1981 BEACHED ANIMAL AND PLASTIC LITTER SURVEYS REPORT.

by Steve Kendall

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INTRODUCTION

Beached animal surveys on Adak beaches began in 1973 and have been conducted regularly to date. In 1981, surveys were conducted monthly on 4 beaches. The purpose of the survey was to gather baseline data on mortality patterns of marine mammals and birds. These data may be used to detect unusual mortality patterns due to both natural and unnatural occurrences.

This paper summarized the results of Adak's beached animal surveys from January through October 1981. Beach surveys on other islands and plastic litter surveys are also discussed.

STUDY AREA

The four beaches surveyed are on Adak Island, in the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge (AIU, AMNWR). Adak Island is in the Andreanof Island group of the Aleutian Islands, located at 50° 51'N, 177° 4'W. The Aleutians divide the Bering Sea and the North Pacific Ocean. Adak receives 67.41 inches of precipitation a year, with many overcast, foggy, and windy days. The beaches surveyed were selected because of size, substrate, access, and exposure to wind and ocean currents. All four beaches are on the northeast side of the island facing the Bering Sea (Fig. 1).

Kuluk A is a beach 1.94 km long with a southern exposure into Kuluk Bay. Its boundaries are marked by Candlestick Bridge and Command Car Hill. Kuluk B beach is 3.55 km long and has an eastern exposure on Kuluk Bay. Its boundaries are marked by the metal dump and NavFac Creek. Both beaches are sandy. The Clam Lagoon Seawall beach is 3.22 km long and has an eastern exposure to Sitkin Sound. It is a boulder beach with a definite north and south boundary. The Lake Andrew Seawall is also a boulder beach with a northern exposure to Andrew Bay. It is 3.22 km long; bounded on the west by Lake Andrew's outlet and on the east by rugged shoreline (Fig. 2).

EQUIPMENT

Very little equipment is required for beach surveys. A Rite-in-the-Rain notebook is needed for recording any beached animals, and a plastic garbage bag is needed to collect specimens.

WEATHER

Beach surveys were conducted on calm and clear days each month. They were also conducted during low tide to allow more beach to be covered.

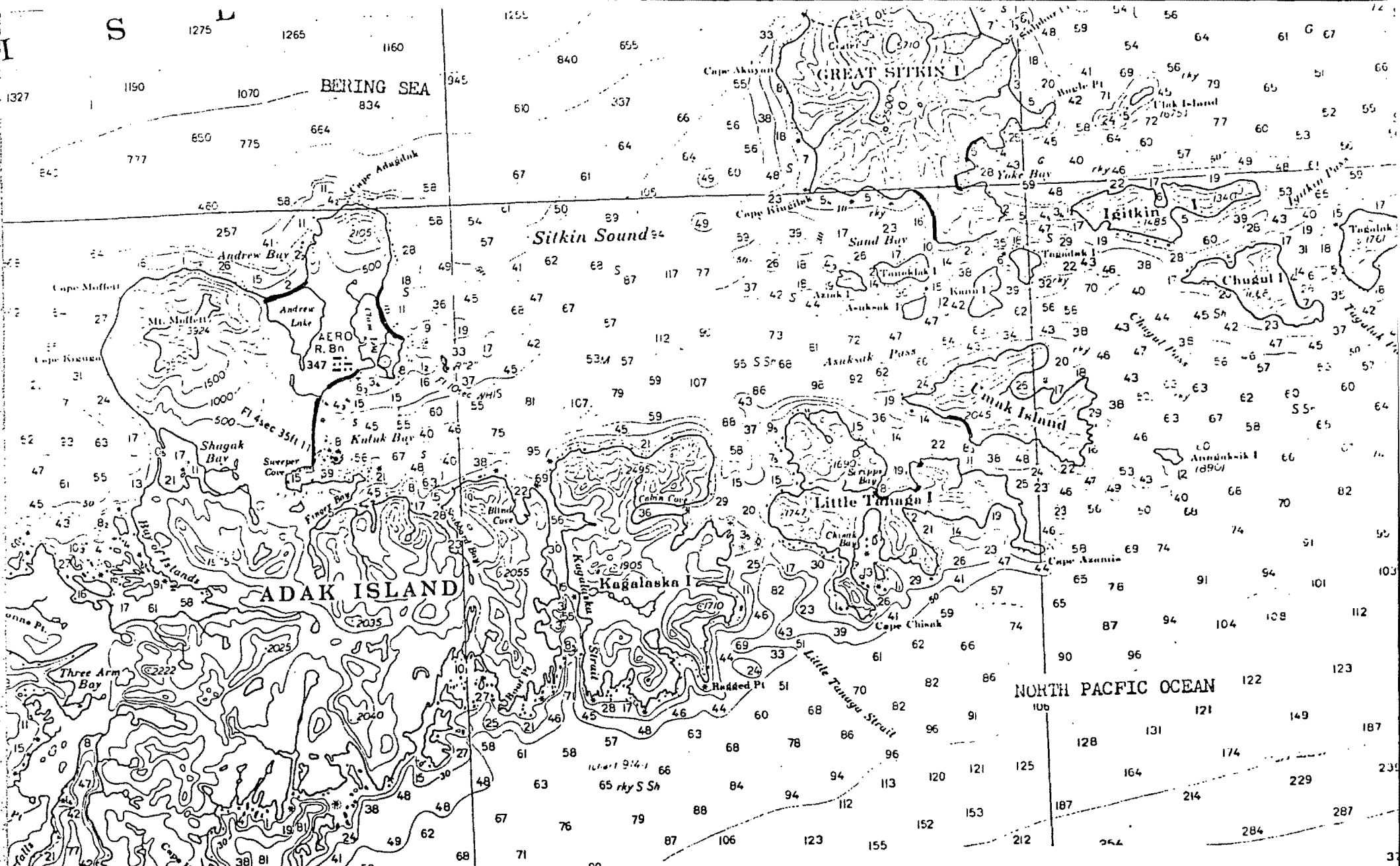

Fig. 1. The beaches surveyed in 1981 beached animal and plastic litter surveys.

— Beaches Surveyed

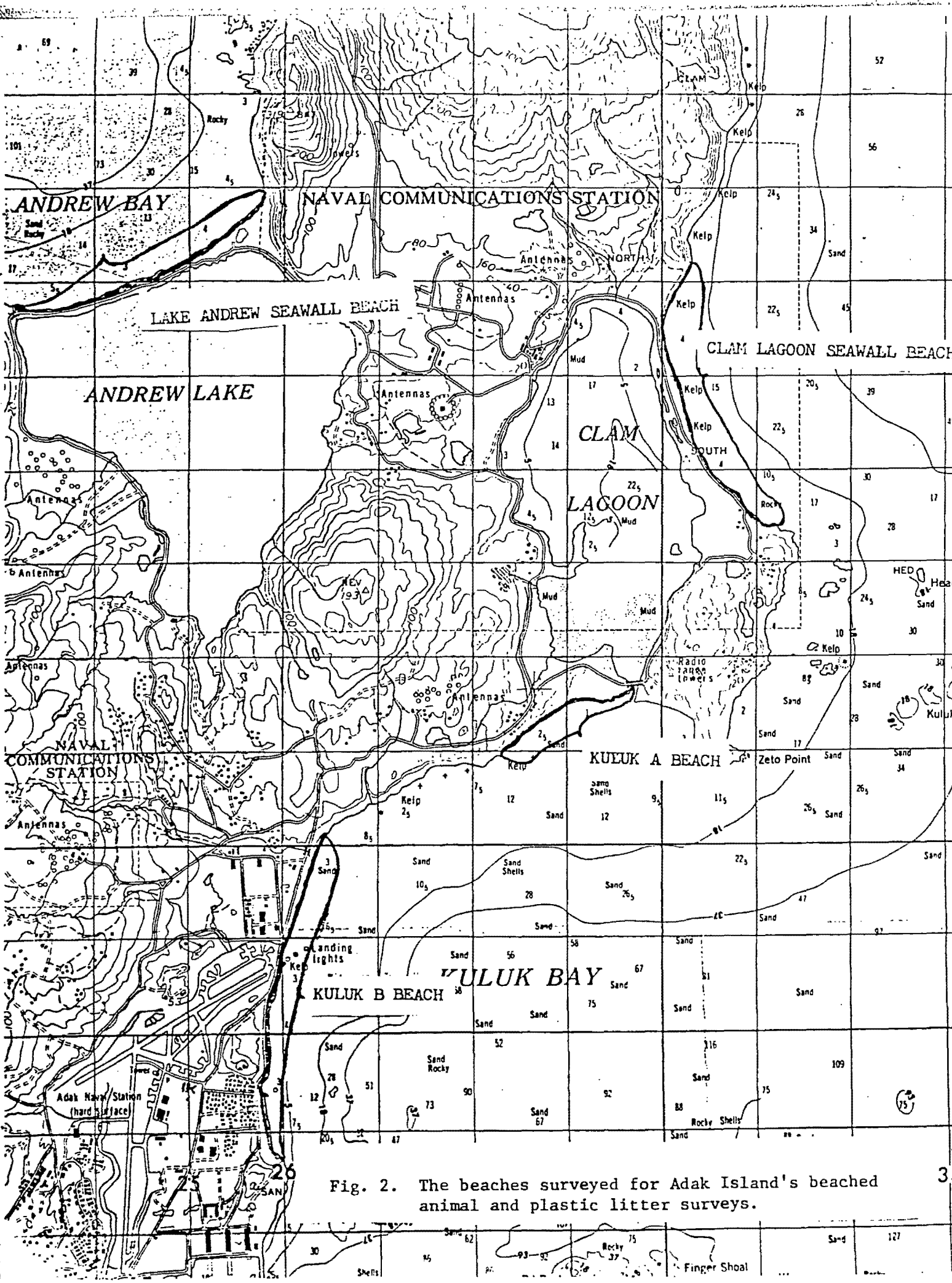

Fig. 2. The beaches surveyed for Adak Island's beached animal and plastic litter surveys.

PROCEDURE

Each beach was surveyed monthly. The observer(s) walked along both high and low tide lines. All birds and mammals, or remains were identified, tallied, and removed from the beach to prevent double counting. If the animal was in good condition it was collected for use as a mount or study skin. If it was in poor condition it was moved above the storm line and anchored down with rocks. If possible, the cause of death of the animal was determined.

Any unusual water conditions (i.e. oil, red tide) were also recorded. All information was recorded on an Alaska Beached Bird Survey form (Fig. 3). One copy was sent to the U.S. Fish and Wildlife Service area office in Anchorage, and one was filed at the refuge headquarters of the AIU, AMNWR.

RESULTS AND DISCUSSION

A total of 119.63 km of beach were walked in 41 surveys (Appendix 1). Birds and mammals were found on 16 of these surveys. There were 0.03 birds/km beach walked, and 0.14 mammals/km beach walked (Table 1). The cause of death was not determined for any of the beached animals. There were no observations of oil or any other unusual water conditions.

Fig. 3. Forms used in record data collected on Adak's beached animal survey.

ALASKA BEACHED BIRD SURVEY

OBSERVER: ADDRESS:

BEACH LOCATION: Mo. Day Yr.

STARTING PLACE:

FINISHING PLACE:

LENGTH: OIL ON BEACH: _YES _NO

SPECIES	QUAN	DEGREE OF OILING			PROBABLE CAUSE OF DEATH	REMARKS
		NONE	< 50%	> 50%		
TOTAL						

SURVEY INSTRUCTIONS

1. The beached bird survey should be conducted during the first week of each month. When the survey is prohibited by inclement weather the count should be conducted the following weekend or when possible. In remote areas a single survey without repetition may still be valuable.
2. Pick a beach that is conveniently located for you. A beach with large amounts of flotsam & jetsam is likely to collect more birds than a clean beach. The beach should be within your walking ability but at least 1 or 2 km long. It is better to do a short stretch thoroughly than a longer stretch carelessly. The identical stretch of beach should be surveyed each trip. It is best to make two passes along the beach walking near the high tide line on the first pass & near the storm line on the return pass.
3. After examining a dead bird for oil, leg bands & probable cause of death the carcass should either be removed from the beach & disposed of well above the storm line or be appropriately marked (wing removed). Band numbers should be entered under the "remarks" column. Unusual circumstances or evidence that a bird has died from entanglement with fishing line or nets, plastic or other debris should be noted under "remarks" column. Dead marine mammals should also be recorded.
4. Observations of large numbers of oiled carcasses should be reported to USFWS at 276-3800.
5. Use a separate reporting card for each count conducted and be sure the card is accurately completed. Fill in a card even if no birds are found. Cards should be returned after each count. Additional cards & information can be obtained by contacting Kent Wohl, USFWS, Anchorage, Ak. (phone: 276-3800).

Table 1. Beached animals found on Adak during 1981.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
Clam Lagoon Seawall Beach												
Total birds/km	0.62	0	0	0	0	0	0	0	0	0	0	0.62
Total mammals/km	0	0	0	0.31	0.31	0.31	0.93	0.62	0	0	0	0.25
Lake Andrew Seawall Beach												
Total birds/km	0	0	0	0	0	0	0	0	0	0	0	0
Total mammals/km	0	0	0.31	0.31	0.62	0.31	0	0	0.31	0	0	0.21
Kuluk A Beach												
Total birds/km	0.52	0	0	0	0	0.52	0	0	0	0	0	0.10
Total mammals/km	0	0	0	0	0.52	0	0	0.52	0.52	0	0	0.14
Kuluk B Beach												
Total birds/km	0	0	0	0	0	0	0	0	0	0	0	0
Total mammals/km	0	0	0	0	0	0	0	0	0	0	0	0
Total birds/km	0.25	0	0	0	0	0.08	0	0	0	0	0	0.03
Total mammals/km	0	0	0.08	0.17	0.34	0.17	0.25	0.25	0.17	0	0	0.14

Three goose-beaked whales (Ziphuis cavirostris) and one Stejneger's beaked whale (Mesoplodon stejnegeri) were discovered in late July and early August. Two other whales beached at this time, one of which was returned to the ocean. The cause of beaching was not determined. Data and samples collected from these whales were sent to the Smithsonian Institute in Washington D.C. for analysis.

Another noteworthy occurrence was a higher incidence of beached sea otters (Enhydra lutris) in the late spring and early summer months, with the highest in May. April and May were found to have higher occurrences of beached sea otters on Amchitka from 1978-80. (Brennan, K. 1980. Amchitka beach surveys 1978-80. Unpublished report. AIU-AMNWR files). John Trapp (1975. Adak beach surveys, 1973-75. Unpublished report. AIU-AMNWR files) found the majority of beached otters during March and April on Adak from 1973-1975. (See Table 2).

Table 2. Incidence of beached sea otters, on Adak and Amchitka Islands, Alaska.

Month	Amchitka 1978-80 otters/km beach walked	Adak 1973-75 otters/km beach walked	Adak 1981 otters/km beach walked
January	0.87	0.11	0
February	0.36	0.16	0
March	0.63	1.68	0.08
April	0.73	0.83	0.17
May	0.82	0	0.34
June	0.28	0.07	0.17
July	0.08	0	0.08
August	0.10	0	0.08
September	0.25	0	0.08
October	0	0	0
November	0	0	0
December	0.23	0.19	---
TOTAL	0.45	0.23	0.10

The 1981 numbers were not unusually high but may be of importance in understanding sea otter biology. Kenyon (1969) found a higher mortality level in March and April on Amchitka beaches from 1955-63. He believed this to be caused by a combination of rough weather and a weakened physical condition due to the stress of winter. The higher mortality found in the spring on Adak was probably a result of this stress. Most of the otters found in May and June were very decomposed or just skeletons.

The results from 1981 were essentially the same as those found in 1980, but quite a bit lower than 1978-80 results on Amchitka (Brennan, K. 1980. Amchitka beach surveys 1973-75. Unpublished report. AIU-AMNWR files) and the 1973-75 results on Adak (Trapp, J. 1975. Unpublished report. AIU-AMNWR files). The 1981 results were also slightly lower than found in 1976 on Adak beach surveys (calculated from 1976 field data). Table 3 summarizes all of these results.

Table 3. Beached animals found in the Aleutians.

	Adak 1981	Adak 1980	Adak 1976	Adak 73-75	Great Sitkin, Little Tanaga & Umak 1981	Amchitka 78-80
Birds/km beach walked	0.04	0.06	0.05	0.16	0.20	*0.28/**
Mammals/km beach walked	0.14	0.08	0.24	0.27	0.10	*0.70/**
Animals/km of beach walked	0.18	0.14	0.29	0.43	0.30	*0.98/**

*Beaches surveyed bi-weekly
**Beaches surveyed opportunistically

RECOMMENDATIONS

Beached animal surveys provide an index of mortality trends, are simple to conduct, and require little time, equipment, and personnel. For these reasons it is recommended that they be continued.

OTHER BEACH SURVEYS

Several beaches on islands east of Adak were also surveyed this year. Each beach was surveyed only once while doing seabird work in the area.

STUDY AREA

Beaches were surveyed on the islands of Little Tanaga, Umak, and Great Sitkin (Fig. 1). Little Tanaga is 35 km east of Adak with Umak lying 6 km northeast of it. Great Sitkin is 15 km north of Little Tanaga. Little Tanaga is indented with several bays and coves. Umak is not as indented and has a large percent of shoreline which is cliffs that rise straight up from the ocean. Great Sitkin only has two major bays, but has several sand and cobblestone beaches. Table 4 and Figure 4 give descriptions of the beaches and show their locations.

EQUIPMENT

The same materials were used as on other beach surveys.

WEATHER

The surveys were conducted in late June when the weather was fairly calm. On the two days the surveys were conducted, on Umak and Little Tanaga, the wind was out of the east-northeast at 10-15 knots. On 25 June there was a 40 percent cloud cover. On 26 June there were 95% clouds.

When the Yoke Bay area was surveyed, the wind was out of the north at 10 knots. There was a 40% cloud cover. Sand Bay was surveyed on an overcast day with a 5 knot north wind.

PROCEDURE

The surveys were conducted once this year. Little Tanaga A and B beaches were done on 25 June. Little Tanaga C and Umak beaches were done 26 June. These surveys were conducted in conjunction with seabird nesting plots and inland bird transects. On Great Sitkin, Sand Bay beach was done 25 June and Yoke Bay beaches were done 27 June. These were completed in conjunction with searches for red fox. High and low tide lines were walked on these beaches. All of these are new transects except one; Umak beach was surveyed in 1980.

RESULTS AND DISCUSSION

In these surveys, one sea otter was found on Umak and two tufted puffins, (Lunda cirrhata), which were prey of peregrine falcons (Falco peregrinus), were found on Little Tanaga C beaches. This results in 0.10 mammals/km, 0.20 birds/km and 0.30 animals/km. When Umak beach was surveyed last year, no animals were discovered.

Table 4. Description of other beaches surveyed.

LOCATION	BEACH	LENGTH	SUBSTRATE	EXPOSURE	BOUNDARIES
Little Tanaga Island	A	0.57 km	sand	Northeast to Scripps Bay	Stream on northwest end. End of sand on southeast end.
Little Tanaga Island	B	0.57 km	sand	Northwest to Scripps Bay	Boulder beaches mark both ends.
Little Tanaga Island	C	0.19 km	cobblestone	Northeast to Umak Pass	Marked by cliffs on both ends.
Umak Island	Umak	1.2 km	cobblestone	Southern to Umak Pass	Ruins of barge on southeastern end. Rugged coast on western end.
Great Sitkin Island	Sand Bay	4.0 km	sand	Southwestern to Sand Bay	Rocks and boulders on Northwestern end. Zalivia Point on south end.
Great Sitkin Island	South Arm	0.76 km	sand	Eastern to Yoke Bay	Cliffs mark both ends.
Great Sitkin Island	Middle Arm	2.67 km	sand	Southeastern to Yoke Bay	Cliffs mark both ends.

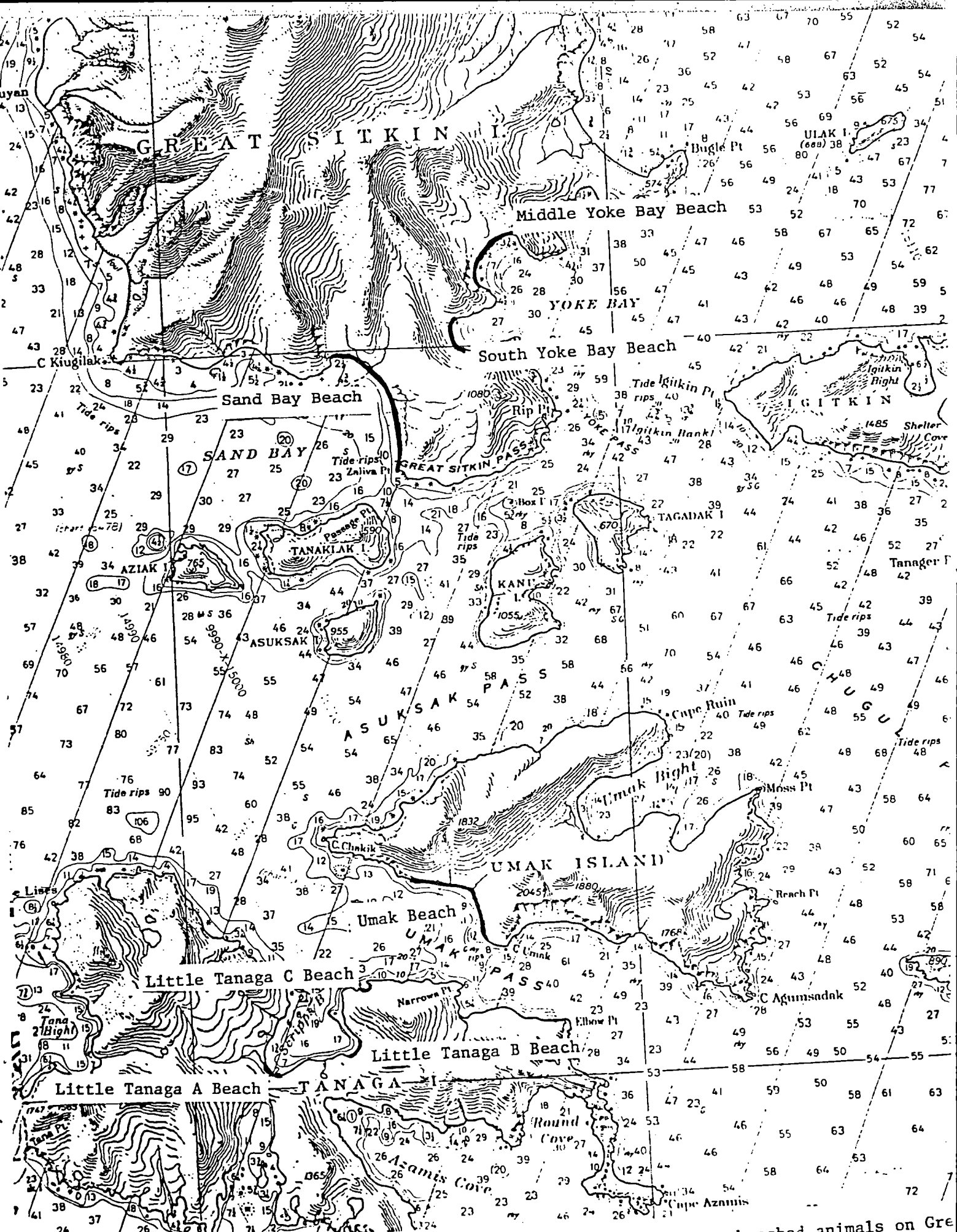

Fig. 4. The beaches surveyed for beached animals on Gre
Sitkin, Umak and Little Tanaga Island.

No animals were found on any of the sand beaches. This may be due to the fact that the sand is less stable than cobblestones and debris is quickly buried. Although Umak beach is cobblestone, no dead animals were found on it. This can be attributed to the waters which move through the pass and quickly and frequently wash the beach.

RECOMMENDATIONS

It is recommended these beaches be surveyed in conjunction with other work being done in the area. These and any other beaches on other islands provide a good index of animal mortality. A suitable beach would be one with easy access, not under 0.20 km long, made of sand, boulders, and cobblestone and exposed to currents of the ocean. Cobblestone and boulder beaches are most desirable but sand beaches are also valuable beacuse they are easier to walk and can be done quickly.

OTHER - PLASTIC LITTER SURVEYS

INTRODUCTION

Plastic litter surveys were conducted during 1981 simultaneously with beached animal surveys. This study was started in the Aleutians on Amchitka Island, 1972-1974. This year is the first it has been done on Adak. The purposes of the study are to 1) determine the rate that plastic litter is deposited on the beaches, 2) find its origin, and 3) provide some baseline data which may be used to regulate litter dumping.

Plastic litter can be detrimental to wildlife populations in several ways, in addition to reducing the aesthetics of the beaches. It can be a source of entanglement for marine mammals and birds. Marine mammals are attracted to floating objects and will sample them for edibility (Merrell 1979); not only does this encourage entanglement, but often materials and bottles contain toxic substances. This section summarizes the amounts of plastics found on Adak beaches from January to September 1981.

STUDY AREA

Same as for Adak beach surveys.

EQUIPMENT

A Rite-in-the-Rain notebook was used to record all plastic materials left on the beach. Pink cloth tags were wired onto these materials. Garbage bags and backpacks were used for removal of plastic items.

Table 5. Results of Plastic Litter Survey.

Method I - Items/km of beach walked

	Kuluk A	Kuluk B	Clam Lagoon	Total
February	16.2	29.4	4.0	18.2
March	37.8	3.7	10.1	13.91
April	1.4	13.2	No Data	9.05
Total	18.47	15.44	7.07	14.25

Method II - Kg plastic/km beach

Lake Andrew/0.40 km		Clam Lagoon (3.23 km)	
April	79.55	May	35.17
June	21.75	July	6.51
August	86.58	September	18.16
Total kg/km beach	187.88	Total kg/km beach	59.88
Total kg/km beach walked	62.63	Total kg/km beach walked	19.96

Total kg/km of beach 247.75 kg/km

Total kg/km of beach walked 28.63 kg/km

are representative of many Alaskan and especially Aleutian beaches. The beaches surveyed on Amchitka are more exposed to ocean currents than those on Adak, and therefore, it is believed more materials would accumulate on Amchitka beaches. The higher figure for Adak beaches might reflect an increase in litter since 1974, or simply be a result of the accumulation of plastic from several years. No conclusions can be drawn for one year's data on accumulation rates. It will take several years before a pattern can be determined.

It is important to note that ropes, nets, and strapping material make up the majority of materials. These materials are from fishing boats in the North Pacific and Bering Sea (Merrell 1979). A few materials such as toys, baby bottles, and women's shoes may have come from the Asiastic coast. It appears that the fishing vessel crews are responsible for the majority of the litter. Merrell (1979) suggested PCB's, phthalates and other toxic substances may leach from plastics. In studies done on Amchitka Island by White and Risebrough (1977), peregrine falcon (Falco peregrinus) and bald eagle (Haliaeetus leucocephalus) eggs were found to contain far higher levles of PCB's than any of the other areas sampled in the Pacific. Because of the remote location, they believed the PCB's were from a local source. They suggest plastic litter as one possible source.

Table 6 refers to the PCB levels in Adak bald eagles compared to eagles from several states (Prouty et al. 1977 and Kaiser et al. 1980). The figures for Adak eagles come from autopsies done by the Patuxent Wildlife Research Center. The mean PCB levels in Adak bald eagles are near the mean levels from eagles sampled throughout the U.S., including Alaska. It is assumed that Adak too, should have lower PCB levels because of its remote location. This again suggest a local source of PCB's.

Table 6. Mean PCB levels in bald eagles.

ADAK ISLAND

	# of eagles	Mean PCB levels (ppm in carcass)	Range	Mean PCB levels (ppm in brain)	Range
1973	0				
1974	0				
1975	0				
1976	6	13.41	7.0-23.0	1.5	0.87-3.3
1977	2	1.7	0-3.4	0.28	0.26-0.29
1978	7	2.5	0.40-5.5	0.22	0-0.61
1979	4	10.9	1.8-18	1.38	0-1.6
1980	1	10.0		12.0	

NATIONAL

	# of eagles	Mean PCB levels (ppm in carcass)	Mean PCB levels (ppm in brain)
1973	34	23.01	7.5
1974	50	9.9	1.6
1975	49	7.7	1.2
1976	50	12.0	2.2
1977	67	5.5	1.5
1978			
1979			
1980			

RECOMMENDATIONS

Plastic surveys are very time consuming. In spite of this, and because of the huge amount of plastics and possible PCB's in them, I recommend that the study be continued. Changes should be made in the present methods due to fewer employees. The length surveyed on Clam Lagoon Beach should be reduced to no more than 1 km. Surveys should be conducted every other month.

Also, instead of determining weight, size and description for each piece of plastic, these measurements should be combined. All plastics should be picked up, placed in a garbage bag and weighed. Any materials too large to remove should be tagged and given an estimated weight. The total weight of plastic found on each beach should be recorded. Once a year all meterials should be described to help in determining the sources of the litter. These new methods should be explained and kept in the plastic survey file as a reference for new observers.

Several representative samples of plastics should be analyzed to determine PCB and other chemical levels, and their ability to leach from the plastic.

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APPENDIX 1

CLAM LAGOON SEAWALL BEACH

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	TOTAL
# of Surveys	1	1	1	1	1	1	1	1	1	1	0	10
Total # Kilometers	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	0	32.20
Bird species												
Gull sp.	1	-	-	-	-	-	-	-	-	-	-	1
Cormorant sp.	-	-	-	-	-	-	-	-	1	-	-	1
Pintail	1	-	-	-	-	-	-	-	-	-	-	1
Total birds/km	0.62	-	-	-	-	-	-	-	0.31	-	-	0.62
Mammal species												
Otter adults	-	-	-	1	1	-	1	1	-	-	-	4
Otter pups	-	-	-	-	-	1	-	-	-	-	-	1
Goose-beaked whale	-	-	-	-	-	-	2	1	-	-	-	3
Total mammals/km	-	-	-	0.31	0.31	0.31	0.93	0.62	-	-	-	0.25

LAKE ANDREW SEAWALL BEACH

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	TOTAL
# of Surveys	1	0	1	1	1	1	1	1	1	1	0	9
Total # Kilometers	3.22	0	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	0	28.98
Total birds/km	-	0	-	-	-	-	-	-	-	-	-	0
Mammal species												
Sea otter	-	-	1	1	2	1	-	-	-	-	-	5
Harbor Seal	-	-	-	-	-	-	-	-	1	-	-	1
Total mammals/km	-	-	.31	.31	.62	.31	-	-	.31	-	-	0.21

APPENDIX 1 (Cont'd)

KULUK A BEACH

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	TOTAL
# of Surveys	1	1	1	1	1	1	1	1	1	1	1	11
Total # Kilometers	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	21.34
Bird species												
Murre	-	-	-	-	-	1	-	-	-	-	-	1
Cormorant	1	-	-	-	-	-	-	-	-	-	-	1
Total birds/km	0.52	-	-	-	-	0.52	-	-	-	-	-	0.10
Mammal species												
Otter	-	-	-	-	1	-	-	-	1	-	-	2
Stejnegers whale	-	-	-	-	-	-	-	1	-	-	-	1
Total mammals/km	-	-	-	-	0.52	-	-	0.52	0.52	-	-	0.14

KULUK B BEACH

# of Surveys	1	1	1	1	1	1	1	1	1	1	1	11
Total # of Kilometers	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	39.05
Total birds/km	-	-	-	-	-	-	-	-	-	-	-	0
Total mammals/km	-	-	-	-	-	-	-	-	-	-	-	0

APPENDIX 2

OCCURRENCE OF PLASTIC ITEMS PER KILOMETER OF BEACH
FEB - APRIL

BEACH

	Kuluk A			Kuluk B			Clam Lagoon		
	2/27	3/3	4.7	2/27	3/5	4/7	2/27	3/17	TOTA
PLASTICS									
Bottles - containers									
5 gallon				3					3
1 gallon		1		6		1			8
1/2 gallon		2							2
1 quart		4		4					8
Misc. small bottles		1		1					2
buckets				4					4
cups				3					3
bowls				1					1
beer braziers		1		2				1	4
laundry baskets				3					3
sonabouy containers				2					2
1 inch rope						1	2	3	6
1/2 inch rope					2	1			3
strapping material	3	1	1	1		1			7
polyproline		2					1		3
1.4 inch wire						2			2
pipe				1					1
nets		1			2	4		2	9
floats				1			1	2	4
sheets of plastic				2		1			3
baggies	1					3			4
trash bags		2							2
aircraft tire				1					1
truck tire				1					1
shotgun wad				1					1
bottle tops		13		2					15
door mats						1			1
tennis shoe								1	1
misc plastic	8			1	1	3		1	14
TOTAL	12	28	1	40	5	18	4	10	118
Kilometers of beach	0.74	0.74	0.74	1.36	1.36	1.36	0.99	0.99	8.28
plastic/kilometer	16.2	37.8	1.4	29.4	3.7	13.2	4.0	10.1	14.25

APPENDIX 3

MATERIAL

	LAKE ANDREW								CLAM LAGOON									
	4/16		6/30		8/1		total		5/22		7/30		9/28		total		TOTAL	
	lgth. m	wt. kg	lgth. m	wt. kg	lgt. m	wt. kg	lgth. m	wt. kg	lgth. m	wt. kg	lgth. m	wt. kg	lgth. m	wt. kg	lgth. m	wt. kg	lgth. m	wt. kg
rope (3,2,1, 3/4, 1/2, 1/4, 1/8, 1/16, in dia.)	66.90	6.07	72.29	4.86	25.1	13.95	165.0	24.88	106.76	50.63	27.74	8.27	86.11	27.53	220.61	86.43	385.61	111.31
Strapping material 1/2"			35.89	0.22	7.7	0.85	43.36	1.07	309.68	36.51	3.66	0.35	9.60	0.40	322.94	37.26	366.30	38.3
Pipe (5, 1-1/2, 1 in. dia.)	0.91	0.45					0.91	0.45			1.52	0.28	5.49	1.81	7.01	2.09	7.92	2.54
	area sq m		area sq m		are sq		area sq m		area sq m		area sq m		area sq m		area sq m		area sq m	
Nets (3,2, 1-1/2, 1 in. mesh)	17.21	22.71	17.95	1.78	5.2	12.73	40.38	37.22	17.37	15.88	6.83	2.47	38.86	14.23	63.03	32.58	103.41	69.8
Sheets of plastic			0.99	0.16	3.2	0.77	4.11	0.93	0.19		2.59	0.60	18.78	0.09	21.56	0.69	25.67	1.6
Containers	#		#		#		#		#		#		#		#		#	
2 gallon			1	0.15			1	0.15			2	3.18			2	3.18	3	3.3
1 gallon	1	0.91					1	0.91	3	0.23					3	0.23	4	1.1
1/2 gallon	2	0.62			1		3	1.07			1	0.06	1	0.45	2	0.51	5	1.5
1 quart	6	0.26	6	0.29			12	0.55	2	0.20	7	1.64	10	0.55	19	2.30	31	2.9
1 pint	3	0.17	7	0.09	6	0.45	16	0.71	1	0.06	3		7	0.26	11	0.38	27	1.0
1 cup	1	0.03			1	0.09	2	0.12	2		1	0.03			1	0.03	3	0.1
100 ml bottle										0.45					2	0.45	2	0.4
misc. bottle	1	0.01			1	0.03	2	0.04										0.4
Misc. Materials																		
rope frag.	4	0.14	12	0.16	9	2.41	25	2.71	8	0.29	10	0.22	3		21	0.51	46	3.2
buried rope	1						1						19		19		20	

(Table # cont'd)

Material	Lake Andrew								Clam Lagoon									
	4/16		6/30		8/17		tot		5/22		7/30		9/28		total		TOTAL	
	#	wt. kg.	#	wt. kg.	#	wt. kg.	#	l	#	wt. kg.	#	wt. kg.	#	wt. kg.	#	wt. kg.	#	wt. kg.
Misc. Materials (cont.)																		
bag	1	0.03	4	0.18			5	0.			1	-			1	-	6	0.21
lid	5	0.17	5	0.05	7	0.31	17	0.			3	0.68	9	0.16	10	0.84	27	1.37
bucket	1	0.05					1	0.									1	0.05
bottle tops	1	0.01	1	-			2	0.									2	0.01
bowl	1	0.03					1	0.									1	0.03
sandal.shoe			1	0.24	2	0.91	3	1.									3	1.15
shot gun wad									2	-	5	0.08	18	-	25	0.08	25	0.08
fiberglass											1	0.45			1	0.45	1	0.45
crate													1	2.27	1	2.27	1	2.27
tray													1	1.36	1	1.36	1	1.36
dish													1	0.23	1	0.23	1	0.23
toy													1	0.03	1	0.03	1	0.03
life vest													1	0.23	1	0.23	1	0.23
flashlight													1	0.14	1	0.14	1	0.14
laundry basket													1	0.45	1	0.45	1	0.45
foam									2	0.09	1	0.45	37	0.84	40	1.38	40	1.38
styrofoam frag.			2	-	1	0.03	2	0.			10	0.30	2	0.03	12	0.33	14	0.36
packing material			3	0.11	1	0.23	4	0.	1	-					1	-	5	0.34
misc. grag.	7	0.09	7	0.10	10	1.00	24	1.	5	2.30	6	0.26	31	4.78	42	7.34	66	8.53
TOTAL Weight		31.82		8.70		34.63		75.		113.70		21.04		58.67		193.41		268.56