption of contents.
  - Chewing refers to the action of passing a food item directly into the mouth with the forepaws for consumption.
- 2. <u>Time Periods</u> <u>Time periods cover a 24-hour period (PDT)</u>. 0530 and 2200 are first and last light of day, respectively. Numbers within table are otters seen feeding.
- 3. <u>Trio</u> Refer to Notes on Table 2, Note on Recognition of Individuals, for explanation.

### Abbreviations

Mo - Mother

P - Pup

D - Dependent

M - Male
F - Female

Indiv. - Individual (sex undetermined)

Table 6. Extended Behavioural Observations on Specific Otters

# EXTENDED MENAVIOUNAL OBSERVATIONS ON SPECIFIC OTTERS

A Community of the state of the

EXTENDED BEHAVIOURAL OBSERVATIONS ON SPECIFIC OTTERS

Constitution of the Consti

halla Charling Developels

ACTIVITY	Sleeping intermittent with grooming Pup norses.	Frightened by observer's movement. about 200m S grooming along the way	Slowly drifting S to Bleeding Rock, grooming and playing (10 min.)	Feeding, pounding white clams.	Swim to kelp, grooming along the wa	Grooming.	All three aleap. Observations terminated.		Male swims N of Gull Is.	Male returns from N of Gull Is.	Male swims in NE area Gull Is.	. Hale grooms.	Male sleeps, female arrives.	Male and female continue aleeping.	Male grooms, female aleaps.	Kale and female skeep.	Female wakes and swims around S end Cull Is.	Male sand sales and Send	Cull 1s stapping to groom in kelp at SW corner. Female last from vi	Female feeding (2 urchins) W of Gu Is. She swims toward kelp and mai leaves kelp. Both roll togehter.
OTTERS	Trío	2	T.	<b>=</b>	=	2	2		Male &	2	2	z	*	:	=	=	z	±		*
TIME	1735 - 1907	1907 - 1916	1916 - 2006	2006 - 2031	2031 - 2044	2044 - 2117	2117		0715	0815	0815 - 0820	0820 - 0845	0845 - 0940	0940 - 1100	1100 - 1125	1125 - 1207	1207 - 1230	1230 - 1305		1305 - 1315
LOCATION	Kelp E of Cull Is	Kelp Z of Gull Is	SE Cull Is	E Gull Is	E Cull Is	Kelp E of Cull Is	Kelp E of Gull Is	A PROPERTY OF THE PROPERTY OF	NE Gull Is	NE Coll Is	NE Cull Is	NE Cull Is	NE Cull Is	NE Call Is	NE Gull Is	NZ Cull Is	NE Cull Is	N C 11 1 18	i i i	S# Cull Is
त इ	July 20								July 31										· mys maday s spellid	n maka kanada sa maka kanada kanada kanada sa maka kanada kanada kanada kanada ka
ACTIVITY	Sleeping	All three wake, leave kelp and begin feeding.	Ceased feeding, swim back to kelp grooming on route and while in kelp. Dependent nurses.		All three sleeping.	Slowly move app. 75m SE of kelp. Grooming occurs with intermitteet resting.	Swim back to kelp slowly still grooming. Dependent nursing.	Swim to feeding location.	Feeding, pounding white clams.	Disturbed by boat passage, swim to Bleading Rock.	Feeding, pounding white clams.			Grooming and short period play (about 5 min.)			Swim S to Bleeding Rock. Start food diving.	Swim while feeding to NE Gull Is.	Feeding, pounding white clams.	Grooming.
CTTERS	14. 00.	P'	Mari Ar		=	e F	ę.	=	# <del>-</del>	ų.	2	;	=	ري. د		9	r .	*	æ	\$
Service de la constante de la	0460 - 0710	0710 - 0910	0910 0935		0935 - 1125	1125 - 1153	1153 - 1230	1230 - 1235	1235 - 1355	1355 - 1406	1406 + 1432		1432 - 1439	1639 - 1530		1550 - 1545	1545 - 1610	1610 - 1617	1617 - 1701	1701 - 1735
LOCATION	E CO	NE Gull Is	Kelp E of Cull is			S S E C S S S S S S S S S S S S S S S S	Kelp H of Coll 18	NE Cull Is	NE Call Is	SE Cull is	82 000 28	Relp & of	Call 13	Kelp E of Coll Is	Xely B of	\$ 1	SE Goll Is	NE GULL TO		4. 8 0 H 0 H 0 H 0 H 0 H 0 H 0 H 0 H 0 H 0 H
12 - < 0	July 20								•				•							

Lapanassandayayisid	Veloritation of the second	FORTER FORTER METERS OF TENSION OF THE CONTRACT OF THE CONTRAC	VIOURAL DESERVATIONS ON SP	EXTENDED BEHAVIOURAL DESERVATIONS ON SPECIFIC OTTERS	removations/profess		SS STANTOURAL OF	VYIOURAL OSSERVATIONS ON	EXTENDED BEHAVIOURAL OBSERVATIONS ON SPECIFIC OTTERS
ET.	LECATION	127.5 2.14 2.14	OTTERS	ACTIVITY	H K G	LOCATION	(4) >: H	OTTERS	ACTIVITY
	S. C. L. L. S.	1335 ~ 1345	No.16 & S.	Male returns to kelp and sleeps. Female stims towards Humpback is and is lost from sight.	Aug. 1	N Dozánz Rock	1020 - 1040	Trao	Mother and dependent resting. Male casually grooming and resting alternately.
	SW Coll Is	- 1430	<b>2</b>			N Dozing Rock	1040 - 1050	** **	Mother awakes and begins grooming. Dependent nurses. Male continues casual procurns.
	SH Gull Is	0000 - 1000	Ė	Male wakens and swims up W side Gull Is around N end to NE side Gull Is. En route consumed two large red writhins and a large fleshy object.		N Dozing Rock	1050 - 1130	£	Slow swim SE to about 250m SE of Doz: Rock.
	NE CULL IS	1500 - 1520	ž	Male fording, pounding white class.		SE Dozing Rock	1130 - 1245	*	Reeding consisting of pounding action
	NE CULL ES	1520 - 1530	<b>:</b>	Male alowly swims to kelp E of Gull Is.		SE Dozing Rack	1245 - 1302	Tie	Swim back to M Dozing Rock. Grosming en roste.
	Koly E of			, and a second		N Dozing Rock	1302 - 1340	<b>2</b>	Concentrated grooming.
	Set I too	1520 - 1555	**	Male grooming.		N Dozing Rock	1340 - 1440	z	Casual grooming and resting. Pup
	% % % % % % % % % % % % % % % % % % %	1555 - 1615	<b>=</b>	Male sleeps, female returns. Observations terminated.					attempts nursing but mother rolls to discourage this.
						M Dozing Rock	1440 - 1450	z	All grooming. Pup nurses.
		Annahamili Andrewsky a stamman vommona Versilan				N Dozing Rock	1450 - 1535	£	Grooming and resting alternately.
**************************************	N. Dezing Rock	0550 + 0925	1. 0	nd femsie biting each o asping each other aroun		N Dozios Rock	1535 - 1556	<b>:</b>	Slowly swim to SE of Dozing Rock.
				neek. Dependent crawiing up on back of female.		SE Dozing Rock	1556 - 1634	**	Feeding. Near end of feeding swim- while feeding to just N of Dunion
	N. Dozing Rock	0925 - 0935	<b>.</b>	All three swim SS to position W of Dozing Nock.		•	,	=	Society of the second s
	W Dozing Rock	0935 - 0950	2	Swim back to original position M Dozing Rock.		N SOOM PAINTER NO SON	Chat L From		24(CCD112)0. CCCM81-C#1-10128 FR-1-1-1124-1-4-1-4-1-4-1-4-1-4-1-4-1-4-1-
	N Dozing Rock	0000 - 1000	br. Lee	Groonies.					
	N Dozing Rock	1000 - 1005	ä	Much rolling and splashing. Dependent crying frequently. The female omargas with a bloody and swollen nose which she vigorously rubs with forepaus. Possibly precupulatory behaviour.					
	N Donieg Rock	1605 - 1020	<b></b>	Dependent cries continuously for 7 minutes while nother grouns. Stopa crying as nursing started. Male grouns as well.					

EXTENDED BEHAVIOURAL OBSERVATIONS ON SPECIFIC OFFERS

9 WONT NO SALES

. Activities - For description, sea Notes on Table 3, Behaviours Logged

- For description, see Notes on Table 2, Note on Recognition of Individuals.

Tric

Table 7. Timing of Food Dives

	COMMENTS		iga Saipunod paarasgo oiri	c.1,4ms.	Trio pounding white clams			Trio pounding white clam	Itio pounding white class		59.	
\$3.1	INTERVAL L ON SURFACE	(sec)				20 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	120	0 0 4 4 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.4601 0.005			
TABLE /	DURATION DR DIVE	(sec)	0.30 % 0.00 %	3 0 0 0 <b>4</b>	5 200 A	2	2 8 8 2 5 9	000 000 000 000 000	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			
	\$2 <b>}</b> }	0.44.4 M. 4	0610		0750		080\$	0950	2045	,		
		LOCA's FOR	NE Call Is		NE Cull Is			•				·
	the second	DATE	July 18		July 19							
		COMMENTS		One otter, pounding white clama.	Mo/D pounding white clams. Dependent follows mother down. Dependent also receiving food from mother.	Male & female observed pounding white clams.	Section of the sectio	tity Document of the first followed by dependent and then male.	Tric observed pounding white			-
TABLE 7 (Page 1)	AND SECOND	ON SURFACE (sec)		ÖÖ	·	X: 3	·					
TABLE 7 (	SHEARTS OF SHEET	OF DIVE	105	0 % % % & & & & & & & & & & & & & & & &	447 440 440 440 440	2004 4 L L L L L L L L L L L L L L L L L		00000				
Abbutters world		in Xi	1310	0630	0630	21.22	5790	0710	0790			
		LOCATION	N Kompback Is	NE Humpback Is		NE Europeack Is	W Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z		8 44 44 15 15 15 15 15 15 15 15 15 15 15 15 15			
		is eve	Section and the section of the secti	Loly 3		51 Vinc	July 17	,	Jely 18		· .	a

		s coments	Trio commenced feeding.  Disturbed by bost passa.  Resume feeding.  Ceased feeding.
	SEATE COOL	TATARVAL ON SURFACE (Sec)	
7.826.7 (Paye a)	TIMING OF FOOD DIVES	DURATION OF DIVE (sec)	1 0000 00 1 1 0 1 0 1 0 1 0 1 1 1 1 1 1
		37.74 27.74	1235 1300 1300 1432 1605- 1611 1611 1701 2006- 2024
		LOCATION	NE Cull Is  Immediately Sw Electing Rock E Gull Is.  Sw Bleeding Rock
	5-	MATE STREET	3u.y 20 NE
	erika tanak-un-nere	COMMENTS	On surface, swim to feed position.  Trio pounding white class These dives are timed for formal contained by her depondent in all instances. Malu followed in majority of dives. Arrival back on seconds.  Swam back to raft position (app. 450m in 405 sec.)
3250 3)	OD DIVES	INTERVAL <sup>1</sup> ON SURFACE (sec)	180 180 180 180 180 180 180 180 180 180
[5.85.5] (Page 3)	TRING OF TOO	DURATION OF DIVE (sec)	8
		553 377 44 44	feeding ding 40 2 hours.
		LOCATION	Represents a feeding session including 40 food divers in 2 bours 0910
e a		53 14 12 13	2017 20

		CONSTRUCT		Trio feeding.			Ceased feeding, grooming begins. Observations terminated.			
	roco olves	INTERGAL <sup>†</sup> ON SURFACE (sec)	1 1 27	0 00	90 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	<b>.</b> 1				
TAN	TIMING OF FO	DURATION OF DIVE (sec)	110	0 6 0 6	13298888 13388888	. •				
		T. L. Mark	tock 1556		Represents second feeding session in- cluding 13 dives in A hour, 18 minutes.		1634			
		DCATION	SE Dozing Rock		Represents second feeding session i cluding 13 dives l hour, 18 minute					
Total Contract of the Contract		STAC	Aug. 1			A. A				················
		COMMENTS		Ceased feeding.	Fenala feeding.	Female disappears from sight.	Male feeding since 1440 while progressing along W Gull Is.	Cansed feeding.	Trio feeding. Distance obscured the timing of dashed dives.	,
	\$50	INTERVAL <sup>1</sup> ON SURFACE CON (sec.)		165 Ce.	20 60 60 70 85	± 14	1 1 0 %	115	130 130 130 130 130 130 130 130 130 130	
Section of the sectio	TIMIRG OF FOST DIVES	DURATION TA OF DIVE ON (sec)	Temperature (Andrews Constitution of the Const	5.	100 50 95 85 90 65	بر د د	1 twis	۲ <sup>۸</sup> ده	1	
At the desired Assessment	de de la company	a a a a a a a a a a a a a a a a a a a	970Z	2031	o. 72 0.	\$0\$0	1500	000	11000 - \$988 - \$	
The state of the s		LOCATION	Sw Bleeding Rock		8 14 15 15 15 15 15 15 15 15 15 15 15 15 15		e rino un		SE Rosing Rock 1100  Nepresents a first fieding 24 food dives in 1 hour, 45 minuses.	
- Hershiller Arvanshirvavi		54 45 63	July 20		3017 31				van ge	

## TIMING OF FOOD DIVES

Automorphism (Control of Control of Control

Interval on Surface The period of time between aequential food dives devoted to consumption of retrieved food items.

- For description, see Notes on Table 2, Note on Recognition of Individuals.

4

A dashed entry in table denotes food dive(s) not timed.

Table 8. Weather Conditions during Observation Periods.

ON PERIODS
3 OBSERVATION PERIODS
DURIN
NEW CONDITIONS DON
WEATHER CON

Verlaght-Automatorischen

OBSERVATION PERIOD CONDITIONS	1030 - 1200 NA breeze increasing, sunny (market increase		÷		0905 - 1000 NW wind, sunny. Wind increase intensity by noon.	2030 - 2145 NW wind, sunny, scattered cloud.	0555 - 0730 NW wind, sunny.	2000 SW wind, sunny.	morning Sunny but foggy, clouding over in evening.	morning Slight SW wind, cloudy.	2100 - 2140 Slight NW wind, sunny, seas calm.	0625 - 0945 NW wind, sunny.	2100 - 2125 Very brisk NA wind, choppy.	2145 - 2206 Very brisk NA wind, choppy.	0545 - 0720 RW wind, sunny, seas rippled.	2115 - 2200 NW wind, sunny, low swell.	0750 - 0830 Slight SE breeze, sunny, seas calm.	0540 - 0605 NA wind, sunny, seas rippled.		٠ ١ ١ ١ ١	0530 - 0530 SE breeze, 1088y, seas rippies.	0710 - 0740 SE breaze, foggy, seas rippled.	1030 - 1045 Wind shifting W to SW, foggy, seas rippled.	of the supplied of the supplie	
DATE	June 20 103	•		June 21 . 070	150	20.	June 22 05		June 23	100 24	2,1	June 25 . 06	21	12	June 26 05	23	June 27 07	8			Jone 29 01	0	ë		ė
CONDITIONS	NW wind, sunay, hot.	W. wind, sunny, hor.	NW wind, sunny, no cloud.	NE wind, sunny, hot.	SE wind, cloudy, choppy, 2 - 3 ft. swells	במרכים ופעצפי	Sp. wild . Horiedshig, crodel.	op will, dvirtabl.	bg breeze, cloudy, overcast.	Sg breeze, cloudy, cool, rathy, some winds caps.	SE breeze, cloudy, cool, rainy, some white	and a second and a second a se	Arisk SE Wand, Gloudy, Cold, Choppy, Walke cape.	Brisk SE, rainy, cloud, choppy. Some clearing	- March	Siight be wind, sunny with some cloud.	Brisk NW wind, cloudy, cool, choppy.	W wind, cloudy.	NA wind, sunny.	Na wind, sunny, cakm.	Stilf NW breeze, sunny, choppy.		3 C 1 1 1 2 4 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	WW wind, sunny.	W. breeze, suday,
OSSERVATION PERIOD	1145 - 1510	7000 - 1400	1220 - 2320	000 - 0001	ě	\$ 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		1	ŧ	1450 ~ 1910	1635 - 1730		7330 - 7350	15:0 - 2:05	:	1040 - 1305	1600 - 1800	1400 - 1700	2030 - 2100	0060	0000 0000		0717 . CYOY	0610 - 0735	0700 - 1000
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2150	OBSERVATION PERIOD	CONDITIONS	2,140	OBSERVATION PERIOD	CONDITIONS
June 30	23.05 + 23.45	SE wind, sunny, rippled.	20.27 19	1950 - 2125	Very brisk NW wind, sunny, sea choppy.
	2002 - 2020	SE wind, sunay, seas rippled.	July 20	0600 - 2130	WH wind, sunny, slightly choppy.
r Alor	\$180 · \$400	Faint SE wind, sunny, seas caim.	July 21	0615 - 0745	hw breeze, no cloud, slightly choppy, sunrise at 0625.
	\$177 - 0080	Faint SE wind, sunny, acas calm.	***	gujunom	EM wind, sunny.
	1935 - 2010	Steady WW wind, sunny, light thep.	(%) (%)	1140 1300	Very brisk NA wind, sunny, choppy,
	2030 + 2350	Strondy WW wind, suppry, light chop.	* * * * * * * * * * * * * * * * * * *	1950 - 2200	Very brisk NW wind, sunny, choppy with some
74.05 74.05 74.05	3045 - 1145	My breeze, sunny, seas rippled-			white cape.
	0506 1 5061	Brisk NW wind, sunny, seas choppy.	July 24	0530 - 1130	Steady NW wind, sunny, slightly choppy, sunfise at 0625.
July 3	0550 - 0830	NW breeze, sunny, seas calm.	104 · 100 ·	2050 - 2200	Brisk W. wind, sunny, choppy, sunset at
\$ 1 5 m		Ny wind, sunny.			2115.
*** *** *** ***		W wind, sumy.	July 25	0530 - 1245	NA wind, sunny, slightly choppy, sunrise at 0625.
July 14		NW wind, summy.		1320 - 1400	SE wind, sunny, sea slightly choppy.
STATE	1015 - 1325	W-WW breeze, sunny, sea calm.	,	2000 - 2200	Slight SE breeze, sunny, sea cala.
	2100 - 2200	Brisk WW wind, sunny, light chop.	900	0720 - 1100	Slight NV breeze, sunny, sea calm.
10 X	\$ 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Brisk Nº wind, sunny, light chop, sunrise at 0615.		2050 - 2115	SE breeze, overcast, sea rippled.
	00007	High We wind, sunny, seas choppy, many	July 27	2100 - 2145	SE breeze, sunny, slightly chappy.
		white caps.	65 X X 85	0500 - 0730	Slight NY wind, sunny.
3424	\$70% - 0889	Ny broeze, sunny, seas rippied, aunrise at 6625.	July 29	rootasije	NA wind, sunny.
	2050 - 2215	Very strong NW wind, cloudy, seas very chappy.	July 30	1930 + 2200	Stiff SE wind, sunny, seas choppy, high NW swell which was present entire day.
301% 138	0080 - 0800	NW breeze, sunny, seas rippled.	July 31	0080 - 0080	SE breeze, foggy, seas calm.
	2045 - 2215	Brisk WF wind, sunny, seas choppy, sunset		0800 - 1615	Brisk NV wind, sunny, choppy.
		. On 12 C 2 2 2	A. 25.	0545 + 0700	Very slight SE breeze, no cloud, seas calm.
July 19		NA breeze, sunny, seas rippled.		0700 - 1645	Brisk SE wind, sunny, slightly choppy.

### TABLE 9

### NOTES FROM SCUBA DIVE SURVEYS OF INVERTEBRATE FOOD STOCKS

### DIVE 1

Transect followed SE corner Gull Island from  $10\ \mathrm{m}$  offshore, east,  $100\ \mathrm{m}$ . Depth  $3\ \mathrm{m}$  to  $12\ \mathrm{m}$ .

The only potential otter food found was one octopus (Octopus sp.), three chitons (one Tonicella liniata and two Cryptochiton stelleri) and numerous top shells (Tegula funebralis). The most abundant broken shells were from mussels (Mytilus spp.) and clams (identification unknown).

No live abalone (Haliotis kamtschatkana) or urchins (Strongylo spp.) were found.

### DIVE 2

Area immediately east of Dozing Rock. Depth 3 m to 14 m.

No measurable concentrations of bottom fauna suitable for otter was found. Total of five urchins (Strongylocentrotis purpuratus) were seen during the 45 minute duration of the dive. Test diameter was less than 10 cm and all were in cracks in the rocks. One abalone about 4 cm long was found. In approximately the same area a previous diving survey (Miller, 1972) estimated the concentration of urchins at 6 to  $10/m^2$ .

Table 10. Algal Inventory Transect Data

Shills forth on site were visually identified on site, species present included: Callintenn ligatum into or intro or internal in internal internal

			/v r/ministra /validana	Andrew A hand-dependent of the department of the	
TRANSLER NO. 1 GRADART NO. 1 ATTENDATION (em): USE TAKEN SOLDS (and. 1004TION: Soriel Cave Is.	N. (cm): 0 - 5 SLOTZ (0): 5 - 100	5 - 10° DATE: June 18	TRANSECT NO: 1 QUADRAT NO: 2 DEFUE: 29' ATTENUATION (cm): SUSSTRATE: cobbles, sand. LOCATION: Burial Cave Is.	TIME: 1830 m): 0 - 5 SLOPE (0): 0	DATE: June
TLORA - TAXON	NUMBER	WET WEIGHT (gm)	FLONA - TAXON	NUNBER	WET WEIGHT (gm)
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No. No. 2 and 2 an	2 1 1 1 105ALS 103	20 07 - 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	FAUNA - TAXON	LENGTH/ NUVBER STZE (cm)	WEI WEICHT (gm.)
N9.752			Turbo sp. polychacke worm Diodore aspera Posteria sp.	-50	% O G
L. erccharina, average across 55 plants # 98.57 ga/plant.  Collingia, average # 225 ga/plant.  Lininianales average # 225 ga/ plant.  Collines present to all quadrates.	m 98.57 gm/plant. t. co allines.		The state of the s	TOTALS 574	. v

DIVE QUARACT (1 m)

TRANSECT NO: 1 QUADRAT NO: 3 CHRIST 30' ATTENDATION (cm): CHRIST CODDIES, sand bottom. LULATION: Burist Cave is.	x^ + ⊖	SLOPE (°): 0 - 5	DATE: June 18	TRANSECT NO: 1 QUADRAT NO: 4 DEPTH: 30' ATTENUATION (cm): 5 - 10 SUBSTRAIE: Cobbles in sand/ shell bottom. LOCATION: Surial Cave Is.	10 SLOPE ( <sup>3</sup> ): 0 - 5°	0 - 5° DAIE: June
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ZAĽXA – RAŠON		NOMBER	WET WEIGHT (gm)	FAUNA - TAXON LEN SIZN	LENGTH/ NUMBER SIZE (cm)	wet weicht (sm)
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COUNTION: Sansby Camp  FLORA - TAXON  FLORA - TAXON		SIONE (°): 0 - 5° '	DEPTH: + 1.0 ATTENUATION (cm): - 20 SUBSIRATE: sand, shell, rock	0 :(^): 0	
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S Bedrock Blockuttop Rock	GRADRAT XO: 1 ATTENDATION (cm):	2.5	TIME: 1315 SLOPE (*): 10 - 15	1-15 DATR: June 25	TRANCECT NO: 6 DEPTH: 23' SUBSTRACE: Bedrock, LOCATION: Bleeding Rock	OJADRAT NO: 2 ATTENVATION (cm): 10	TIME: 1340 SLOPE (1): 0	0 - 5° DATE: Juny :
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wagajaja para da	TRANSECT NO: DIPLH: 14' SUBSTRAIE: Be LOCATION: NO	AANSE PARIN AND DE SELECTION SELECTIONS	Laurencia spectabilis Callianthron regenerars Bossiella plumosa Listeronia gracilis Listeronia on Regeneration californica Les nation assentina Nerve assentina Nerve assentina Nerve assentilis Mirrochada coultavi Hitleyskig ovalis	PAUNA -  Dendrobeania sp.  Strela mortecovensis Fas warms Francohnico Mertsansii Francohnico Mertsansii Francohnia helianthoides Pyranopodia helianthoides Aplicius sp. Ablicius sp.
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νη 1 Φ		STVLOL	LENGTH SIZE (cm)	1.25 0.15 - 0.75 TOTALS
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TRANSECT NO: 8 DEPTH: 7' SUBSTRATE: Bedrock, LOGATION: Deer Island	FLORA -	Phyllospadix scouleri Bossiella pinnosa Corollica voccouveriensis Callicathem reservans Evenera secciality	FAUNA -	Tonicella lineara Balanchyllia elegans
5° DATE: Jun: 26	NET WEIGHT (gm)	3 - 5 kg -10 - 10 -10 - 10 50 - 175	WET WEIGHT (gm)	175 -10 -10 185
TIME: 1605 SLOPE ( <sup>0</sup> ): 0 - 5°	MUNDER	1004 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	NIPERS R	8 4 4 C
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Notes on Table 10

Algai Inventory Transact Data

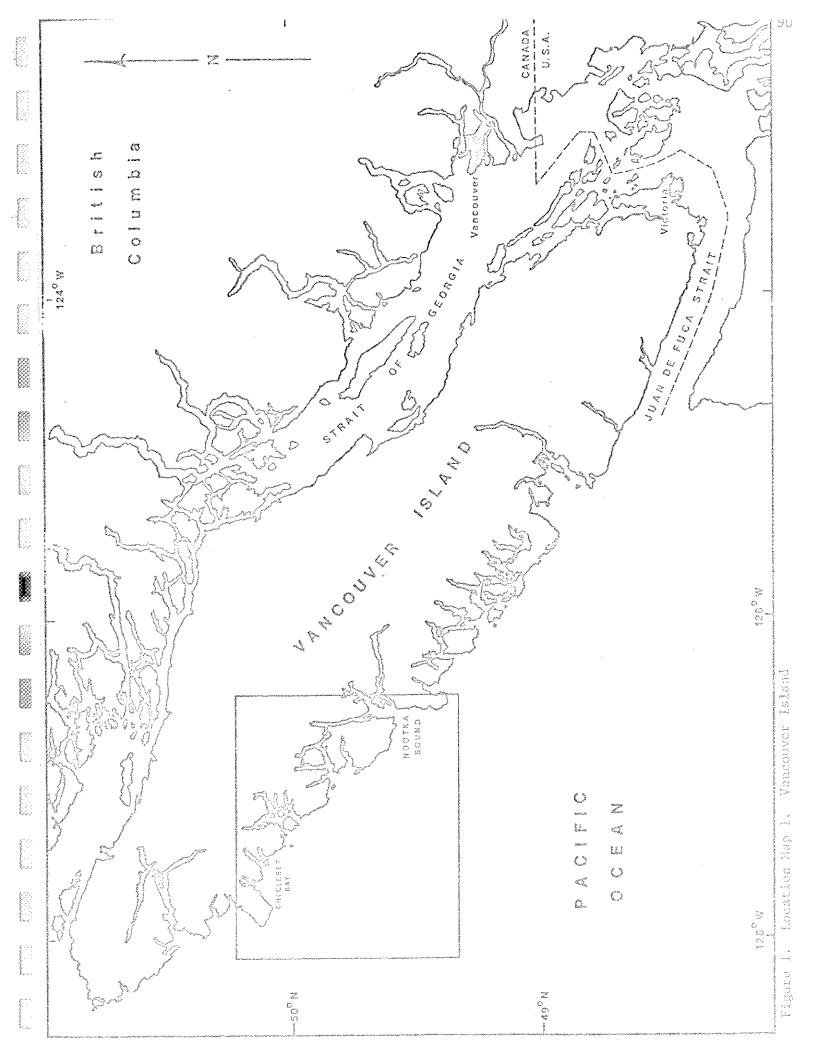
\* - Neight used in attaining an average weight par plant for the

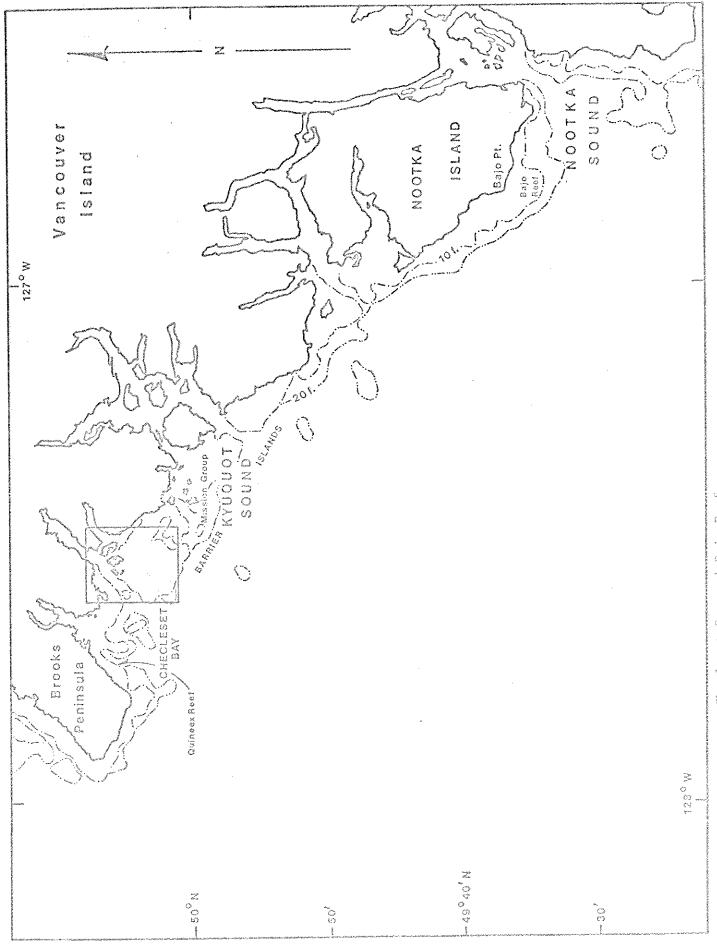
\* 60 E V 10 C

Negarive sign before a veight indicates specimen weighed leastion the recorded weight.

Positive sign following a number indicates an estimated minimum

number of individuals present for the quadrat.





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Figure 2. Location Map 2. Checleset Bay and Bajo Reef

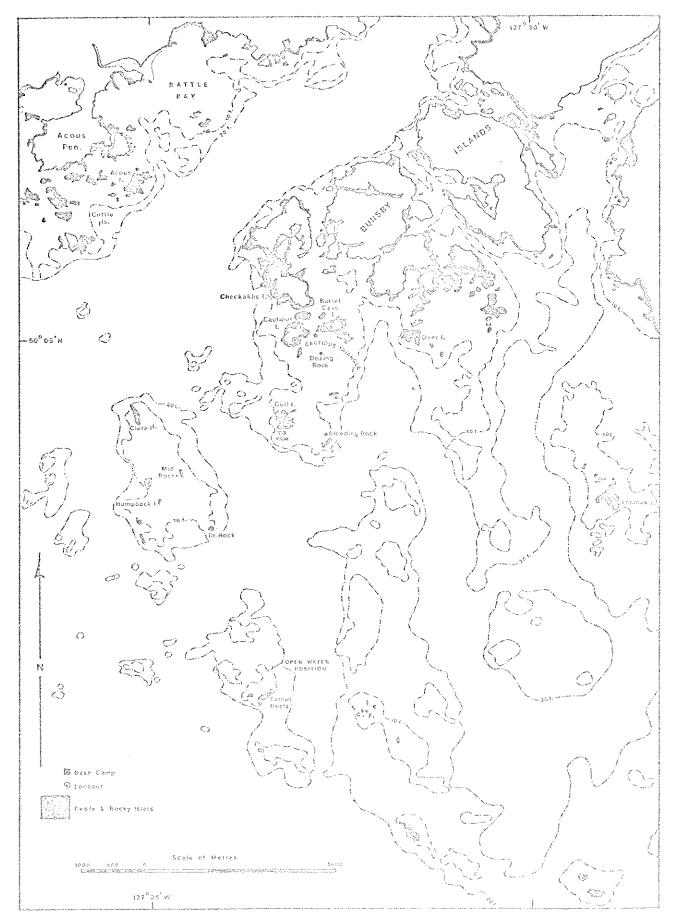


Figure 3. Location Map 3. Bunsby Islands, Checleset Bay.

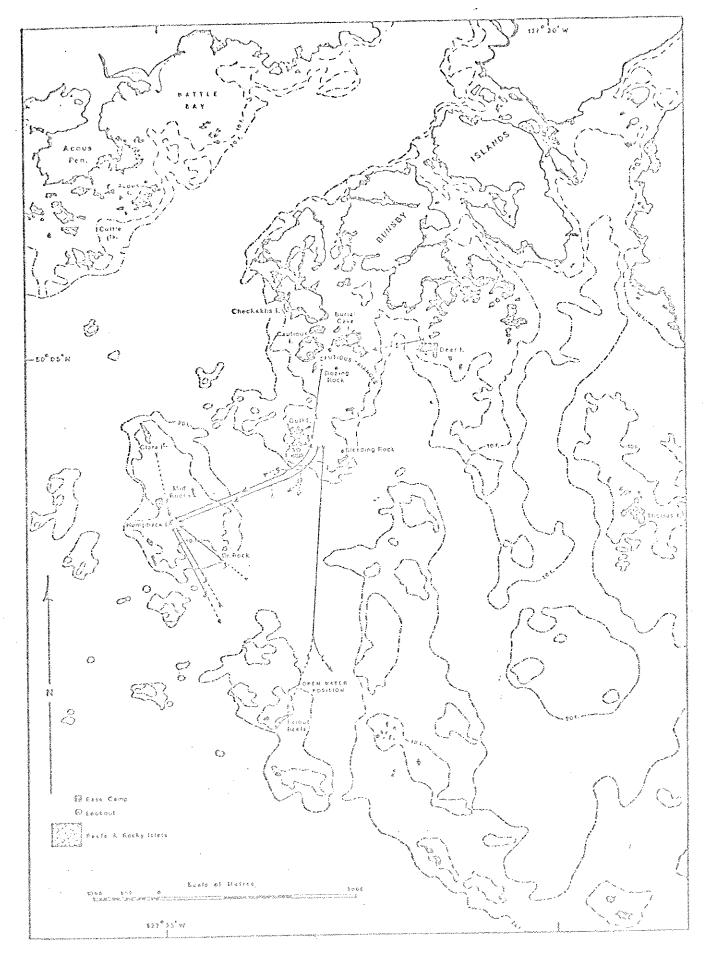


Figure 4: Diurnal Travel (Sec notes on Figure 4 following)

## NOTES ON FIGURE 4 - DIURNAL TRAVEL

- 1. Arrowed pathways indicate a straight travel path along the surface.
- 2. Numbers within arrowed pathways indicate number of separate occasions this pathway was observed to be utilized by otters.
- 3. Dotted portions of arrowed pathways indicate a postulated direction of travel based on known rafting areas.

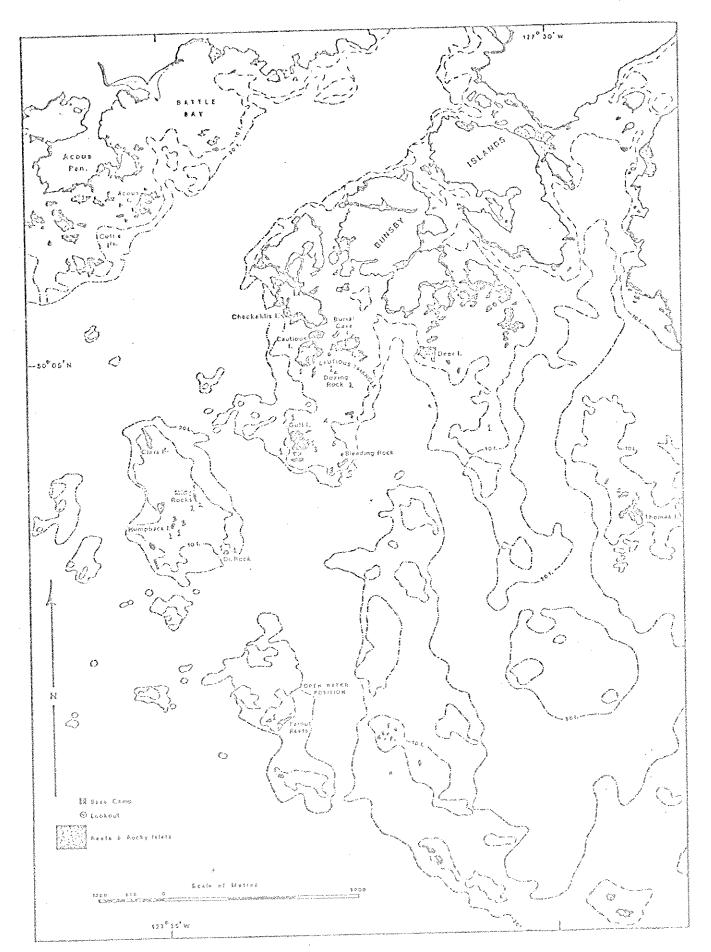


Figure 5: Diurnal Feeding Activity (See notes on Figure 5 following)

## NOTES ON FIGURE 5 - DIURNAL FEEDING ACTIVITY

1. Numbers in figure 5 indicate locations where feeding occurred and number of times feeding was observed at that location.

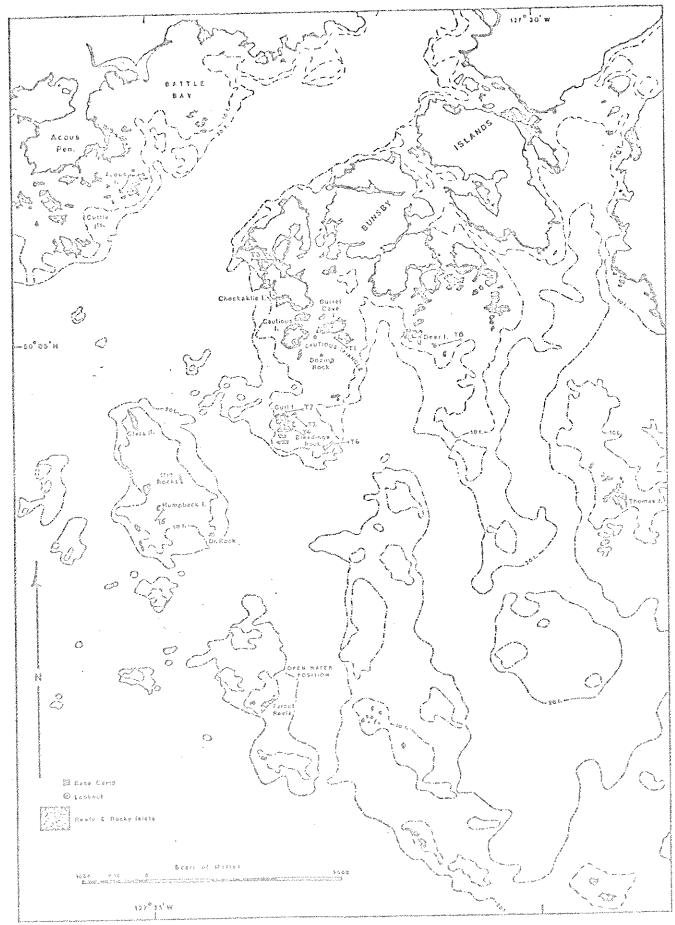


Figure 6: Location of Algal Inventory Transects. (See notes on Figure 6 following).

## Notes on Figure 6

Location of Algal Inventory Transects

T - transect. Line on figure describes location, direction transect laid, but not length of transect.

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