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To: Jim Faro
Ak. Dept. Fish & Game

Jim Estes
U.S. Fish & Wildlife Service

Date: April 5, 1978

From: Jim Taggart
Game Technician

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Subject: Round Island Walrus

During the 1977 field season we were stationed on Round Island from the first week of June to September 30 to observe the summering male walruses. We collected data in several areas of interest:

1. Overall patterns of use on the island,
2. Patterns of formation and dispersal of walrus herds,
3. Weather and sea condition data (for correlation purposes),
4. Experimental marking techniques,
5. Time lapse photographs of groups,
6. The effects of various disturbances on hauled out animals,
7. Individuals entering groups and the interactions that resulted,
8. Sea lion and walrus interactions,
9. Visitor use on the island,
10. Autopsevs and tooth collection of natural mortalities.

This is an interim report. A final report will be submitted after the 1978 field season.

Overall Patterns of Use

To facilitate population estimates and determination of changes in the distribution of walruses, we divided the beach of Round Island, from the tip of the spit to West Cape, into 68 fifty meter sections (with removeable markers). See map. The number of walruses present on each fifty meters was recorded daily until August 24, and from August 24

to the end of September twice daily at high and low tides. It was not feasable to census the entire island by foot each day because of the amount of time required, and our boat was not seaworthy enough to be of much use.

Through the course of the summer, we observed groups of walrus on every beach at Round Island at least once. However, there was very strong preference and probably competition for three beaches: the spit, (see graph II) the large beach south of East Cape, and the large beach south of West Cape. These three beaches are both large enough to hold several thousand walruses at a time and are composed of gravel or cobble substrate. The spit was used during every period of high numbers, in conjunction with only one of the other two beaches. The beach south of East Cape was used consistently until July 25, when we had our first heavy winds of the summer which directly exposed the beach to heavy surf. From July 25 to the end of September we never again observed walrus on that beach. It should be added that we had several north and northwest winds during September generating waves that washed animals off the spit and west side, which did not relocate south of East Cape in spite of the fact that it was in the protected leeward side of the island. Miller described use of only one of the primary beaches at a time in 1972-73. Miller estimated that the island was used by approximately 3000 walruses at a time, while we estimated that on at least one occasion more that 10,000 walruses used the island in 1977. W. Cunningham (1975), and D. Irons and L. Aumiller (1976), reported similiar autumn use patterns and numbers to those we observed. We postulate three explanations for the apparent change since 1972-73:

1. There were large numbers of walruses on the relatively inaccessable back side of the island that Miller was unaware of.

2. Numbers have greatly increased since 1972-73.

3. The synchronous hauling out patterns were not pronounced in 1972-73.

Although our censusing of the back side was too sporadic to make any detailed conclusions, it was used heavily after August 1 and insignificantly before August 1. We suggest that this pattern was caused by the clear warm weather in June and July, in combination with the ~~southwest facing~~ cliffs that rise precipitously from the south west beaches which act as an effective reflector oven. On a still clear day, the west beaches are surprisingly hot. Thus, these beaches were unoccupied until August when we had primarily cool overcast weather and fewer daylight hours.

Walrus numbers cycled through definite highs and lows with a mean of 9.7 days between each cycle, and a range of 5 to 15 days. The three longest cycles (11, 13, and 15 days) were disrupted by strong winds about midway in the cycle. Apparently, the disruption lengthened the time walrus herds spent hauled out. This is an indication that length of stay on the island is a function of amount of time spent resting, rather than the number of days lapsed since feeding. See graph I.

Graph I illustrates one of the problems with aerial censusing. In addition to the fact that high number peaks lasted only one day, two orders of magnitude change in numbers was common in a span of 2 or 3 days. Even when directing activities from the island, we were never able to coordinate good weather, high numbers, and an available aircraft.

The spit was always the first place to be occupied by walruses. Population buildups usually started at the north end with a small densely packed group. New walruses joined the group by hauling out on the exposed intertidal beach at low tide. As the tide came in, the

walruses on the seaward periphery were washed off and relocated with newly arriving walruses at the lateral edge of the groups. Thus the group grew linearly (remaining tightly packed) with spurts of lateral growth at high tide and growth perpendicular to the coast at low tide. (Graph This pattern was more pronounced during spring tides, and when the seas were rough (see graph III). When the seas were completely flat, the first two or three ranks of walrus on the sea periphery reamined a part of the group at high tide, even though they were submerged to their necks.

Once the spit was full, newly arriving walruses continued to haul out on the exposed intertidal beaches. Those walruses washed off the spit during the high tide compression relocated on adjacent beaches (4.25-east). Graph II The interesting fact was that groups often formed on these auxiliary beaches at high tide (when excess walruses were washed off the spit) and dispersed at low tide, apparently to relocate on the exposed intertidal beach of the spit. This pattern was most prevalent during periods of high tidal fluctuations (extreme spring tides). Graph III The high-low tide migration ceased once auxiliary groups reached a fairly large size (200-300 walruses).

The exception to the linear growth pattern were two platform rocks. One platform at location 30 was characterized by very sporadic use. However, the walruses often showed strong preference for this location. It was common to see this platform used when no adjacent beaches were occupied, in spite of the fact that it was submerged at high tide and all the walruses were washed off. Thus, groups formed and dispersed twice a day here. See graph II.

Although the platform at location 16 (NW end of Boat Cove) was often used during periods of low walrus numbers, it was not heavily used until the spit was full (0-4.25). Once the spit was full and

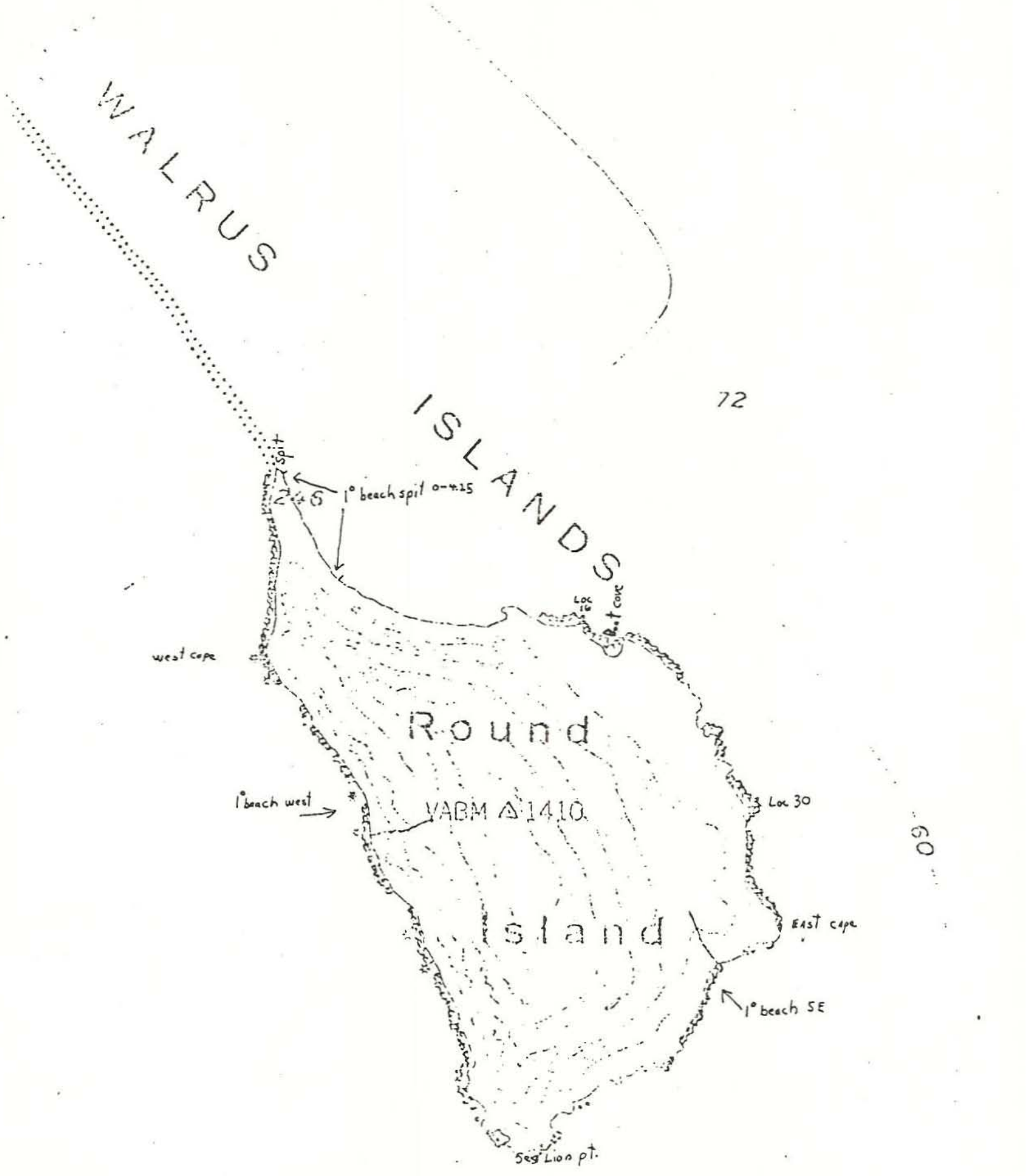
the auxiliary beaches started to fill in, beaches adjacent to location 16 also filled in simultaneously. Apparently this platform acted as a focal point for formation. Although it is 1200 meters from the spit, we have observed the same high tide formation-low tide dispersal we found on auxiliary beaches adjacent to the spit. See graph II.

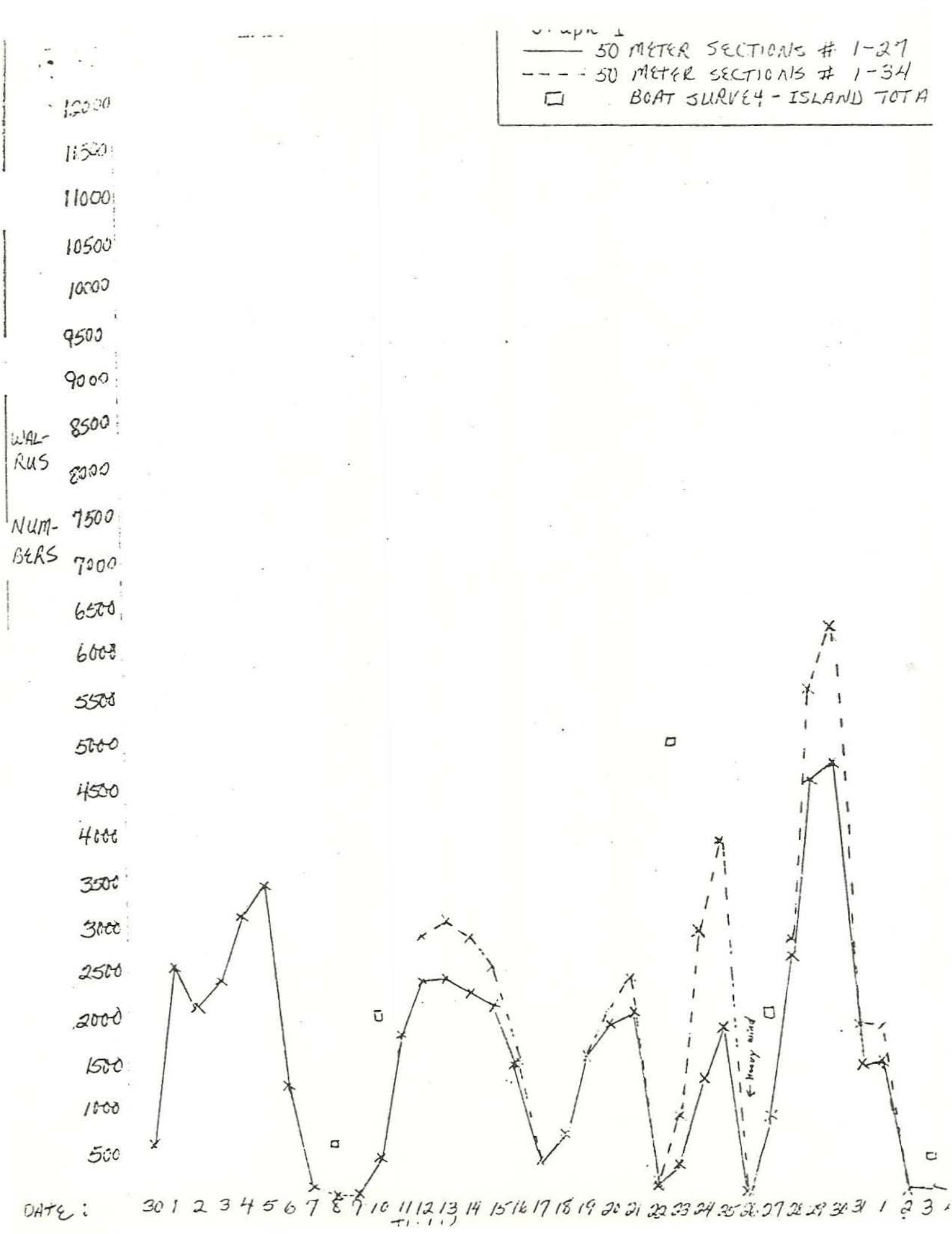
Formation and Dispersal of Groups

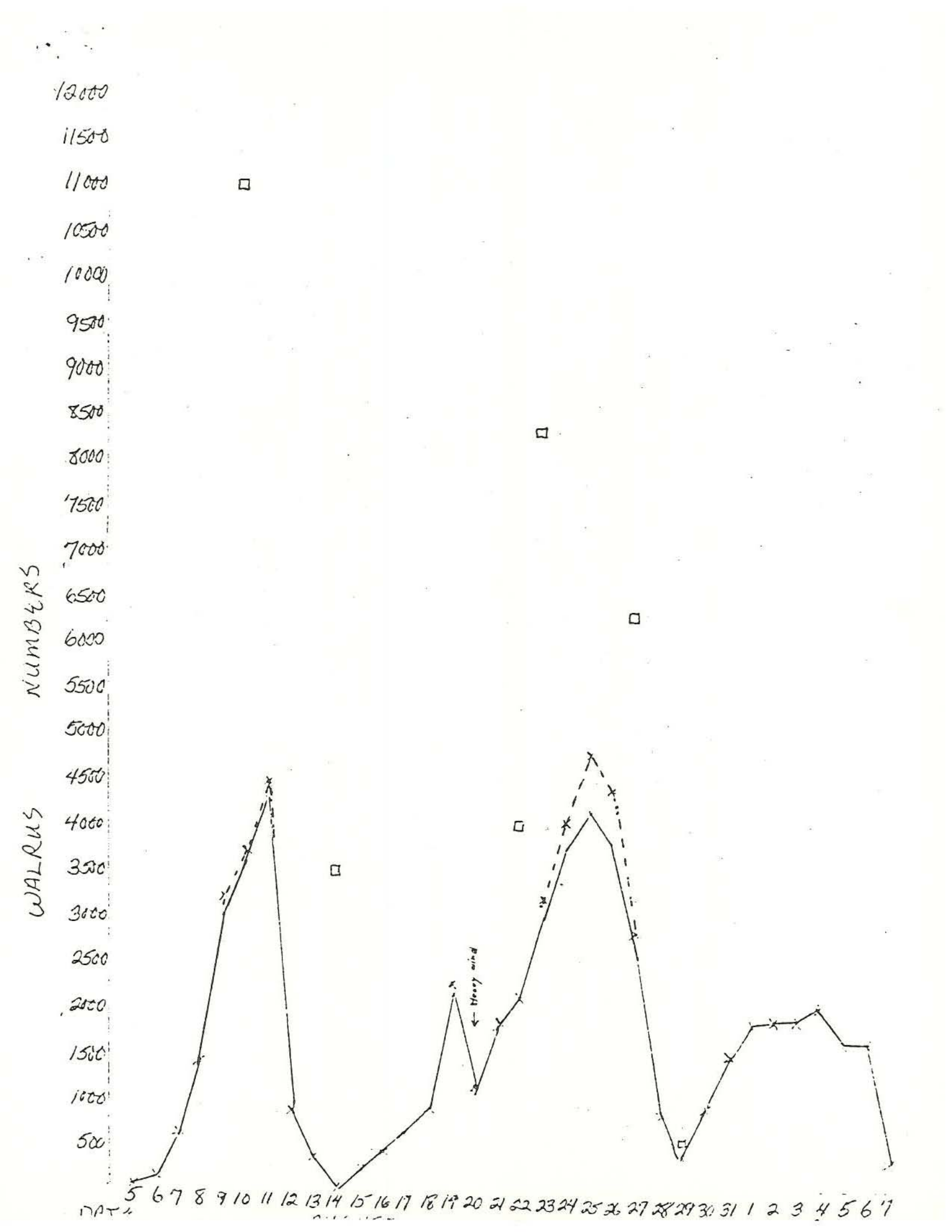
In addition to looking at the overall use of Round Island by walruses, we observed intensively individual groups. We collected data on 28 groups, from the time they formed until they dispersed, throughout cycles. At approximately 2 hour intervals during the daylight we scan sampled the groups and recorded the following information:

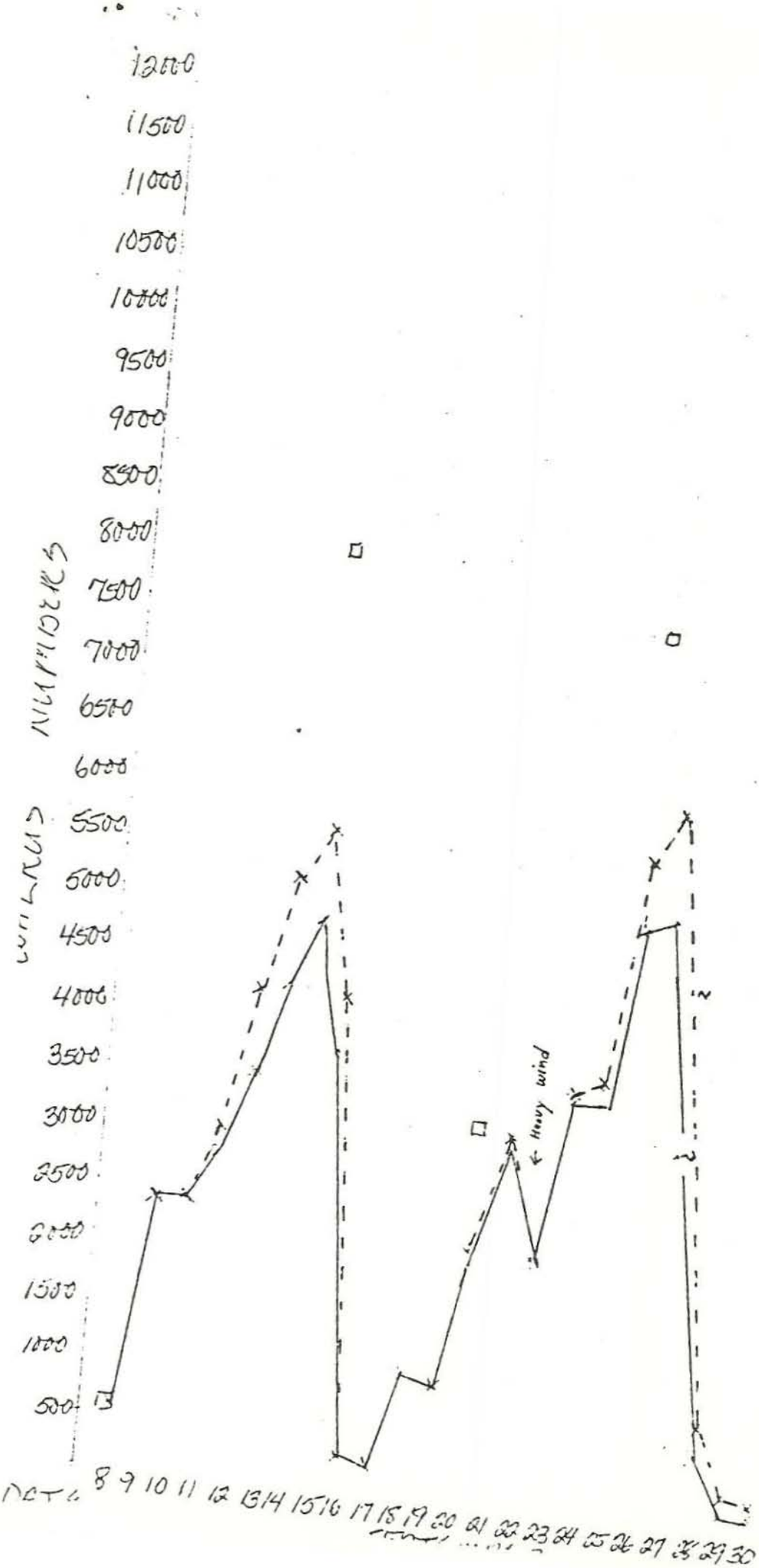
body size,
tusk size,
tusk damage,
amount of contact with other walruses,
activity,
orientation in relation to slope of the beach,
and sleeping position.

We collected this data on twenty walruses from each of three locations in the group: Seaward periphery, center, and cliff periphery. For correlation purposes, we recorded major weather parameters, sea state, total group size, and substrate size. The data are presently being analyzed.


WALRUS
ISLANDS
72
1° beach spit
1° beach spit 0-4.25
Loc 29
East cove
west cape
Round
Island
VABM A 1410
1° beach west
Loc 30
East cape
1° beach SE
Seal Lion pt.
09
BRISTOL
BAY


50 METER SECTIONS # 1-27
50 METER SECTIONS # 1-34
BOAT SURVEY - ISLAND TOTA
WAL-RUS NUM-BERS
12000
11500
11000
10500
10000
9500
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
Heavy wind
DATE :
30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3


WALRUS NUMBERS
12000
11500
11000
10500
10000
9500
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
Heavy wind
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7


12000
11500
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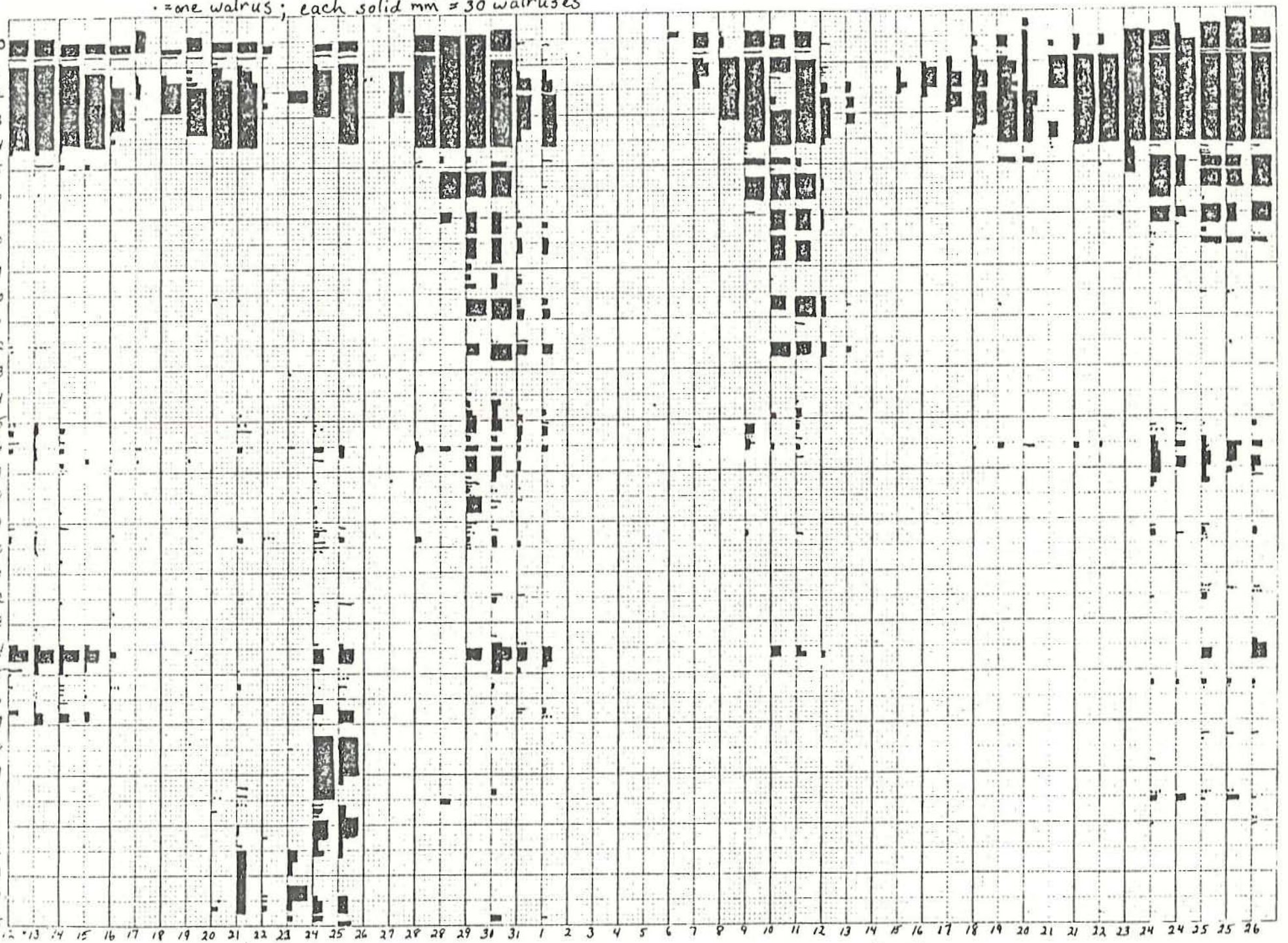
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
Heavy wind
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Graph II

. = one walrus; each solid mm^2 = 30 walruses



K+E 10 X 10 TO THE CENTIMETER
KEUFFEL & ESSER CO. MADE IN U.S.A.

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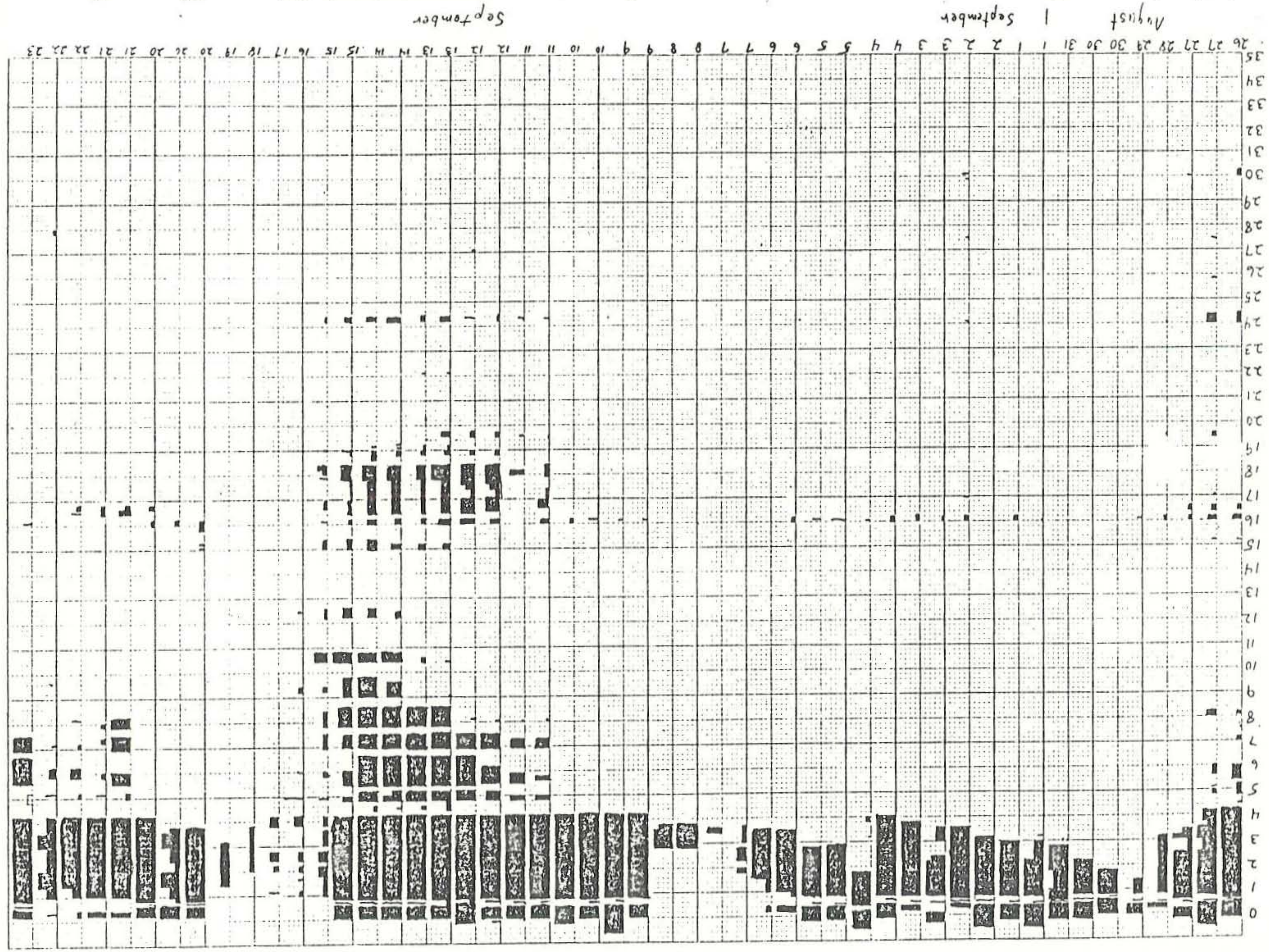
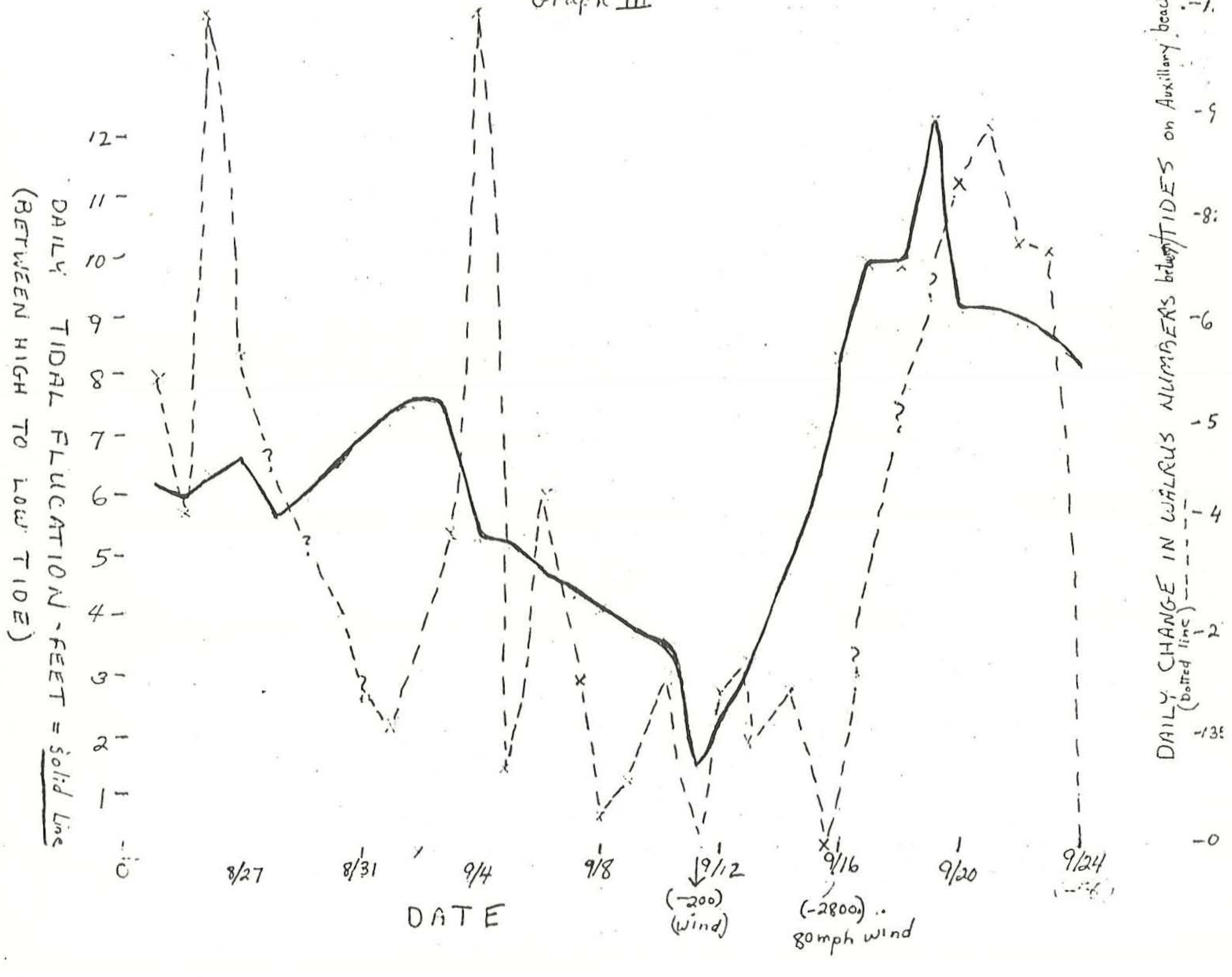


Graph III


DAILY TIDAL FLUCATION - FEET = solid Line
(BETWEEN HIGH TO LOW TIDE)
DAILY CHANGE IN WALRUS NUMBERS between TIDES on Auxillary beaches
(Dotted line)
DATE
8/27
8/31
9/4
9/8
9/12
9/16
9/20
9/24
(-200)
(wind)
(-2800)
80mph wind

Experimental Marking

Several types of experimental marking were attempted:

Livestock marker - Several walruses were marked using livestock markers, none of which were resighted. Even if we had had resightings, livestock markers would not have been satisfactory. When touched, walruses immediately became alarmed and headed for the water, thus we didn't have time to put numbers on them. Livestock markers streaked on walruses moving toward the water and wouldn't be distinctive enough to differentiate between large numbers of individuals.

Traffic line paint - Traffic line paint had similiar problems as the livestock marker. With the slightest touch of a paint brush, the walruses became alarmed and headed for the water, making it impossible to draw numbers. Even when paint was dripped onto walruses from a hidden spot, they became alarmed. The alarm was probably caused by the unusual feeling of the dripping paint on their skin, and/or the unfamiliar smell. A plastic baggie full of paint with a baseball sized rock in it was more successful. However, we never had a resighting - and again the marks weren't distinctive enough for large scale markings.

Spaghetti tags - A number of types of tags delivered with a crossbow were tried. The tag heads and delivery points were all from the manatee tagging project.

First we tried unaltered manatee tags and initially had problems with the bow string sliding over the arrow when the trigger was pulled. This was solved by filing a shallow notch in the back of the arrow. However, we soon realized that the unaltered manatee tags were unsuitable for walruses. The flags were ripped off by air resistance caused by the high speed arrows, the points often bent on impact, and penetra-

tion was poor. We rebuilt the tags, using aircraft cable, sharpened double heads, electrician's insulation for the color coding, and flags swedged on the end of the cable. Later we swedged seal flipper tags on the cable. Both types of tags were successful in that we had resightings, however, both types fell out eventually. Several tags we found on beaches. Even though double, the heads were not of heavy enough gauge, as the heads on the recovered tags were folded back. This problem could be solved by using larger, sturdier heads, and tags that are smooth and non-bulky so that they won't catch when drug across rocks or neighboring walruses.

The seal flipper tags were difficult to use because the arrows didn't fly straight. We were limited as to how far we could accurately hit a walrus because we had to retrieve the arrows (we only had 7 delivery points) with a fishing reel. The fishing reel required us to be close to the animals, it reduced penetration, and dragging the arrows over the herds often caused disturbance. Having disposable arrows in the future would make tagging faster and far less disruptive. We found that color coded spaghetti tags could be read at a greater distance than could numbered seal tags. However, only very distinctive bright colors should be used (for example, we had trouble distinguishing between red and orange). The pink flags were large enough that the tags were easily spotted (several we spotted ½ mile away); however an extruded oopik was sometimes mistaken for a tag. Flourescent orange would be a better color. We tried flourescent green, and it was very difficult to see, especially in the water.

Near the end of the tagging project, we ran out of the small swedges and had to hold the heads on with the larger copper swedges. Consequently, we had trouble with penetration. So we hand tagged

several walruses with a delivery point mounted on the end of 3 foot dowell - which, to our surprise, gave better penetration than the cross-bow. However, if this technique is going to be used in the future, we would suggest a six or eight foot dowell for safety reasons. Because of the close proximity of the person doing the tagging, this technique is quite disruptive. The disturbance can be kept to a minimum by working on lone walrus. This technique evoked very interesting responses in three individuals. One old walrus who was awakened by the jab in his back, bent his head around and looked closely at the tag, and then at us. He proceeded to chase us up the beach (fortunately it is easy to walk away from a charging walrus on land). On two occasions the reaction of a lone warlus was to flee to a nearby small pod of walruses (3 and 6 animals), although in both cases the water was closer than the pods.

To illustrate the difficulty involved in resighting individuals, we identified two walruses that had three tusks. Even though quite distinctive, we resighted each animal only twice.

The conclusions are obvious: in addition to developing tags that will stay in, it is important that the tags be both distinctive and easily spotted.

If an effective method of dying or painting tusks could be figured out, making a walrus conspicuous from a distance, specific identification could be determined from a small color-coded spaghetti tag on the back of the neck. If the spaghetti tag is small and streamlined, it would be difficult for a walrus to rub it out against a rock.

Tagging Summary

Date	Number Animals Tagged
7/4	6
7/6	2
7/11	4
7/13	1
7/15	17
7/21	29
7/25	6
7/27	10
Total	79

Resightings of Tagged Walruses

Walrus #	Date Resighted	Location Sighted	Date Tagged	Location Tagged
16	7/14	25.75	7/11	25.5
14	7/14	26	7/11	25.5
16	7/15	30	7/11	25.5
12	7/16	Spit (2.5)	7/6	25
15	7/18	30	7/11	25.5
	7/20	Spit	Unid. tag.	
46	7/23	28	7/21	15.25
16	7/24	16 & 20	7/11	25.5
39	7/24	16	7/21	19.75
30	7/24	31.5 & 16	7/15	30
22	7/24	16	7/15	30
48	7/24	30	7/21	31
49	7/24	31.75	7/21	31
21	7/25	19.5	7/15	30
11	7/27	Back side spit	7/6	24.5
30	7/29	30	7/15	30
18	7/29	24	7/15	30
74	7/31	24.25	7/21	31
74	8/1	16, time 0730	7/21	31
74	8/1	24.25, time 1500	7/21	31
55	8/9	15	7/21	31
71	8/10	18.5	7/27	Spit (3)
78	8/17	Spit (3)	7/27	Spit (3)

Recovered Tags

Date Found	Reason For Drop-out
8/19	Unknown
8/10	Head bent backwards
8/13	Cable broke
8/13	Head bent backwards
8/13	Unknown
8/22	Improper placement

Time Lapse Photographs

In order to watch groups continuously, we set a time lapse super 8 movie camera approximately 300 feet above the large beach on the west side of the spit. An intervalometer was set so the camera took three frames at one second intervals every ten minutes.

Although the film has not been analyzed in detail, it appears it will be a valuable source of data for formation rates and dispersal rates, and detailed disturbance analysis.

Effect of Disturbance on Walrus

The response of walruses to disturbance is unpredictable. For example, on June 15 we sat on a rock 10 feet above a group of 42 walruses and tagged 20 of them with a crossbow. Although the animals closely watched our movements, none of them spooked into the water. During the Lindblad Explorer's third visit, 6 walruses slept soundly all day on Flat Rock while Zodiaks with up to 15 passengers cruised in and out of Boat Cove at ½ hour intervals. When leaving Round Island at the end of September, we had to throw rocks at a group of 200 walruses to clear enough of the beach to get the Avon raft into the water.

On the other hand, several times large herds stampeded spontaneously into the sea as we poked our heads cautiously over the edge of cliffs to collect behavior data. The barely audible sound of a high commercial prop would often cause numerous herds of walruses to panic immediately. Several times we observed groups of walruses stampede for no apparent reason (were too far away for our presence to be the cause).

Types of disturbances we observed were: small boats with photographers, large fishing boats, commercial planes, single engine and twin engine planes, and one sonic boom.

Small boats with people trying to photograph and sight-see have

to get so close it is essentially impossible to have both satisfied photographers, and walruses remai on the beach. The second Lindblad Explorer visit, when 5 Zodiaks circled the island at 500 yards, was an example of how disruptive boats can be to hauled out walrus herds. Of the one small herd present on the island (100 animals), one half stampeded off the beach even before the rafts came within 500 yards. The remainder of the herd spooked before the boats came close enough to satisfy the occupants. In two other instances, photographers worked out of small boats. Both parties stampeded thousands of walruses even though they thought they were being careful. Of course, stampeding walruses make fantastic action for movies.

In addition to these small boats, 4 large fishing boats passed by the island. The boats had no effect until they were $\frac{1}{4}$-$\frac{1}{2}$ mile from shore - at which time the walruses began spooking. One large tender cruised to within $\frac{1}{4}$ mile and blew its horn causing more than fifty percent of the walruses on the spit to panic into the water. Boats that created more noise caused disturbance of animals from greater distances.

High commercial planes often caused stampeding. Even when the herds didnt spook, the walrus usually sat up and surveyed when high commercial props passed overhead.

Small float planes circling the island generally cleared most of the beaches. On one occassion we observed a walrus that was killed from the stampede caused by a low flying aircraft. This individual had apparently worked himself onto a high platform at high tide and at low tide panicked when the plane circled. He was apparently killed when he dove head first onto the exposed rock fifteen feet below.

Disturbances appeared to have different long term affects on walrus herds depending on how long the animals had been hauled out prior to the disturbance. During the middle of a cycle when disturbances caused herds to abandon beaches, walruses would desert the less desirable auxiliary beaches and glutt the more preferred gravel beaches. The initial influx of such large numbers of walruses resulted in such dense packing of animals that the walruses were sometimes held in vertical positions by adjacent animals. The continual immigration and high body contact resulted in an abnormally high amount of aggression and activity, even when compared to an actively forming group. This aggression continued until several high tides washed off the excess animals, who would then relocate on the peripheral beaches again.

Disturbances that occurred at the end of a cycle appeared to cause the walruses to leave a day or two before they would otherwise, thus terminating the cycle prematurely. Disruption of groups might help maintain cycles by causing simultaneous migration to the feeding grounds instead of a gradual dribble.

Certain factors made herds more sensitive to disturbance:

1. The longer a group had been resting on a beach, the more prone they were to spook, i.e., toward the end of a cycle.
2. Large herds seemed more sensitive to disturbances than small groups. The large numbers of walruses increased the probability one would panic, leading the rest of the herd into the water due to their contagious behavior.
3. Groups of walruses sitting offshore in shallow water surveying a hauled out group would often become alarmed at the slightest noise while the animals in the established herd would be unaffected.
4. Herds that had recently been disrupted were extremely sensitive to the slightest disturbance.

Starting July 22, we began keeping a running tally of disturbances on the island. Until the middle of August, an average of 8 disturbances per week were recorded; from mid-August to the end of September, 2 disturbances per week was the average. The drop-off in number of disturbances was probably due to poor weather conditions and generally less air traffic.

Prior to August 2, it was difficult to collect walrus behavior data due to the frequency of disruptions. Most of the groups dispersed prematurely, or were rearranged.

Individuals Entering a Herd

To understand group formation and dispersal better, we observed individual walrus from the moment they landed offshore until they entered a herd and came to a resting position. An actively forming herd is characterized by large numbers of walruses sitting offshore in neck deep water surveying the hauled out animals, and many animals swimming around in large circles in the shallow water. During this surveying period in shallow water, the walruses performed activities we classified as displacement, i.e., grooming, yawning, snorkeling (alternately swimming and surveying), and solitary tusk display. It was common to see surveying walrus abrubtly terminate displacement activity and move toward the herd suddenly. Nasal contact between individuals and inflated neck pouches with a church bell sound (described by Miller, 1972-73) were less frequently observed offshore activities. Twenty six percent (21 walruses) of the observed offshore animals swam away after surveying without attempting to enter the beached herd. Seventy four percent of the offshore walruses succeeded in joining the established herd. Of the observed newly arriving walruses,

Disturbances

Date	Time	
6/11		Fishing boat (shooting)
6/18		Fishing boat (shooting)
6/18		180 circled low
6/18-6/22		Penn Air Goose landed with photographers.
6/24		Penn Air Goose circled
6/24		NOAA ship anchored
6/26		Fishing boat from Togiak with photographers.
6/27		185 circled low
6/29		Avon from Crooked (ADF&G)
7/4		185 circled
7/9		Widgeon (our supplies)
7/14		185 circled
7/14		Avon from Crooked Island (ADF&G)
7/15		185 landed (photographers)
7/17		Skiff with photographers.
7/18		Skiff with photographers.

6/11 to 7/18 - disturbances partially recorded

Disturbances

Date	Time	
7/23	1545	Penn Air Goose circled island at about 500'.
7/23	1945	Commercial jet - high.
7/23	2043	185 circled island at 500'.
7/24	2215	Large fishing boat circled island 1/4 mile offshore.
7/27	1155	Commercial prop high.
7/27	1210	NOAA helicoper.
7/27	1315	NOAA helicopter on way to Crooked Island.
7/27	1440	NOAA helicopter leaving Crooked Island.
7/29	1540	Fishing boat 200 yards offshore.
7/29	1830	Single engine float plane 2000' over top of island.
8/1	1050	185 circled island at 1000'.
8/2	1110	Coast Guard Hercules, 4 engine prop - flew directly over camp at less than 1000'.
8/3	1330	2 engine commercial prop 250' circled.
8/4		High commercial prop.
8/5	1200	High commercial jet.
8/7	1420	Orange/white Widgeon at 200' circled island.
8/8	1735	185 circled low (ADF&G)
8/9	1210	185 circled 1000'.
8/9	1215	Sonic boom
8/9	1355	Widgeon, 200' circled island.
8/10	0900	Fishing boat circled island 100 ' from shore.
8/11	1120	Commercial plane -
8/11	1455	High commercial plane - we were at observation cove.

1-4 stood up (75%)
5.5-6.5 - (75%) stood up 25 in water
7-7.5 - (100% stood up) 100 in water
8-8.75 (75% stood up) 50 in water
10.25-11 (75% stood up) 40 in water
12-12.5 (25% stood up) 12 in water

Date	Time	
8/16	0955	Commercial jet, high.
8/20	2050	185 circled spit at 200'.
8/24	0930	Commercial prop, high.
8/22	1630	185, high.
8/26	1415	High plane.
8/27	1445	Alaska Star - big boat - circled.
9/2	1945	High commercial prop
9/2	1705	High commercial prop (loud)
9/3	1200	Fishing boat came into Boat Cove
9/16	0900	Commercial prop, high.
9/20	1015	Commercial prop.
9/21	0940	Commercial prop.
9/21	1530	Coast Guard Hercules, medium high.
9/29	1500	High commercial prop.

7/23 to 9/30 - disturbances totally recorded.

ninety three percent engaged in aggressive interactions with beached animals before establishing themselves a resting place.

All interactions between the subject walrus and any walruses he encountered were recorded in a sequential manner. We were able to discern 17 displays, vocalizations, facial expressions, submissive signals and activities that were common during these interactions:

Displays-	static tusk display, jab, kinesic tusk display;	(as identified by Miller, 1972-73)
Vocalizations-	bellow, grunt, lip flutter;	
Facial expressions-	vibrissee erection, open mouth, yawn;	
Submissive signals-	orienting away (with the head), bowing the head, bellow, vibrissee erection;	
Other activities-	grooming, surveying, swimming, snorkeling, nasal contact with another walrus, hitting another walrus with a flipper.	

We recorded all of the interactions for 91 walruses, watching each for a time period that ranged from 30 seconds to 29 minutes, with an average of 7 minutes 25 seconds per walrus. A total of 1697 signals were recorded. We have begun analyzing this data to see if the signals have communication value. The response of an interactant to the signal of a subject walrus was compared to the random frequencies of signals using a chi squared test. The table that follows shows that a number of the responses are significantly different from random frequencies.

Question:	Chi^2 Value	Expected Chi^2 Value*	d.f.
What activity initiates a static or kinesic tusk display?	37.44	12.8	5
What activity initiates a bellow?	33.15	14.4	6
What activity initiates a jab?	14.76	12.8	5
What activity follows a static tusk display?	44.10	16.0	7
What activity follows a kinesic tusk display?	53.50	20.5	10
What activity follows a bellow?	2.24	11.1	4
What activity follows a jab?	60.44	17.5	8
What activity follows a grunt?	13.90	11.1	4
How often does a kinesic initiate a static or kinesic tusk display?	24.02	5.02	1
How many jabs initiate a jab?	.59	5.02	1
How often does a kinesic or static tusk display recieve a jab?	13.82	5.02	1
How many walrus that bellow recieve a jab?	1.90	5.02	1
Class specific activities among small, medium, and large walruses:			
Is bellowing class specific?	164.9	7.38	2
Is jabbing class specific?	61.2	7.38	2
Is a kinesic tusk display class specific?	25.5	7.38	2
Is a static tusk display class specific?	2.68	7.38	2

*Expected Chi^2 Value at p .025

After collecting additional information on individual interactions during the 1978 field season, we will attempt to put together a predictable sequence of signals between two individuals of various size classes. We hope to be able to determine the probability of a specific response from walrus B, given a certain signal from walrus A.

Sea Lions and Walruses

Two separate incidents of walruses and sea lions interacting were observed this past summer.

On June 18 a lone sea lion laid on a rock 50 feet from shore where 200 walruses were hauled out. During 3 hours of observation the only interaction we observed was when a walrus surfaced as if he were going to haul out onto the rock. When the walrus saw the sea lion, he snorted and then immediately dove. Although dozens of walruses swam by, and around the rock, no others showed any response to the sea lion's presence.

August 1 we spent the day observing at Sea Lion Point. The first cove northeast of Sea Lion Point was fully occupied with walruses. After the beach of walruses became densely packed, many walruses began swimming over to the sea lion rocks. Some walruses were startled when they saw the sea lions and immediately dove. Six walruses landed and placed their front flippers on the rock and surveyed the sea lions that were within 35-40 feet. A medium sized sea lion repeatedly false charged these surveying walruses, and turned around approximately 20 feet from them and then rejoined the sea lions. Several walruses reacted with static tusk displays. One walrus gave a static tusk display as soon as he landed on the rock, and continued to do so until he swam away. After the initial "pioneer" walrus landed on the rock, other walruses were attracted, sometimes forming a group as large as 25 animals surveying from the water. None of the

walruses remained in sea lion territory longer than about 5 minutes before swimming away. The walruses that landed and displayed ranged in size from medium to large.

Although we visited Sea Lion Point five days during the course of the summer, we never observed walrus attempting to approach sea lion rocks other than on August 1; but it was common for walruses swimming by Sea Lion Point to surface and survey the sea lions as they swam by.

Round Island Visitors

Eight groups of photographers visited Round Island in 1977. Six of these groups camped on the island; two parties arriving in boats remained for less than one day; and the Lindblad Explorer cruise ship visited on three different occasions.

Out of the 6 parties of photographers who camped on the island, 4 parties were "weathered-in" and unable to leave when scheduled due to bad weather. Although previously warned by A.D.F.&G. personnel, all of these 4 groups lacked sufficient emergency food. Additional problems encountered were wet feet in hiking boots, poor quality rain gear, blown down tents, and wet sleeping bags. To solve these difficulties, visitors should be asked to bring 2 weeks emergency food supply, and warned of the possibility of greater than 70 knot winds. The problems mentioned above occurred in spite of the fact that no winds greater than 30 knots coincided with the photographers. It is common to have as few as 2-3 days in a month with suitable landing conditions for a float plane.

Visitors arriving in boats created several problems. A crew of TV photographers circled the island on 2 different days in a fishing boat out of Tosiak. Both times we were not expecting them and became unnecessarily alarmed thinking they might be walrus poachers. Not

knowing when these photographers arrive at the island, we are unable to meet them and discuss precautions they must take to avoid disturbing walrus. Circling the island unguided, this particular boat spooked large numbers of walruses and created much unnecessary disruption. Another photographer arrived in a Togiak fishing boat and was dropped off on the back side of the spit to camp. We, by chance, happened to see him as we were doing a boat survey the same afternoon. Had winds from the west hit, he would have had no place to retreat other than scaling the cliffs. These circumstances could be avoided by requiring boats to come into Boat Cove to pick up an ADF&G employee as a guide before circling the island, or preferably, make it mandatory for the boats to land and approach walrus on foot, guided by an ADF&G employee.

The Lindblad Explorer, a cruise ship with 80-100 passengers, was unable to land on the island their first visit due to bad weather. The ship circled the island from about ½ mile offshore so their passengers could view walruses, and caused no disturbance. Their second visit, five Zodiaks with fifteen passengers in each boat circled the island. Although only 200 walruses were hauled out this particular day, the Zodiaks spooked a small group of 100 animals from approximately 300 yards offshore. Circling the island, the sea lions were extremely disrupted by the boats, as was another small group of walruses. From this experience we decided to isolate the walrus disturbance to one particular beach on the Lindblad's third visit, and not allow any circling in Zodiaks. July 23, we landed the boats one at a time in Boat Cove. After 60 passengers had assembled there, we led them overland to the first beach southeast of camp where 300 walruses were hauled out. Six walruses laying in Boat Cove enabled people who were not capable of walking to the southeast beach an

opportunity to photograph a few animals. Zodiaks were shuttled into Boat Cove from the Lindblad at ½ hour intervals to return passengers to the ship as they wished. The passengers were extremely pleased with photos taken from the cliff overlooking the beach and no walruses were disturbed. For future large cruises, walking the people overland to a particular beach seems to be the ideal way to enable them to photograph without disrupting animals.

Note: Photographers planning to visit Round Island should be informed that the walrus appear to be cyclic and for several days out of approximately every 10 days in 1977, numbers were low; and several times no animals were present on the island between cycles.

Mortality

Due to the advanced stages of decomposition, the cause of death was very difficult to determine on most of the carcasses we examined. On three carcasses we concluded the cause of death to be gunshot. In addition, we observed three beached (not dead) walruses that were suffering from gunshot wounds - two had holes in the chest cavity, and one had a hole in a foreflipper and also the bone was broken. It was common to find sick or injured animals remaining on beaches after high numbers of walruses had left, who were apparently too weak to leave. Although we actually observed only one such walrus die, we felt this was a contributing source of carcasses on Round Island. Presumably, the rest of the carcasses were from fatalities that occurred out at sea and then floated to Round Island. Walruses that had been out at sea were easy to identify as they were white on one side (the half in the ocean) and black or reddish brown on the side above water that was exposed to the sun. Due to the weight of the skull and tusks, the head hung at a lower level in the water and thus blood collects in the head giving it a purple bruised appearance.

Round Island Visitors

June 10, 1977-September 30, 1977

Date	Number Visitors/ Party	Total Length of Stay	Number "Unplanned Weathered-in" Days	Number Man-Days	Number Camp Days	Mode of Transportation
6/22-6/26	5	5	2	25	20	Penn Air
6/22-6/26	2	5	2	10	8	Penn Air
6/24-6/25	7	2	0	14	0	NOAA ship
6/26-7/8	2	13	7	26	24	Togiak fishing boat
6/29-7/3	2 ADF&G	5	3	10	8	Avon from Crooked Is.
7/15	3	1 hr.	0	3	0	185 (private)
7/17-7/18	3	2	0	6	3	Skiff from a tender
8/21-8/29	1	8	0	8	7	Togiak fishing boat
Total	25	43	14	102	70	
8/10	3-5(?)	few hrs.	offshore	0		Togiak fishing boat
8/13	3-5(?)	few hrs.	offshore	0		Togiak fishing boat
6/16	80-100	few hrs.	offshore	0		Lindblad Explorer
6/25	80-100	few hrs.	offshore	0		Lindblad Explorer
7/23	80-100	1/2 day		0		Lindblad Explorer

We collected the skulls from all the carcasses that had good ivory. From all the carcasses, we collected a molar for aging. The sectioning hasn't been performed yet.

The results of the two autopsies are included.

Why Round Island?

A question we've frequently asked ourselves this summer was why the walrus use Round Island and not the other Walrus Islands.

Round Island is so steep that it is characteristic for the leeward side of the island to be calm even during 70 m.p.h. gales. Although the other islands have miles of prime beach, they aren't nearly as steep and, therefore, aren't as effective windbreaks. Maybe for this reason walrus have developed a tradition for using Round Island.

Date	Location	Carcass Condition	Apparent Injuries	Blubber thickness	Body length	Collected Ivory	Collected skull	Collected oosik	Ivory previously chopped	Number
6/14	East side	old		-	-	X	-	-	-	-
6/14	East side	old		-	-	X	-	-	-	-
6/14	East side	old		-	-	-	-	-	-	-
6/15	Spit	old	Bullet hole in head	27mm	3m 33cm	-	X	X	-	1-77
6/15	Boat Cove	very old	Bullet hole in head	-	-	X (nose plate)	-	-	-	2-77
6/17	Back side spit			-	-	-	X	X	-	3-77
6/17	Back side spit		Hematoma in head	-	-	X (nose plate)	-	X	-	4-77
6/17	Back side spit			-	-	X	-	-	-	-
6/18	Spit	fresh	Massive head injury numerous bullet wounds	-	-	X (1)	-	-	X (1)	
7/7	25	old		-	-	-	-	X	X	-
7/7	25	old		-	-	-	-	X	X	-
7/9	Back side spit	old		-	-	-	X	X	-	-
7/9	Back side spit	fresh	Broken oosik	-	-	-	X	-	-	6-77
7/9	Back side spit			-	-	-	X	X	-	7-77
7/9	Back side spit			-	-	X	-	X	-	-
8/11	Back side spit	fresh		-	-	X(1)	-	X	-	-
8/22	Back side spit	very old		-	-	-	X	X	-	8/77
8/22	28			-	-	X(1)	-	-	-	-

Date	Location	Carcass Condition	Apparent Injuries	Blubber thickness	Body length	Collected Ivory	Collected skull	Collected oosik	Ivory previously chopped	Number
8/22	Between East Cape & Lion Pt.			-	-	X(1)	-	X	-	-
8/21	Spit			-	-	-	X	-	-	9-77
8/27	27			6cm	308cm	-	X	X	-	10-77
8/27	27		Hematoma in head Right flipper hemmorraged	3cm	357cm	-	X	X	-	11-77
8/28	Spit	very old		-	-	-	X	X	-	12-77
8/28	24			2.5cm	332cm	X(1)	-	X	-	-
9/25	Spit			0cm	305cm	-	X	X	-	13-77
9/30	Back side spit			0cm	-	-	X	X	-	14-77

Walrus Autopsy

Date: 8/28/77

A. Standard length: 332 cm
Blubber thickness: 2.5 cm

B. Internal Examination

1. Bleeding out of mouth
2. Blubber in lower abdomen contained yellow fluid.
3. Mites present on epidermis on entire body.
4. Collected oosik and teeth.
5. Thoracic and abdominal viscera normal.
6. Blood clot inside heart, approximatly 2 lbs. in weight.
   Trachea foaming inside, dark color.
   Left lower lung lobe contained blood.
7. Pericardial fluid red.
8. Liver normal
9. Spleen normal
10. Esophagus and stomach normal.
13. Kidneys bloated, mushy.

Walrus Autopsy

Date: 6/15/77

A. Standard length: 3m 33cm
Blubber thickness: 27 ml

B. Internal Examination:

1. Severe thoracic damage
2. Blubber normal.
3. Left lateral side of head, posterior to eye: bullet hole penetrating through and beyond dermis.
4. Skull and mandible retained (#1-77).
5. Massive amounts of blood in thoracic cavity. Pulmonary tissue hemmorhagic.
6. Right lung greenish yellow, no normal tissue.
   Trachea: small blood clot present.
   Left bronchi hemmorhagic, right normal.
7. Heart, normal
8. Liver soft, mushy, greenish.
9. Spleen greenish.

DATE	TIME	DIRECTION	VELOCITY	COVER	STATE			PRESSURE	TEMP	PRECIP.
6/21/77	0915	ESE	5	70	1	52	59	29.62	60	0
6-22-77	1145	ENE	<5	100	1	50.5	52	29.71	53	0
6-23	1030	ESE	<5	100	1	49	53	29.78	61	½ hr drizz
6-24	1830	S	30	50	3	48	55.5	29.72	56	0
6-25	—	—	—	—	—	—	—	—	—	½ hr
6-26	0840	E	15	75	2	46.5	49	29.82	49	0
6-27	1015	W	10	50	2	54	56.5	29.84	57	0
6-28	1645	W	30	5	3	59	68	29.84	69	0
6-29	1315	E	<5	5	1	61	63	30.04	63	0
6-30	1325	W	25	5	2	61	70	30.14	70	0
7-1	1045	NW	30	0	3	56	59.5	30.05	59.5	15 min.
7-2	1100	NW	40	5	3	52	58	30.02	58.5	0
7-3	0910	SSW	20	5	2	50.05	50.05	29.88	50	✓
7-4	0845	W	10	0	2					0
7-4	1345	SSE	10	25	1	51	55	29.82	59	0
7-5	1415	SE	5	95	1	56	60	29.82	60	2 hrs
7-6	0845	SE	30	100	4					
7-6	2155	SE	30	100	4	50	55.5	30.01	55.5	0
7-7	1245	SE	30	100	4	49.5	50	30.02	50	all day
7-8	1105	E	10	100	2	50	50	29.98	50	3/4 day
7-9	0845	E	<5	75	1	51.5	51	30.00	51.5	0
7-9	2000	S	30	0	2	—	—	—	—	0
7-10	0930	NE	<5	100	1	48	49	30.14	49.5	0
7-11	1200	E	<5	100	1	53	59	29.95	60	4 hrs
7-12	1145	NW	30	100	3	48.5	51	29.86	54	0
7-13	1000	NW	5	100	2	46	49.5	29.84	51.5	0
7-14	1000	W	5	100	2	48.5	52	29.84	53	0
7-15	0900	NW	10	95	2	—	—	—	—	2 hrs
7-15	1600	S	20	95	2	47.5	51	29.86	53	2 hrs
7-16	0900	NW	5	0	1	46	47	30.02	72	0
7-16	2200	NW	20	5	2	—	—	29.98	62	0
7-17	1000	NW	20	0	2	—	—	—	62	0
7-18	1000	NW	20	0	3	56.5	59	30.12	67	0
7-19	1000	SW	20	100	3	55	57	30.09	60	0
7-20	0900	WSW	10	0	2	56.5	61	30.00	59	0
7-21	1030	E	25	100	3	53.5	57	29.78	57	1 hr
7-22	0900	NE	15	95	3	54	57	29.73	60	0
7-23	0730	SE	5	10	2	—	—	29.92	59	0
7-23	1000	—	0	0	2	—	—	—	72	0
7-24	0830	SE	5	100	1	54.5	55	29.95	60	3 hrs
7-25	1200	SE	30	100	3	55	57.5	29.84	64	✓
7-25	1900	SE	50	100	4	—	—	29.50	55	✓
7-26	0830	SE	60	100	4	51.5	52	29.25	55	✓
7-27	0930	SE	10	100	2	53.5	56	29.55	59	✓
7-28	1100	SE	5	95	2	59.5	55.5	29.84	64	✓
7-29	1230	SE	10	100	2	52.5	57.5	29.78	58	✓
7-30	1200	N	<5	100	1	57	60	29.78	62	✓
7-31	1000	W	10	10	3	55	59	29.83	61	0
8-1	0830	ENE	10	5	3	54.5	58	30.02	60	✓
8-1	1700	—	0	0	2	—	—	—	72	0
8-2	1200	NE	30	100	3	54	55	29.84	57	✓

8-3	1100	ESE	10	25	2	55.5	57	29.78	62	✓
8-4	0915	SE	35	100	3	52	54	29.45	59	✓
8-5	0930	SE	35	100	3	51.5	53.5	29.84	59	✓
8-6	1100	SE	25	100	3	51.5	53.5	29.69	58	✓
8-7	1000	NNW	5	100	2	52	54	29.45	60	✓
8-8	0900	NW	5	100	2	53.5	54.5	29.48	58	✓
8-9	1200	NW	5	85	2	—	—	29.74	68	✓
8-10	1030	SW	5	100	2	55	56.5	29.56	59	✓
8-11	1120	E	25	100	3	54.5	55.5	29.92	60	✓
8-12	1000	ENE	35	100	3	54.5	55.5	29.78	58	✓
8-13	1020	ESE	25	100	3	53.5	55	29.78	59	✓
8-14	1000	ESE	15	100	3	53.5	55	29.82	59	✓
8-15	0940	ESE	5	100	3	53	54.5	29.89	58.5	✓
8-16	0800	ESE	35	100	3	51.5	53	30.02	56	✓
8-17	0830	ESE	20	100	3	55	56	29.72	60	✓
8-18	1030	ESE	20	100	2	53.5	54.5	29.92	60	✓
8-19	1015	E	15	75	2	55.5	58	30.12	61	✓
8-20	1230	SE	40	25	3	61.5	65	29.89	69	✓
8-21	1000	SE	15	25	2	59	62	29.76	67	0
8-22	1030	SE	5	25	2	58	61	29.73	62	0
8-22	1600	SE	5	0	1	—	—	—	74	0
8-23	1130	SW	10	0	1	59.5	62.5	29.67	68	0
8-24	1330	0	0	100(Fog)	1	60	62	29.65	72	✓
8-25	0930	0	0	100	1	54	55.5	29.71	58	✓
8-26	1100	0	0	100	1	52	54.5	29.61	62	0
8-27	0830	0	0	100	1	56	57	29.59	60	0
8-27	1600	SW	15	—	—	—	—	—	—	0
8-28	0900	SW	15	0	2	53	56	29.78	58	0
8-29	1200	0	0	0	1	57	60.5	30.02	65	0
8-30	0900	NNW	10	95	2	52.5	53.5	30.04	57	0
8-31	1030	0	0	100	2	52	53.5	30.11	58	0
9-1	1000	0	0	95	1	53	55	30.09	61	0
9-1	1200	0	0	0	1	—	—	—	—	✓
9-2	0845	0	0	75	1	54.5	57	30.06	61	0
9-3	0930	W	25	0	2	53.5	55.5	30.01	57	0
9-4	0900	WNW	25	50	3	49.5	52	29.99	56	✓
9-4	1600	WNW	10	0	—	—	—	—	72	0
9-5	0930	WNW	15	100	2	53	54.5	29.86	58	✓
9-6	0930	SE	50	100	4	49	50.5	29.41	53	✓
9-7	1000	W	260	100	4	48.5	49.5	29.54	52	✓
9-8	1100	W	20	75	3	49	51.5	29.89	53	✓
9-9	1000	NE	25	100	3	47	47.5	29.74	51	✓
9-10	1000	SE	10	100	2	52.5	52.5	29.19	55	✓
9-11	0900	NNW	40	95	3	49.5	50	29.71	52	✓
9-12	1130	NNW	10	100	2	50.5	51.5	30.20	56	0
9-13	0845	WSW	20	100	2	49.5	50.5	30.11	54	✓
9-14	1030	WSW	15	100	2	50	51	30.05	55	✓
9-15	0830	S	35	100	3	50	51	29.75	54	0
9-15	1200	SW	270	—	—	—	—	—	—	0
9-16	0900	W	40	25	4	47	49.5	30.00	53	✓
9-17	1200	W	30	95	3	49	51	29.79	54	✓

9-17	1600	W	770	–	–	–	–	–	–	✓
9-18	0930	W	40	95	4	46.5	48.5	29.76	52	0
9-19	0900	S	<10	100	2	45.5	47	29.61	50	0
9-20	0900	N	15	100	2	46.5	47.5	29.32	50	0
9-21	0830	W	760	30	4	38	42	29.48	43	0
9-22	1030	W	750	10	4	39.5	43	30.02	44	0
9-23	0930	E	10	40	2	42.5	45.5	29.53	50	✓
9-24	0930	S	20	100	2	46	49	30.09	52	0
9-25	0930	N	<10	100	2	46	48	30.35	52	0
9-26	0800	E	<10	100	1	–	–	30.06	50	0
9-27	1200	E	0	100	2	–	–	–	–	0
9-28	1000	NW	770	25	4	37	40	29.68	42	0
9-29	1200	WNW	50	25	4	36	40	29.89	42	0
9-30	0900	ENE	10	<25	3	36	39	30.12	41	0
9-30	1700	–	0	<10	1	–	–	–	–	–

+ SEA STATE: 1 = CALM
2 = RIFFLE TO LIGHT CHOP
3 = WHITE CAPS
4 = HEAVY SEAS, SURF

PRECIP: ✓ = at least 1 hr rain