UNITED STATES GOVERNMENT

Memorandum

TO: Director, Bureau of Sport Fisheries & Wildlife DATE: 24 May 1965
Attn.: Richard H Manville, Director, Bird & Mammal Laboratories, Washington, D. C.
FROM: Biologist, BSFW, Sand Point NAS, Seattle, Wash.

SUBJECT: Report "Aerial survey of sea otters, 19 April to 9 May 1965"

Herewith I am sending you three copies of "Aerial survey of sea otters and other marine mammals, Alaska Peninsula and Aleutian Islands, 19 April to 9 May 1965." The report also contains observations of birds, prepared by James G. King.

I have promised to send copies of the report also to Refuge Supervisor David L. Spencer; Refuge Manager Robert D. Jones; James G. King; and the Alaska Department of Game. If you wish to have more copies I can send you two or three more and still have a couple left for my file here.

This report was very hurriedly done because of the notification received before I left that Senator Bartlett would like to have figures. Mrs. Todd should have particular credit for checking all figures, typing and mimeographing the entire report, and transcribing data from the original field charts. Since this is a report of only this one survey, I did not include an estimate of the total number of sea otters in Alaska. After combining figures from the present survey with those from other areas, I think the estimate will still be similar to the previous estimate of 25,000 to 30,000 otters for all of Alaska. Perhaps to give one figure it would be best to say about 30,000 otters.

Karl

Karl W. Kenyon

Encl. 3

Copies – 15 made
Wash D.C – 3
Spencer – 1
King – 1
ADF&G – 1
Jones – 1
Smith – 1
SCF Seattle – 1
} 24 May

Wash D.C – 1
Reg Dir Portl – 1
Jay (Loan) – 1

Gillett-W DC 12 – 1 – 16 Sept '65
13



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service Regional Information

May 19, 1965

Name: David L. Spencer

Telephone: Kenai 283-7563

BUREAU OF SPORT FISHERIES AND WILDLIFE

Station: Alaska Wildlife Refuges

Address: P.O. Box 500, Kenai, Alaska 99611

Release Date: Immediate

ALEUTIAN SEA OTTER COUNT COMPLETED

A recent count of sea otter by federal and state wildlife officials disclosed that sea otter are extending their range and slowly increasing in number.

This is the third sea otter survey made in the Aleutian Islands to document sea otter population growth and reoccupation of former range. Previous surveys were in 1962 and 1959.

The survey party included Karl Kenyon, Theron Smith, Dave Spencer and Jim King of the Bureau of Sport Fisheries and Wildlife and Ed Klinkhart of the Alaska Department of Fish and Game. The count was made from a DC-3 aircraft flying at an altitude of 200 feet along all coast lines and over water areas less than 20 fathoms in depth. The survey also recorded migratory birds, sea lions, seals and walrus. The present Alaskan sea otter populations extend from Prince William Sound to the western Aleutians. Greatest numbers are found between Adak and Kiska Islands. Although once native to southeastern Alaska and the British Columbia coast, these areas have never been reoccupied. One group is found off the California coast.

The beautiful, heavy fur of the sea otter was in great demand during the two previous centuries. Russian and American fur hunters exploited the then widespread

resource with no thought for the future. By 1912,when the Aleutian Islands National Wildlife Refuge was established, fewer than 1,000 of these valuable animals were left. Since that time, the sea otter has made a comeback. Mr. Karl Kenyon, marine mammal biologist, has studied sea otter for more than ten years, and estimates that there are now 25,000 to 30,000 in Alaska.

An attempt was made several years ago to repopulate the Pribilof Islands with the otters, which have been extinct there for many years. Seven otters from Amchitka (the number was small since the animals are hard to care for in captivity), survived for a few years after they were set loose in the Pribilofs. However, the animals eventually disappeared; apparently the number planted was not large enough to multiply. In 1956, five were moved to the Near Islands, however, otter now in this area are believed due to natural migration.

The population of Amchitka seems to have reached the saturation point and a number of sea otters die each winter from lack of food. To remove some of the pressures for survival and to learn more of the food habits and reproduction of the sea otter, 500 of the animals were harvested in 1962 and 1963 by the Alaska Department of Fish and Game.

These 500 pelts may be sold to furriers some time in the next few years. In the late 19th century, one sea otter pelt went for $1,700. This was the highest price ever paid and unless a great demand arises, these pelts probably will have a lower value. If sea otter fur should become popular, a controlled harvest, similar to the heavily-regulated hunt of fur seal, may be made under the supervision of state and federal officials.

The survey disclosed that otter populations have spread eastward from the densely populated Adak area to the Great Sitkin, Atka and Amlia areas. Areas overpopulated in 1962 have generally reduced in populations. The Near Islands --Attu, Agattu and Shemya--long devoid of sea otter, have been reinhabitated since 1962. Total otter populations in the Aleutians are estimated to be 15,500.

Further inquiry can be made to the Supervisor, Alaska Wildlife Refuges, P.O. Box 500, Kenai, Alaska.

Distribution:

Central Office, Washington
Regional Director, Portland
Refuge Managers, Bethel, Cold Bay, Kenai, & Kodiak
Game Management Agents, Anchorage, Fairbanks & Juneau
ANCHORAGE TIMES
ANCHORAGE NEWS
CHEECHAKO NEWS, Kenai
INLET COURIER, HOMER
PETTICOAT GAZETTE, Seward
NEWS-MINER, Fairbanks
KODIAK MIRROR, Kodiak
Karl Kenyon, Seattle
Croxton, ADF&C
Alaska Department of Fish and Game, Juneau

AERIAL SURVEY OF SEA OTTERS

AND OTHER MARINE MAMMALS

ALASKA PENINSULA AND ALEUTIAN ISLANDS

19 April to 9 May 1965

by

Karl W. Kenyon

and

BIRD OBSERVATIONS, ALEUTIAN ISLANDS

SURVEY, APRIL-MAY 1965

by

James G. King, Jr.

U.S. FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife
Sand Point Naval Air Station
Seattle, Washington 98115

20 May 1965

ABSTRACT

An aerial survey, 19 April to 9 May 1965, yielded information on marine mammals and birds in the Aleutian Islands and limited areas along the Alaska Peninsula. A total of 12,687 sea otters was recorded. The presence of sea otters in the Near Islands, where none was found on a 1959 survey, was confirmed by the sighting of 27 there. The 1965 count of sea otters at Amchitka Island, where 637 were killed in 1962 and 1963, showed a decline of 416 otters (27%) over a 1959 count. In areas judged to be overpopulated in 1959, decreased populations were found (the Rat and Delarof Islands). Previously unpopulated or sparsely populated areas showed population influx and growth (the Near, Andreanof, and Fox Islands, including waters off the S. W. tip of the Alaska Peninsula). The estimated total number of sea otters in the areas surveyed is about 17,000.

CONTENTS

	Page
Introduction	2
Purpose and scope	2
Itinerary	3
Personnel	4
Methods	5
Results	6
General summary	6
Near Islands	12
Rat Islands	13
Delarof Islands	14
Andreanof Islands	14
Islands of Four Mountains	15
Fox Islands and SW tip of Alaska Peninsula	15
Alaska Peninsula and Augustine Island	17
Figures	18
Appendices	
A. Charts to show sea otters observed	23
B. Steller sea lion, harbor seal, and walrus observations	48
Steller sea lion	48
Harbor seal	51
Pacific walrus	52
C. Bird observations, Aleutian Island survey, April-May 1965 by J. G. King	53

D. Field Observations (Surface) of Adak
Sea Otters, rat, Eiders, Savs Sparrow

INTRODUCTION

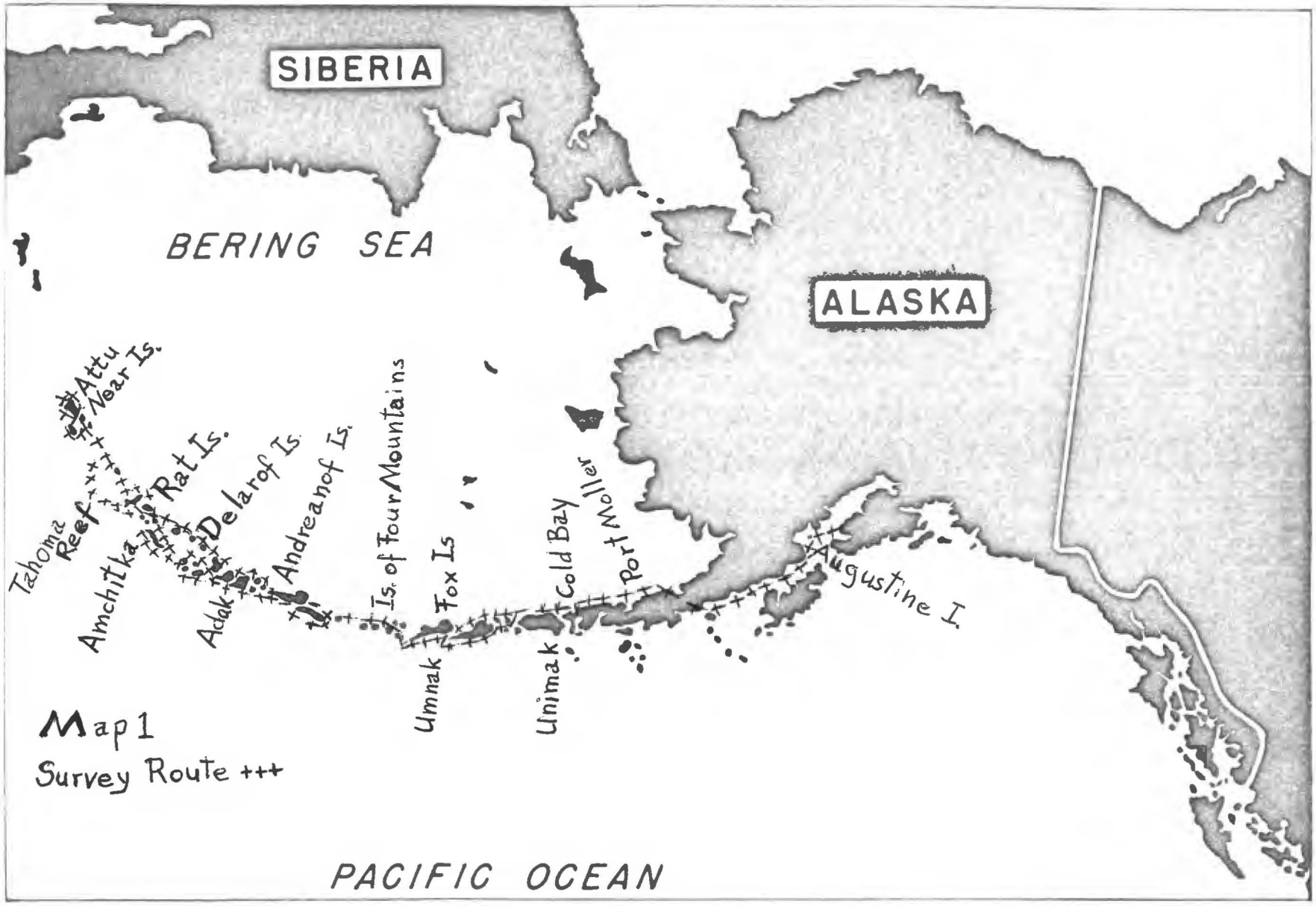
Purpose and Scope

The purpose of this report is to summarize data on the distribution and numbers of sea otters. The information was gathered by means of an aerial survey between 19 April and 8 May 1965. Included is a brief comparison of the 1965 data with information obtained on similar surveys in 1959 and 1962. A more comprehensive analysis of the significance of the available data to our knowledge of the population dynamics of the sea otter will be presented in a later report.

The 1965 survey included the Aleutian chain and parts of the Alaska Peninsula (Map 1). Because of unfavorable weather, the survey of several islands was not complete. Available data from previous surveys indicate, however, that all areas having significant sea otter populations within the survey area were included.

Information obtained in each group of islands is discussed and all observations are listed in table form. The distribution of sea otters is shown on charts (Appendix A).

In addition to the data on sea otters, counts and estimates of all Steller sea lions, harbor seals, and certain species of birds are included. The marine mammal data were gathered primarily by D. L. Spencer, K. W. Kenyon, and E. G. Klinkhart. The data on birds were recorded by J. G. King. Parts of his memorandum of 12 May 1965 are included (Appendix C).


SIBERIA
BERING SEA
ALASKA
PACIFIC OCEAN
Attu
Near Is.
Tahoma Reef
Amchitka
Rat Is.
Adak
Delarof Is.
Andreanof Is.
Is. of Four Mountains
Umnak
Fox Is
Unimak
Cold Bay
Port Moller
Augustine I.
Map 1
Survey Route +++

Itinerary

Date, 1965	Ar. -Dep.	Location	Flight time[1/]
18 April	2003	Depart Seattle-Tacoma Airport	
" "	2300	Arrive Anchorage (2100 local time)	
19 "	1150	Depart Anchorage	
" "	1223	Arrive Kenai, pick up Spencer	
" "	1252	Depart Kenai, survey Augustine Island and parts of the Alaska Peninsula from Cape Douglas to Wide Bay	
" "	1813	Arrive Cold Bay	5.8
21 April	1034	Depart Cold Bay. Wind conditions prevented survey en route	
" "	1238	Arrive Umnak, take on gas	
" "	1358	Depart Umnak. Partial survey en route to Adak but unfavorable weather conditions hampered survey	
" "	1836	Arrive U.S. Naval Station, Adak	6.7
25 "	1042	Depart Adak. Survey Andreanof Islands east of Adak to Atka Pass	
" "	1307	Arrive Adak	2.5
26 "	1122	Depart Adak. Survey Andreanof Islands west, Adak to Tanaga	
" "	1540	Arrive Adak	4.3
30 "	1106	Depart Adak. Survey small islands missed on 25 April but unfavorable weather forced cancellation of further work	
" "	1200	Arrive Adak	.9
2 May	0849	Depart Adak. Survey Delarof and Rat Islands	
" "	1703	Arrive Shemya, take on gas	
" "	1815	Depart Shemya, survey Near Islands	
" "	2040	Arrive Shemya	10.6
3 "	1006	Depart Shemya. Survey Tahoma Reef and several Rat Islands missed on 2 May	
" "	1436	Arrive Adak	4.5

[1/] Chartered DC-3 aircraft No. N 2768A.

Date, 1965	Ar.-Dep.	Location	Flight time
6 May	1346	Depart Adak. Survey Atka to Seguam and Samalga Islands	
" "	1758	Arrive Umnak	4.2
8 "	0915	Depart Umnak, survey some of Fox Islands and Bering Sea area off Unimak, to Cold Bay	
" "	1423	Arrive Cold Bay	5.8
" "	1555	Depart Cold Bay. Survey Bering Sea from Cold Bay to Port Moller, then go on instrument flight to Kenai	
" "	2001	Arrive Kenai	4.1
" "	2030	Depart Kenai	
" "	2100	Arrive Anchorage	.5
" "	2228	Depart Anchorage	
9 "	0411	Arrive Seattle (0111 Anchorage time)	

Distance covered:

Commercial airline, Seattle to Anchorage and return	3,000 mi.
In chartered DC-3	
En route to and from survey areas	1,000
In survey areas	5,000
Total	9,000

Cost of charter: $6,810 (49.2 hours at $175 per hour).

Personnel (Fig. 1)

Theron A. Smith, Pilot, BSFW Aircraft Supervisor
David L. Spencer, Copilot and observer, Refuge Supervisor, BSFW
Karl W. Kenyon, Observer, Biologist, BSFW
James G. King, Observer, Waterfowl Supervisor, BSFW
Edward G. Klinkhart, Observer, Game Biologist, Alaska Department of Game
C. Peter McRoy, Student, University of Washington, Department of Oceanography, was carried as a passenger from Anchorage to Cold Bay and return in conjunction with his studies of eel grass for the Division of Refuges

METHODS

As in similar past surveys, a DC-3 aircraft (N 2768A) was flown at an air speed of about 120 to 125 miles per hour and an altitude of 200 to 300 feet. In areas where wind and terrain permitted, we found that the optimum observation altitude was 250 feet. One observer sat in the copilot's seat, one stood behind the pilot, and a third stood between them. In this way we obtained a view of all areas passed over. Under the usual conditions of wind and visibility, otters were seen in a strip from about one-half to three-quarters of a mile wide. Groups of otters were easily seen to a distance of about 1 mile. The 4-foot-long body of a sea otter resting on its back with the head and sometimes the hind feet protruding upwards is distinctive (Fig. 3) and not easily confused with other objects.

We frequently saw small pups carried on the mothers' chest. Because distance and light conditions prevented consistancy in the observation of small young, these are not included in the counts. Included in our counts and estimates are independent animals, i.e., adults and large juveniles. The majority of otters were scattered singly or in groups of up to 25 or 30 animals. These could be quite accurately counted. Several large groups composed of 200 to 400 otters were seen and the number present was estimated. To obtain an estimate, part of the large group was counted and the remainder estimated on the basis of the counted fraction. Photographs of several large groups were taken (Figs. 2 and 3). A count from the photograph was compared with the field estimate. Because the estimates were reasonably close to the counts, no correction factor is applied.

In most areas the band of sea otter habitat around islands is less than a mile in width, so that animals present are seen on one pass through an area. Where shallow areas, to a depth of 15 to 30 fathoms, are extensive, such as off the north shore of Unimak Island and the northwestern tip of the Alaska Peninsula, we flew many sectors through the survey area. On frequent occasions we flew over areas adjacent to our inshore flight track and found that depths shown on our U.S. Coast and Geodetic Survey charts accurately indicated where sea otters could be found.

The number of otters observed was immediately recorded on a U.S.C.G.S. chart of each survey area. A complete set of these charts is contained in Appendix A.

Weather conditions are an important factor in the success of an aerial survey. Winds over 15 miles per hour and fog, snow, or rain squalls created unsatisfactory survey conditions. Light winds of up to 10 miles per hour and a high overcast constituted satisfactory conditions. Satisfactory visibility and wind for aerial surveys existed on 8 days out of 20 spent in the field.

An estimate of the total number of otters in the survey area is calculated on the assumption that between 50 percent and 75 percent of the otters present were seen. In most areas we believe we recorded at least 75 percent of the animals present. This belief is based on the fact that we have resurveyed many areas repeatedly, both at short and long intervals. The number and location of otters seen on these duplicated surveys is consistently related to available habitat, observed population growth, and attrition. We consider that a satisfactory general estimate of the number of sea otters in the areas surveyed is obtained by presuming that 75 percent of the otters present were seen.

RESULTS

General Summary

A total of 12,687 sea otters was recorded (table 1). Our estimate of the number of otters in the areas surveyed (presuming that we saw 75 percent and excluding dependent young) is 16,916, or about 17,000. Of these, about 16,800 are in the Aleutian Islands and in the adjacent waters of Bristol Bay along the north shore of the Alaska Peninsula to Port Moller (56° N. lat., 160° W. long.).

In table 2 it is shown that the sea otter population declined in two important areas, the Rat and Delarof Islands. Studies based on food habits analysis and observed mortality in one area (Amchitka Island) indicated that the available habitat in these areas contained greater than maximum sustainable populations when previously surveyed in 1959. In view of data available, it would have been surprising if the Rat and Delarof Islands' populations had not declined.

Three populations, in the Near, Andreanof, and Fox Islands, exhibited population increases (table 2). The number of otters observed in these areas on previous surveys when correlated with knowledge of habitat requirements found at Amchitka, indicate that continued growth may be expected in these areas extending to a number of years in the future. The available habitat from which otters were exterminated before 1911 is still large relative to the present population.

The indicated great increase in the Fox Islands to Port Moller population may probably be attributed primarily to three factors: (1) An influx of otters from the Sanak Island-Sandman Reefs area augmented the population. Recently, R. D. Jones, Jr. (personal communication) told me that he has seen otters in False Pass which is a passage between the North Pacific and Bering Sea. (2) A north wind of several days duration prior to and during our 1965 survey may have concentrated large numbers of otters near shore from their extensive offshore feeding grounds. During the 1962 survey of this same area, we found otters more scattered than in 1965. In 1962 they were spread over many square miles of open water and as far as 5 to 6 miles off shore. Presumably we failed to see many of them in 1962. (3) A large number of mothers carrying young were observed during both surveys--obviously reproduction accounted for some but certainly not all of the observed population increase in this area.

Except for the Bristol Bay area north of Unimak Island, Becheven Bay, Izembek Bay, and Port Moller, available sea otter habitat is concentrated near the shores of the often precipitous volcanic Aleutians. Deep waters surrounding these islands are not frequented by the bottom-feeding sea otter.

Table 1.--Aerial survey of marine mammals in 1965

Location	Date of survey	Sea otter	Steller sea lion	Harbor seal	Remarks and additional species observed
Near Is.					
Attu	2 May	13	4,000	60	
Agattu	" "	4	1,300	10	
Alaid	" "	0	2,500	20	
Nizki	" "	0	0	0	
Shemya	" "	10	2,000	0	
Ingenstrem Rks.	" "	0	100	0	All in water; 1 Laysan Albatross.
Total		27	9,900	90	
Rat Is.					
Buldir	2 May	15	3,500	0	
Tahoma Reef	3 "	0	86	0	Many birds and 3 Laysan Albatrosses.
Buldir Reef	2 "	0	0	0	" " " 15 "
Kiska, L. Kiska and Tanadak	2 "	1,137	1,485	145	
Sea Lion Rock	" "	92	0	0	2 Laysan Albatrosses
Segula	3 "	56	650	20	1 " "
Davidof-Khvostov and Pyramid	" "	39	0	0	
Little Sitkin	" "	135	15	12	
Rat	2 "	326	650	110	
Amchitka	" "	1,144	710	215	
Semisopochnoi	3 "	203	1,100	70	
Total		3,147	8,196	572	
Delarof Is.					
Gareloi	3 May	83	100	0	
Unalga	2 "	16	520	0	1 Laysan Albatross
Kavalga	" "	155	0	20	
Oliuga	" "	144	0	25	
Skugul, Tag and Ugidak	" "	46	100	100	
Gramp Rock and Ilak	" "	32	75	20	
Ulak	" "	107	300	0	
Amatignak	" "	70	0	0	
Total		653	1,095	165	

Table 1.--Aerial survey of marine mammals in 1965--Continued

Location	Date of survey	Sea otter	Steller sea lion	Harbor seal	Remarks and additional species observed
Andreanof Is.					
Tanaga	26 Apr.	1,059	130	272	
Kanaga	" "	1,054	175	10	
Bobrof	" "	32	100	0	
Adak	" "	1,336	610	10	
Great Sitkin	25 "	710	281	16	
Kagalaska	" "	298	1	0	
Little Tanaga	" "	509	0	0	
Umak	" "	392	0	0	
Anagaksik	" "	0	475	0	
Atka	6 May	228	4,900	26	
Amlia	" "	159	3,700	10	
Seguam	" "	28	4,400	14	
Total		5,805	14,772	358	
Is. of Four Mountains					
Amukta	21 Apr.	0	200	0	Survey N. side only
Chagulak	" "	0	0	0	" " " "; many thousands of fulmars
Yunaska	" "	0	350	0	Survey N. side only
Carlisle	" "	0	250	0	" " " "
Chuginadak	" "	0	0	5	" " " "
Total		0	800	5	
Fox Is.					
Samalga	21 Apr.	9	25	450	Poor survey conditions
Adugak	6 May	0	400	0	
Umnak	21 Apr.	0	0	230	SE side only
Unalaska	8 May	0	2,100	350	S side only; 6 eagles
Egg	" "	0	50	0	
Baby	" "	0	0	200	
Akutan	" "	0	9,000	0	Survey S. side only; 2 killer wh., 1 eagle
Rootok	" "	0	10	0	Survey N side only
Avatanak	" "	2	0	0	" " " "
Tigalda	" "	32	650	60	" N and E side only; 1 minke wh., 1 eagle
Aiktak	" "	0	100	150	Survey N side only
Ugamuk	" "	0	10,975	50	
Unimak	" "	144	810	0	Survey N and W side only
Total		187	24,120	1,490	

Table 1.--Aerial survey of marine mammals in 1965--Continued

Location	Date of survey	Sea otter	Steller sea lion	Harbor seal	Remarks and additional species observed
Amak Is. and Sea Lion Rks.	8 May	11	4,100	0	5 ♂ walrus near SW shore
Bering Sea					
Becheven Bay to Port Moller, 0 to 3 miles offshore	8 May	2,421	0	1,860	75 ♂ walrus 1/2 mi. off C. Glazenap
3 mi. + offshore	" "	316	0	0	
Total		2,748	4,100	1,860	
Cook Inlet to Wide Bay					
Augustine I.	19 Apr.	18	0	0	Wind and sun, fair to poor survey conditions
Shaw I.	" "	65	0	0	" " " "
Cape Douglas	" "	6	0	0	" " " "
Douglas Reef	" "	30	0	300	" " " "
Kinak Bay	" "	1	0	0	" " " "
C. Ilktugitak	" "	0	200	0	" " " "
Puale Bay Rks.	" "	0	750	0	" " " "
C. Gull	" "	0	0	3	" " " "
Takli I.	" "	0	0	25	" " " "
Total		120	950	328	
Total all areas		12,687	63,933	4,868	

Table 2. --Sea otters observed and estimated in the Aleutian Islands [1] and along the north side of the Alaska Peninsula, 1959-65

Island group	Surveys 1959 21-27 May	Surveys 1962 29 Mar. to 10 Apr.	Surveys 1965 19 Apr. to 8 May	Increase No.	Increase %	Decrease No.	Decrease %	Est. pop. 1965
Near Is.	0	N. S. [2]	27	27	100	-	-	44
Rat Is.	3,489	N. S.	3,147	-	-	342	10	4,196
Delarof Is.	1,397	N. S.	653	-	-	744	53	870
Andreanof Is.	4,630	5,066	5,805	1,175	25	-	-	7,740
Is. of Four Mountains	N. S.	0	0	-	-	-	-	0
Fox Is. [3]	N. S.	833	2,935	2,102	252	-	-	3,913
Total			12,567					16,763

[1] The incomplete survey of the mouth of Cook Inlet and along the northeast coast of the Alaska Peninsula is omitted from this table.

[2] No survey.

[3] This includes all of the Fox Islands plus Amak Island and waters off the north side of the Alaska Peninsula from the mouth of Becheven Bay to Port Moller.

Rarely did we see them in water from 20 to 30 fathoms in depth. The vast majority were in water near shore over depths of 10 to 15 fathoms. The distribution of otters, relating the number seen to available habitat (i. e. shallow water within the 30-fathom curve), is shown on the copies of our survey charts, Appendix A. In particular, charts 10 and 23 indicate the relationship of otter numbers to water depth. Where contour lines are close together and near shore few otters are present. Because we explored many offshore areas adjacent to heavily populated islands, we consider that an insignificant number of otters were missed because they were outside areas covered by the survey. The only exception, as previously indicated, is the extensive shallow area of southwestern Bristol Bay.

The counts and estimates of numbers of marine mammals other than sea otters were made incidentally. An effort was made, however, to obtain as much information as possible. The data are presented in table 1 and comments on the 63, 933 Steller sea lions, 4, 868 harbor seals, and 80 walruses we recorded are presented in appendix B.

Near Islands

The only previous survey of the Near Islands was made on 19 May 1959. Observation conditions were excellent and the entire group was covered but we found no otters. Biologist B. F. Jones (FRI), however, reported sighting a single sea otter on 12 June 1959 near Attu. In 1964, Refuge Manager R. D. Jones obtained skeletal remains of a sea otter and other observations from Agattu and saw one otter at Alaid.

The 1965 survey, during which we recorded 27 otters, was the first to reveal positively the establishment of sea otters at Attu Island.

The source of the present small population in the Near Island group is problematic. It is possible that the animals reached Attu across 185 miles of deep open water from Medny Island of the Commander group. It seems more probable to me that the animals came from the heavily populated Rat Islands, crossing passes between Kiska, Buldir, and Shemya. The greatest distance between possible feeding areas along this route is about 45 miles. The possibility also exists that some of the five otters taken by R. D. Jones to Attu in 1956 survived. At any rate, it is now apparent that a small population is established at each of the major islands of the Near Islands group.

Rat Islands

In recent years we have attempted three comprehensive surveys of the Rat Islands. The 1959 and 1965 surveys were successfully accomplished under comparable good to excellent observation conditions. The 1962 survey failed because of long-continued, unfavorable weather.

Studies conducted on Amchitka Island since 1955 and intermittent surveys made since 1935 have indicated that the sea otter population there grew to a large size, causing over-utilization of food resources during the mid-1940's. Population reduction through starvation was then observed and a moderately fluctuating population in balance with the habitat resulted.

It was thus not surprising that our 1965 observation of 1,144 otters there was less than our 1959 tally of 1,560, a reduction of 416 otters, or 27 percent. It is interesting to note that during the interval between surveys 637 otters were killed, either for their pelts by the Alaska Department of Game (502 skins) or for Fish and Wildlife Service studies. Apparently reproduction during the 1959-65 period compensated only partially for the natural and artificial mortality that occurred. It may be concluded either that habitat conditions were such that the population could not regain its 1959 level, or else the slow rate of reproduction in the sea otter prevented compensatory population growth.

Studies based on findings made at Amchitka indicated that the 1959 population was at or above the carrying capacity of the habitat in all of the Rat Islands. Therefore a general population reduction was expected. The 1965 survey revealed a 10 percent reduction (table 2).

On 3 May 1965 we visited Tahoma Reef, which lies about 33 miles south of Buldir Island, because of the possibility that sea otters might wander to this shallow area where food is available. We found large kelp beds and breakers there and a number of pelagic birds and sea lions (table 3). Although we made several passes over the shallow water, no sea otter was seen. The abundance of birds and sea lions indicate that upwelling in this area creates favorable feeding grounds for marine wildlife. Perhaps the lack of any rock or land above the surface of the sea prevents this reef from being attractive to sea otters.

Delarof Islands

The only previous comprehensive survey was made in 1959. This indicated that the sea otter population of the Delarof Islands by analogy with the Amchitka population exceeded in size the maximum sustainable population for the available habitat (square miles of water less than 30 fathoms in depth). The 1965 survey shows a 53 percent decline in the population (table 2) which confirms the conclusions previously reached. A relatively stable, mildly fluctuating population may be expected to continue in these islands.

Andreanof Islands

This group is of particular interest because contiguous islands containing a large amount of unoccupied sea otter habitat are available. Previous observations, plus surveys made in 1959 and 1962, indicated that this population was growing and extending its range from west to east. The present survey confirms previous observations and indicates continued population growth of about 25 percent since 1959 (table 2). The Andreanof Islands population may be expected, within the next 10 to 15 years,

to reoccupy all available habitat and reach a maximum sustainable population size of approximately 12,000 otters. A more comprehensive analysis of the Andreanof Islands population is in process of preparation for publication.

Poor weather conditions prevented a survey of the north side of Atka Island. No otters were found there in 1962 and by analogy with other areas studied, few otters will occupy waters off the north shore until a much larger population occupies the south shore.

Islands of Four Mountains

No sea otter has been seen in the Islands of Four Mountains. The 1962 survey was complete. In 1965, both because of available flight time and poor weather conditions, sample surveys only were conducted in this island group. The available sea otter habitat is small. The islands are steep, volcanic cones furnishing only a narrow band of sea otter habitat. Because the Islands of Four Mountains are isolated from any sizable sea otter population by long distances, it will be many years before this group will be repopulated. Repopulation will probably occur when the Andreanof Islands population reaches maximum size and even then the number of sea otters in this island group will undoubtedly never be large.

Fox Islands and SW Tip of the Alaska Peninsula

A complete survey of this group was undertaken in 1962. In 1965 sample areas were surveyed. These samples confirmed the conclusions from the previous survey that a significant sea otter population does not exist at Umnak or Unalaska (two of the largest islands in the Aleutian chain). No growth of the small Samalga population is indicated by our surveys. Weather conditions, however, were not ideal in 1965 so that the survey there is not strictly comparable with those of 1959 and 1962 (table 2).

The Krenitzin Island population appears still to be centered near Tigalda Island, but all islands could not be visited because of snow squalls. It may be assumed that these animals reached the Krenitzin Islands from the large populations at Sanak and from the Bering Sea north of Umnak.

We extended the survey along the north shore of the Alaska Peninsula about 10 miles northeast of Port Moller but found no sea otters beyond the mouth of the bay. Our observations suggest that Port Moller (56° N, 160°50' W.) is near the northeast extremity of the sea otter's range in Bristol Bay.

Probably one of the most significant observations we obtained was of the very large number of otters occupying shallow water north of the Alaska Peninsula and Unimak Island. Many of these animals were gathered into large rafts well outside the surf line, apparently sleeping on their backs at midday when we made our survey (see Fig. 3). Scattered individuals were feeding. Although the 1965 survey showed that the majority of the otters in this area were within the 3-mile limit, the 1962 survey demonstrated that numbers of them may feed in waters near the 20-fathom curve, which in this area is from 5 to 8 miles from shore. A possible reason that more otters were near shore during the 1965 survey was that a north wind of approximately 30 knots had blown steadily for several days before our survey. At the time of the survey, the wind had dropped to 10-15 knots but was still from the north. We can only speculate how much and where the otters of this large population haul out. Examination of the beaches of Amak Island by several observers did not reveal either dead otters or fecal material. The dearth of such evidence suggests that few otters use the island as a hauling ground. At present there are no observations to indicate that these animals haul out on land with any regularity or frequency. The large size of this population and the opportunity for otters to find food beyond the 3-mile limit, where they would be vulnerable to hunters, is of particular significance and indicates a need for protective legislation.

If the available habitat may be populated as densely as some of those of the Aleutian Islands, the population might reach from 10,000 to 15,000 otters. No quantitative study of the marine invertebrate fauna of southwestern Bristol Bay has been made. A qualitative study (P. A. McLaughlin, Survey of the benthic invertebrate fauna of the eastern Bering Sea. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 401, 1963), however, revealed a variety of crustaceans and molluscs in this area and suggests that it is rich. The large numbers and variety of aquatic birds and marine mammals there indicate that food species are abundant.

Alaska Peninsula and Augustine Island

The survey of sample areas near the mouth of Cook Inlet and along the northwest coast of Shelikof are of little significance. Winds coming from high mountain passes created unsatisfactory survey conditions. The counts of otters, however, are included in table 1.



Figure 1. --The 1965 Aleutian Islands aerial survey crew beside the DC-3 survey aircraft. (L. to R.) Jim G. King, Edward G. Klinkhart, David L. Spencer, Theron A. Smith, and Karl W. Kenyon at Umnak Island. This island airstrip is maintained by Reeve Aleutian Airways as a fuel and overnight stopping place. The volcanic rock-surfaced air strip is a remnant of World War II and is surrounded for many miles by the disintegrating buildings of an abandoned U.S. military post. During our survey we also obtained fuel at Cold Bay, through the courtesy of the U.S. Navy at Adak and the Air Force at Shemya. 21 April 1965. KWK 65-14-5.



Figure 2. --Two hundred and eighty sea otters resting at midday in a kelp patch in the central Andreanof Islands. No females carrying young are visible in this photograph. Probably such aggregations are composed almost exclusively of males. Further studies are necessary to ascertain the degree of segregation of the sexes. In areas where kelp beds are available, otters almost invariably choose them as resting places. Where the animals inhabit the offshore areas, however, they form rafts and rest in the open sea (Fig. 3). 25 April 1965. KWK 65-16-8.



Figure 3.--A raft of 142 sea otters in the open waters of southwestern Bristol Bay, between Amak Island and Izembek Bay. In this area there are no kelp beds, usually associated with resting otters. Shallow water, where otters feed on bottom-inhabiting invertebrates, extends at least 5 to 8 miles offshore. The characteristic appearance of the sea otter, floating on its back with head and hind feet held up, is illustrated as is the characteristic elongated grouping of the animals when they raft in open water. 8 May 1965. KWK 65-17-14.



Figure 4. --Amchitka Island, where detailed studies of the sea otter were undertaken in 1955. This view is from near the southern tip of St. Makarius Point looking northward toward Kirilof Point and the Bering Sea. Areas frequented by otters are in the foreground. The Quonset huts and other structures were built by the U. S. military forces during World War II, in the early 1940's. Although these buildings may stand for many more years, they have long been abandoned by the military and are now in various stages of decomposition. Rats, introduced during WWII, find shelter in such buildings.

Amchitka may have been the place where the largest colony of sea otters remained in 1911. It was here in 1935 that large numbers were rediscovered. In 1943, during WWII, Refuge Manager F. Beals conducted an aerial survey that revealed a local population of over 3, 400 otters. Much mortality in the late-winter, early-spring period of stress occurred during the late 1940's. The Amchitka population appears now to have stabilized at about one-half its maximum size. 2 May 1965. KWK 65-16-33.



Figure 5. --All that remains of the cargo vessel San Patrick lies among the rocks of Ulak Island. The ship ran aground during a storm in the winter of 1964-65. All men on board were lost. Oil spillage from wrecks such as this probably kills sea otters locally. No otters were observed to within about one-half mile on either side of the wreck. A similar ship wreck in the Shumagin Islands during World War II was said to have killed "hundreds of otters." 2 May 1965. KWK 65-16-18.

APPENDIX A

CHARTS TO SHOW SEA OTTERS OBSERVED 19 APRIL TO 8 MAY 1965

All observations of the number and location of sea otters were entered directly on charts during the survey. The following copies summarize this field data. Unless otherwise indicated on the charts, the survey track followed the shoreline of each island and included within the range of the observers' view all sea otter habitat. Sea otter habitat includes the tidal rocks and adjacent waters out to a depth of 30 fathoms.


ALEUTIAN
ATTU ISLAND
THIRD JUD
Survey 2 May 1965
Total otters = 13
AMS
Sheet NN 59-12
Series Q 501

(2)



Survey 2 May 1965
Total otters = 4

AMS NN 59-12
Series Q 501

0,000
10 15 20 Statute Miles
15 20 25 30 Kilometers
5 10 Nautical Miles

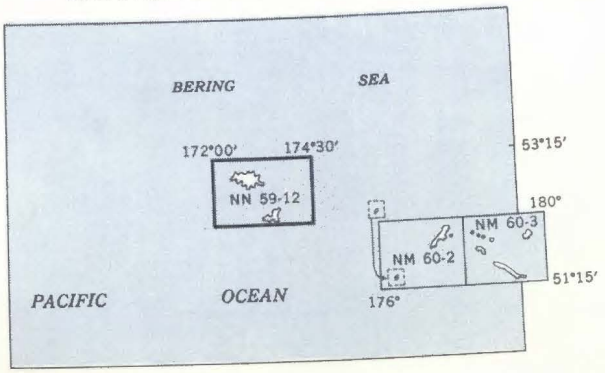
200 FEET
CATED BY BROKEN LINES
EA LEVEL

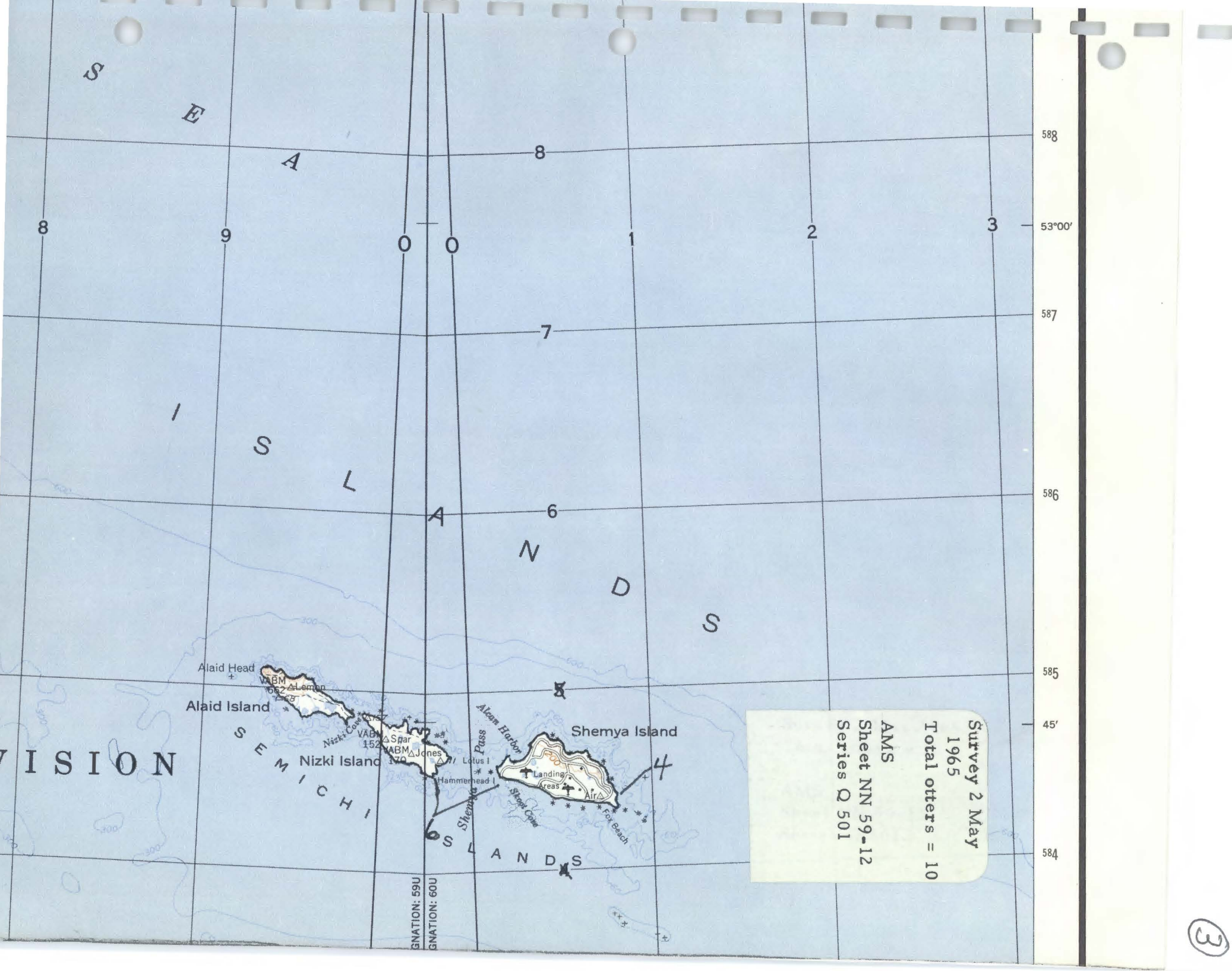
OR PROJECTION
N D

LOWER LOW WATER
XIMATE LINE OF MEAN HIGH WATER

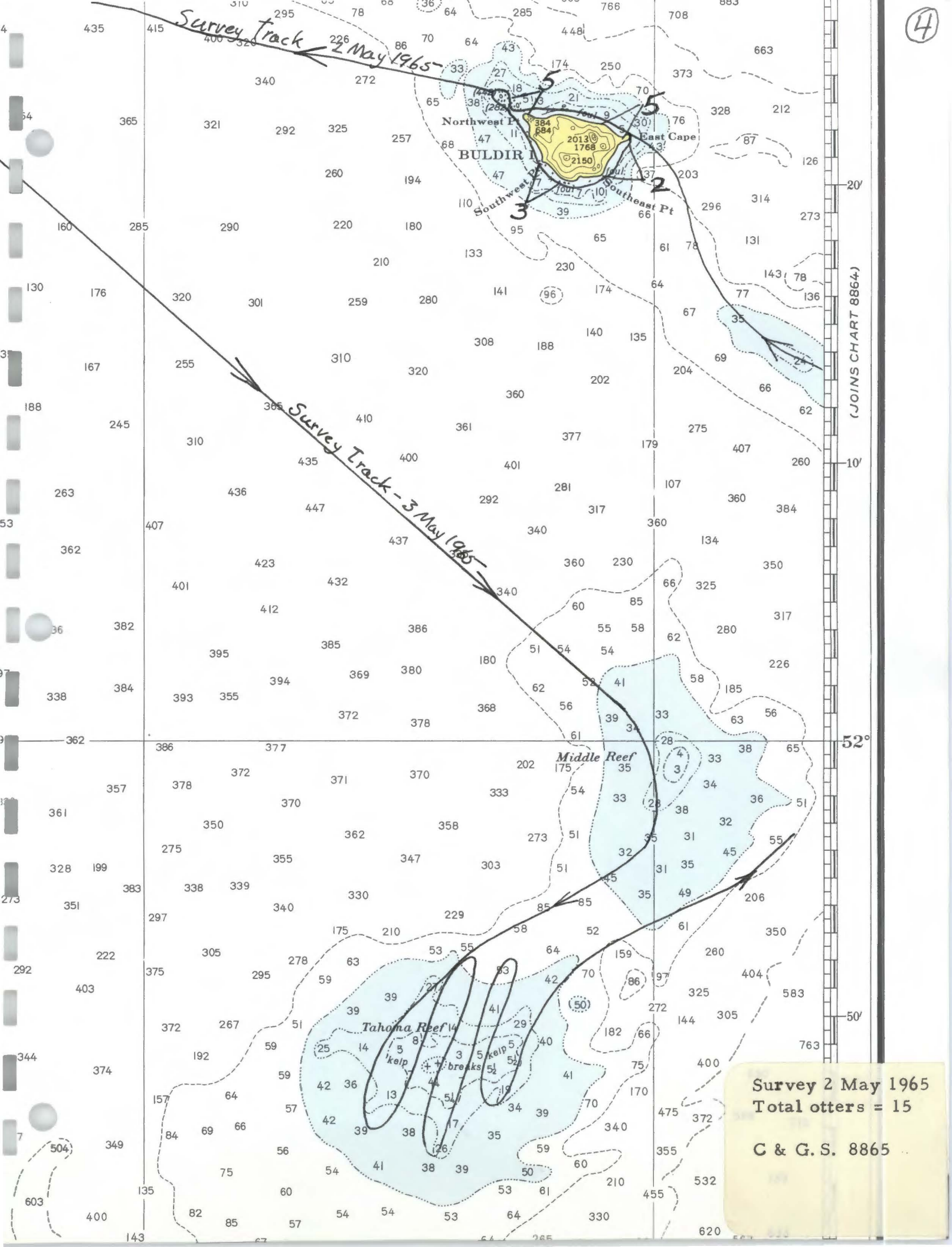
ER UNIVERSAL TRANSVERSE MERCATOR GRID
ND 60
ID NUMBERS ARE OMITTED

LOCATION DIAGRAM FOR NN 59-12




SEA
ISLANDS
SEMICHI
ISION
Alaid Head
VABM
Alaid Island
Nizki Cove
VABM △Spar
VABM △Jones
Nizki Island
Lotus I
Hammerhead I
Alsum Harbor
Shemya Pass
Shemya Island
Landing
Kreas
Air△
Shoal Cove
Fox Beach
SLANDS
8
9
0
0
1
2
3
8
7
6
588
587
586
585
584
53°00′
45′
4
6
GNATION: 59U
GNATION: 60U
Survey 2 May
1965
Total otters = 10
AMS
Sheet NN 59-12
Series Q 501

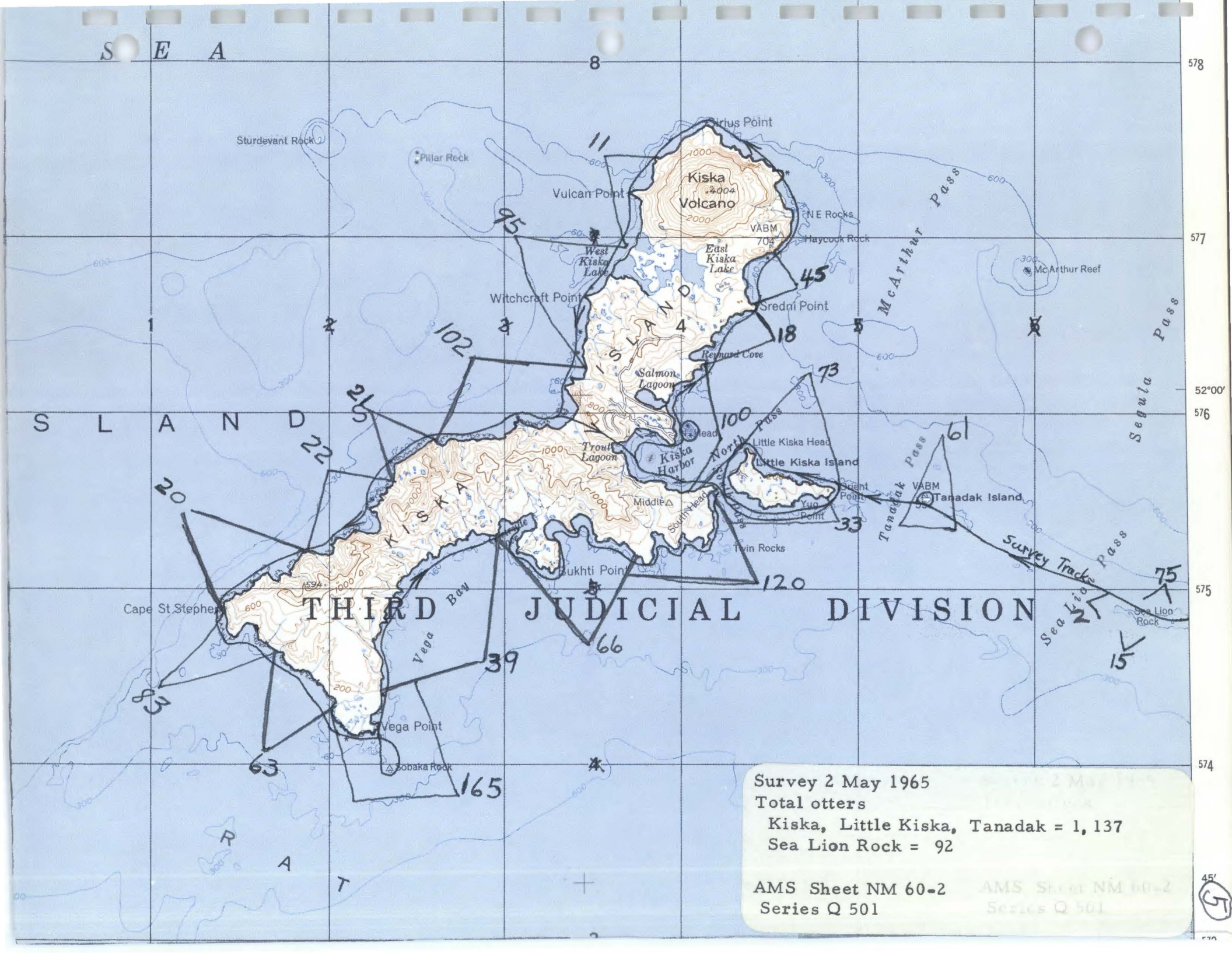
(3)



(4)

Survey 2 May 1965
Total otters = 15

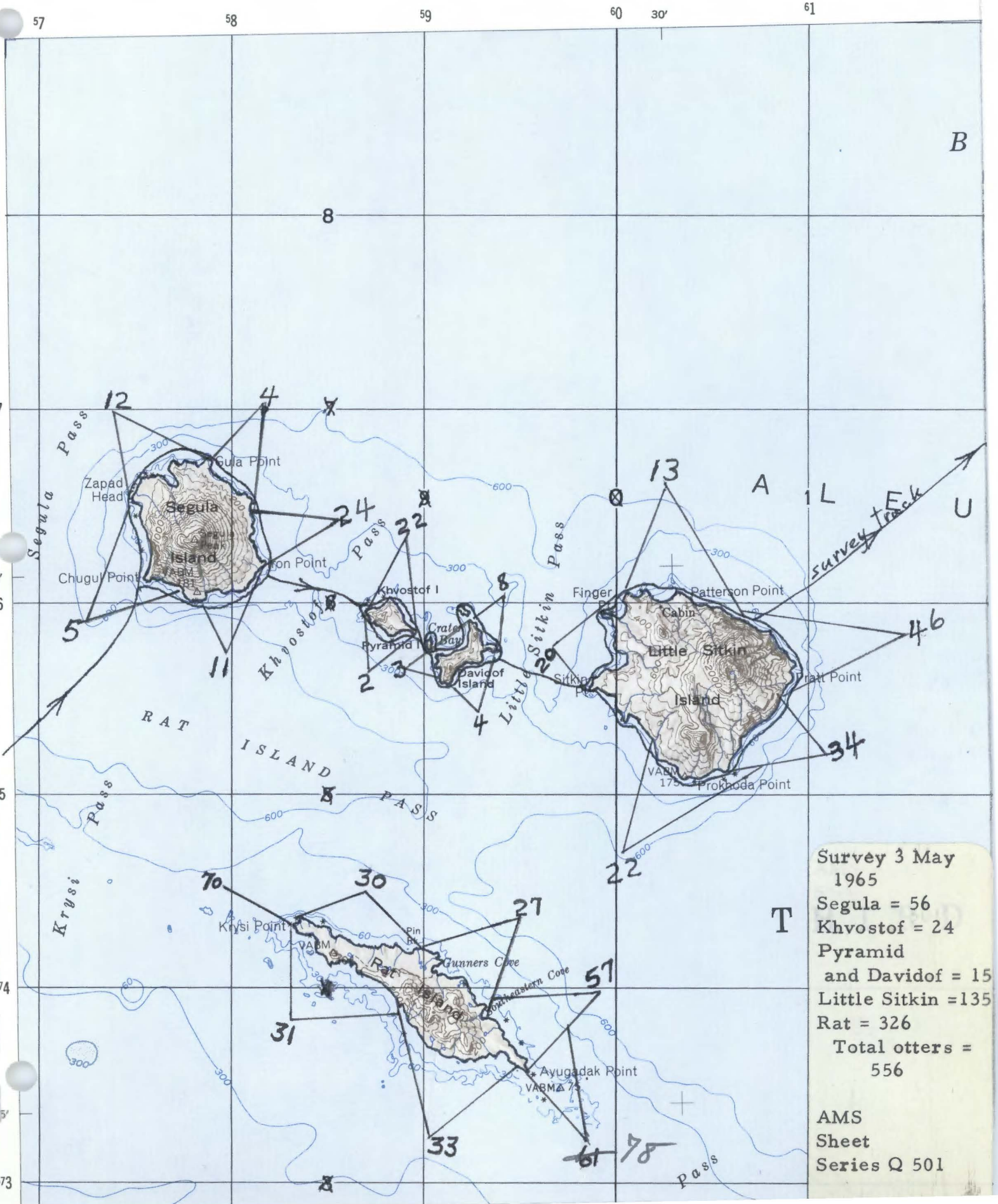
C & G.S. 8865

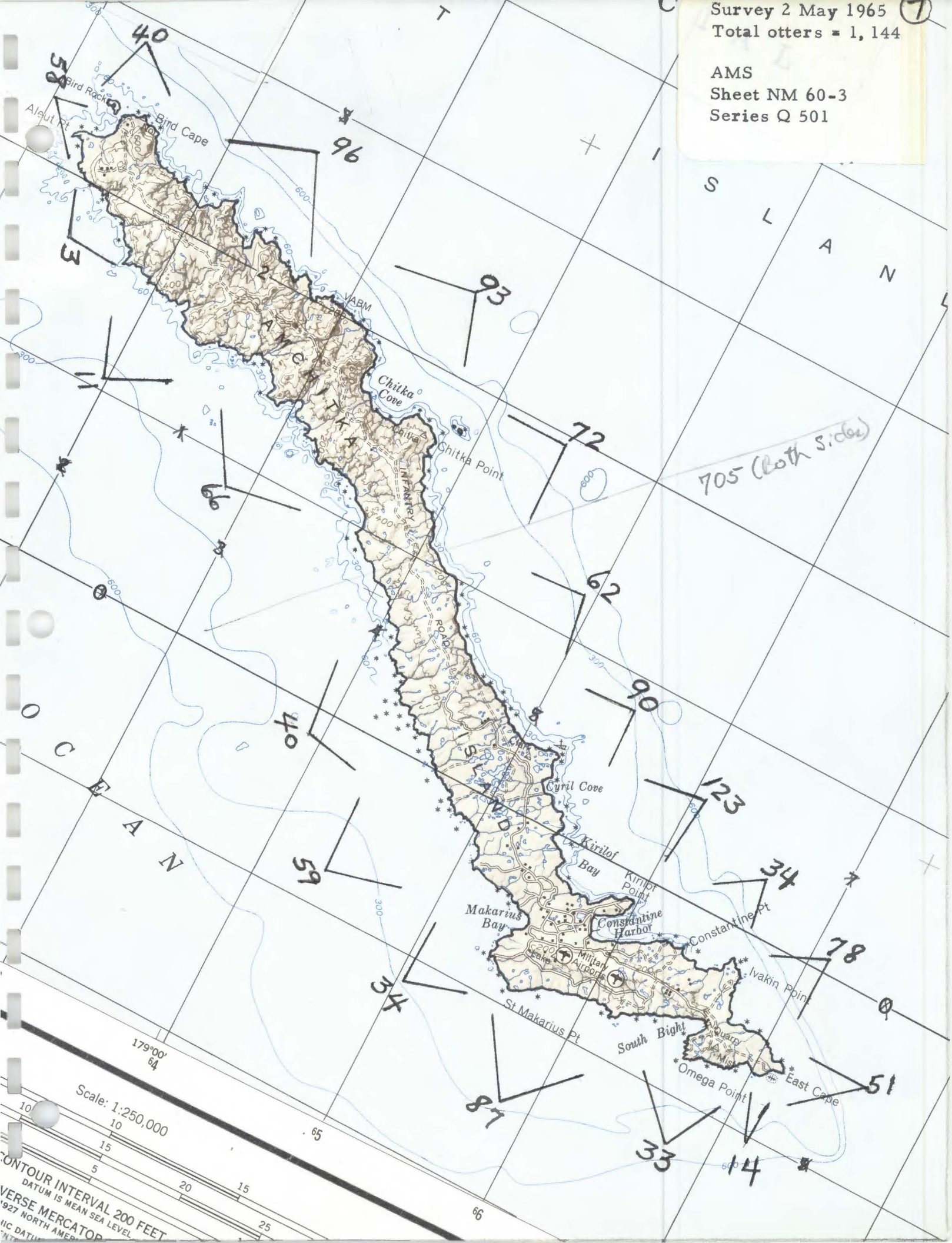


Survey 2 May 1965
Total otters
Kiska, Little Kiska, Tanadak = 1, 137
Sea Lion Rock = 92

AMS Sheet NM 60-2
Series Q 501

LASKA 1:250,000




Survey 2 May 1965 (7)
Total otters = 1, 144
AMS
Sheet NM 60-3
Series Q 501
705 (Both Sides)
Bird Rock
Bird Cape
Attu Pt
ANOTTKA
Chitka Cove
Chitka Point
INFANTRY
ROAD
Cyril Cove
Kirilof Bay
Kirilof Point
Makarius Bay
Constantine Harbor
Constantine Pt
Lake
Military Airports
Ivakin Point
St Makarius Pt
South Bight
Quarry
Mine
Omega Point
East Cape
ISLAND
OCEAN
179°00'
64
65
66
Scale: 1:250,000
CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL
VERSE MERCATOR
1927 NORTH AMER

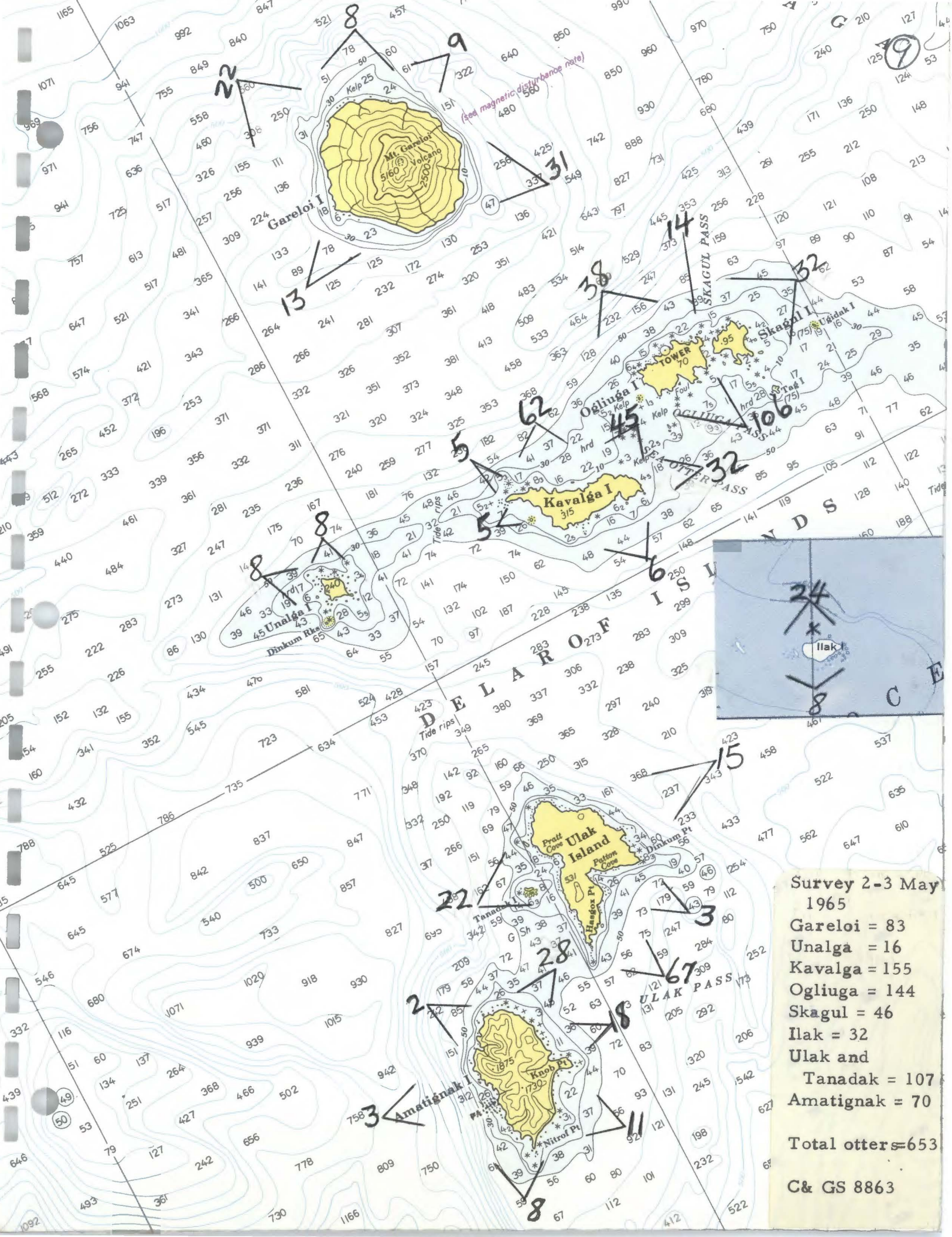
FIRST EDITION–AMS

NM 60-3
AMS SERIES Q501



Survey 3 May 1965
Total otters = 203

AMS
Sheet NM 60-3
Series Q 501



Survey 2-3 May 1965

Gareloi = 83

Unalga = 16

Kavalga = 155

Ogliuga = 144

Skagul = 46

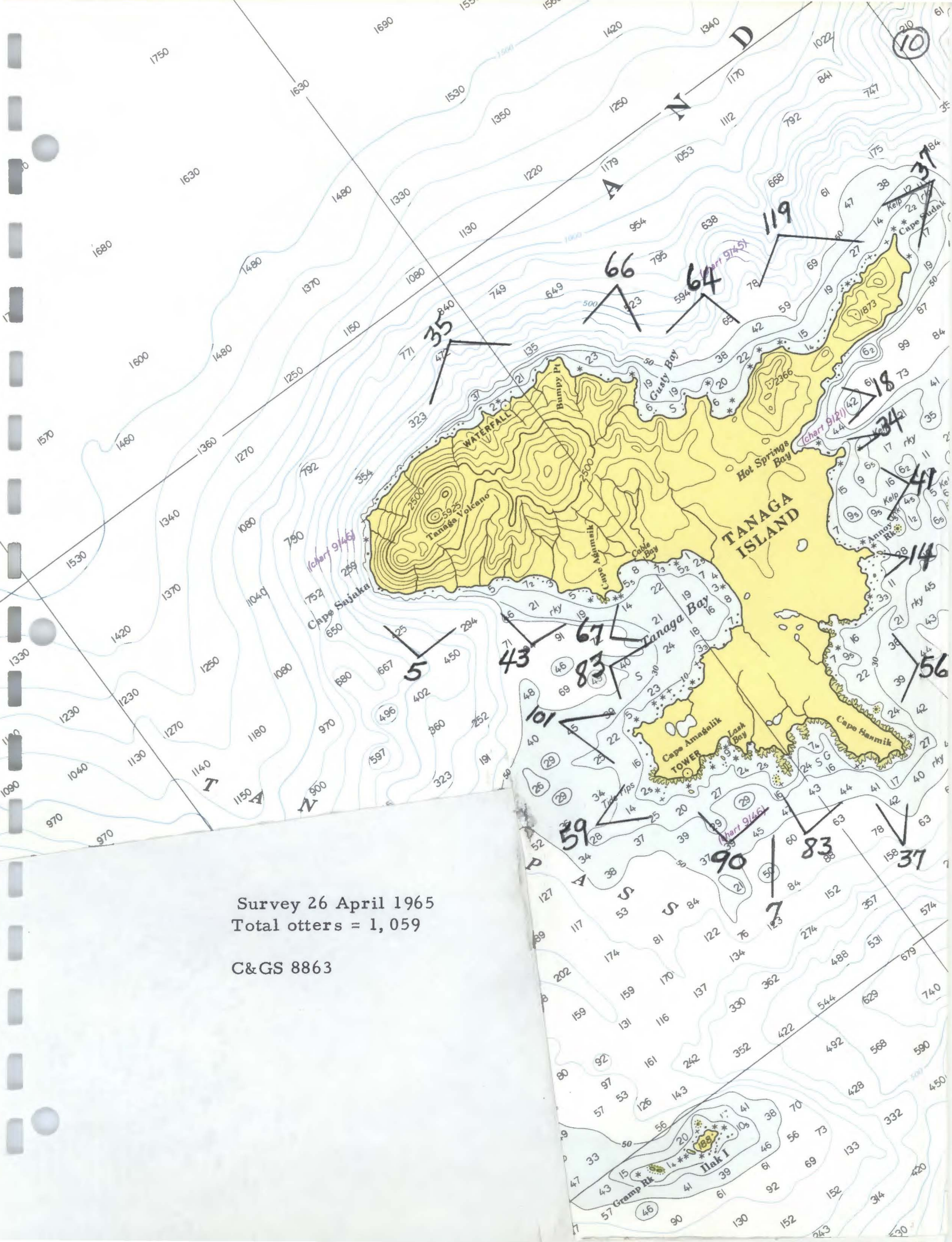
Ilak = 32

Ulak and Tanadak = 107

Amatignak = 70

Total otters=653

C& GS 8863



Survey 26 April 1965
Total otters = 1,059

C&GS 8863

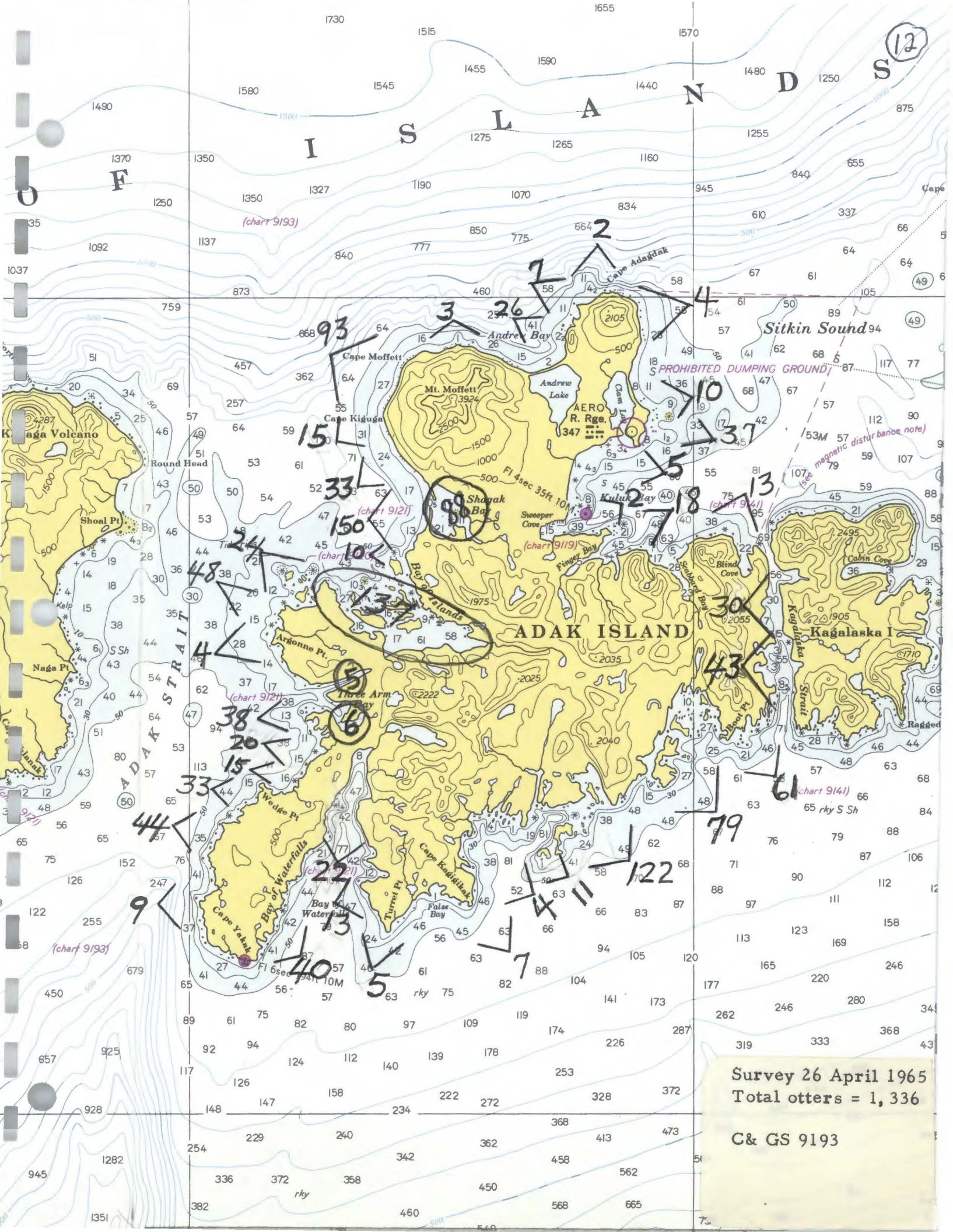


Survey 26 April 1965

Total otters Kanaga = 1,054

Total otters Bobrof = 32

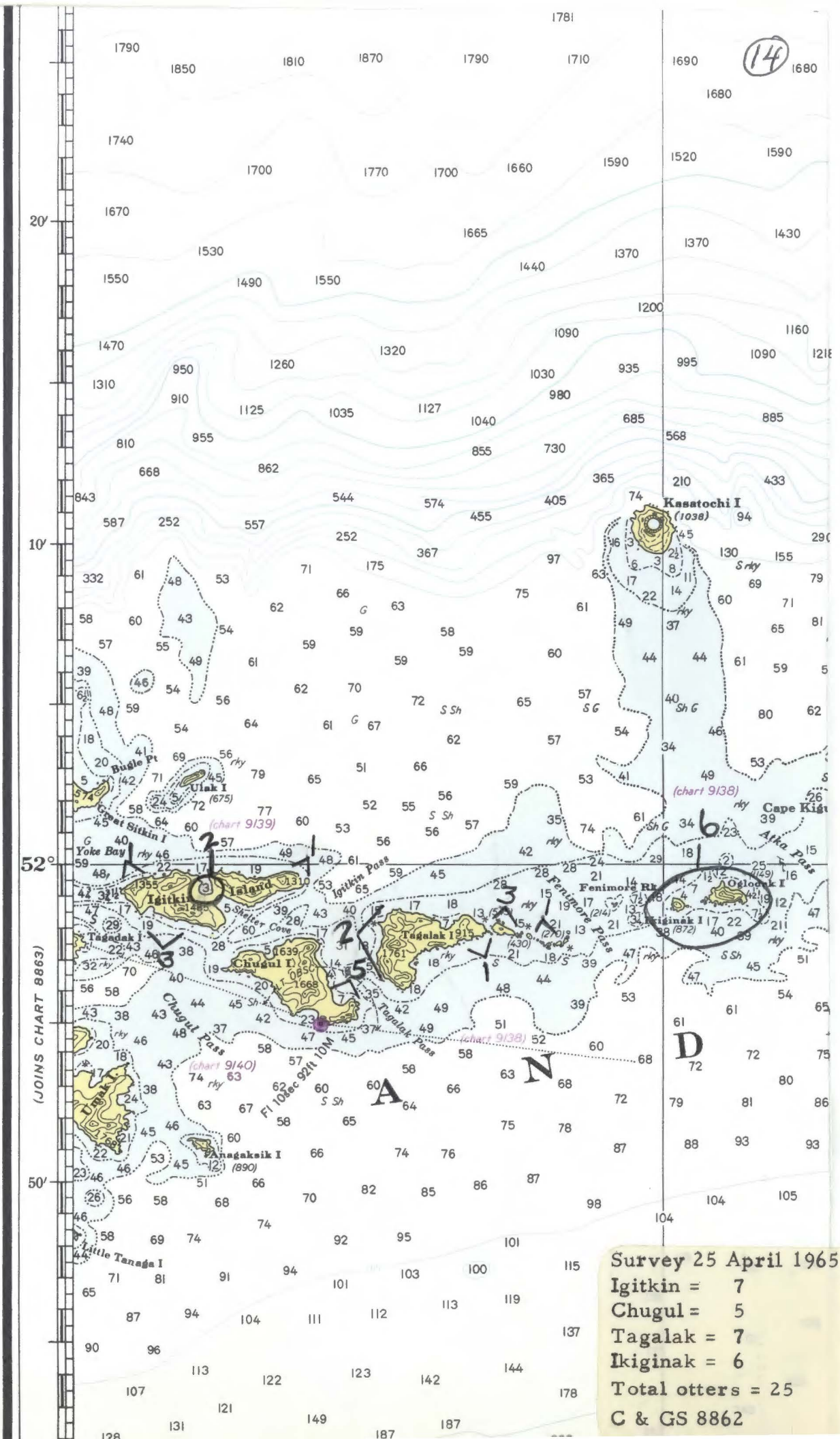
C & GS 8863



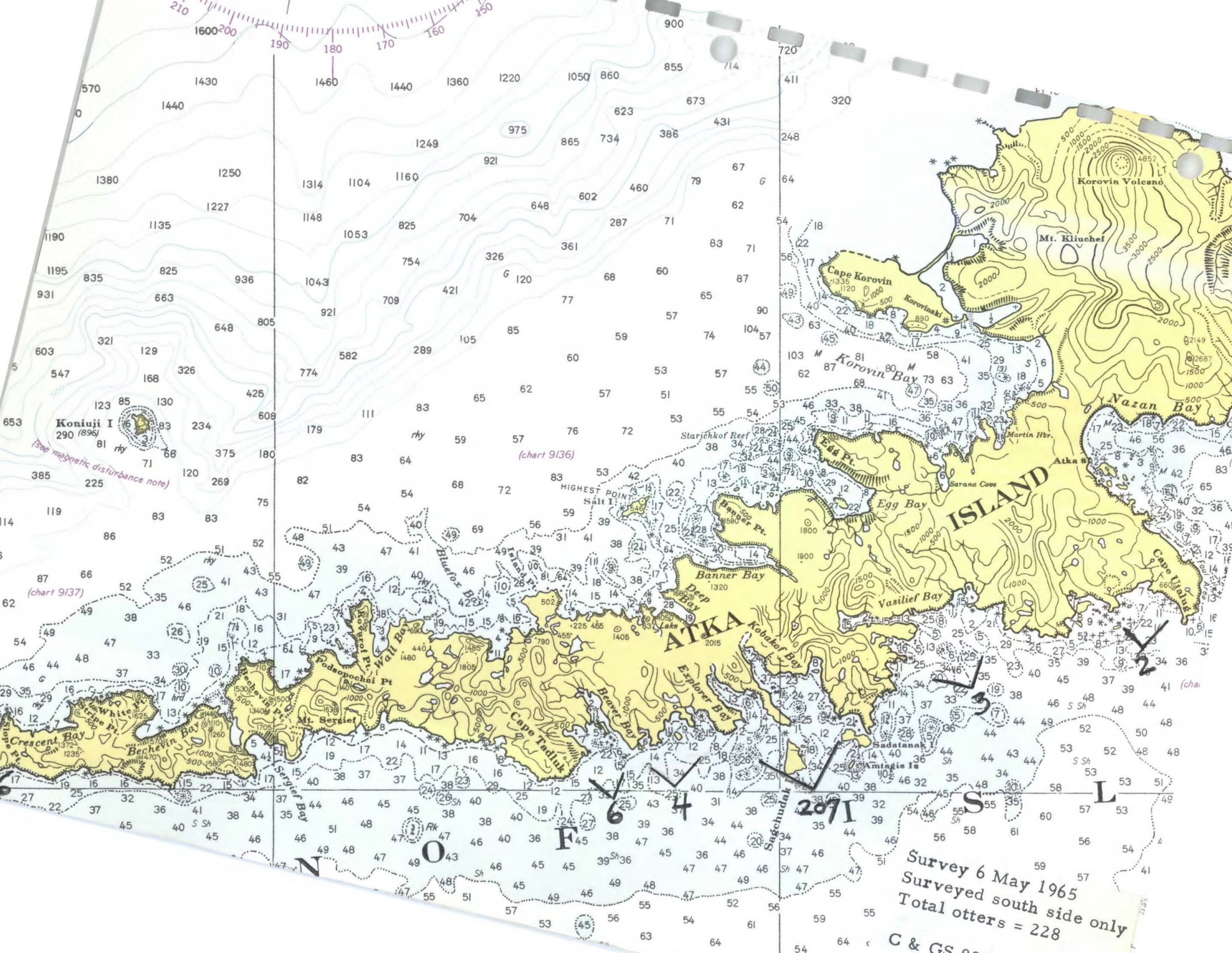
Survey 26 April 1965
Total otters = 1, 336

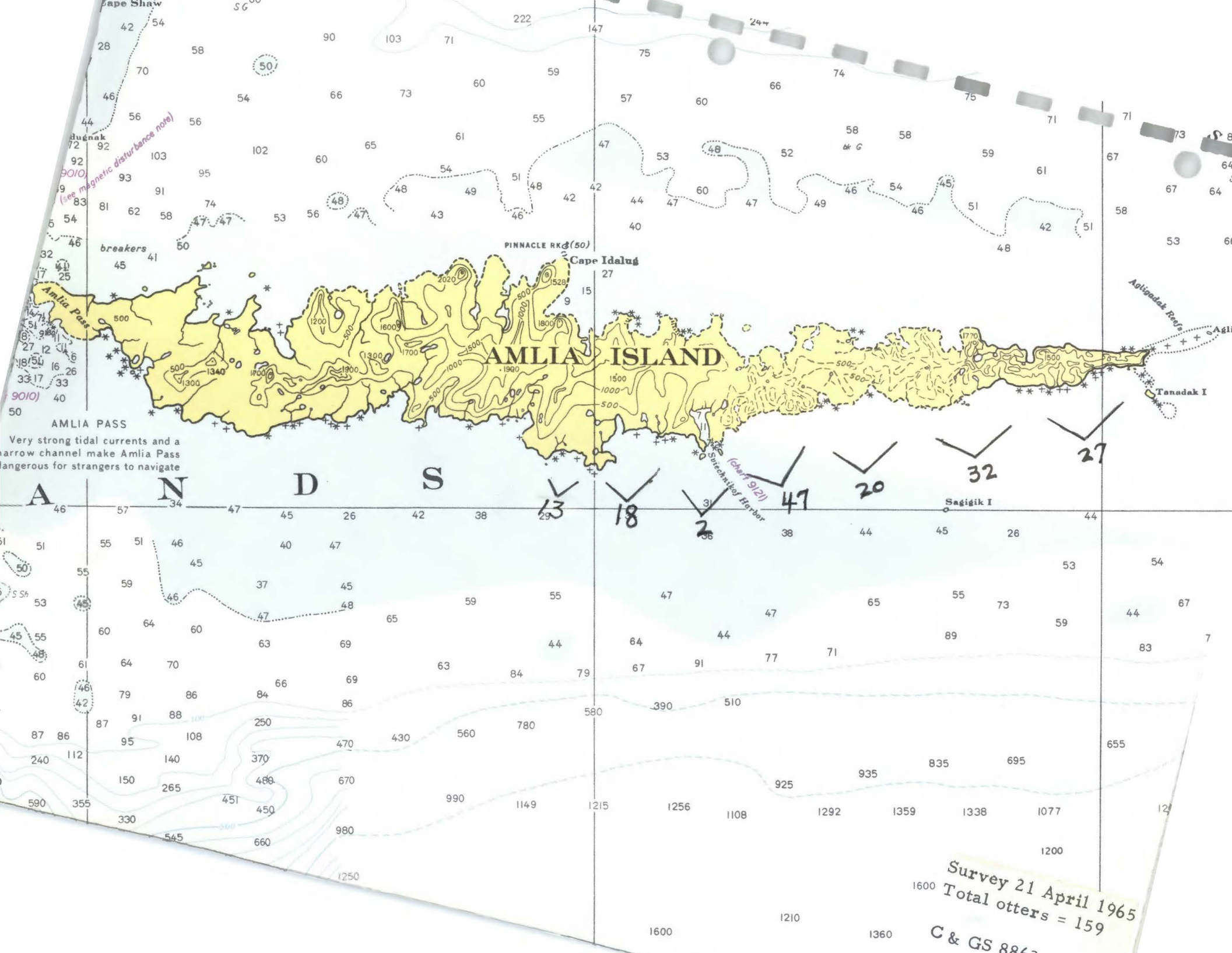
C& GS 9193

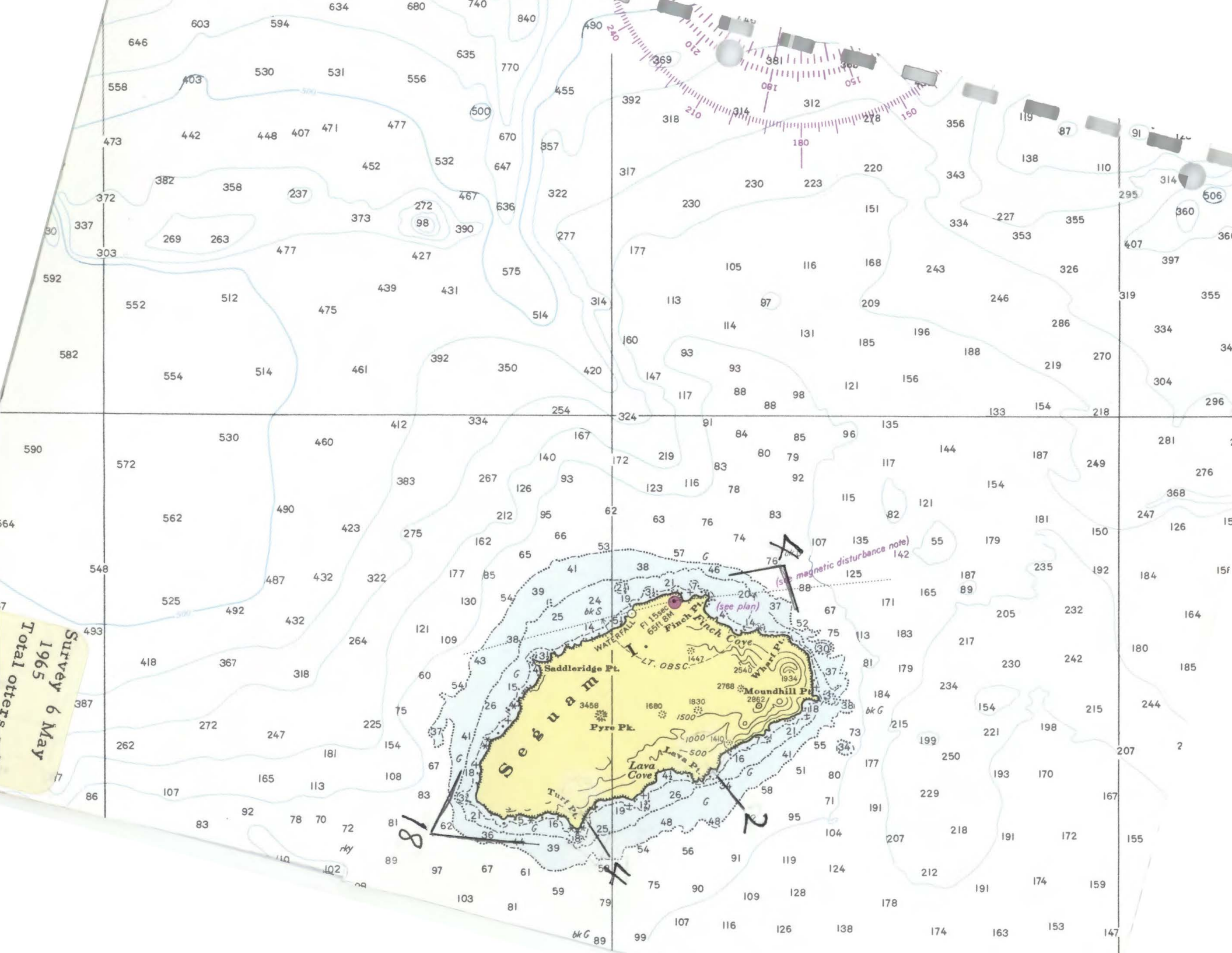

(13)
Survey 25 April 1965
Great Sitkin = 222
Ulak = 1
Box = 450
Tanaklak = 1
Aziak = 9
Asuksak = 2
Umak = 392
Little Tanaga = 509
Kagalaska = 298
Total otters = 1,884
AMS NM 1-2
Series Q 501
Swallow Head
Saddle Pt
Teapot Rock
Sulphur Pt
Volcano
Cape Akuyan
GREAT SITKIN ISLAND
Bugle Pt
Great Sitkin Island
Ulak I
Cape Adagdak
Mount Adagdak
Cape Kiugilak
Yoke Bay
Igitkin Bight
Igitkin
Igitkin Pass
Tanager Pt
Tagadak I
Aziak I
Asuksak I
Asuksak Pass
Umak Island
Cape Ruin
Moss Pt
Reach Pt
Cape Umak
Umak Pass
Cape Agumsadak
Anagak
Cheigul Pass
Head Rock
Kuluk Shoal
Beacon
Zeto Pt
Kuluk Bay
Clam Lagoon
Garnet Rocks Cove
Pit Rock
Finger Bay
Lucky Pt
Mid Pt
Scabbard Bay
Thunder Pt
Blind Pt
Blind Cove
Black Pt
Oglala Pt
Cape Lises
Cape Chakik
Mel
Com
LITTLE TANAGA ISLAND
Tana Pt
Cabin
Narrows Pt
Serpent Bay
Elbow Pt
Cape Azamis
Little Tanaga Island
Agony Pt
Chisak I
Chisak Bay
Cape Chisak
Rip Rock
Piper Cove
Chaika Rock
Azamis Cove
Round Cove
Upper Arm Cabin Cove
Lower Arm
Tana Bight
Silak I
KAGALASKA STRAIT
Kagalaska Strait
Galas Pt
Campers Pt
Campers Cove
Sas
Spud
Cabin
Ned
Boot Bay
Boot Pt
Kaga Pt
Sharp Cape
Quail Bay
Ragged Pt
STRAIT
ISLAND
ANDS
ANDS
Sand Bay
Great Sitkin Pass
Tanaklak I
Tagadak I
Karl Pass
Middle Yoke Creek
Little Yoke Creek
Tarmark Creek
Glacier Ck
Akuyan Cr
Sitkin Cr
Bugle Ck
Saliva Pt
Rip Pt
Yoke Pass
Igitkin Bight
Igitkin Pass
Shelter
Umak Bight
Umak Pass
Cape Umak
Island
Reach Pt
Moss Pt
Cape Ruin
Umak Island
Cape Azamis
Little Tanaga Island
Agony Pt
Chisak I
Chisak Bay
Cape Chisak
Rip Rock
Piper Cove
Chaika Rock
Azamis Cove
Round Cove
Upper Arm Cabin Cove
Lower Arm
Tana Bight
Silak I
Kagalaska Strait
Galas Pt
Campers Pt
Campers Cove
Sas
Spud
Cabin
Ned
Boot Bay
Boot Pt
Kaga Pt
Sharp Cape
Quail Bay
Ragged Pt
STRAIT
ISLAND
ANDS
Sand Bay
Great Sitkin Pass
Tanaklak I
Tagadak I
Karl Pass
Middle Yoke Creek
Little Yoke Creek
Tarmark Creek
Glacier Ck
Akuyan Cr
Sitkin Cr
Bugle Ck
Saliva Pt
Rip Pt
Yoke Pass
Igitkin Bight
Igitkin Pass
Shelter
Umak Bight
Umak Pass
Cape Umak
Island
Reach Pt
Moss Pt
Cape Ruin
Umak Island
Cape Azamis
Little Tanaga Island
Agony Pt
Chisak I
Chisak Bay
Cape Chisak
Rip Rock
Piper Cove
Chaika Rock
Azamis Cove
Round Cove
Upper Arm Cabin Cove
Lower Arm
Tana Bight
Silak I
Kagalaska Strait
Galas Pt
Campers Pt
Campers Cove
Sas
Spud
Cabin
Ned
Boot Bay
Boot Pt
Kaga Pt
Sharp Cape
Quail Bay
Ragged Pt
STRAIT
ISLAND
ANDS

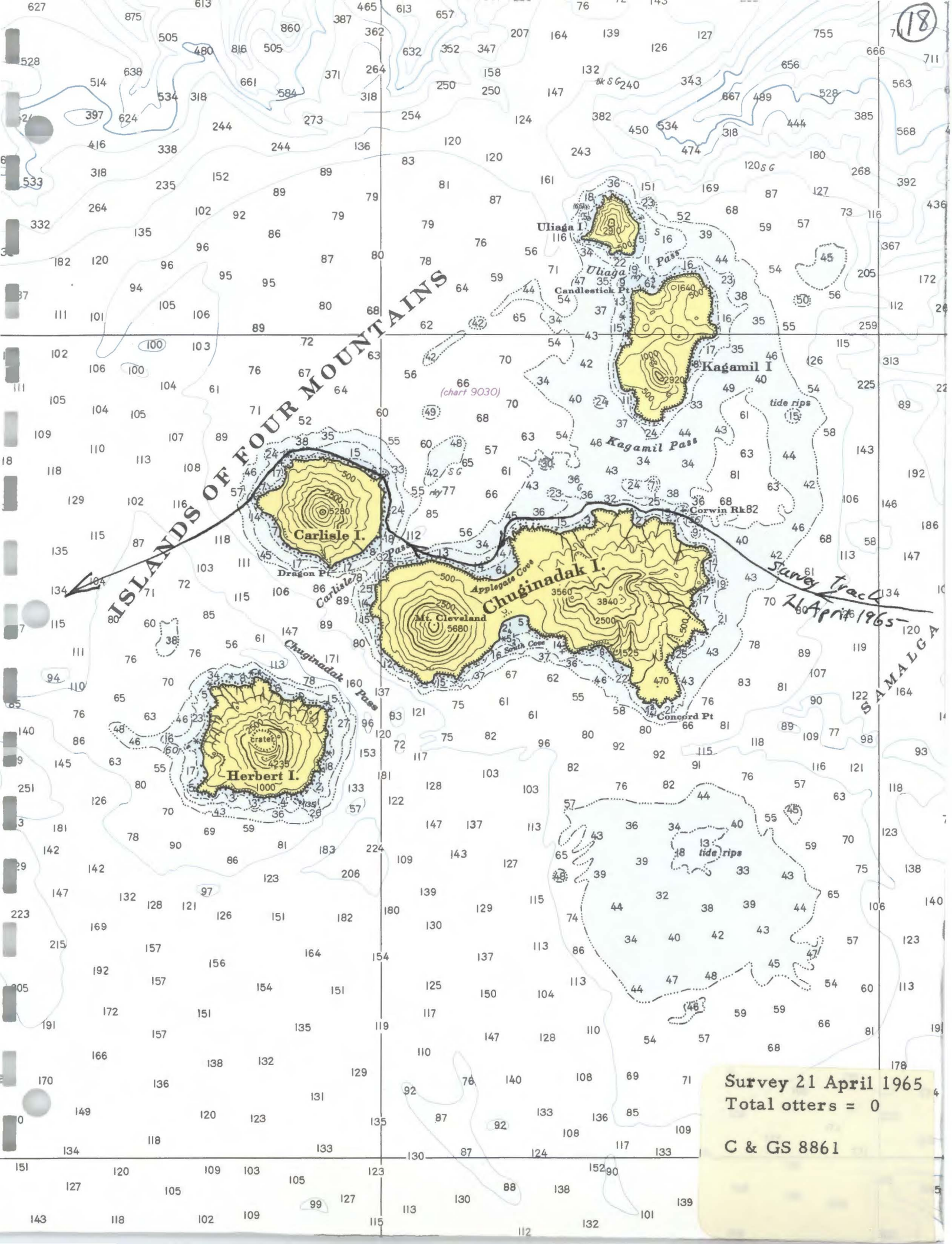


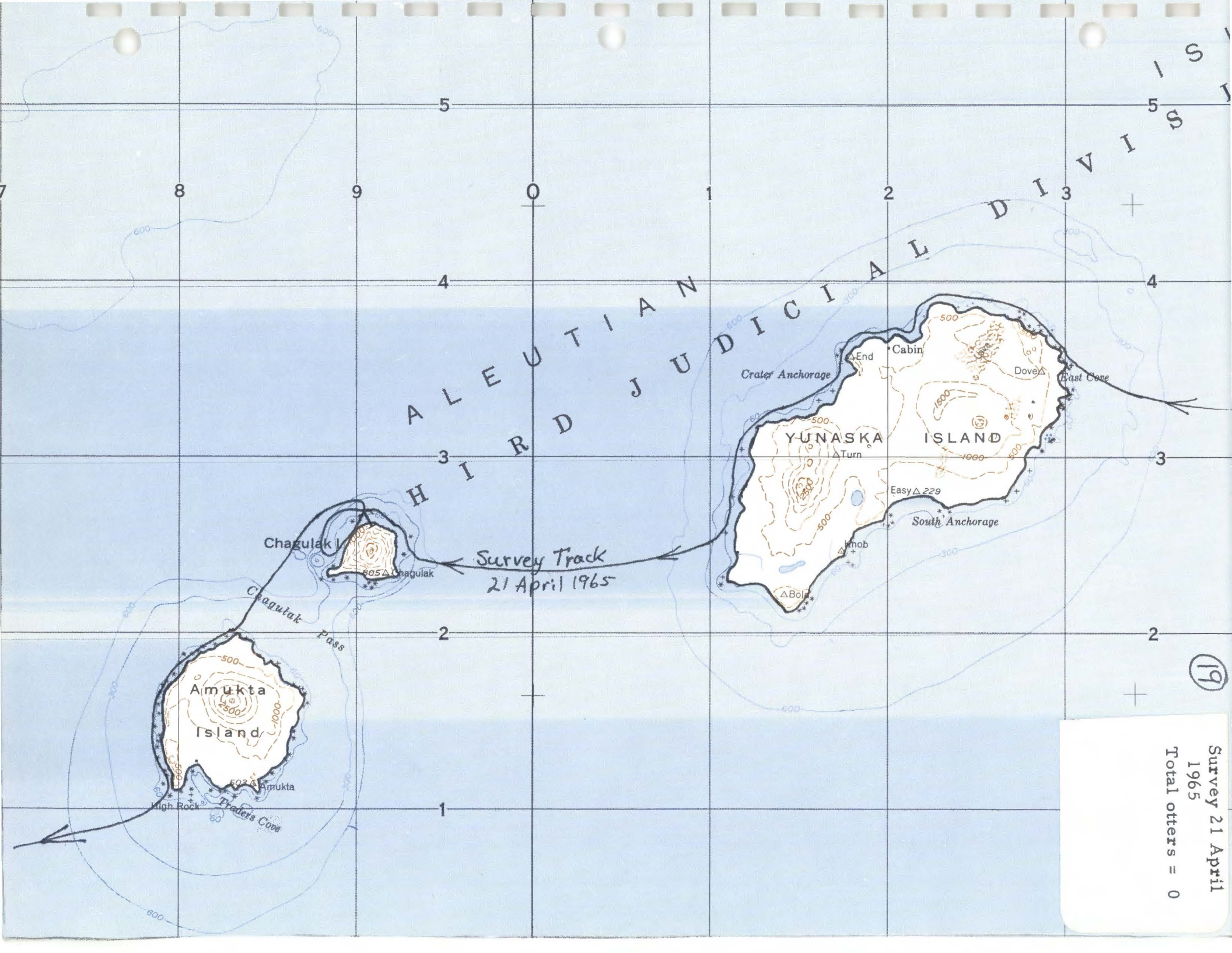
Survey 25 April 1965
Igitkin = 7
Chugul = 5
Tagalak = 7
Ikiginak = 6
Total otters = 25
C & GS 8862

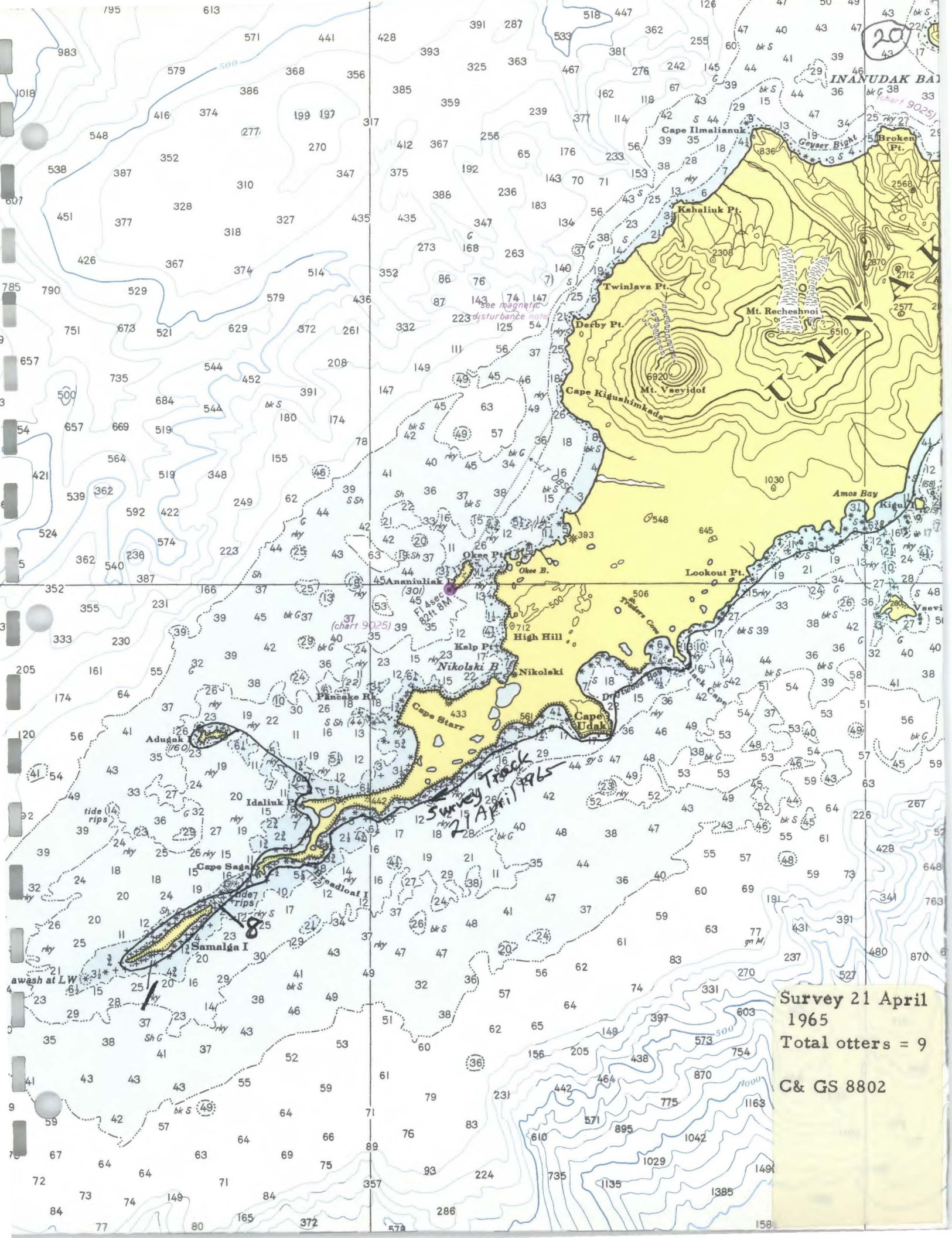

Korovin Volcano
Mt. Kliuchef
Cape Korovin
Korovinski
Korovin Bay
Nazan Bay
Martin Hbr.
Atka
Sarana Cove
Egg Pt.
Egg Bay
ISLAND
Cape Ulaluf
Starichkof Reef
Koniuji I
290 (896)
(See magnetic disturbance note)
(chart 9136)
(chart 9137)
HIGHEST POINT
Salt I
Ranger Pt.
Banner Bay
Deep Bay
Lake
Vasilief Bay
ATKA
Kobakof Bay
Explorer Bay
Beaver Bay
Cape Tedluk
Bluefox Bay
Island Pt.
Podsopochni Pt
Wall Bay
Mt. Sergief
Sergief Bay
Crescent Bay
Bechevin Bay
White Pt.
Stripe Pt.
Sadatanak I
Amlagis Is
Sachudak
Survey 6 May 1965
Surveyed south side only
Total otters = 228
C & GS

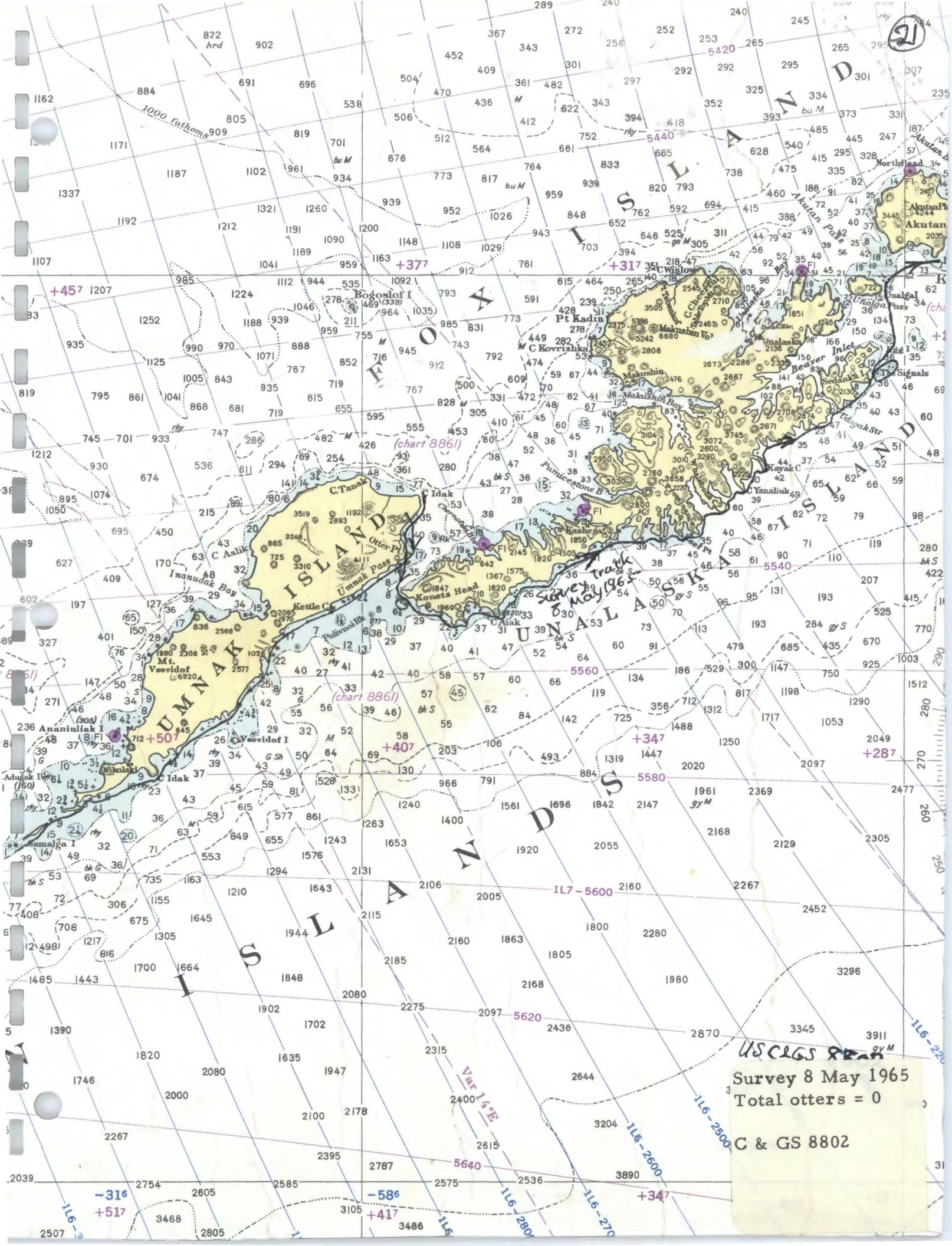

AMLIA ISLAND
Cape Idalug
PINNACLE RK
Amlia Pass
AMLIA PASS
Very strong tidal currents and a narrow channel make Amlia Pass dangerous for strangers to navigate
breakers
Agligadak Reefs
Tanadak I
Sagigik I
(see magnetic disturbance note)
(chart 9121)
A N D S
13
18
2
47
20
32
27
Survey 21 April 1965
Total otters = 159
C & GS 8862

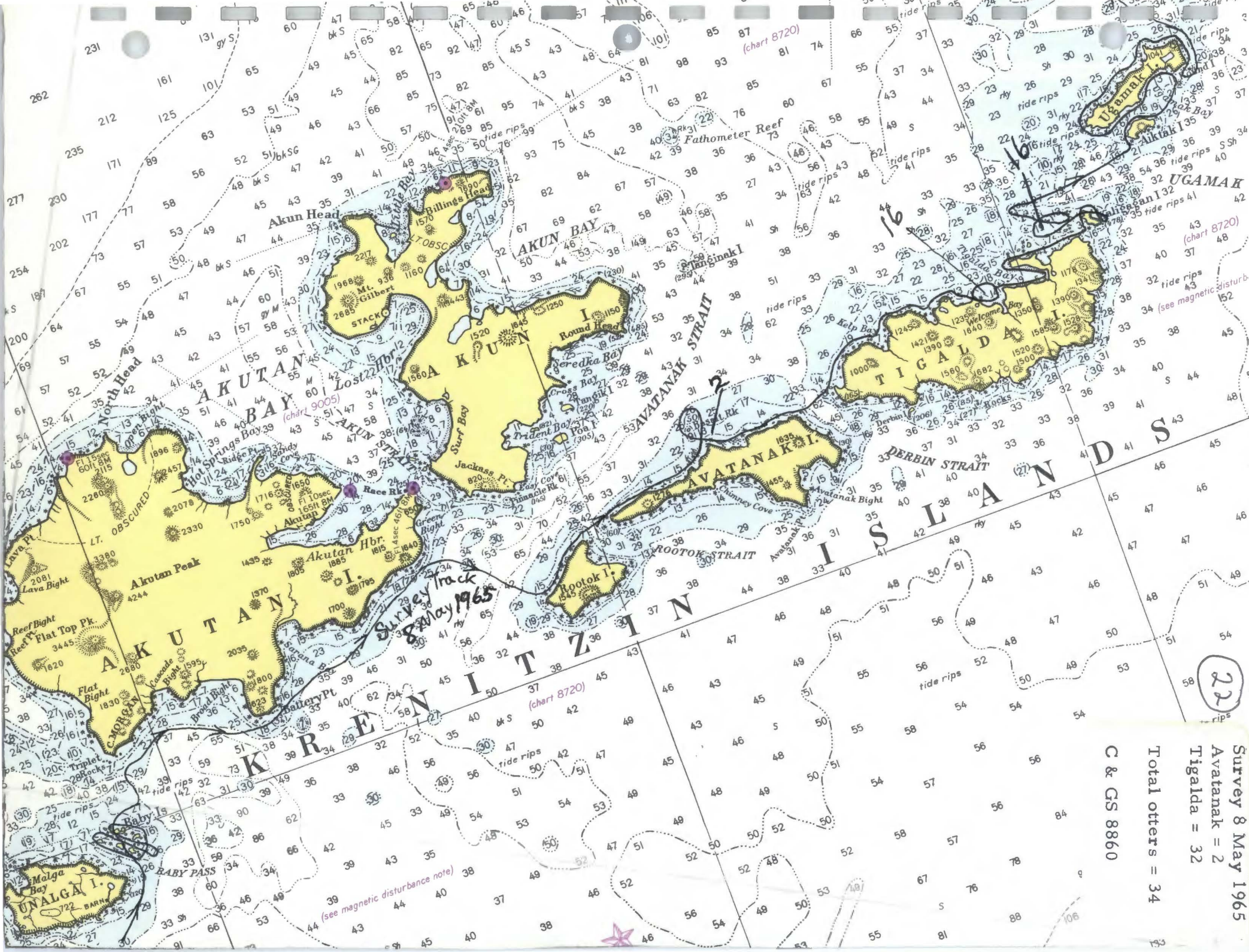

Seguam I.
Saddleridge Pt.
Pyre Pk.
Lava Cove
Lava Pt.
Turf Pt.
Finch Pt.
Finch Cove
Wharf Pt.
Moundhill Pt.
WATERFALL Fl 15sec 65ft 8M
LT. OBSC
(see plan)
(see magnetic disturbance note)
Survey 6 May 1965
Total otters


(18)
ISLANDS OF FOUR MOUNTAINS
Uliaga I.
Uliaga Pass
Candlestick Pt
Kagamil I
(chart 9030)
tide rips
Kagamil Pass
Carlisle I.
Dragon Pt
Carlisle Pass
Chuginadak I.
Applegate Cove
Mt. Cleveland
5680
Corwin Rk
Survey Track
21 Apr 1965
SAMALGA
South Cove
Concord Pt
Chuginadak Pass
Herbert I.
crater
1235
tide rips
Survey 21 April 1965
Total otters = 0
C & GS 8861

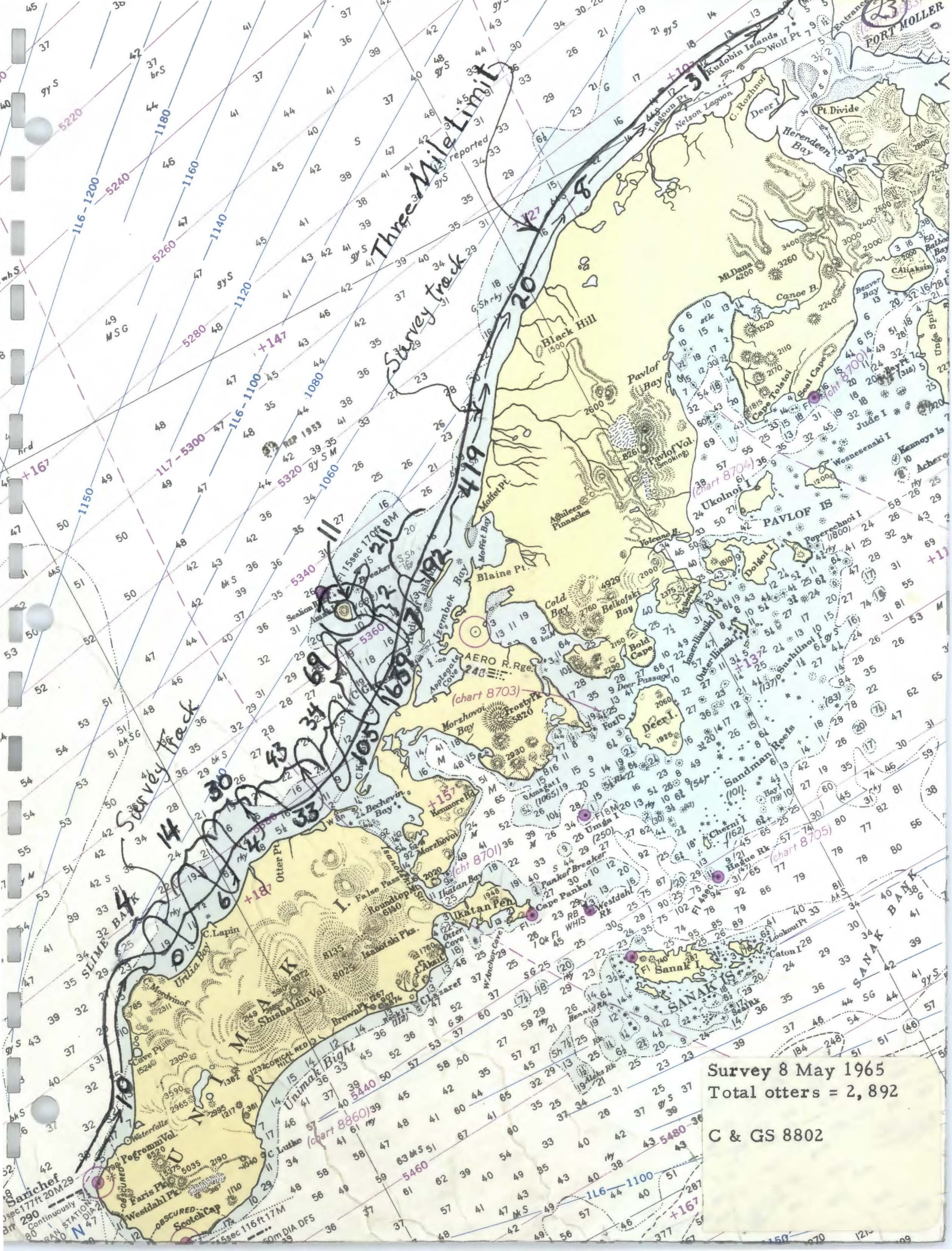

ALEUTIAN
THIRD JUDICIAL DIVISION
YUNASKA ISLAND
Amukta Island
Chagulak I.
Chagulak Pass
Survey Track
21 April 1965
Crater Anchorage
Cabin
End
Dove
East Cove
Turn
Easy △229
South Anchorage
Knob
Bol
805 △ Chagulak
503 △ Amukta
High Rock
Traders Cove
19
Survey 21 April
1965
Total otters = 0


UMNAK
Cape Ilmalianuk
Broken Pt.
Geyser Bight
Kshaliuk Pt.
Twinlava Pt.
Derby Pt.
Mt. Recheshnoi
Mt. Vseyidof
Cape Kigushimkada
Amos Bay
Okee Pt.
Okee B.
Lookout Pt.
Ananiuliak I.
High Hill
Kelp Pt.
Nikolski B.
Nikolski
Pinnacle Rk.
Cape Starr
Cape Udak
Aduguk I.
Idaliuk Pt.
Cape Sagak
Broadloaf I.
Samalga I
awash at LW
tide rips
see magnetic disturbance note
Survey Track 21 April 1965
Survey 21 April 1965
Total otters = 9
C& GS 8802

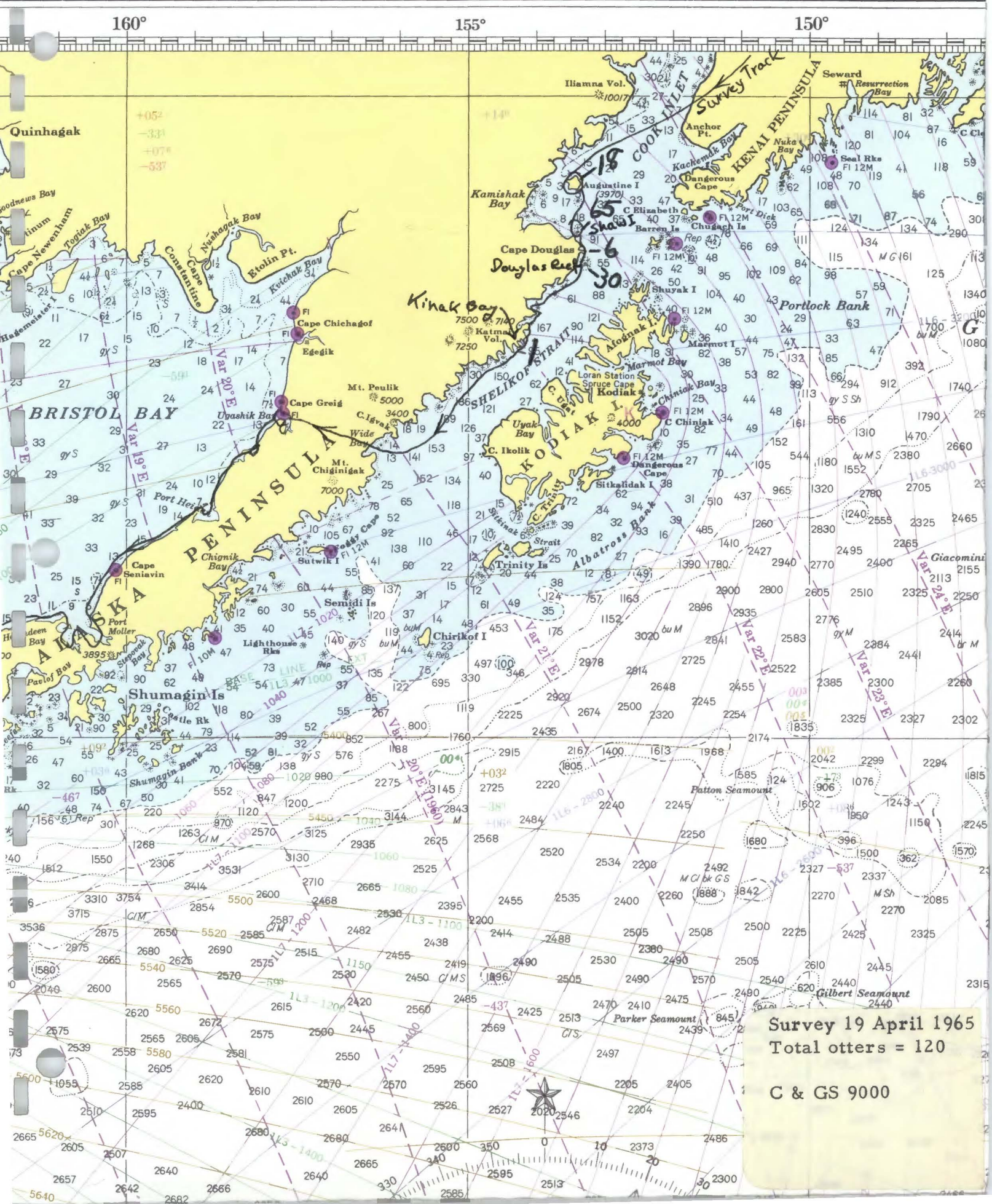

FOX ISLANDS
UNALASKA ISLAND
UMNAK ISLAND
Survey track May 1965
(chart 8861)
(chart 8861)
Survey 8 May 1965
Total otters = 0
C & GS 8802



Survey 8 May 1965
Avatanak = 2
Tigalda = 32
Total otters = 34
C & GS 8860


Three Mile Limit reported
Survey track
Survey track
Survey 8 May 1965
Total otters = 2, 892
C & GS 8802
Black Hill
Pavlof Bay
Pavlof Vol. (Smoking)
PAVLOF IS
Ukolnoi I
Blaine Pt.
Cold Bay
Belkofski Bay
Bold Cape
AERO R.Rge
Morzhovoi Bay
Frosty Pk
Deer I.
Sandman Reefs
Kennore Hd.
Otter Pt.
I. False Pass
Ikatan Bay
Ikatan Pen.
Cape Pankof
Sanak I.
SANAK IS.
SANAK BANK
SLIME BANK
Unimak Bight
Shishaldin Vol.
Pogromni Vol.
Scotch Cap
Westdahl Pt.
Sanichef
Kudobin Islands
Wolf Pt.
Nelson Lagoon
Deer I.
Pt. Divide
Herendeen Bay
Canoe B.
Seal Cape
Cape Tolstoi
Jude I.
Ugamak I.
Kennoye Is.
Ikatan Bay
Caton I.
Lookout Pt.
Sea Rk.
Hague Rk.
Westdahl Rk.
Pankof Breaker
Umga I.
Chernoi I.
Foxl.
Deer Passage
Otter Cove
Izembek Bay
Moffet Bay
Moffet Pt.
Agileen Pinnacles
Volcano B.
Dolgoi I.
Popercchnoi I.
Outer Ilinski I.
Inner Ilinski I.
Sea Otter Creek
Anchor Cove
Mt. Dana
Black Hill
Unalaska
Ugamak Bight
Otter Cove
Isanotski Pks.
Roundtop Mt.
Mordvinof
Brown Pt.
Cape Lutke
Waterfalls
Faris Pt.
Westdahl Pt.
Scotch Cap
Caton I.
Sea Rk.
Hague Rk.
(chart 8703)
(chart 8701)
(chart 8704)
(chart 8705)
(chart 8860)
(chart 8702)

1st Ed., Oct. 1918 C-1918-189



APPENDIX B

STELLER SEA LION, HARBOR SEAL, AND WALRUS OBSERVATIONS

Steller Sea Lion

During the 1959 and 1962 aerial surveys, counts and estimates of sea lions were obtained (see Kenyon and Rice, J. Mamm. 42(2): 223-234, May 1961). In 1965, certain areas previously surveyed were omitted (see discussion of Andreanof and Fox Islands and Islands of Four Mountains). Comparable data obtained in 1965 are presented in table 3. In these areas the number of sea lions seen was 14,000 less in 1965 than in previous years. Since all areas were not covered, it is possible that large numbers of sea lions were missed in 1965. These data indicate to me that our knowledge of the habits and annual cycle of behavior of sea lions is fragmentary. Obviously, further surveys and other more comprehensive studies are required.

That many sea lions may be at sea and away from hauling grounds in the late-April, early-May period is indicated by our observation on 21 April 1965 of a large concentration of sea lions at 52°14' N., 173°54' W., 5 miles off Cape Kudugnak on the east coast of Atka Island. The concentration was divided into two "herds" which were roughly circular. The animals were estimated to be from 1 to 5 meters apart and appeared to be heading in a generally easterly direction. We estimated that the larger herd contained about 2,000 and the smaller about 1,000 animals. If several similar concentrations were at sea it would account for the low 1965 census.

Table 3. --Numbers of sea lions observed where comparable surveys were made

Location	Date	Sea lions	Date	Sea lions
		Number		Number
	1959		1965	
Near Is.				
Attu	Late May	5,010	Early May	4,000
Agattu	" "	6,700	" "	1,300
Alaid	" "	1,500	" "	2,500
Shemya	" "	2,500	" "	2,000
Total		15,710		9,800
Rat Is.				
Buldir	Late May	2,500	Early May	3,500
Kiska-Tanadak	" "	1,450	" "	1,485
Rat	" "	750	" "	650
Amchitka	" "	1,200	" "	710
Semisopochnoi	" "	2,500	" "	1,100
Total		8,400		7,445
Delarof Is.				
Amatignak	Late May	250	Early May	0
Unalga	" "	350	" "	520
Ulak	" "	1,500	" "	300
Gareloi	" "	2,500	" "	100
Skagul, Tag, and Ugidak	" "	1,300	" "	100
Gramp Rock	" "	700	" "	75
Total		6,600		1,095
Andreanof Is.				
Tanaga	Late May	175	Early May	130
Adak	" "	3,350	" "	610
L. Tanaga	" "	650	" "	281
Anagaksik	" "	700	" "	475
Atka	" "	2,650	" "	4,900
Amlia	" "	2,620	" "	3,700
Seguam	" "	425	" "	4,400
Yunaska	" "	800	" "	350
Carlisle	" "	100	" "	250
Total		11,470		15,096

Table 3. --Numbers of sea lions observed where comparable surveys were made--Continued

Location	Date	Sea lions	Date	Sea lions
		Number		Number
	1960		1965	
Fox Is.				
Adugak	Early Mar.	1,000	Early May	400
Tigalda	" "	760	" "	650
Ugamak	" "	13,400	" "	10,975
Aiktok	" "	600	" "	100
Unimak	" "	4,200	" "	810
Amak to Sea Lion Rk.	" "	2,350	" "	4,100
Total		22,310		17,035
Grand total		64,490		50,471
Rounded		64,500		50,500

Harbor Seal

During the 1965 survey we made our first attempt to record all harbor seals seen. We did not do this on previous surveys because: (1) Surface observations in some Aleutian areas indicated that an unknown fraction of the seals previously seen along the shore were seen on aerial surveys. Seals are difficult to see because they are often dark in color and blend well with dark rock and water backgrounds. (2) When in the water only the head protrudes. It is small and easily overlooked. (3) Our search for sea otters floating on the water left little time to estimate numbers of seals resting along the shore, especially when many sea otters were present. (4) Taking time from our primary objective to obtain information of questionable value did not appear justified.

In 1965 we decided to record the harbor seals seen because: (1) Recent increases in exploitation may require any available data for conservation purposes. (2) Any enumeration, even though incomplete,would furnish information on distribution and minimum abundance.

Knowledge is lacking that would enable us to make a realistic estimate from our data of harbor seal populations in the Aleutians. For example, we recorded no seals at Buldir Island on our aerial survey, but during a July 1963 visit to this island I regularly saw about 10 seals along the north coast.

In some areas it is probable that a nearly constant percentage of a local seal population may be seen regularly resting together on land. For example, on a sandbar at the mouth of Becheven Bay I estimated that we saw 1, 500 seals at 1050 on 21 April 1965, and about the same number again at the same place at 1245 on 8 May. In late afternoon (1810 local time), 19 April 1965, I estimated two groups of seals resting on separate sandbars near the mouth of Izembek Lagoon to number 50 and 300 seals, respectively. At 1600 on 8 May I estimated the numbers on the same sandbars at 60 and 300 seals. C. Peter McRoy has estimated the seal population of Izembek Lagoon to number about 600 to 700 animals (letter of 30 July 1964).

The meager data from Izembek Lagoon suggest that where we recorded seals on land (total 4,868, table 1), we may have seen about 50 percent of those present and that the total number in the areas we surveyed might number at least 10,000 animals.

Pacific Walrus

On 8 April 1962 during an aerial survey, we recorded about 100 adult male walruses hauled out on the east shore of Amak Island (see Kenyon, Sea Otter Studies, unpub. report of 11 Oct. 1962). Large numbers of walrus jaws that I observed on 9 July 1960 along the cobble beaches of this island indicate that it was once a favorite hauling ground. Our 1962 observation, however, was the first in many years to indicate that walruses continue to frequent this area.

On 8 May 1965 we saw 5 walruses near the west shore of Amak Island and an additional 75, in several groups, off Cape Glazenap, near the mouth of Izembek Lagoon at 55°16' N, 163°04' W. As our aircraft approached, the animals submerged, some sank down backwards giving us a chance to see that they were adult males. Others turned and dived head down, so that we could not see their tusks at close range. It is necessary to see the large tusks of the males to determine approximate age and sex. From what we were able to see, I presumed that the majority of animals were adult and subadult males. Their color was light--pinkish white--indicating a dearth of pelage. They were in water 8 to 12 fathoms in depth.

The 1962 and 1965 observations suggest that walruses regularly visit the southwestern corner of Bristol Bay, which is near the southern limit of drift ice. No ice was visible in this part of Bristol Bay during either survey.

APPENDIX C

BIRD OBSERVATIONS, ALEUTIAN ISLANDS SURVEY APRIL-MAY 1965

By
James G. King, Waterfowl Supervisor

Between April 19 and May 4, 1965, I accompanied a party surveying sea otter populations in the Aleutian Islands. My objectives were (1) to see the Aleutian Island waterfowl habitat, (2) to determine if any useful waterfowl information could be derived from this type survey, (3) to make any observations possible of birds, and (4) to determine if there were any projects we should consider developing in this area.

The principal islands of the chain are listed in the table together with the principal bird observations I was able to get. The method employed was not ideal for making bird observations for the following reasons. (1) The flight path was directed toward areas of sea otter habitat and frequently away from bird concentrations as they constitute a hazard for the plane. (2) Visibility from behind the wing of a DC-3 is only fair for making bird observations. (3) The speed and elevation of the flight was too high and fast for the best observation of birds. In spite of the technical disadvantages of this type air survey some interesting and valuable data was obtained which is given in the tables and summarized by species.

My impression on this my first trip to the Aleutians are of fantastic volcanic geology, of the bird and sea mammal life and of the wide extent of the military middens of World War II. This has been a badly abused refuge from an esthetic point of view. The barbed wire entanglements, old machinery and old buildings are decomposing very slowly and it will take many generations before this rubble ceases to be a principal feature of the landscape on many of the islands. Less obvious but more insidious are the military-introduced rats which are exterminating the ground nesting song birds from many of the islands. The foxes dating from an earlier day are much in evidence on almost every island by their trails which criss-cross the landscape and by the confinement of roosting and nesting birds to absolutely sheer cliffs and offshore islets.

While at Adak Navy Base I attended a meeting of the local sportsmans' club and made tentative arrangements to get duck wings and goose tail feathers during the hunting season. I was informed that the waterfowl kill on Adak may amount to 500 birds or more. We should be able to derive some good information on the Emperor Goose and the Aleutian Common Teal from such a collection.

The bird observations on Adak were gathered from the ground on the several days we were weathered in except for an Eagle and Eider count from the air.

Bird Observations

Common Loon - April 24. One pair was observed from the beach in Finger Bay, Adak.

Laysan Albatross - May 2. One observed just east of Kiska and 14 west of Kiska over Buldir reef. They are seen as single birds.

Fulmar - May 2. About 30 were seen over Buldir reef. They may be common elsewhere but are easily confused with gulls from the air.

Cormorant - Cormorants seem to be present on all of the islands and the Pelagic Cormorant is the most numerous. No count of cormorants was attempted but it was quite obvious that they are much more numerous at Attu and Agattu than farther east. I estimate 15,000 plus at Attu and 10,000 plus at Agattu. Cormorants were usually noted only near the water and below the airplane until we reached the Near Islands where they were noted high above us, especially at Attu.

Whistling Swan - April 21. Two pairs apparently on territory and a flock of 10 were seen at Unimak. No swans of any sort were seen west of Unimak.

Canada Goose - May 5. Four Canada Geese were seen in a flock evidently just after taking off from a small island on the east side of Kiska. At Buldir Island 52 Canada Geese were observed, 10 in pairs and the rest in flocks. This was in no wise a complete census of the island.

Black Brant - April 19. Some 5,000 brant observed at Izembek Bay. No observations farther west, although we watched for them.

Emperor Goose - April 19. Some 33 thousand were observed in our incomplete survey of the bays of the north side of the Alaska Peninsula. Subsequently only 875 Emperors were seen in the Aleutians so we may assume the bulk of the birds had left the chain prior to our trip. We were informed that the 200 odd geese that winterest at Shemya left about April 24.

Mallard - Ten were observed at Clam Lagoon on Adak on April 23. Only 10 were seen from the air at Kanaga. Many more could have been present in the islands.

Common Teal - On April 23, 8 pairs and a flock of 10 were observed from the road at Clam Lagoon and near MacDonald Lake. There was always 2 or 3 pairs in the ponds near the runway. Evidently this species has been able to survive in spite of the fox and rat introductions but it is difficult to believe that these unnatural predators have not had some effect on the size of the population. We were told that no teal were seen at Shemya this winter. Perhaps through the collection of duck wings at Adak we can learn something about productivity of this species in America.

Scaup - April 23. Something over 100 Scaup were observed from the road at Clam Lagoon on Adak. Scaup were not observed from the air. On April 24 only 9 of 49 Scaup in Adak harbor were females.

Common Goldeneye - Something over 100 were observed at Clam Lagoon, Adak, April 23.

Bufflehead - Some 35 observed on Clam Lagoon April 23. Subsequently pairs were seen in small ponds at three locations on Adak looking for all the world like breeding pairs on territory.

Old Squaw - April 24, 57 were observed in small flocks in Adak harbor. These do not show up well from the air and thus were not recorded during the flights.

Harlequin - On April 24 in Adak harbor 44 Harlequin were present consisting of 15 adult male, 3 immature male, 19 female, and 7 undetermined. Harlequin were frequently seen from the air but do not show up well enough to get counts.

Common Eider - The male Common Eider is readily observed from the air and an effort was made to get as complete a count as possible. Numerous pairs were observed and small flocks of up to 30 some birds. In many cases where a flock was observed closely enough the sex ratio was about even. No immatures were identified. As Common Eiders can be seen in huge flocks on the Alaska Peninsula in April, it is assumed that the small, well-scattered flocks we observed represent the total males observed doubled. We found a broken egg shell at Adak on April 28 indicating nesting was already in progress. Over one-half of the eiders observed were at Attu and while circling the island one or more was always in view.

Although a really precise figure for the breeding population of eiders in the Aleutians cannot be made from the coverage made, I believe it is safe to say that there are not over 10,000 breeding pairs of Common Eider in the Aleutian Chain. Fox predation is a serious problem to the eiders, and if foxes can be eliminated considerable increase in breeding birds may develop. Considering the number of birds at Attu, there would seem to be plenty of room for a larger eider population on many of the other islands.

Red-breasted Merganser - Six observed off the beach at Adak, April 23.

Bald Eagle - These great birds are frequently easy to see from the air and an attempt was made to get as accurate a count as possible for each island. Only 7 percent of the eagles observed were immature indicating either a low productive rate or that they were not on the beach where they could be seen. Although I could not be precise from my back seat vantage point, it appeared that about 50 percent of the adult eagles seen were associated with a nest. Many incubating females and nests with eggs were noted. No eagles were seen in the Near Islands, although a nest was seen at Buldir and the largest counts made were at Kiska and Amchitka. Our survey indicated there are probably not over 200 pairs of nesting Bald Eagles in the entire Aleutian Chain.

Willow Ptarmigan - Two were observed at Adak.

Glaucous Gull - About 1 percent of the gulls on Adak appeared to be of this species.

Glaucous-winged Gull - These birds were much in evidence on all of the islands. They were particularly numerous around the dump at Adak. They congregate on small offshore islands where they appear to be preparing to nest in places secure from foxes and rats. At Buldir and also at Segula, gulls were occupying the slopes. We know there are no rats or foxes at Buldir and the behavior of the gulls indicate there may be none at Segula.

Black-legged Kittiwake - Several small colonies were observed at various points in the islands. Only at Buldir is there really large numbers.

Murres - Difficult to identify from the air. Several observations are included in the table.

Raven - Fifteen or twenty were in residence at the Adak dump. We were advised there are about this many at Shemya.

Winter Wren - Only one was observed at Adak and that near an old building at Finger Bay. We understand that rats have been particularly hard on this species.

Gray-crowned Rosy Finch - April 24 we saw 30 of these birds while walking from Sweeper Cove to Finger Bay on Adak. They were the most numerous songbird at Adak.

Song Sparrow - Only 3 were seen at Adak in the course of several afternoons afield. This bird may be having a problem from the rats.

Lapland Longspur - One was observed at Adak April 28.

Snow Bunting - About one dozen were observed at different times around Adak.

Aleutian Islands

		Date	Bald Eagle	Common Eider	Emperor	Other
	Amak					
*	Unimak	4-21				Swan 14
	Ugamak					
	Tigalda					
	Avatanak					
	Rootok					
	Akun					
	Akutan					
	Unalga					
	Unalaska					
*	Umank	4-21	4	140	179	
	Samalga	4-21		18	186	
	Uliaga					
	Kagemil					
	Chuginadak					
	Carlisle					
	Herbert					
	Yunaska					
	Chagulak					
	Amukta					
*	Seguam	4-21	4			
*	Amlia	4-21	9	120	40	
	Atka					
*	Koniugi					Kittiwake colony
	Kasatochi					
	Oglodak	4-30		32		
	Tagalak	4-30	4	80		
	Chugul	4-25		160		
	Igitkin	4-25		240		
	Little Ulak	4-25		50		
	Great Sitkin	4-25	9	240		
	Umak	4-25		288		
	Little Tanaga	4-25		278		
	Kagalaska	4-25		32		
	Adak	4-25	17	488		
	Kanaga	4-25	13	16	2	Mallard 10

Aleutian Islands (Continued)

	Date	Bald Eagle	Common Eider	Emperor	Other
Bobrof	4-25		40		
Tanaga	4-25	15	76	400	
Ilak	5-2	1	8		
Skagul	5-2	1	32		
Ogliuga	5-2	1			
Gareloi	5-1	1			Kittiwake 2, 000+
Kavalga	5-2	1	20		
Ulak	5-2	3	80		
Unalga	5-2	2	8		
Amatignak	5-2	3	22		
Semisopochnoi	5-1	2	4		Murres 20, 000+
Amchitka	5-2	49	148	2	
Little Sitkin	5-1	6			
Rat	5-2	5			
Davidof	5-1		12		
Segula	5-1	2			Auklets 3, 000+
Kiska	5-2	22	26	3	Canada Goose 4
Buldir	5-2	1	120		Gulls 5, 000+ Canada Goose 52 Kittiwake 100, 000+ Murre 100, 000+
Buldir Reef	5-2				Laysan Albatross 14 Fulmar 30
Shemya	5-2		98		
Nizki			20		
Alaid			26		
Agattu			330	62	Cormorants 10, 000+ Kittiwakes 10, 000+ Murre 10, 000+
Attu			3, 740	1	Cormorants 15, 000+
Totals		175	6, 992	875	

Where no date is given, these islands were not surveyed.

* Islands so marked were only partially surveyed

Cook Inlet & Alaska Peninsula

	Date	Bald Eagle	Common Eider	Emperor	Other
Augustine I.	4-19		80		
Cape Douglas	4-19		12		
Ugashik Bay	4-19			1,100	
Cinder River	4-19			5,200	
Port Heiden	4-19			21,400	
Ilnik Lagoon	4-19			3,150	
Nelson Lagoon	4-19			2,470	
Totals			92	33,320	

Appendix D. --Field observations (surface) at Adak
(Sea Otter, Rat, Wren, Song Sparrow)

Sea Otter

On 28 April 1965, David L. Spencer, Jim King and I walked along the northeast shore of Shagak Bay and covered about 2.25 miles of beach. We found one dead juvenile ♂ sea otter weighing about 20 pounds (estimated). It showed no external wounds, except that rats had chewed the lips and nostrils. It had been dead about 3 to 5 days. I examined it internally and found it emaciated, having no body fat subcutoneously or around the abdominal organs. Its age and condition at death appeared the same as many otters found at Amchitka Island. Comparison of aerial counts show a declining population at Adak and this dead animal indicates that, even though unoccupied habitat is available at no great distance, mortality due to depleted food resources is occurring.

I recorded a rough analyses of 8 fecal remains found along about 100 yards of rocky beach on the N. E. shore of Shagak Bay. This appeared to be a favorite hauling ground and was where the dead otter was found.

Two sea otters displaying mating behavior were watched through binoculars for 15 minutes. The female was mildly receptive to the attention of the male. The two rolled and clung to each other until the male attempted copulation, which he did 3 times. On each occasion the female broke away and tried to leave the area but the male pursued her and twice engaged her in another bout of rolling and clinging behavior. After the third attempt at copulation, the female began to dive for food. The male accompanied her on each dive and the two were close together on the surface eating when observations were terminated.

Birds and Rats

During our walk along the beach on 28 April, we were in the habitat of the winter wren and song sparrow. We saw only 4 song sparrows and no wrens. Rat diggings and droppings were abundant among the Elymus tussocks along the beach edge. In similar habitat at Adak in 1947, both birds were abundant. I visited the 1947 location on 23 April 1965 and saw one song sparrow but no wrens; observation conditions were poor - 25-30 mph wind.

Fecal analyses:

Food organisms	Occurrences (~~Freyberg~~) Number	Frequency Percent of fecal samples having item
Arthropod crabs (crustacca)	1	13
Molluscu		
Chitons (Amphineura)	2	25
Horse mussel (Mediolus)	3	38
Blue mussel (Mytilus)	1	13
[1/] Clam (Pelecypoda)	3	38
Echinodermata		
Green sea Urchin (Strongylocentrotus)	4	50

1/ 3 species of clam shells were common on the beach of Shagak Bay: Macoma, Protothaca and Humalaria.

I postulate that the Adak Sea Otter population may have reached a maximum size of slightly under 4,000 otters in the year 1960-61, i.e.

			Count	Extimate of total
1957	Surface Survey	=	399	997
1959	Aerial "	=	1,718	2,291
1962	" "	=	2,260	3,013
1965	" "	=	1,337	1,783

about 50± otters per square mile of habitat and that population reduction through emigration and mortality will continue until about 1970 when the population should stabilize at an estimated population of 900 sea otters, i.e., 12 otters per square mile of habitat.