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Progress Report
OGOTORUK VALLEY MAMMAL INVESTIGATIONS
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Dec 1959

PME-416

MASTER

OBJECTIVES:

1. To determine the state of the population cycle in the small mammals of the Cape Thompson region and of adjacent regions which may be directly related ecologically.
2. To investigate the dynamics of such population cycles, especially as they relate to the routes of energy flow through the biosphere.
3. To investigate the ecological relations of the mammalian ultimate links in the terrestrial food chain (weasels, foxes, wolves, etc.).
4. To investigate the role of the caribou in the region, especially the migratory movements and population dynamics.

DESCRIPTION OF METHODS AND TECHNIQUES:

The population density and species composition of the small mammals of the Ogotoruk Creek region was studied by the quadrat method. The technique was the same as that which I have used since 1954 in studying the small mammals at several places in Alaska (Pruitt 1958; Pruitt and Lucier 1957). Briefly, this method consists of acre plots which are gridded and equipped with permanent wire markers so that 100 traps may be placed regularly on each acre. All traps are equipped with a length of stout cord, 0.8 meters long, with a loop which is slipped over the wire marker. Thus the traps, in succeeding years, may be placed within the same 2 square meters.

On each plot 50 Schuyler and 50 Museum Special traps were used, one of each kind at alternate markers. This alternation of types of traps is necessary since I have shown (Pruitt and Lucier 1957) that Clethrionomys rutilus, Microtus miurus and Microtus oeconomus are significantly different in their susceptibility to different types of traps.

Bait was a standard mixture of rolled oats, peanut butter, chopped raisins and bacon grease. Approximately the same amount of bait was used with each trap. Thus, each type of trap was given as nearly equal "presentation" to the animals as was possible.

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The plots on which the small mammals were to be sampled were, with one exception, analyzed by the botanists.

The traps on each plot were left set for three nights. They were examined once a day during this period and the catch removed. For each mammal caught, the plot number and trap designation (e.g., A-1; F-5; H-8) was recorded as well as a brief description of the exact trap site itself (e.g., runway over Sphagnum under Carex; hole under rock surrounded by Cassiope). Twenty-four plots were sampled during the summer 1959, using a total of 7,200 trap-nights.

Table 1 shows the number of plots set in each vegetation type, the kinds and number of individuals caught, the number of trap-nights on each vegetation type and the relative success of trapping (per cent catch). Figure 1 shows the number of trap-nights in relation to the preliminary calculation of the acreage of each vegetation type.

Specimens were given an initial processing in the field, in which they were examined for ectoparasites and in which food remnants in the mouth and throat were preserved. They were then measured, weighed and skinned. The stomachs were preserved for future food habits analysis, and the viscera were preserved for future parasitological examination. The carcasses and prepared skins were then dried and shipped to the University. Due to the demise of our Dermestid colony, the carcasses are being cleaned and prepared at the Museum of Zoology, University of Michigan. Work on such phases as age-groups and reproductive potential will be begun when the cleaned skeletons are available.

THE MAMMALS:

Sorex sp. prob. arcticus

The identification of the shrews collected is tentative pending return of the skulls from the preparator. I believe it is significant that the number of embryos found in the gravid shrews during the summer 1959 is larger than the average number which I have found in other years. This is the basis for my prediction that the shrew population will probably be high during 1960. The Arctic Shrew was found on plots OTK-4, 7, and 19. From the scanty distributional data collected it appears that they favor dense vegetational cover without excess substrate moisture.

FIGURE 1.

Table 1 - Distribution of Small Mammals by Plots and Vegetation Types

Vegetation Types	Plot No.	Species Trapped	-Summary-		% Catch
			No. Trap Nights	Total Catch	
I <u>Dryas</u> Fellfield	33	<u>Microtus oeconomus</u> <u>Lemmus trimucronatus</u>	300	1 <u>Microtus</u> 1 <u>Lemmus</u>	0.66
II <u>Eriophorum-Carex</u> wet meadow	1	<u>Microtus oeconomus</u>	1500	18 <u>Microtus</u>	1.24
	12	<u>Microtus oeconomus</u>		1 <u>Clethrionomys</u>	
	45	<u>Clethrionomys rutilus</u>			
	34	<u>Microtus oeconomus</u>			
	48	<u>Microtus oeconomus</u>			
III <u>Eriophorum</u> tussock	4	<u>Sorex arcticus</u> <u>Clethrionomys rutilus</u>	1500	27 <u>Microtus</u> 17 <u>Clethrionomys</u>	3.2
	42	<u>Clethrionomys rutilus</u> <u>Microtus oeconomus</u>		1 <u>Lemmus</u> 3 <u>Sorex</u>	
	46	<u>Clethrionomys rutilus</u> <u>Microtus oeconomus</u>			
	36	<u>Clethrionomys rutilus</u> <u>Microtus oeconomus</u>			
	32	<u>Clethrionomys rutilus</u> <u>Microtus oeconomus</u> <u>Lemmus trimucronatus</u>			
IV <u>Carex bigelowii</u> frost scar	13	<u>Dicrostonyx groenlandicus</u> <u>Microtus oeconomus</u> <u>Lemmus trimucronatus</u>	900	2 <u>Microtus</u> 2 <u>Lemmus</u> 1 <u>Dicrostonyx</u>	0.77
	25	<u>Lemmus trimucronatus</u>			

	35	<u>Dicrostonyx groenlandicus</u>			
V <u>Eriophorum-Carex</u> solifluction slope	7	<u>Sorex arcticus</u> <u>Microtus oeconomus</u>	600	25 <u>Microtus</u> 1 <u>Sorex</u>	4.6
	9	<u>Microtus oeconomus</u>			
VI <u>Carex bigelowii</u> high-center polygons	49	<u>Dicrostonyx groenlandicus</u> <u>Clethrionomys rutilus</u>	300	2 <u>Clethrionomys</u> 1 <u>Dicrostonyx</u>	1.0
VII Ericaceous shrub polygons	40	None	300	None	0.0
VIII Mixed grass-sedge saline meadow	No sample				
IX Dryas steps and stripes	No sample				
X Snow-beds	15	<u>Dicrostonyx groenlandicus</u>	600	2 <u>Dicrostonyx</u>	0.5
	28	<u>Dicrostonyx groenlandicus</u>			
XI Gravel bars and benches	5	<u>Microtus oeconomus</u>	900	14 <u>Microtus</u> 1 <u>Lemmus</u> 1 <u>Sorex</u>	1.77
	19	<u>Sorex arcticus</u> <u>Microtus oeconomus</u> <u>Lemmus trimucronatus</u>			
	47	<u>Microtus oeconomus</u>			
XII Miscellaneous types	No sample				

URSUS HORRIBILIS:

Grizzlies were fairly common in the Ogotoruk Valley during the summer 1959. On 27 June one adult was observed in Snow Patch Valley. On 18 July a female with a 2-year old or a yearling were observed near the construction camp. On 19 July what appeared to be the same two bears were observed tumbling and playing on the south slopes of Crowbill Ridge. On 9 August the geological party reported a sow and a yearling Grizzly about 7 miles up the coast about a mile inland. Fresh Grizzly tracks measured on 5 August near plot OTK 35 measured as follows: forefoot - 190 x 150 mm, claws 40 mm, hindfoot-255 x 140 mm,

A number of Grizzly scats were collected and examined. Since the year or season of the scats is not known, this being the first collection in the region, the quantitative significance of the food items is not known. Nevertheless, the data are of considerable interest. The principal identifiable items were vegetation and mammal remains. An oft-repeated observation on Grizzlies has been their predilection for seemingly unsuccessful pursuit of ground squirrels (Citellus parryi). It has even been implied that such pursuit and excavation assumes the nature of play rather than serious food-getting. Consequently the frequent occurrence (five out of eight scat collections examined) of ground squirrel bones and teeth in the scats examined may force a reappraisal of the role of the Grizzly as a predator on ground squirrels. Indeed, one scat pile contained the remains of three individual ground squirrels.

Grizzly signs (tracks or scats) were noted in a wide variety of habitats. Such sign occurred on plots OTK - 32, 35, 1, 7, 9 and 19. I suspect that the vegetation types which produced higher biomasses of small mammals are favored more by Grizzlies than less productive types. It is noteworthy that of the six plots producing highest biomasses of small mammals (OTK 36, 8, 13, 19, 32 and 12) three showed obvious signs of Grizzly activity (OTK- 9, 19 and 32). Possibly the dense vegetative cover on the other plots may have obscured Grizzly sign.

CANIS LUPUS:

Wolves were observed only occasionally during the summer 1959. This was to be expected since only an occasional caribou was observed during the summer. Wolf tracks were noted at several points near the bend of Ogotoruk Creek, the upper basin and on the height of land near the lakes. Wolf sign was also observed adjacent to plot OTK -32. One pair was seen on the Kukpuk River on 26 June.

VULPES FULVA:

Red Foxes were observed frequently during the summer 1959. Two dens were located: one near the southwest end of Crowbill Ridge, and one near the mouth of Kisimulowk Creek. Foxes were observed hunting voles, and ground squirrels. Examination of the entrance to the Crowbill den showed one freshly killed young gull (2-3 weeks old); one old Kittiwake kill; one recently killed ground squirrel, plus at least two older ground squirrel kills; and numerous shells of gull eggs. Their role in the ecology of the valley has not been clarified, and must be inferred from other tundra regions. Foxes were observed utilizing seal and walrus carcasses along the beach. I suspect that the carcass of the Grey Whale (Eschrichtius gibbosus) which was washed ashore near the mouth of Ogotoruk Creek the night of 7-8 August will be an important future source of food for foxes.

GULO LUSCUS:

The Wolverine was observed several times during the summer 1959. The botanical party observed a single animal on the east side of the valley above the Big Bend on 2 August. On 15 August the botanical party observed 3 Wolverines in the "Upper Basin." Mr. Melchior obtained several excellent color photographs at this time.

On 21 August Mr. Lent and I had Wolverines under observation for several hours about 2 miles upstream from the "Big Bend." These appeared to be a female and two young of the year. During the period of observation one of the kits actively dug out a ground squirrel burrow. These Wolverines, especially the adult, were quite susceptible to being tolled by "squeaking."

MUSTELA ERMINEA:

Three specimens of the Short-tailed Weasel were collected during the summer 1959. The Hanford Laboratory party collected one on 1 August. Another was collected by Mr. Max Thompson 6 miles Northeast of the mouth of Ogotoruk Creek on 14 August. The third was taken on plot OTK-42. With so few specimens, no deductions as to habitat preference may be made.

In other arctic regions it has been suggested that the weasel population shifts its habitat to conform with that of whichever microtine is "high" .

MUSTELA RIXOSA

The uncommonly observed Least Weasel was taken twice during the summer 1959. Both captures were in Schuyler traps on the same sampling plot OTK-36. The one taken on 4 August was found with a young Microtus oeconomus lying dead about one foot from the trap containing the weasel. This vole had two small punctures in the skin behind the left ear. Apparently the weasel was carrying a freshly-caught vole when she put it down in order to investigate the trap. Since she was lactating, I suspect that the young weasel taken on the same plot the next day was one of her litter.

CITELLUS PARRYI:

The Ogotoruk Valley and surrounding ridges contains good Ground Squirrel habitat and several squirrels were collected. Plans for live-trapping and marking all the animals on one protected ridge were not fulfilled because the necessary traps never arrived. Live-trapping is a phase of the work which should be done, for the natural over-wintering mortality of these rather aberrant arctic hibernators is not known. The active burrows on the protected ridge were marked.

The number of Ground Squirrels on the protected ridge did not exceed one per acre. This does not represent a particularly dense population and uninhabited burrows were numerous. Several inactive burrows were marked for future comparisons of activity. Ground Squirrel populations of greater density were observed further upstream on the west side of the Ogotoruk drainage. The dry stream bed of the Ogotoruk Creek and the cut-banks along the shoreline support high populations, at least in the summer. The first young were observed during the last week of June.

Ground Squirrels were observed to feed on: Potentilla sp., Anemone narcissiflora, Lagostis glauca, Saxifraga bronchialis, Bupleurum sp., Parrya nudicaulis, Salix phlebophylla, Poa sp., sedges, Dryas sp. Dryas was not fed on as commonly as would be expected from its almost universal occurrence. Ground Squirrels do not feed appreciably on the tall willows of the Salix glauca and S. pulchra types which form the cover for many of the burrow sites. Ground Squirrels show a preference for floral parts whenever available, except in the case of Dryas.

The Arctic Ground Squirrel is an important producer of animal protein, being known to occur in the diet of several different carnivores -- Wolf, Red Fox, Grizzly, Wolverine, Short-tailed Weasel, Snowy Owls, and Short-eared Owls, and Peregrine Falcon.

CLETHRIONOMYS RUTILUS:

A total of 18 Red-backed Voles was collected. The sex ratio, on the basis of this small sample was 100 M:20 F. No females were gravid, but one had 4 placental scars. Sampling in previous years of an upland Eriophorum tussock area on the Baldwin Peninsula had revealed the lack of Clethrionomys in this habitat. Consequently it was very interesting to note that these voles occurred there during the summer 1959 as well as on similar Ogotoruk Valley plots (OTK-4, 32, 36, 42, 45, 46 and 49). Invasion of usually unoccupied habitats is a characteristic of "high" populations of northern mammals. I have also observed similar unbalanced sex ratios in other populations of Clethrionomys that were at their peak. (Figure 2). Growing or expanding Red-backed Vole populations have sex ratios equally divided or favoring the females. On the basis of these data I believe that the Clethrionomys population in the Ogotoruk Valley was "high" during the summer 1959 and will probably crash before next summer.

Red-backed Voles were taken on plots OTK-45, 4, 42, 46, 36, 32, and 49. Thus, it appears that the Eriophorum tussock type of vegetational association is favored by them, since five out of seven plots where they were taken were of this type. Within the Eriophorum tussock type, the areas with polygons produced more voles per acre than did the areas with frost scars.

Thus Clethrionomys appears to favor unbroken vegetational cover and to avoid areas where the cover is broken by frost scars or protruding rocks.

Microtus oeconomus:

A total of 99 Tundra Voles was collected. The number of young or placental scars ranged from 4 to 9, averaging 6. The sex ratio was 100 M:89F. While the pattern of varying sex ratios is not as clear-cut for this species as it is for Clethrionomys, a similar situation probably occurs. The wet meadow plot on the Baldwin Peninsula was apparently "high" in summer 1959, but the coastal tundra plot on St. Lawrence Island has still not recovered from the tremendous population crash of 1955. The indications are thus that the Tundra Vole population of the Ogotoruk Valley will probably be less in 1960 than in 1959. During the period of its high population the Tundra Vole assumes an important role in the transfer of energy through the ecosystem. All the carnivores on which I have food-habits data fed to some extent on Tundra Voles -- Snowy Owls, Short-eared Owls, Jaegers, Foxes, Weasels, Grizzlies. From observations in other parts of the Arctic I suspect that wolves and wolverines were also utilizing voles quite heavily.

While the Tundra Vole is an adaptable species with a quite wide ecological amplitude, its densest concentrations occur in moist vegetational associations. It was taken on plots OTK-33, 1, 12, 34, 48, 49, 46, 36, 32, 13, 7, 9, 5, 19 and 47. The highest population densities occurred on Plots OTK-9 (21 individuals), OTK-36 (17 individuals), and OTK-19 (10 individuals).

Microtus miurus

The Alaska Vole was found on only one plot, the Angmakroq Mountain plot. Its remains did not occur in any of the carnivore feces or regurgitated pellets which I examined. Considering the relatively high biomass of this population (1553 grams per acre) and its proximity to the parts of the Ogotoruk Valley that were diligently sampled, the lack of this species or its remains here is quite puzzling.

This problem deserves further study since it includes such diverse phenomena as population fluctuation, ecological segregation, home range of carnivores and possibly differential food habits.

A total of 51 Alaska Voles was collected. The sex ratio was 100 M:120 F. Only one female showed evidence of reproductive activity (5 placental scars). Considering the time of year that these voles were sampled (during 23,24 and 25 August) the lack of visible reproductive activity is to be expected.

Microtus miurus is different from most other voles of the same genus in several ways. They are quite social animals, being able to exist in harmony in close proximity to one another. This allows the species to utilize fully (perhaps over-utilize) a restricted habitat. They also store food in "hay piles" in a fashion similar to the pikas (Ochotona). This makes them particularly good subjects for food-habits studies.

On the Angmakroq Mountain plot all the M. miurus haypiles were collected and analyzed. The results of this analysis are shown in Tables 2 and 3.

Preliminary examination of the data reveals that there may be a strong selection by M. miurus for Salix reticulata as a winter food. In spite of its rather sparse occurrence on the study plot, it occurs in every hay pile and comprises the major part in some. Trapping records revealed more captures in S. reticulata cover than elsewhere. S. reticulata is noticeably low in quantity in the samples collected outside the main M. miurus concentration. Apparently, plants with large leaves are selected whenever they occur close to the nest. Salix chamissonis occurred in only three samples, but in each of these three it was more than S. reticulata. Cassiope tetragona is not utilized as extensively as might be expected from its common occurrence in the plot area and its close association with hole entrances and runways.

Because the opportunity to examine quantitatively the food of small mammals collected by the mammals themselves is a rather rare occurrence, these hay piles, segregated into species components, have been forwarded to the Hanford Laboratory group for possible analysis in their studies of isotope movements through the ecosystem.

Table 2.

Per cent (by weight) of species in fifteen "Haypiles" collected from Microtus miurus study plot, Angmakroq Mtn., samples were dried at room temperature.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
<u>Species</u>															
1. <u>Salix reticulata</u>	35	29	31	31	47	66	39	59	82	42	61	53	89	86	37
2. <u>Salix chamissonis</u>	--	46	--	60	--	--	--	--	--	--	--	--	--	--	44
3. <u>Dryas octopetala</u>	28	21	04	02	07	05	T	03	05	45	13	14	03	--	T
4. <u>Arctostaphylos alpina</u>	--	--	20	T	20	05	50	T	09	T	13	15	--	T	T
5. <u>Cassiope tetragona</u>	--	01	35	01	21	09	T	19	03	--	06	05	04	04	03
6. <u>Salix phlebophylla</u>	06	T	T	T	--	--	T	T	T	T	T	T	T	--	T
7. <u>Artemesia</u> sp.	12	02	--	T	--	--	--	--	--	--	--	--	--	--	T
8. <u>Saxifraga</u> spp.	02	T	T	T	--	T	T	--	T	T	--	--	--	--	02
9. <u>Solidago multiradiata</u>	02	--	--	T	--	--	--	--	--	--	--	--	--	--	02
10. <u>Anemone</u> sp.	T	--	--	T	--	--	--	--	--	--	--	--	--	--	--
11. <u>Vaccinium uliginosum</u>	--	--	--	T	--	T	06	T	--	--	T	T	T	--	T
12. <u>Epilobium latifolium</u>	--	--	--	--	T	--	T	T	--	--	T	--	T	T	T
13. grasses and sedges	04	01	T	T	T	01	T	T	T	02	01	01	T	T	02
14. mosses and lichens	T	--	T	--	--	05	T	03	--	--	--	T	--	--	02
15. combined traces and unidentified material	11	T	11	05	04	04	05	16	T	11	05	12	04	10	09
Total weight of sample (grams)	127.5	134.0	24.5	78.0	135.0	125.0	88.0	49.5	128.5	71.0	103.0	117.5	104.0	47.0	392.5

Weights were rounded off to the nearest half-gram, before calculating per cent.

"T" represents trace amounts (less than one gram in each sample).

All species occurring in trace quantities were combined with the finely divided, dessicated unidentifiable material to provide a total weight (see item 15).

Large amounts of unidentified material in some sample hay piles probably indicates material remaining from the previous year.

Table 3. Summary of Species Occurrences in Microtus miurus hay piles.

<u>Species</u>	<u>Per Cent of Total, 15 Samples</u>	<u>Frequency excl. T's</u>	<u>Frequency incl. T's</u>	<u>2 Hay Piles outside of main M. miurus community</u>	
<u>Salix reticulata</u>	50	15	15	5	2
<u>Salix chamissonis</u>	16	3	3	--	--
<u>Dryas octopetala</u>	9	12	14	--	--
<u>Arctostaphylos alpina</u>	7	7	12	--	--
<u>Cassiope tetragona</u>	4	11	12	T	T
<u>Salix phlebophylla</u>	1	1	12	46	87
<u>Artemesia</u> sp.	1	2	4	--	08
<u>Saxifraga</u> spp.	1	2	9	T	--
<u>Solidago multiradiata</u>	1	2	2	--	--
<u>Anemone</u> sp.	--	0	2	--	--
<u>Vaccinium uliginosum</u>	--	1	8	--	--
<u>Epilobium latifolium</u>	--	0	7	--	--
grasses and sedges	1	7	15	1	2
mosses and lichens	1	3	7	T	T
combined traces and unidentified matter	7	13	15	1	1
<u>Therofon richardsonii</u>	--	0	0	48	--

Total weight - 15 samples 1725 grams

LEMMUS TRIMUCRONATUS:

A total of 12 Brown Lemmings was collected. A sex ratio of 100 M:30F was calculated but is not significant considering the small size of the sample. Considering the number of trap-nights set in Lemmus habitat, the total catch of only 12 indicates a very low population. The upland study plot on the Baldwin Peninsula, which in previous years had produced Lemmus, this year produced Clethrionomys. I do not have sufficient data to make predictions as to population density next summer for this species.

The Brown Lemming was found in a rather restricted range of vegetational types, being found on Plots OTK-33, 32, 13, 25, 19 and 47. All of these plots have the vegetational cover broken, either by protruding rocks, frost scars or fluvial action.

DICROSTONYX GROENLANDICUS

Only 6 Collared Lemmings were taken. The sex ratio (not significant) was 100:100. Only one gravid female, which had four embryos, was taken. No predictions as to future population size may be made.

Some other workers in Arctic Alaska have observed a very close association between Dicrostonyx and Eriophorum. Indeed, Bee and Hall (1956) postulate the existence of an "Eriophorum-Dicrostonyx Association." On the other hand, in the vicinity of Fawn Lake, Northwest Territories (64° 42' N, 100° 15' W) I have observed that Dicrostonyx was a creature of the rocky or gravelly ridges and uplands. This latter situation occurred in the Ogotoruk Valley. The Collared Lemming was found on plots OTK-13, 35, 49, 15 and 25. It is noteworthy that on none of these plots is Eriophorum dominant, but on three out of five plots Carex bigelowii is dominant. It is also noteworthy that on all the Dicrostonyx plots, the vegetational cover is broken either by protruding rocks (OTK-15 and 28), frost scars (OTK-13 and 35) or by cracking of the surface around Carex tussocks on dry polygons (OTK-49).

RANGIFER ARCTICUS

Previous observations by the Fish and Wildlife Service (UFWS, 1957) indicate the following general movements and populations in northwestern Alaska. " The Kobuk-Noatak caribou were scattered over a large area, a great deal of which was south of its normally accepted range during the winter of 1955-56. In recent years this herd seldom ventured below the Kobuk or the Noatak River. During November and December, 1955, however, a large segment, estimated at 20,000 animals, moved south and west to the head of the Buckland River ranging as far east as the head of the Huslia River. Other segments spread out through the Waring Mountains, south of the Kobuk River more than 50 miles. Here they remained through March and into April."

Estimates of total number in the various areas are presented in Table 4.

Table 4 - Extracted data from table in USFWS
(1957) publication:

Estimates of Caribou Numbers, KobukNoatak Herd.
January 1956 - April 1956.

<u>Locality</u>	<u>Date</u>	<u>Number</u>	<u>Observer</u>
Head Buckland River	Nov. 1955 to Jan. 1956	20,000	S.DeLeonardis Nelson Walker
Crossing Kobuk River Valley in vicinity Kiana and Noorvik.	Oct-Dec.1955	100,000 min.	Blankenship
Between head of Buckland River and Huslia River	April 5, 1956	10,000 min.	Burkholder
Upper Squirrel River.	April 7, 1956	5,000	"
Sheshalik	April 7, 1956	3,000	"
Klery Creek	April 6-7, 1956	1,000	Miner
Kobuk River Valley Between Kiana and Shugnak	April 6-7, 1956	1,500	"
Ambler River	April 6-7, 1956	1,000	"
Shungnak River	April 6-7, 1956	5,000	"
Ambler, Cutler and Noatak	May 3, 1956	10,000	Rhode and Skoog, etc.

" By mid April a definite movement north had begun and by the end of May they had left their winter range and moved north into the Brooks Range. This herd was not contacted again until November. At the head of the Noatak and Cutler Rivers, fresh tracks and trails indicated several thousand caribou had been drifting north and east out of this area presumably towards the north side of the Brooks Range.

"Wien pilots flying out of Kotzebue reported that no caribou had been seen in the lower Noatak-Kobuk area since the previous spring. In addition, very few caribou had been observed along the coast to Cape Lisburne. One small group of not more than 2,000 animals were east of Kivalina for a short period in October.

"Bush pilots flying over the area north of the Brooks Range during October and November reported large numbers of caribou scattered across the Arctic slopes from Pt. Lay to Barter Island. The greatest concentration noted occurred about 50 to 75 miles southwest of Barrow and was estimated by Rev. William Wartes to be not less than 20,000."

One must emphasize the continual presence of caribou in or near the Ogotoruk Valley. Our party first observed caribou in the valley on 22 June. On 30 June a Wien pilot estimated 500 caribou at the headwaters of the Ogotoruk. At the same date the botanists estimated 1,000 caribou between the Ogotoruk and the Kukpuk rivers.

From mid-summer 1959 until 18 October no caribou had been taken by Point Hope people. Kills since 18 October have been near the height of land between the Ogotoruk and Kukpuk Valleys.

From the available records it is apparent that the caribou overwinter on the South side of the Brooks Range. From the number of shed buck antlers I suspect that the Ogotoruk Valley is also used during or shortly after the rut.

VISITORS AND HYPOTHETICAL LIST:

ALOPEX LAGOPUS

No Arctic Fox were noted or collected during the summer 1959. During previous trips into the general region during the winter 1953-54 I have observed Alopex near Kivalina. During 1955-56, 27 Arctic Fox were sold by the Point Hope people and 28 were sold by Kivalina people. I suspect that the whale carcass at Ogotoruk Creek will be an important bait for attracting these foxes during winter 1959-60.

THALARCTOS MARITIMUS

No polar bear were noted during the summer 1959. During the time the polar pack ice is close to shore, Polar Bears are relatively common. The following information is extracted from Tovey and Scott (unpubl. report at 8th. Alaska Science Conference). During 1956-57, 206 Polar Bears were taken in Alaska, 60 per cent of the Alaska kill was from Kotzebue, Lisburne and Point Hope. In Alaska the sex ratio of bears killed was 200:100, while in Greenland it is 300:100 (Pedersen, 1945).

In 1958-59, 225 Polar Bears were taken, 182 by white "trophy" hunters and 43 by native Eskimo hunters. The number of square miles per bear (calculated from number of flying hours and number of bears seen) was 21 square miles per bear in 1958 and 12 square miles per bear in 1959. Trophy hunters.flying from Kotzebue took 107 bears (59 per cent of the total kill). Most of these were taken near Point Hope. Lisburne trophy hunters took 20 (11 per cent). Native hunters from Point Hope took 16 bear (37 per cent of the total). In 1959 native hunter kills averaged 7.7. miles from shore. In 1959 trophy hunter kills averaged as follows: from Kotzebue, 59 bears taken, averaging 56 miles from shore; from Point Hope, 13 bears taken averaging 57 miles out; and from Lisburne, 15 bears taken averaging 35 miles out. The great Kotzebue take is undoubtedly an artifact since this spot is merely an aircraft base; Tovey and Scott believe that most of the bears reported by Kotzebue aircraft are actually killed in the vicinity of Point Hope.

MARMOTA CALIGATA:

No marmots were noted during the summer 1959. The Point Hope people report marmots "in the hills back of Cape Thompson" but their closest occurrence to the Ogotoruk Valley is still unknown.

OVIS DALLI;

White Sheep are also reported in the "Hills back of Cape Thompson." The Point Hope people report their former presence on the coast itself especially in the rocky stretches such as Crowbill and near Cape Lisburne.

THE FOOD WEB:

Figure 3 graphically demonstrates the interrelationships of the organisms of the Ogotoruk Valley and vicinity. Tables 5 and 6 show the basis of the preliminary delimitation of these relationships. Such details as identification of hair in pellets and scats, and the identification of rodent (particularly vole) stomach contents are exceedingly time-consuming and laborious. Work on these more precise phases is proceeding satisfactorily at the present time.

Even at this preliminary stage, it is clear that the marine environment effectively extends onto the land by means of its products being utilized by terrestrial animals. This is accomplished directly, as when foxes use gulls and their eggs, or indirectly, when fortuitously stranded carcasses of marine mammals are used by foxes and bears. The position of man in the food web, for example, would be quite different if either the marine mammals or the caribou were changed in population density or availability.

It must be emphasized that Figure 3 expresses qualitative relationships only. Many years of careful study will be required before, for example, the role of Microtus oeconomus or Citellus parryi could be clarified on a quantitative basis. Even at this stage of analysis it is evident that there are three major terrestrial producers of animal protein in the region. These are the voles and lemmings, the ground squirrels, and the caribou.

SMALL MAMMAL BIOMASS:

Figure 4 shows the number of grams of small mammal biomass per trap-night. It is obvious that the Angmakroq Mountain plot (Microtus miurus) was by far the most productive. The Angmakroq Mountain plot would undoubtedly be classified as a "Snow-Bed Community," but since a detailed botanical analysis has yet to be made I have not included it in the following discussion. Of the remaining vegetational associations, the Eriophorum-Carex solifluction slope type was the most productive, with the Eriophorum tussock type a close second. The productivity of the six highest plots was as follows:

(1) OTK-#36 (686.0 gms total), (2) OTK-#9 (566.6 gms.), (3) OTK-#13 (518.4 gms.), (4) OTK-19 (363.4 gms.), (5) OTK-#32 (295.2 gms.), (6) OTK-#12 (256.2 gms.). Plot OTK-#36 was in Eriophorum tussock type, plot OTK-#9 was in Eriophorum-Carex solifluction slope type, plot OTK-#13 was in Carex bigelowii frost scar type, plot OTK-#19 was in Gravel Bars and Benches type, plot OTK-#32 was in Eriophorum tussock type and plot OTK-#12 was in Eriophorum-Carex wet meadow type. Table 7 gives the small mammal biomass for each plot.

It must be emphasized that short-term observations of population density or biomass of small mammals in the Arctic are actually of little value in clarifying such a basic ecological premise as energy flow through the ecosystem. Populations vary greatly depending on the state of the cycle. For example, my plot on St. Lawrence Island produced 3623.5 grams of Microtus oeconomus biomass in 1954, yet in 1956 it produced only 627.9 grams. Koskimes (1955) has advanced the postulate that since vegetative growth is so slow in the North it cannot stand continuous cropping and therefore cyclic population fluctuations are an evolutionary mechanism to prevent overuse of the range. Therefore, density and biomass data are useful only in terms of complete cycles.

TABLE - 5

Records of Small Mammal Bones and Teeth in Raptor Pellets

SHORT-EARED OWL
Pellet Site

Species:	No.1.	No. 2	No. 4	No. 5	No. 10 (Angmakroq Mtn.)
<u>Clethrionomys</u>					
<u>Lemmus</u>	X	X	X	X	X
<u>Dicrostonyx</u>	X	X	X	X	
<u>Microtus</u>					
<u>oeconomus</u>	X	X	X	X	X
<u>Microtus</u>					
<u>miurus</u>					
<u>Mustela rixosa</u>		X			

SNOWY OWL
Pellet Site

Species	No. 2	No. 5	No. 6
<u>Clethrionomys</u>			X
<u>Dicrostonyx</u>	X	X	
<u>Lemmus</u>	X	X	X
<u>Microtus</u>			
<u>oeconomus</u>			
<u>Microtus</u>			
<u>miurus</u>			

JAEGER
Pellet Site

Species:	No. 2	No. 3	No. 4	No. 7
<u>Clethrionomys</u>				
<u>Dicrostonyx</u>	X			
<u>Lemmus</u>	X		X	
<u>Microtus</u>				
<u>oeconomus</u>	X	X	X	X
<u>Microtus</u>				
<u>miurus</u>				

ROUGH - LEGGED HAWK (?)

Pellet Site

Species	No. 3
<u>Citellus</u>	X

Table 6. Preliminary analysis, scats of Ursus horribilis

Species	Scat Sites							
	#1	#2	#3	#4	#5	#6	#7	#8
Vegetable Matter	X	X	X	X	X	X	X	X
<u>Citellus</u>	X	X				X	X	X
<u>Dicrostonyx</u>			X					
<u>Lemmus</u>			X	X				X
<u>Clethrionomys</u>				X				
<u>Microtus oeconomus</u>		X		X				X
<u>Rangifer</u> hair			X					

Table 7 - Small Mammal Biomass per plot

			% total biomass
OTK - 5	-	95.5 gms.	2.34
OTK - 1	-	157.5 gms.	3.86
OTK - 7	-	192.8 gms.	4.72
OTK - 4	-	113.5 gms.	2.78
OTK - 9	-	566.6 gms.	13.88
OTK - 13	-	518.4 gms.	12.70
OTK - 15	-	121.6 gms.	2.98
OTK -12	-	256.2 gms.	6.27
OTK - 32	-	295.2 gms.	7.23
OTK - 34	-	172.4 gms.	4.22
OTK -33	-	19.5 gms.	0.48
OTK -36	-	686.0 gms.	16.80
OTK - 25	-	13.5 gms.	0.33
OTK - 28	-	58.9 gms	1.44
OTK - 42	-	39.9 gms	0.98
OTK - 49	-	72.1 gms.	1.76
OTK - 48	-	91.7 gms.	2.25
OTK - 45	-	17.0 gms.	0.42
OTK - 46	-	155.0 gms.	3.80
OTK - 47	-	75.6 gms.	1.85
OTK - 19	-	363.4 gms.	8.90
OTK - 40	-	0 gms.	0.0
OTK - 35	-	0 gms.	0.0
Angmakroq Mtn.	-	1553.8 gms	--

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