

CANADA
DEPARTMENT OF MINES
HON. W. A. GORDON, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER
NATIONAL MUSEUM OF CANADA
W. H. COLLINS, ACTING DIRECTOR

BULLETIN No. 70

Annual Report for 1931

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OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1932

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GENERAL ACTIVITIES OF THE NATIONAL MUSEUM OF CANADA

By W. H. Collins, Acting Director

The activities of the National Museum of Canada were forced to undergo a decided readjustment during the year 1931. This was due to a reduction in the appropriation for museum work which was necessitated by circumstances lying wholly beyond the control of the administration and springing from the financial stringency of the times.

No reduction was made in the staff. It is small and any reduction would militate against the proper functioning of the institution. The need for economy resulted in almost complete suspension of field work for the year, field work in other years consisting of botanical and zoological surveys, anthropological investigations, and gathering of material for scientific study and exhibition purposes. Field work was restricted this year to painting and making casts of food fishes taken at Halifax, by way of co-operation with the Department of Fisheries, and to a few weeks' survey north of Kingston by two members of the Biological Division.

It was very little to the disadvantage of the Museum, however, that field work was restricted. Records and material for study tend to accumulate, and a lengthened period of office work permits of clearing away this accumulation. The opportunity for close and extended application in the office was welcomed by the Museum staff. As one consequence, the Department is quite likely to be embarrassed with more reports and scientific articles than can be published with the available funds.

Equipment of the exhibition halls was increased during the year by the construction in our own workshop of one mahogany table case and of five mahogany cases specially designed to carry sixteen standard insect cases. Six of these 16-compartment insect cases have now been constructed and the museum is indebted to the Entomological Branch, Department of Agriculture, for kindly co-operation in making an excellent entomological exhibit.

Good progress was made in the exhibition work in all the Museum halls. Placing of five upright cases in the Palæontological hall a year ago permitted several good exhibits to be set up, among which may be mentioned collections of Pleistocene vertebrates and fossil fishes. A large collection of dinosaur tracks was placed on exhibit and the collection of tracks from Carboniferous sediments was re-mounted. In the west Anthropological hall a number of fine and artistically arranged collections, put on display to demonstrate the artistry of the aborigines of Canada, have attracted much attention. They include wood carving, fine basketry, and wampum, and work in silver, copper, stone, ivory, and black slate. Among the new exhibits in the Biological hall are some life-like groups, including polar bear cubs, the starling, the chestnut-sided warbler, the nighthawk, and the golden plover.

The Acting Director of the Museum wishes to express his appreciation of the co-operation of those members of the Geological Survey staff who

have devoted time and thought to the exhibition of palæontological, geological, and mineralogical material. He is grateful to other Government departments for assistance, and would mention particularly the Northwest Territories Branch and the National Parks Branch, Department of the Interior, and the Department of Indian Affairs. He thanks most cordially the many individuals and organizations who have made donations or exchanges and who have rendered gratuitous assistance in scientific research. Special mention should be made of a donation from the estate of the late Dr. H. M. Ami of valuable collections of fossils, archæological material, and books. Mr. C. J. L. Rickwood was loaned by the National Parks Branch to transcribe folk songs from phonograph records.

This opportunity is taken, also, to express appreciation on behalf of the officials of the Museum and the public in general of the services rendered by the members of the Royal Canadian Mounted Police who are stationed in the Museum building. The courtesy, dignity, and fine appearance of these men have been very favourably commented upon by visitors, and particularly by those who have had much experience with museums.

MUSEUM SURVEY

Of interest to the administrative bodies of the various museums of Canada is a survey of Canadian museums made during the summer of 1931 by Sir Henry Miers and Mr. S. F. Markham, of the Museums Association, London, England. The time available for the survey was short, a very considerable part of it was of necessity spent in travel, and the time that could be spent in investigating at first hand the scope and methods of work of any one institution must have been disappointingly brief. The visit of these distinguished men has, however, in all probability been inspiring, particularly to the staffs of the smaller museums, and it is expected that the report on the survey will present valuable and practicable suggestions towards the improvement of museum work in Canada under existing conditions and towards the betterment of the conditions. It is to be hoped that such a report will have wide distribution in Canada and will result in creating in this comparatively new country an appreciation of the value of museums in the economic and cultural phases of national development. The following paragraph demonstrates Mr. Markham's realization of the importance of properly conducted museum work:

¹"The world is athirst for knowledge today as it probably never has been since the Renaissance . . . Moreover, never before in the world did the working man enjoy such short working hours or such opportunities for the profitable use of leisure. He has been taught to read; the wireless is teaching him to hear; and there are signs that he is eager to understand and to appreciate the things that he can see. I am convinced that the museum movement, if it can expand its ideas to meet modern requirements, can become one of the greatest cultural forces in the world, teaching men to see life clearly and to see life whole."

The National Museum is highly appreciative of the fine spirit of co-operation shown by Canadian and foreign museums. The herbarium has been enriched by the acquisition of valuable collections of plants, in

¹Markham, S. F.: "Impressions of American Museums"; *The Museums Journal*, vol. 31, p. 442 (1932).

exchange for duplicate Canadian specimens. Valuable additions to the fossil collections have been acquired by the exchange of duplicate specimens and casts. The museum officials have had the pleasure of supplying other institutions with anthropological material, and have directed to other Canadian museums collections that they were not in a position to purchase, and have thus been instrumental in having them retained in this country.

The staff of the National Museum is in touch with scientific investigators of other institutions, exchanging information and opinions, assisting and being assisted in the solution of difficult problems, and furthering the advance of scientific research. The members of the staff are recognized throughout the country as authorities on their subjects and their advice is constantly sought by the general public, and particularly by amateur naturalists. Observations made in the field by amateurs are presented to the Museum to be incorporated in the records and embodied in reports. In view of the fact that the museum staff is small and the field for scientific investigation extremely wide, this assistance from amateur and trained Canadian naturalists is of great value, is encouraged, and is much appreciated. Recompense in a small way is made by suggestions on making further observations and collections and by assistance in the determination of botanical, biological, palæontological, and mineralogical specimens.

MUNICIPAL MUSEUMS

The function of the museum in the educational world is in these days becoming increasingly recognized. Information gained through the eye is definite, exact, and lasting; the mental image of things seen is as a rule more firmly impressed than any other. A clear concept of an object is always better obtained by seeing it than by any description. The teacher knows the value of material objects to illustrate the lesson: a copy of Magna Charta rouses the imagination and carries the pupil back to the stirring times of King John; a flint arrowhead, a bone needle, or a fragment of pottery speaks of the prehistoric life of the Indians; a passenger pigeon opens a vista of thought on the conservation of wild life; an old manuscript illustrates the source material of histories; a suite of minerals is useful to illustrate a lesson on one of Canada's leading industries; and a collection of fossils opens the door to a study of geological history, the changing conditions of the continents throughout the ages, and the development of life upon the earth.

The municipal museum can readily adapt itself in a measure to the needs of the schools and may be closely associated with the educational organization of the municipality. The small local museum in a great many cases is dependent for its origin and early growth on the enthusiasm of some one public-spirited man who places on exhibit some valued personal collection and devotes a part or all of his leisure to acquiring additional material and arranging it for display. A good room is needed, as in the public school building or the public library; there must be cases for exhibition and storage, and legible descriptive labelling. For the cases it may suffice to enlist the sympathies of a few of the more generous citizens. The interest of the general community is needed for acquiring exhibition material. The best material is not always found in the possession of the

wealthy, and many of the less prominent citizens have friends in foreign countries who would be pleased to supply at no cost common articles that would have educational value elsewhere.

The local press can be of incalculable assistance. Most people like to be given credit publicly for donations to public institutions, and it is a matter of courtesy and justice that such recognition be given. News items serve to call forth additional donations. Gifts, however small, give occasion for the preparation of instructive articles of readable length. The Perth Municipal Museum, Ontario, illustrates the point; the honorary curator courteously acknowledges through the local press the receipt of donations and in every case prepares an interesting article on the related subject, to which the two newspapers of the town most laudably give space.

MUSEUM LECTURES

Two series of lectures on natural history, geography, geology, forestry, industry, travel and other subjects were given under the auspices of the National Museum. As in previous years the lectures were given on Saturdays, at 10 a.m. and 11 a.m., for children, and on Wednesday evenings for adults. The first series included six lectures; the second ten, and one additional lecture for adults. The first series was scheduled from November 7 to December 16, 1931, and the second from January 6 to March 16, 1932.

Below is a statement of the attendance at these lectures:

<i>First Series</i>		
	Six children's lectures	Six adult's lectures
Total attendance.....	5,100	1,850
Average attendance.....	850	308
<i>Second Series</i>		
	Ten children's lectures	Eleven adult's lectures
Total attendance.....	6,600	4,095
Average attendance.....	660	372
<i>First and Second Series</i>		
	Sixteen children's lectures	Seventeen adult's lectures
Total attendance.....	11,700	5,945
Total attendance all lectures 17,645		

A comparison of the record for this and the previous year shows that the average attendance at the children's lectures in 1930-31 was 660, and in 1931-32 it was 755, an increase of 95; and at the Wednesday evening lectures the average attendance in 1930-31 was 308, whereas in 1931-32 it reached 340, an increase of 32. This increase is a good indication of the popularity of the lectures.

The continued co-operation and interest of officials of departments of the Dominion Government, as well as many outside the Civil Service, in this branch of the educational work of the National Museum, is very encouraging, and the Lecture Committee acknowledges with gratitude

the hearty and sympathetic co-operation of the seventeen speakers who contributed to the success of this educational service. Twelve of the lecturers were officials of Government departments, including—the Department of Trade and Commerce: Commercial Intelligence Service (1) and Dominion Bureau of Statistics (1); Department of the Interior: Northwest Territories and Yukon Branch (1), Forest Products Laboratories of Canada (1), Dominion Lands Branch (1); Post Office Department: Staff and Publicity Branch (1); Department of Mines: Geological Survey (4), Mines Branch (2).

The courtesy of the following institutions and individuals in supplying motion picture films to supplement lectures is also acknowledged: Canadian Government Motion Picture Bureau, United States Bureau of Mines, Canadian Pacific railway, Ontario Motion Picture Bureau, Canadian National railways, Post Office Department, American Museum of Natural History, the Japanese Minister to Canada, McGill University, Castle Films (New York), Boy Scouts Association of Canada, and Department of the Interior.

The assistance of the Canadian Boy Scouts Association (Ottawa district), in providing ushers at the children's lectures has also been a great help to the Committee, as well as developing among the children the idea of self-government.

Particular acknowledgment is made of the co-operation of the local newspapers in generously providing space for reports and other news of the various lectures. The increasing attendance and success of the lectures are due to a great extent to this encouraging assistance.

The subjects of the lectures given in 1931-32, and the respective speakers, were as follows:

First Series:

- Norway today, by F. H. Palmer, Canadian Government Trade Commissioner, Oslo, Norway.
- Clays and what we make from them, by John F. McMahon, Mines Branch, Department of Mines.
- The interest of geography, by Kenneth G. Chipman, Geological Survey, Department of Mines.
- An angler's adventures in many lands, by Charles F. Wilkins, Northwest Territories and Yukon Branch, Department of the Interior.
- The old Cariboo road, by J. C. Brady, Dominion Bureau of Statistics, Department of Trade and Commerce.
- Wood uses, ancient and modern, by T. A. McElhanney, Superintendent, Forest Products Laboratories of Canada, Department of the Interior.

Second Series:

- The eastern islands of the Caribbean, by Lester A. Glass, Trade Commissioner for the British West Indies (Eastern Group), Montreal.
- From ocean depths to the lofty skyscraper, by M. F. Goudge, B.A., B.Sc., Mines Branch, Department of Mines.
- The behaviour and effects of glaciers, by Terence T. Quirke, E.M., M.Sc., Ph.D., Professor of Geology, University of Illinois.
- Behind the Post Office screen, by Walter J. Turnbull, Staff and Publicity Branch, Post Office Department.
- Fossil man, by Loris S. Russell, B.Sc., M.A., Ph.D., Geological Survey, Department of Mines.
- The land of gods and earthquakes, by Rev. P. P. W. Ziemann, B.A., B.D., Fourth Avenue Baptist Church.

Second Series: Concluded.

Some local fishes—their habits and habitats, by N. J. Atkinson, M.Sc., Lucerne-in-Quebec Community Association, Limited.

Water, nature's sculptor, by H. C. Gunning, B.A., Sc., Ph.D., Geological Survey, Department of Mines.

The fruits we eat and where they come from, by Karl B. Conger, President of the Eastern Canada Fruit and Vegetable Jobbers Association.

Mystery island—national domain of Canadian Boy Scouts, by Noulan Cauchon, Chairman and Technical Adviser, Ottawa Town Planning Commission; Vice-President, Ottawa District, Canadian Boy Scouts Association.

The changing Arctic, by Richard Finnie, Dominion Lands Branch, Department of the Interior.

Up to the present lectures arranged by the Lecture Committee have been given only in Ottawa, except where lecturers may have received invitations from educational societies or clubs outside the city to repeat lectures given at the Museum. The possibility of extending the benefits of the lectures to other parts of Canada has been studied by the Lecture Committee, but the inauguration of any comprehensive plan of distribution will have to be delayed until facilities for undertaking this important work are available.

A committee consisting of Harlan I. Smith (Chairman), M. E. Wilson, Clyde L. Patch, and G. W. Richardson (Secretary), is responsible for arranging the lectures and attending to the work involved.

DIVISION OF ANTHROPOLOGY

The activities of the staff were limited almost wholly to office work.

Mr. Diamond Jenness organized the anthropological program of the Pacific Science Congress, which was scheduled to meet in Vancouver in May, 1932, but which has now been postponed. Besides drawing up a list of subjects to be discussed at the meeting and soliciting relevant papers from scientists in both the New and the Old Worlds, he assembled and edited a volume of papers, by nine authors besides himself, on the "Origin and Antiquity of the American Aborigines", which the National Research Council has undertaken to publish and present to delegates attending the congress. For the National Museum, Mr. Jenness completed a comprehensive textbook on the "Indians of Canada", and contributed an article on "Native Indian Art and Industries" which was distributed by the Department of Immigration and Colonization to the press of Great Britain. He published two other articles during the year, "Wild Rice" in the Canadian Geographical Journal, and "Indian Prehistory as Revealed by Archæology", in the new Quarterly of the University of Toronto; and he read a paper on the Sekani Indians of British Columbia at the meeting of the Royal Society of Canada. With the assistance of Mr. Leechman, he overhauled, piece by piece, about half the immense collection of European archæological material that the estate of the late Dr. H. M. Ami entrusted to the National Museum for distribution to Canadian museums and universities. Towards the end of the year he investigated the population possibilities of the Dominion and prepared a lengthy paper on the subject.

During April, May, and part of June, Mr. C. M. Barbeau studied several old collections of Indian handicrafts in the museums of France and England.

The collections of North American Indian specimens studied by Mr. Barbeau in France and England are those of the Trocadero Museum, of Paris; the Louvre (Musée de la Marine); the Municipal Museum of Versailles; the Jardin-des-Plantes; the British Museum; the Pitt-Rivers, at Oxford; and two local museums at Warwick. By request, Mr. Barbeau sorted out the whole American collections of the Trocadero and Versailles museum and re-catalogued them. The collection of the Trocadero is particularly important; it contains a large number of the most ancient specimens of North American handicrafts in existence. The bulk of this collection, like that of Versailles, was made in New France and Louisiana for the Dauphin of France (under Louis XIV), about the middle of the eighteenth century. Some of the specimens from the British Museum and the Pitt-Rivers Museum go back to the period of discovery by the early circumnavigators. Valuable comparative knowledge was obtained from the study of these collections, particularly with regard to the origin and evolution of native American handicrafts.

The Ampere collection of folk songs of France at the Bibliothèque Nationale was also studied and the parallels of French-Canadian folk songs were noted.

Mr. Barbeau's activities at the museum, after the month of June, were divided between routine work and the preparation of his materials for monographs on the "Tsimshyan Indians of the Northwest Coast". Much time was given to linguistic work in connexion with the three dialects of the Tsimshyan; and the work of sorting out bulky materials in lexicon form is still proceeding. The preparation of a large monograph on "The Eagle Phratry—Its Recent Growth Among the Tsimshyan" is under way. This monograph is meant to be the first instalment of what will cover the complete social structure of the Tsimshyans.

A book of French Canadian folk songs, comprising sixty numbers, is nearly completed and should be ready for the publisher within two months. The demand for books of this kind in French has been insistent for some years and a plan for publication is now being discussed with the Quebec government.

Mr. H. I. Smith worked on the organization of accumulated data, with bibliographies, on the following subjects: prehistoric use in Canada of native fruits and seeds; cave dwellings in Canada; mammal and serpent forms in prehistoric Canadian art; archæological human skeletal remains found in Canada; archæological sites in British Columbia in the area from cape Mudge southward to the International Boundary; Pontiac county, Quebec; Brant, Peel, and Lincoln counties, Ontario. He also partly arranged the bibliographies of the archæology of Ontario, Quebec, New Brunswick, and Newfoundland.

Mr. Smith also matched the negative material for three motion pictures, wrote the titles for three, and worked on plans for a motion picture demonstrating the activities of the National Museum and the Geological Survey.

Mr. W. J. Wintemberg completed the writing of his report on the culture of the Lawson village site. A few days were spent in the valleys

of Ottawa and Gatineau rivers in search of sites of Indian habitation, and a small Algonkian site was discovered on the banks of the Gatineau near Chelsea, Quebec.

A series of special exhibits illustrating some of the finer phases of aboriginal art was placed in the west hall of anthropology. These exhibits are highly suggestive to commercial artists seeking something distinctively Canadian and have attracted much attention. They include:

Fine basketry	Work in silver
Wood carving	Work in copper
Native beads	Work in ivory
European beads	Work in stone
Wampum	Fakes and frauds
Plaques	Pottery pipes
Jade	Painting
Black slate	Porcupine-quill work

Two special collections of material were assembled for exhibit outside, one for the Boy's Hobby Show at the Young Men's Christian Association, Ottawa, and one for the Sparks Street window of the Canadian Pacific Railway ticket office, Ottawa. Assistance was given the Geological Survey in the planning and preparation of an exhibit in the coal section to show the application of aniline dyes.

No large loans were made during the year, but numerous demands from the Normal and public schools for material for object lessons were met.

Mr. Douglas Leechman, owing to the large amount of work in connexion with the setting up of exhibits and preparing labels for the same, sorting and accessioning new material such as the Dr. H. M. Ami collection of archæological material from France, making monthly inspection of all specimens in storage and on exhibition to guard against losses from insect pests, and the cleaning, preservation, and repair of specimens collected many years ago, found little time for research work. He succeeded, however, in developing a new method of preventing the distortion of wooden specimens found in water or swamps; he avoids the use of chemicals which subsequently have to be eliminated. Few such specimens reach this museum, but the method is of distinct value.

At the request of the National Research Council some work was done on the removal of green stains from bronze statuary. No precise information has been received as to the method finally adopted, but it is believed that one of the methods suggested by this division has been used.

An ultra-violet lamp has been constructed and has proved to be of value. By its aid, faded labels and specimen numbers are rendered more legible; the use of iron in anthropological specimens, thus proving them post-European, is easily detected; aniline dyes are rendered evident in many cases; faking and retouching of specimens is shown; various fibres can be distinguished one from another; and pathological conditions in bones and teeth are sometimes revealed. Such lamps have already been employed in art museums, but this is believed to be the first time ultra-violet light has been employed in anthropology.

Publications

The following articles were published by the staff of the division during the past fiscal year:

- Wild Rice. By D. Jenness. Canadian Geographical Journal, June, 1931.
 Gaspé Peninsula. By Marius Barbeau. Canadian Geographical Journal, August, 1931.
 Our Indians, Their Disappearance. By Marius Barbeau. Queen's Quarterly, November, 1931.
 Indian Prehistory as Revealed by Archæology. By D. Jenness. University of Toronto Quarterly, January, 1932.
 French Canada—Its Survival. By Marius Barbeau. Dalhousie Review, January, 1932.
 Indian Native Art and Industries. By D. Jenness. Published by the Department of Immigration and Colonization in a number of British newspapers and magazines.
 The following papers by Marius Barbeau were published in LaPresse, Montreal: L'Île d'Orléans; L'École des Arts et Métiers de Mgr. de Laval; Le Prince d'Orange et le Prince Eugène (chansons); Notre tradition, que devient-elle; Pourquoi nos vieilles églises disparaissent.

Lectures

The following lectures were given during the year:

- Popular fallacies concerning the Canadian Indian. By Douglas Leechman. Women's Press Club, September 15, 1931.
 Indians of the British Columbia coast. By Douglas Leechman. Glebe Collegiate Senior Lyceum, Ottawa, December 4, 1931.
 Why Canadians should be interested in their handicrafts. By Marius Barbeau. Radio address, January, 1932.
 French survival in Canada. By Marius Barbeau. Arts and Letters Club, Ottawa, February, 1932.
 A series of French-Canadian sketches and legends. By Marius Barbeau. Broadcast in French by the Canadian National railways over its eastern network on Mondays in February and March, 1932: (1) Gaspé, au bord de la mer; (2) Le beau danseur; (3) Les loups-garous; (4) Les trésors enfouis; (5) Le château Bigot; (6) Le cheval noir; (7) La chasse Gallery; (8) Les revenants; (9) La poule noire.

Accessions to Museum

The additions to the collections of the National Museum have been less than usual this year, owing to the small amount of field work undertaken. This loss has been offset to a certain extent, however, by the receipt of the large collection of archæological material from the estate of the late Dr. H. M. Ami. Some of this material has had to be discarded as showing no signs of human workmanship. It is, therefore, unwise to estimate the number of specimens that will be retained after distribution of duplicates to other institutions. Another valuable accession is an interesting wampum record from the Iroquois which was secured through Chief Loft, of Caledonia, Ontario.

The specimens catalogued in the course of the fiscal year are:

Ethnological.....	50
Archæological.....	490
Osteological.....	4
Total.....	544

The Ami collection is not included in the above table.

(a) FROM STAFF:

From W. J. Wintemberg:

33 archæological specimens from Hull, Quebec.

(b) DONATIONS:

From the H. M. Ami estate:

Large series of archæological specimens from France.

Human cranium from the central Arctic

From the H. F. McLachlin estate:

Copper spear-point from Algonquin park, Ontario

From the Rev. P. A. McEwen estate:

Turtle form carved in soapstone, from Ontario

From W. H. Collins:

Copper celt from Georgian bay, Ontario

From E. M. Kindle:

Human frontal bone from lake Deschenes, Quebec

From L. S. Russell:

Human remains from Bassano, Alberta

From F. H. McLearn:

3 archæological specimens from Saskatchewan

From R. T. D. Wickenden:

350 archæological specimens from Saskatchewan

From D. C. Scott:

20 ethnological specimens from parts of Canada

From Fenley Hunter:

Moose-hair embroidery from Simpson, N.W.T.

From Major L. T. Burwash:

4 pieces of Eskimo clothing from the central Arctic

From Miss F. McGillivray:

3 ethnological specimens from the prairies

3 archæological specimens from Ontario

From H. McGregor:

Stone beads from Stillwater, B.C.

From J. McDermaid:

2 archæological specimens from Hull, Quebec

From P. Orkin:

7 archæological specimens from Hull, Quebec

From W. B. Hoare:

9 archæological specimens from Repulse bay, N.W.T.

From John Steele:

22 archæological specimens from Ontario

From J. R. Kerr:

10 pottery fragments from Manitoba

From H. W. Seton-Karr:

8 archæological specimens from Somaliland, E. Africa

From K. F. Wiest:

7 archæological specimens from the United States

(c) PURCHASES:

From L. S. Russell:

Blackfoot saddle and trappings from Alberta

From F. Loran:

30 archæological specimens from Manitoba

From A. B. Clemons:

Lizard form in rock, from Saskatchewan

From Chief Loft:

Wampum record from Ontario

From H. H. Cheney:

3 pieces of clothing from the interior of Alaska

From R. S. Bishop:

25 ethnological specimens from the prairies

DIVISION OF BIOLOGY

R. M. Anderson, Chief of the Division, reports:

Progress has been made in detailed study and identification of the accumulated reserve collections of the National Museum of Canada. At the end of the year the catalogued specimens of birds in the museum numbered 25,010, and of mammals 11,427. In connexion with the systematic studies, several consignments of specimens were determined for various collectors and institutions. The museum specialists are always glad to examine and determine specimens of mammals and birds from any part of the country for the information of collectors, and to receive authentic records of the distribution and spread of species. In some cases new records of occurrences of species in various provinces, and even new records for the Dominion of Canada, have been secured in this manner.

Various lots of specimens have been received on loan from: Royal Ontario Museum of Zoology, Toronto; Provincial Museum, Victoria, B.C.; Provincial Museum, Regina, Sask.; Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Museum of Vertebrate Zoology, University of California, Berkeley; California Academy of Sciences, San Francisco; Bureau of the Biological Survey, United States Department of Agriculture, Washington, D.C.; Field Museum of Natural History, Chicago; and the Charles P. Connor Museum, State College of Washington, Pullman, Washington; also from Mr. Stuart Criddle, Treesbank, Man.; Mr. Kenneth Racey, Vancouver, B.C.; Mr. Eli Davis, London, Ont.; and Mr. Wm. H. Moore, Scotch Lake, N.B.

Mr. Anderson was delegated by the department to attend a biological conference held at Matamek, Moisie bay, Saguenay county, Que., from July 24 to August 1, under the auspices of Mr. Copley Amory, of Washington, D.C. Mr. Amory has been a summer resident on the north shore of the gulf of St. Lawrence for over twenty-five years and has observed the ebb and flow of animal and plant life of both land and sea, and the far-reaching effects of these cycles or fluctuations in abundance on the health, economic status, and general well-being of the human population. These problems have been studied in a more or less detached way by scientists in different countries, and Mr. Amory conceived the idea of gathering specialists in many more or less allied subjects—mammalogy, ornithology, entomology, ichthyology, marine biology, forestry, meteorology, climatology, and general ecology—for a round table conference where the problems could be discussed from various angles. About thirty people from five different countries—Canada, the United States, England, Scotland, and Germany—accepted Mr. Amory's hospitable invitation, and both the Federal Government and the Quebec Provincial Government sent delegates to take part in the conference. Mr. Charles Camsell, Deputy Minister of Mines, acted as Chairman of the conference.

Papers were presented on fluctuations in wild life in various aspects, reports on the ruffed grouse investigations that have been carried on for several years, salmon investigations, cod fisheries, the whaling industry, climate in relation to forestry, astronomical cycles, fur-farming, and epidemic diseases of animals in a wild state and in captivity, and the

relations of all these topics to wild life conservation. The relations of museums to wild life investigations were presented by Charles Elton of Oxford University Museum, H. E. Anthony of the American Museum of Natural History, J. R. Dymond of the Royal Ontario Museum of Zoology, and R. M. Anderson of the National Museum of Canada. The importance of accurate determination of species when recording field and laboratory investigations was stressed. Emphasis was also laid on the function of the larger scientific museums obtaining zoological material of all kinds and preserving it for investigational research and for future reference and in identifying specimens for field workers, game officials, pathologists, and bacteriologists. It is expected that the proceedings of the conference will be published by the generosity of Mr. Amory, and credit is due to him for his service to science in initiating and carrying through this conference.

Field Work

Mr. Clyde L. Patch, chief taxidermist, assisted by Mr. J. E. Perron, museum-helper, made a biological reconnaissance between Ottawa and Kingston, Ont., from July 21 to August 19, 1931. Camps were made at Clayton lake near Clayton, Sharbot lake, Clear lake near Arden, Loughborough lake and Collins lake near Inverary, and Seeley bay. In all, 204 amphibians, reptiles, mammals, and birds, representing 37 species, were collected. These made interesting additions to the museum collections, which contained few specimens from the area covered. The several broods secured of the ribbon snake, *Thamnophis sauritus*, supply data on the number and individual variation of young and the dates of their arrival. This snake is rare in Canada, being recorded from only three localities, and was previously represented in our herpetological collection by a single specimen. Discovery of the blue-tailed skunk, *Eumeces fasciatus*, at Mountain Grove, Ont., extends the known range of this species nearly 100 miles eastward. The cottontail rabbit, *Sylvilagus floridanus mearnsii*, was found to be abundant in the southern part of Frontenac county and several specimens were taken at Clear lake and Collins lake. Information gathered from residents indicates that the cottontail is extending its range in that region. During the autumn and winter of 1931-1932 the cottontail was reported for the first time in Ottawa and its environs in Carleton county. Reports have also been received of damage caused by the cottontail to trees and young shrubbery in Rockcliffe. No reports of this species have yet been received from Quebec, but as specimens have been seen along Ottawa river, it is anticipated that the cottontail rabbit will soon spread northward into parts of Quebec where prevailing conditions are suitable.

Mr. Claude E. Johnson, artist, spent the time between July 21 and September 14, 1931, at Halifax, N.S., making coloured drawings of Atlantic food fishes, to be used for illustrative purposes, in co-operation with the Department of Fisheries. Laboratory facilities and assistance in obtaining fresh material were provided by Mr. R. S. Shreve, Acting Chief Supervisor of the Department of Fisheries at Halifax, and by Dr. A. H. Leim, Director of the Halifax Experimental Station of the Biological Board of Canada. Thirty-two coloured plates and twenty detail pen sketches were made; several plaster casts were made for exhibition in the museum, as well as a collection of marine specimens in formalin.

Mr. Charles H. Young, collector-preparator specialist, collected and mounted about 500 specimens of *Microlepidoptera* in Ottawa district, and C. E. Johnson, D. Blakely, taxidermist, and Jos. Rochon, osteological preparator, collected a few specimens of local animals.

Office Work

R. M. Anderson completed the manuscript for a museum bulletin on "Methods of Collecting and Preserving Vertebrate Animals." This is primarily intended to give necessary instruction in modern methods to field workers in the interest of the museum and collectors of scientific material, as well as to give valuable information to trappers, hunters, farmers, or nature lovers who may wish to collect specimens for themselves or to preserve specimens in shape for identification. Thousands of valuable specimens are lost or destroyed every year on account of ignorance of their scientific value or lack of knowing how to take care of them. This work is illustrated by forty-six line drawings by Mr. C. E. Johnson. Work was continued on a report on "Animal Life and Life Zones of Southern British Columbia", covering the four seasons' work (1927-1930) of museum field parties along the International Boundary from the strait of Georgia to the Rocky mountains. Some progress has been made on the "Check-List of Canadian Mammals", the completion of which depends largely on intensive work in previously neglected regions of the Dominion. The same contingencies have operated on the progress of work on the projected illustrated and descriptive book on the "Mammals of Canada" which has been under way for several years.

Mr. P. A. Taverner completed the manuscript and drawings for a bulletin on "Water Birds, Game Birds, and Birds of Prey of Canada," and work was begun on the compilation of a new descriptive book on "Birds of Canada," combining the essential features of his previous works, "Birds of Eastern Canada", and "Birds of Western Canada", which are now out of print.

Progress has been made by C. L. Patch, chief taxidermist, in preparing and installing biological exhibits in the museum hall. The following birds and mammals, either in groups or as single specimens, have been placed on exhibition in the systematic habitat series. Mammals: polar bear cub (Banks island); red squirrel and young, grey and black squirrels (Ontario), eastern woodchuck (Ontario). Birds: chestnut-sided warbler and young (Ontario), nighthawk (Ontario); golden plover and young (Churchill, Man.); American scoter (Ottawa river), starling (Ontario); sage grouse (Saskatchewan). In the taxidermy section 169 birds and mammals were prepared for the study collections. The exhibits containing sections of 67 forest trees of Canada were re-labelled and re-arranged. Progress has been made in preparing an exhibit of several species of the most important large Canadian forest trees, with sections of the trunks. A total of 314 mammals, birds, amphibians, and reptiles were loaned for nature study and art work in the schools.

Considerable work in re-arranging insect exhibits has been done by Mr. W. B. Hutchings, of the Entomological branch, Department of Agriculture, under direction of Mr. Arthur Gibson, Dominion Entomologist,

and Curator of Insects in the National Museum. Mr. C. E. Johnson and Mr. Chas. H. Young of the museum staff assisted in the entomological exhibit work by remounting and making accessories for six habitat cases of large insects showing the food plants, and work is progressing on several more cases of the same type.

Lectures

The Place of Systematic Zoology in Study of Wild Life Fluctuations. By R. M. Anderson. At Canadian Biological Conference, Matamek, Saguenay county, Que.

Mammal Life of Ontario. By R. M. Anderson. Carleton East and Carleton West Teachers' Institutes, at National Museum of Canada.

The Gannets of Bonaventure. By Clyde L. Patch. Hull Intermediate School, Hull, Que.

Amphibians and Reptiles. By Clyde L. Patch. The Province of Quebec Society for the Protection of Birds, Montreal, Que.

Accessions to Museum

ZOOLOGICAL COLLECTIONS

Mammals received and catalogued.....	179
Birds received and catalogued.....	169
Amphibians and reptiles received and catalogued.....	265
Insects received and catalogued.....	502
Nests and eggs received and catalogued.....	5

MAMMALS

<i>By Members of Staff</i>	96
<i>By Gift</i>	83

Stuart Criddle, Treesbank, Man. 1 skin and skull of pocket gopher (*Thomomys t. talpoides*), melanistic specimen.

W. H. Bryenton, Herb lake, Man., 1 skin and skull of red-backed mouse.

E. G. White, Ottawa, 1 head of northern white-tailed deer, male, in the flesh.

Mrs. S. K. Squires, Fredericton, N.B., 1 white-footed mouse, in the flesh.

Dr. R. E. DeLury, Ottawa, 1 varying hare, 1 red squirrel, and 2 black squirrels, in the flesh.

Arthur D. Pope, Ottawa, 6 red squirrels, juvenile, for mounted family group.

Miss Margaret White, Ottawa, 1 muskrat, in the flesh, taken on streets of Ottawa.

Dr. A. A. Kingscote, Guelph, Ont., 1 skin and skull of silver fox, from experimental station.

J. A. Munro, Okanagan Landing, B.C., 1 skull of bighorn sheep, from Vaseux lake, B.C.

Geo. H. Hammond, Entomological Branch, Dept. of Agriculture, White Grub Laboratory, Clarenceville, Que., 1 short-tailed shrew.

H. M. Laing, Comox, B.C., 2 skulls of northwestern cougar, 1 skeleton of Vancouver Island marten.

Hoyes Lloyd, Ottawa, 1 eastern chipmunk, in the flesh.

H. D. Merrill, Prince Albert, Sask., 1 "hunter's skin" of muskrat, near albino, from Foster lakes, northern Saskatchewan.

R. M. Anderson, Ottawa, 1 skin and skull of Rhoads red-backed mouse, *Clethrionomys gapperi rhoadsii* (Stone), *topotype*, taken at Mare Run, May's Landing, New Jersey, May 16, 1931, collected and prepared by A. H. Howell, Francis Harper, and E. A. Preble.

J. M. Swaine, Associate Dominion Entomologist, 1 long-tailed shrew (*Sorex cinereus*), from Cascapedia river, Que.

R. T. D. Wickenden, Ottawa, skins and skulls of 3 black-tailed prairie-dogs (*Cynomys ludovicianus*), 1 Richardson ground squirrel, 1 white-footed mouse, from Saskatchewan; 1 red squirrel from Ottawa district.

MAMMALS—Concluded

By Gift—Concluded

- G. Potter, Ottawa, 1 big brown bat (*Eptesicus fuscus*), found flying in house, Dec. 17, 1931.
- Northwest Territories and Yukon Branch, Department of the Interior, Ottawa, 3 skins of lemming, from Lake harbour, Baffin island, collected by J. D. Soper.
- National Parks of Canada, Department of the Interior, 4 skulls of black bear (subadult), from Waterton Lakes park, Alberta; 2 skulls of grizzly bear (subadult), from Waterton Lakes park, Alta.; 2 skins and 2 skulls of grizzly bear (young), from Jasper park, Alta.
- Hudson's Bay Company, mammal skulls (2 otter, 7 mink, 1 marten, 1 muskrat, 9 weasels) collected by W. Jefferys, Mistassini post, Que.; 20 small mammals, including 14 skins and 6 skulls (red squirrel, flying squirrel, grey chipmunk, weasel, meadow mouse, mink), and 1 long-tailed shrew in formalin; collected by F. McLeod, Woswonaby post, Que.

By Purchase:

- Northwest Territories and Yukon Branch, Department of the Interior, by payment of bounty, 1 skin of very large black wolf, taken near Fort Reliance, N.W.T.

By Exchange:

- Morris M. Green, Ardmore, Pennsylvania, 1 skin and skull of Alaska brown lemming (*Lemmus trimucronatus alascensis*), *topotype*.
- Stuart Criddle, Treesbank, Man., 2 skins and 2 skulls of pocket gopher (*Thomomys talpoides rufescens*).

BIRDS

By Members of Staff: 16 specimens.

By Gift:

- W. H. Bryenton, Herb lake, Man., skins of snowy owl, great horned owl, Richardson owl, and pileated woodpecker.
- Department of Marine, Ottawa, 1 common loon, with nest and eggs, collected by Capt. John Hearn, C.G.S. *Mikula*, obtained from Eskimo, latitude 60° 44' north, longitude 70° west.
- Dr. R. E. DeLury, Ottawa, 1 purple finch, 2 robins, 1 ruby-throated hummingbird, 1 white-breasted nuthatch, in the flesh, found dead at Central Experimental Farm.
- National Parks of Canada, Department of the Interior, 1 horned grebe in the flesh, killed at McDonald lake, Que.; 1 horned owl in the flesh, picked up by S. Hennessey, Ottawa; 3 whistling swans in the flesh, from Niagara Falls, Ont.
- R. W. Tufts, Wolfville, N.S., 1 set of eggs of spruce grouse.
- Northwest Territories and Yukon Branch, Department of the Interior, 1 little brown crane from mouth of Parry river, Arctic coast, 1 snowy owl from Gjøa haven, King William island, and 1 old-squaw duck from Bathurst inlet, collected by Major L. T. Burwash; 64 skins of birds from Lake harbour, Baffin island, collected by J. Dewey Soper in 1930-1931; 3 skins of Ross goose from Chipewyan, Alberta, through John A. McDougal, district agent at Forth Smith, N.W.T.
- Prof. Wm. Rowan, Department of Zoology, University of Alberta, Edmonton, 4 skins of dowitcher, *Limnodromus griseus*, from Alberta; 1 head of whistling swan.
- B. C. Lloyd, Davidson, Sask., 1 skin of hybrid willow ptarmigan x spruce grouse, taken near York Factory, Man., by Ven. Archdeacon R. Faries (described and illustrated in Annual Report, 1930, National Museum of Canada, 1932, page 89, Plate I).
- Frank Lake, Ottawa, 1 yellow-bellied sapsucker, in the flesh.
- Anonymous donor, Ottawa, 1 bluebird, in the flesh.

BIRDS—Concluded

By Gift—Concluded

- Richard Schock, Ladysmith, Que., 1 goshawk, in the flesh.
 Stuart Markell, Ottawa, 1 Florida gallinule, in the flesh, from Wales, Ontario, May 15, 1931.
 Hudson's Bay Company, 1 skin of Richardson owl, collected by W. Jefferys, Mistassini post, Que.
 Frère Gabrielis, St. Tite, Comte de Champlain, Que., 1 nest of house sparrow.
 R. T. D. Wickenden, Ottawa, 4 skins of Swainson hawk, 3 marsh hawk, 1 ferruginous rough-legged hawk, 2 great horned owls, 4 sage grouse, from Saskatchewan; 1 great horned owl, in the flesh, from Ottawa.
 Ottawa Humane Society, 1 saw-whet owl, juvenile, taken from a boy at market; died in captivity.
 John Mallon, Ottawa, 1 cedar waxwing, found dead.
 H. M. Laing, Comox, B.C., 1 sandhill crane, taken 15 miles inland, Oyster river, Vancouver island.
 John Marshall, Ottawa, 1 American scoter, in the flesh.
 Louis Carrier, Val Morin, Que., 1 great horned owl, in the flesh.
 Poultry Division, Central Experimental Farm, Ottawa, 1 great horned owl, in the flesh.
 Hudson's Bay Company, skins of 3 snowy owls, 2 hawk owls, 2 ptarmigan, from Great Whale River post, east side of Hudson bay, Que.
 G. Wiggins, Maryland, Pontiac county, Que., 1 red-tailed hawk, juvenile, in the flesh.
 Major Allan Brooks, Okanagan Landing, B.C., 2 skins of juvenile western evening grosbeak, *Hesperiphona vespertina brooksi* Grinnell.
 Hugh Kelly, Ottawa, 1 great horned owl, in the flesh.
 A. L. Gormley, Pakenham, Lanark county, Ont., 1 great horned owl, in the flesh.
 Anonymous donor, Ottawa, 1 great horned owl, in the flesh.
 L. B. Potter, Eastend, Sask., 1 sharp-shinned hawk, in the flesh.
 E. Marshall, Ottawa, 1 American coot, in the flesh.
 C. F. Holmes, Dollard, Sask., 1 sage grouse, in the flesh.
 Arthur C. Twomey, Camrose, Alberta, 1 Caspian tern, fresh skin for mounting.
 J. M. Ullett, Woodroffe, Ont., 1 double-crested cormorant, in the flesh.
 H. H. Pittman, Wauchope, Sask., 1 skin of Hutchins's goose.
 A. J. Shortt, Ottawa, 1 red-throated loon, found wing-tipped on roadway 5½ miles south of Ottawa.
 Willcox McLachlan, Masson, Que., 1 starling, in the flesh.
 R. A. Cummings, Vancouver, B.C., 2 band-tailed pigeons, 6 fox sparrows, 3 white-crowned sparrows, 3 marbled murrelets, 2 nests and eggs of little flycatcher.

By Exchange:

- James Moffitt, San Francisco, Cal., 4 skins of Ross goose, 1 skin of tulé goose.
 J. H. Fleming, Toronto, 1 skin of white-winged dove.
 Dr. Louis B. Bishop, Pasadena, Cal., 3 sage sparrows, 2 white-faced glossy ibis, 1 Louisiana heron, 1 yellow-billed loon.
 H. V. Williams, Grafton, N.D., 6 skins of red-tailed hawk.
 R. W. Tufts, Wolfville, N.S., 2 skins of Acadian sharp-tailed sparrow, green skins for mounting.

AMPHIBIANS AND REPTILES

<i>By Members of Staff</i>	200
C. L. Patch, Frontenac county, Ont., and Blue Sea lake and Gatineau Point, Que.....	177
C. E. Johnson, Halifax and Hubbards, N.S., and Ottawa, Ont.....	21
J. E. Perron, Arden, Ont.....	2
<i>By Gift and Exchange</i>	65
J. Roland Brown, Georgia.....	3
W. A. Dent, Sarnia, Ont.....	1
Lawrence Gething, Hudson Hope, B.C.....	1

AMPHIBIANS AND REPTILES—Concluded

By Gift and Exchange—Concluded

Victor E. Gould, Wolfville, N.S.	3
Charles F. Holmes, Georgovia, Sask.	1
D. Leechman, Ottawa	2
Edgar Lester, Arnprior, Ont.	1
Robert Lockwood, Golden Lake, Ont.	1
L. Marcotte, Sherbrooke, Que.	1
Erich Marherr, Europe	13
Wm. H. Moore, Scotch lake and Macnaquac, N.B.	17
Lloyd W. Patch, Edgewater, Maryland	2
J. P. Perron, Ottawa	1
Catherine Renaud, Wilson Corners, Que.	1
Werner Schroeder, Italy and Germany	12
R. W. Tufts, Wolfville and Spa springs, N.S.	2
C. R. Twinn, Montebello, Que.	1
L. N. Wadlin, Aylmer, Que.	1
A. A. Wood, Indian Head, Sask.	1

FISH

By Gift:

- Mrs. W. Taggart, Ottawa, 1 gar pike (*Lepidosteus osseus*), from Constant bay, Ottawa river.
Northwest Territories and Yukon Branch, Department of the Interior, Ottawa, 8 specimens of sticklebacks and Arctic charr, from Lake harbour, Baffin island, N.W.T., collected by J. Dewey Soper, summer of 1931.

ARTHROPODS

By Members of Staff:

- Charles H. Young, 500 specimens of Microlepidoptera from Ottawa district, mounted.

By Gift:

- W. J. Spence, Ottawa, 1 tarantula, caught alive in bunch of bananas at J. Smiley's fruit store, Ottawa.
Mrs. H. Coleman, Ottawa, 1 striped morning sphinx.
Northwest Territories and Yukon Branch, Department of the Interior, Ottawa, 5 bottles of insects, from Lake harbour, Baffin island, N.W.T., collected by J. Dewey Soper, summer of 1931.

National Herbarium

M. O. Malte, Chief Botanist, made substantial progress in the work on the Flora of Arctic Canada, due in part to collections of Arctic plants being obtained as loans from the United States National Herbarium, Washington, D.C., The New York Botanical Garden, New York, and The Gray Herbarium, Cambridge, Massachusetts. No field work was undertaken.

<i>Plants received</i>	974
Gray Herbarium, Cambridge, Mass.	2
Farlow Herbarium, Cambridge, Mass.	88
Morten P. Porsild, Disko, Greenland	445
Botanical Museum, Copenhagen, Denmark	243
B. Lynge, Oslo, Norway	15
Northwest Territories Branch, Department of the Interior	124
A. M. Berry, Sioux Lookout, Ont.	56
H. Groh, Ottawa	1

DIVISION OF PALÆONTOLOGY (Geological Survey)

E. M. Kindle, Chief of the Division, reports:

Office Work

Mr. C. M. Sternberg made good progress with the preparation of a catalogue of the types in the vertebrate collections and has completed a manuscript on the Carboniferous footprints in the Museum. Miss A. E. Wilson has contributed work on the catalogue of type invertebrate fossils and has with the assistance of Mr. A. LaRocque completed one of the new table case exhibits. Miss M. Fritz, of the University of Toronto, has submitted a report on "The Permian Bryozoa of Vancouver Island". Dr. Roy L. Moodie reports that his manuscript on the "Palæopathology of Canadian Dinosaurs" is nearly completed. The manuscript on the Devonian coral faunas of the southern part of Mackenzie River valley, by Professor Stanley Smith of Bristol, England, is approaching completion. Work by E. M. Kindle on the Bibliographic Index of North American Devonian fossils has been in progress throughout the year. The section on the Crinoidea has been completed and collaborators have made good progress with other sections. The planning and installation of new Museum exhibits have occupied considerable time.

Museum Exhibits

A large collection of Cretaceous dinosaur tracks representing eight species, from Peace River canyon, Alberta, has been placed on exhibition. New mounts of Palæozoic footprints were prepared and the collection of Carboniferous tracks re-arranged. A new case of mammals, including a collection of Pleistocene vertebrates from the Klondike placer deposits, with mammoth, camel, and other extinct vertebrates, was completed. An exhibit of fossil fishes representing chiefly the best known Canadian horizons of these vertebrates has been installed. Restorations of some of the Upper Devonian Gaspé fishes by Mr. L. S. Russell and a water colour picture of the noted locality for these fishes at Maguasha, Que., by Mr. Arthur Miles, add to the interest of this exhibit.

Educational Work

Loans of small collections of fossils to illustrate classroom work have been made to city schools when requested. A series of motion picture reels showing the various stages of collecting, transporting, mounting, and exhibiting large vertebrate fossils, as well as life-like restorations of the daily life of dinosaurs in Cretaceous times, has, through co-operation with the moving picture Bureau, been revised during the year.

Visiting Scientists

The exhibit and reference collections, which include fossils from nearly every section of Canada, are available for study by Canadian and foreign palæontologists who may wish to visit the Museum in connexion with research problems. Among the palæontologists who have visited

the Museum during the year for the purpose of studying the fossil collections are Prof. R. S. Lull, of the Peabody Museum, at Yale, and Prof. H. P. Lewis of Sheffield University, England.

Publications

The following papers were published by members of the staff during the year:

"A New Viewpoint in Palaeontology." By E. M. Kindle. Trans. Roy. Soc., Canada, 3rd ser., vol. XXV, sec. IV, pp. 21-27.

"Sea Bottom Samples from the Cabot Strait Earthquake Zone." By E. M. Kindle. Bull. Geol. Soc., Am., vol. 42, pp. 557-574, 2 figs.

"What Are Fossils Good For"?. By E. M. Kindle. Can. Min. Jour., March, 1932, pp. 110-112.

"The Earliest Geological Map in Canada." By E. M. Kindle. Can. Min. Jour., vol. 52, No. 28, pp. 798-799.

"Early Tertiary Mollusca from Wyoming." By L. S. Russell. Bulletins of American Palaeontology, vol. 18, No. 64, pp. 1-38, Pls. 1-4 (1931).

"Notes on Baffinland Fossils." By A. E. Wilson. Trans. Roy. Soc., Canada, 3rd ser., vol. XXV, sec. IV, pp. 285-306.

Accessions to Museum

Several small collections of fossils from various parts of Canada have been examined and reported on during the year.

Exchanges of small collections of fossils have been arranged with the Museums of Cornell University, the Ohio State University, and the Royal Ontario Museum.

A large collection of invertebrate fossils was generously donated by Mrs. H. M. Ami. This valuable collection, which consists mainly of Palaeozoic fossils from the Ottawa and St. Lawrence valleys, was collected and assembled by the late Dr. H. M. Ami.

Other collections received during the year from members of the staff and other sources are recorded as follows:

VERTEBRATE FOSSILS

Presented:

U.S. National Museum, Washington, D.C., U.S.A.

Fish scales on two pieces of rock from Canyon City, Colorado, U.S.A.

U.S. National Museum, Washington, D.C., U.S.A.

Cast of phalanx of camel from the Klondike.

Sternberg, C. M., Ottawa, Ontario

Mallotus villosus (Muller), 6 specimens in nodules from Ottawa river below Greens creek. Pleistocene (Leda clay).

Redpath Museum, Montreal, Quebec

Cheirotherium barthi Kaup, cast of 4 tracks (fore feet and hind feet), also small track. Jurassic (Bunter sandstone), near Hilderberghausen, Saxony.

Redpath Museum, Montreal, Que.

Cheirotherium barthi Kaup, cast of 4 tracks. Jurassic (Bunter sandstone), near Hilderberghausen, Saxony.

Redpath Museum, Montreal, Quebec

Archaeornis siemensii (Dames), cast of skeleton. Jurassic (Lithographic limestone), Eichstadt, Bavaria.

Redpath Museum, Montreal, Quebec

Rhamporhynchus phyllurus Marsh, skeleton showing wing membrane. Jurassic (Lithographic limestone), Solenhofen, Bavaria.

Fowler, Roy L., Aldersyde, Alberta

Aspideretes superstes Russell, carapace. Paskapoo, High river, at mouth of Sheep creek.

VERTEBRATE FOSSILS—*Concluded**Exchange:*

- Ohio State University, Columbus, Ohio, U.S.A.
Macropetalichthys sullivanii Newberry, cephalic shield. Middle Devonian
 (Columbus limestone), Columbus, Ohio, U.S.A.
 Peabody Museum, Yale University, New Haven, Conn., U.S.A.
Hipparion gracile Kaup, cast of skull and jaws. Pliocene (Pikermi beds)
 Pikermi near Athens, Greece.
 Peabody Museum, Yale University, New Haven, Conn., U.S.A.
Semionotus micropterus (New.), complete fish. Triassic, Lake Saltonstall,
 E. Haven, Conn., U.S.A.

INVERTEBRATE FOSSILS

Presented:

- Wm. Allingham, Geol. Surv., Canada, Ottawa
 1 Cephalopod; Main st., Westboro. Ordovician.
 Emil Bronlund
 A small collection of fossils from Sturdee creek, a tributary of Finlay river.
 G. E. Fairbairn, Borings Division, Geol. Surv., Canada
 21 lots (in vials and envelopes) fossils from Wright's quarry, Hull, Que.
 Ordovician.
 Dr. I. W. Jones, Quebec Geol. Surv., Quebec, Que.
 2 specimens *Favosites helderbergiae*; Pekan brook, 1,700 feet from its junction
 with Madeleine river, Gaspé pen., Que. Devonian.
 Prof. H. P. Lewis
 A small collection of Brachiopods from Abitibi river, northern Ontario.
 Devonian.
 T. A. Link (Imperial Oil Co.), through G. S. Hume
 A small collection of fossils from the right bank of St. Mary river, L.S. 2,
 sec. 33, tp. 4, range 24, W. 4th mer.
 Burritt Smith, Skaneateles, N.Y.
 4 specimens *Ephora quadricostata* (Say); St. Marys, Maryland. Miocene.
 W. N. Playfair, Esq.
 2 specimens from the Ordovician of Hull, Que.
 U.S. National Museum, Washington, D.C., U.S.A.
 12 specimens Medusea, Middle Cambrian fossils from the Coosa valley,
 Alabama, U.S.A.

Exchange:

- C. L. Fenton, 915 Columbus st., West Liberty, Iowa
 (a) Recent brachiopods from Puget sound, B.C.
 (b) Burgess shale fossils from mount Field, B.C.
 U.S. National Museum, Washington, D.C.
 49 species (100 specimens) Cambrian invertebrates (various localities).
 C. E. Weaver, University of Washington, Seattle, Washington
 A collection of Tertiary fossils from the state of Washington; identified and
 labelled.

By Staff:

- C. E. Cairnes
 5 lots of fossils from the vicinity of Okanagan lake, B.C.
 W. E. Cockfield
 6 lots of fossils: vertebrates, invertebrates, and plants, British Columbia.
 Mesozoic.
 H. C. Gunning
 8 lots of fossils, Vancouver island.
 G. S. Hume
 Fossils from Canyon creek, Moose mountain, Bow River forest reserve.
 Carboniferous and Jurassic.
 D. F. Kidd
 Fossils, Ferguson river. Pleistocene.
 E. M. Kindle
 Pelecypods encrusted with marl; Mink lake, near Eganville, Ont. Recent.

INVERTEBRATE FOSSILS—*Concluded**By Staff—Concluded*

- C. H. Kindle
Trilobites, etc., Murphys creek, 2 miles east of corner of beach (near Percé), Que. Cambrian.
- B. R. MacKay
3 trays fossils; Blairmore area, Alberta. Palæozoic and Mesozoic.
2 lots of fossils; Byron creek and Bellevue, Alberta. Carboniferous.
- L. S. Russell
Land, freshwater, brackish-water, and marine molluscs; vertebrates; southern Alberta and Saskatchewan. Mesozoic and Cenozoic.
- W. J. Wintemberg
1 box marine invertebrates; 1 slab rock with *Petricola pholadiformis* and borings; Magdalen islands. Recent.
- L. S. Russell
Series of samples of Bearpaw shale from southern Alberta, containing foraminifera.
- R. T. D. Wickenden
Series of 20 samples from the Bearpaw in southern Saskatchewan, containing foraminifera.
- R. T. D. Wickenden
8 species of foraminifera from well samples in the Alberta shales in southern Alberta.
- R. T. D. Wickenden
Foraminifera from well samples: Pembina valley, Manitoba; Boyne beds to Palæozoic, Moose Jaw, Sask.; Bearpaw to Palæozoic, Simpson, Sask.; Bearpaw to Palæozoic, Outlook, Sask.; Bearpaw to top of Alberta shale; Boundary well, L.S. 4, sec. 9, tp. 1, range 27, W. 3rd mer., Lower Bearpaw to Lower Jurassic; Rush lake, L.S. 2, sec. 30, tp. 19, range 11, W. 3rd mer., Lower Bearpaw to Lower Cretaceous; Eagle Butte, Alberta, well No. 1, Bearpaw to Lower Cretaceous.

By Purchase:

- G. F. Sternberg, Esq., Hays, Kansas, U.S.A.
1 slab radiolites, south of Castle Rock, Cove co., Kansas, U.S.A.
- Ward's Nat. Sci. Estab., Rochester, N.Y., U.S.A.
1 slab *Fusulina secalica* from the Pennsylvanian Coal Measures near Tecumseh, Nebraska, U.S.A.

LITHOLOGIC SPECIMENS

- E. M. Kindle, Geol. Surv., Canada, Ottawa
A collection of marl balls, Canandaigua lake, N.Y. Recent.
- L. J. McCullagh, Roche-Percée, Sask.
A small collection of concretions from sec. 24, tp. 1, range 7, W. 2nd mer.
- J. F. Morkill, M.E.I.C.
Blue clay concretions; banks of St. Francis river, Que.

DIVISION OF MINERALOGY (Geological Survey)

Eugene Poitevin, Chief of the Division, reports:

Owing to lack of space it is impossible to put the systematic collection of minerals on display and it has been considered advisable to limit activities in the museum halls to improving the present exhibits and changing them from time to time as public interest demands. The systematic collection, however, is not suffering from neglect; it is added to as opportunity arises and has been considerably increased during the year.

There were 667 educational collections prepared during the fiscal year; almost half of these were prospector's collections and 200 were educational collections prepared for the Bureau of Mines, Quebec.

The following are the most outstanding items of museum work performed:

- (1) Preparation of a large number of collections for the Quebec government.
- (2) Cataloguing systematic collections.
- (3) Incorporation of a large number of specimens from various localities in the systematic collection.

During the year just ended, Mr. F. D. Moose, museum helper, was superannuated after seventeen years of continuous service.

Field Work

H. V. Ellsworth, mineralogist, spent a few days examining the Cardiff Township, Ontario, uranium deposits and about a week in the Eastern Townships of Quebec examining chromiferous iron deposits.

A. T. McKinnon, mineral collector, spent five weeks during the summer months in Ontario and Quebec, where he collected $15\frac{1}{2}$ tons of minerals needed for the preparation of our educational collections.

Laboratory and Office Work

The number of visitors seeking information regarding the mineral industry was about the same as usual. A large number of ores, mineral specimens, and rocks collected throughout Canada were investigated and reported on as to their commercial value.

In addition to the administration of the division, Eugene Poitevin spent a good deal of his time in the further study of chromite ores and their associated ultrabasic rocks, of which some of the results were published in the Summary Report of the Geological Survey for 1930, part D. He has also continued the study of the minerals occurring in the granite rocks cutting the serpentine of eastern Quebec.

H. V. Ellsworth studied some minerals from the Great Bear Lake pitchblende deposits. Considerable time was spent in connexion with the installation of spectroscopic equipment. An investigation into possible sources of vanadium in Canada is also in progress.

R. J. C. Fabry completed the analyses of the following rocks and minerals.

Minerals: Three minerals were analysed in full, viz.: chromite (purified from foreign minerals) from Montreal chrome pit, Coleraine township, Megantic county, Que. (for Mr. Poitevin); chromite (purified from foreign minerals) from summit of Olivine mountain, Tulameen, B.C. (for Mr. Poitevin); manganese ore, NW. $\frac{1}{4}$ lot 3, McTavish tp., Ont. (for Mr. Tanton). Rocks: One granodiorite to complete a series for Mr. T. T. Quirke (Pickerel River region). Three rocks ranging from a granite via an intermediate stage to an olivine diabase were analysed in full for T. C. Phemister. They came from the following localities, in order of decreasing acidity: (i) Kelly lake, Ont.; (ii) Shakespeare tp., Ont.; (iii) Espanola, Ont.

Numerous analyses were made for Mr. W. H. Collins, of the transition zone material between the norite and micropegmatite of the nickel irruptive; five specimens have been completed from McLennan township, and three specimens from Levack township.

Museum Work

During the year additions have been made in a small way to the exhibits in the National Museum and the Museum has continued to build up the collections by valuable specimens, acquired mostly by exchange.

Educational Collections

During the fiscal year just ended 1,661 specimens were used in the preparation of 667 collections, which were issued as follows:

Province	Grade 2	Grade 3	Special grade 4	Miscellaneous	Mineral chips	Prospector's minerals	Prospector's rocks
Yukon.....	0	0	0	0	0	0	0
British Columbia.....	0	0	0	6	0	69	44
Alberta.....	0	0	0	0	0	13	9
Saskatchewan.....	0	0	0	1	0	21	9
Manitoba.....	0	0	0	0	0	23	11
Ontario.....	0	39	0	18	1	84	51
Quebec.....	0	1	200	7	0	13	4
New Brunswick.....	0	0	0	0	0	4	1
Nova Scotia.....	0	0	0	0	0	6	2
Prince Edward Island	0	0	0	0	0	0	0
Foreign.....	1	1	0	13	0	10	5
	1	41	200	45	1	243	136

Accessions

EXCHANGES:

Mr. Shimatsu Ichikawa, Kitashinjo-mura, Imatate-gun, Fukui-ken, Japan. Five small specimens of quartz; one unlabelled apatite specimen; one lot apatite crystals from Ashio mine, Shimotsuke province, Japan.

Mr. John Obert, 553 Maple ave., Ridgewood, N.J., U.S.A. One specimen stevensite (all pectolite); one specimen prehnite (after anhydrite), Paterson, N.J., U.S.A.

DONATIONS:

Mr. C. E. Cairnes, Geological Survey, Ottawa. Tetradyomite, White Elephant claim, Vernon Mining Division, B.C.

From Dr. Ami's collection—Almandite, Stikine river, Alaska; fine apatite crystals from Ontario and Quebec.

Mr. Wm. P. Crawford, Bisbee, Arizona, U.S.A. Delafossite, Briggs mine, Bisbee, Arizona, U.S.A.

Mr. Thomas Graham, Comox, B.C. Nodule of coal in the Brechin mine of the Western Fuel Company at Nanaimo, Vancouver island, B.C.—collected some time in the year 1907—donated through Mr. Chas. Camsell.

Mr. G. Hanson, Geological Survey, Ottawa. Suite of specimens from the Premier mine, B.C.

DONATIONS—*Concluded*

- Mr. G. A. Labine*, Eldorado Gold Mines (through Mr. D. F. Kidd, Geological Survey, Ottawa). Specimen of pitchblende from the number two zone on the Eldorado Gold Mines property (Cobalt group of mineral claims) at Labine point, Echo bay, on the east side of Bear lake, lat. $66^{\circ} 06'$, long. $118^{\circ} 02'$.
- Mr. Ant. Larose*, Weir, Que. Blue apatite and colourless diopside, lot 10, range 2, Montcalm, Argenteuil co., Que.
- Mr. A. G. McDonald*, Kamloops, B.C. Axinite from 2 miles southeast of "Paul Lake," 12 miles northeast of Kamloops, B.C.
- Mr. H. H. Nininger*, Curator of Meteorites, Colorado Museum of Natural History, Denver, Col., U.S.A. Meteorodes—oxidized pallasite meteorites—from Kiowa county, Kans., U.S.A.
- Mr. B. T. O'Grady*, Resident Mining Engineer, Nelson, B.C. (through Mr. A. T. McKinnon). Three specimens of stannite from Regal Silver Mines, Limited, near Albert canyon, B.C.
One large specimen of cyanite from west bank of Columbia river, Revelstoke, B.C.
- Mr. Chas. G. Palmer*, Duncan, B.C. (through Mr. C. H. Dickie, M.P.). Flexible sandstone from quarry on border of Agra district and Bhartpur state in northern India.
- Mr. T. L. Tanton*, Geological Survey, Ottawa. Braunite and psilomelane from NW. $\frac{1}{4}$ lot 3, McTavish tp., Ont.

THREE IROQUOIS WAMPUM RECORDS

By *Diamond Jenness*

Illustration

PAGE

Plate I. Three Iroquois wampum records..... 29

The National Museum of Canada recently acquired from Chief William D. Loft, an intelligent and highly respected Mohawk Indian of Caledonia, Ontario, three wampum records that appear to be unique enough to deserve illustration and presentation of his interpretations.

The first (Plate I, figure 1) is the covenant or Magna Charta of the League of the Five Nations, the record of its foundation and organization, made by the Iroquois women at the command of *Dekanawida* and his associates when they established the League about 1580 A.D. In the tradition known to Chief Loft, *Dekanawida* appointed fifty sachems from the five nations, Mohawk, Seneca, Onondaga, Cayuga, and Oneida, made them join hands in a circle, and ordained that they should all be of equal rank and bear individual titles. That they might remember their titles and positions in the council house, he then devised this wampum record, which he entrusted to the keeping of an outstanding warrior, a man who bore the title *Sharenhkhonwaneh*, "Majestic Tree," through his appointment as the first sachem of the wolf clan in the Mohawk nation. The successors to this title and sachemship remained the official keepers of the record down to the latest *Sharenhkhonwaneh*, Chief Loft himself, now seventy-three years of age. At the time of the Revolutionary war its keeper was a noted warrior whose ordinary name was *Dewaserageh*, "Two Axe," because he carried two tomahawks into battle. Two Axe deposited the record during that disturbed period inside a brass kettle, which he buried under the soil in the middle of a hazel bush beside Osagundaga creek. There it remained eight years. Then the celebrated Joseph Brant (who was the first sachem, *Tehkarihoken*, of the turtle clan of the Mohawks) secured it for the ceremony renewing the council fire of the Five Nations that was held on the banks of Grand river; but after this ceremony it reverted once more to its hereditary keeper.

The number of separate beads in the record is slightly over 1,800, all white, and, as seen under the X-rays, drilled from both ends, which indicates their manufacture before iron was in everyday use and establishes a considerable antiquity for the record. From a large circle formed by two entwined strings, symbolizing respectively the Great Peace and the Great Law that were established among the Five Nations by the formation of the League, there hang fifty pendants to represent the fifty sachems of the confederacy. That representing the seventh Onondaga sachem, *Hononwiyendeh*, who was the keeper of all the other records of the League, is slightly longer than the rest; it served as a guide in the reading of the record and in arranging the sachems in their proper order.

The circle was laid down as in the figure, with all the pendants turned in towards the centre and with the long pendant representing the seventh Onondaga sachem to the left of the join in the circle. Beginning from this join and reading counter-clockwise, you have fourteen pendants for the fourteen sachems of the Onondaga nation,¹ then eight pendants for the Seneca nation, nine for the Mohawk, nine for the Oneida, and, finally, ten for the Cayuga, who were thus to the right of the Onondaga. It was in this same order that the sachems took their seats in the council house. There the Mohawk, if they were introducing a question, referred it first to the sachems of the Seneca nation, who sat on their right. When the Seneca gave their judgment the Mohawk referred it to the sachems of the Oneida and Cayuga. Lastly, the Mohawk laid it before the sachems of the Onondaga, who could express an independent opinion only if the other nations had disagreed. According to Chief Loft's tradition, *Dekanawida* ruled that if the nations failed to reach a unanimous agreement the matter was to be referred to the council of matrons for decision.

The second wampum record (Plate I, figure 2) which contains about 300 beads also drilled from both ends, is closely associated with the first. *Dekanawida* ordained, besides a record for the entire League, a mnemonic record of the sachems of each nation; and this is the record of the Mohawk nation. Chief Loft, as first sachem of the Mohawk wolf clan and bearer of the title *Sharenhohonwaneh*, is the hereditary keeper of this record also. Whether the records of the Seneca and other nations are still in existence he did not know.

Since the Mohawk nation had nine sachems there are nine pendants in the record. A short string of beads unites them, symbolizing that the sachems should all be of one mind. The nine pendants are grouped in threes, for there were three clans in the Mohawk nation and each clan was represented on the council by three sachems. The pendant representing the first sachem of each clan contains white beads only, that representing the second sachem had two purple beads among the white, and that representing the third sachem three purple beads. Laying the record down as in the figure so that the pendant on the left contains white beads only it reads, from left to right:

Turtle Clan

1st sachem: *Tehkarihoken* "the mediator"

2nd sachem: *Hayenwatha* "he who uses a comb", i.e., combs out differences and unites the people

3rd sachem: *Shadekarihwade* "the clear thinker, the reliable one"

Wolf Clan

1st sachem: *Sharenhohonwaneh* "majestic tree"

2nd sachem: *Tehyonhhehkon* "he who has two lives"

3rd sachem: *Ohrenrehkawa* "great limb on a tree"

Bear Clan

1st sachem: *Tehhennahkarineh* "he who drags horns"

2nd sachem: *Ahstawenserontha* "he hangs up the rattles"

3rd sachem: *Shoskoharohwaneh* "a great bush"

¹For convenience the pendants of each nation have been separated at the Museum by a knot of red ribbon.

The third wampum record (Plate I, figure 3) was known to Chief Loft as the record of the Three Sisters. Its hereditary keeper was a woman who bore the title of *Konwahtjohontjon*, and it had been handed down in Chief Loft's maternal family for many generations. The last woman to bear the title was his sister, who left no female heir so that the true line of succession is now extinguished.

The record contains a little over 900 beads, all drilled from both ends like the beads in the other two records. They hang in eleven pendants, six long ones of white beads only and five short ones of purple beads. Their origin and significance as given by Chief Loft are as follows:

Many generations ago the Mohawk clans lived in separate villages, Bear people in one village, Turtle in another, and Wolf in a third. In a village of the Wolf clan there lived three beautiful maidens who could not meet without quarrelling. They quarrelled so constantly that at last a pious, middle-aged woman named *Konwahtjohontyon*, "Forsaken Fire-side," resolved to reform them. She approached each girl individually and said to her, "Come tomorrow to my wigwam at such and such a time. I have something to show you." Each girl visited her wigwam at the stated hour, and to her surprise met the other two girls there also. But before they had time to quarrel with one another *Konwahtjohontyon* said to them "I am glad that you have come. Now I will show you something". She led them to her plantation, and showed them corn, beans, and squash all growing together in the same mound, "Look", she said, "The Great Spirit gave us these foods, and your forefathers discovered that if they planted them all in the same hillock they would all grow without injuring one another and yet each would maintain its individuality. They are three sisters that grow together in harmony. You three girls must live in the same way. Now go home, and in three days come back to my wigwam, when I will explain to you a wampum string that I am making".

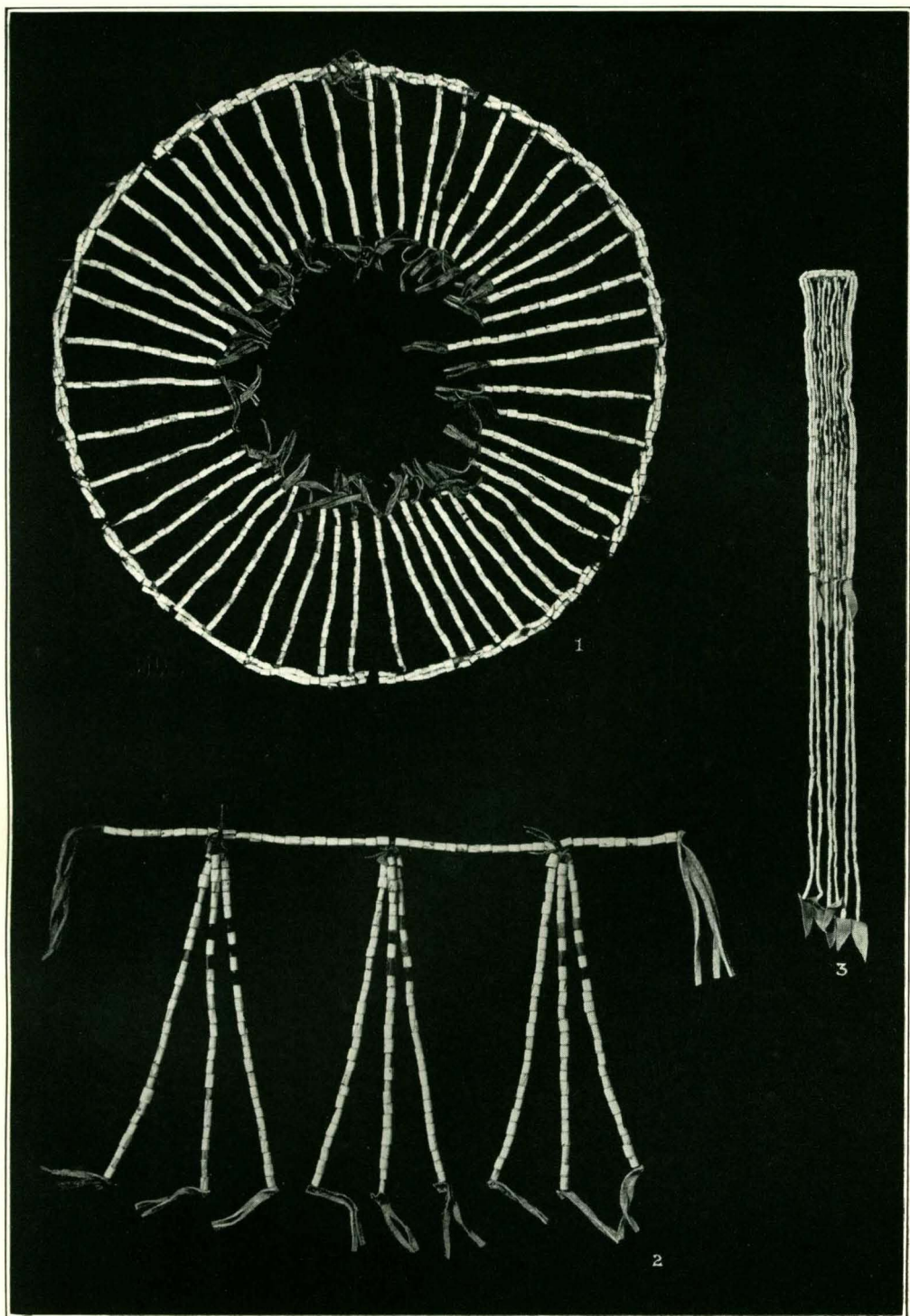
The girls returned in three days and the woman showed them this wampum string. The five dark strings represent the five nations of the Iroquois, three of the six white strings the three girls. "Now", said the woman, "If any of you breaks the rules that are laid down for your conduct, I will replace a white bead with a dark bead in that white string hanging beside the string that represents you. Then you will be disgraced throughout the whole village".

The girls went away, and the woman kept the string in her possession. Other girls in groups of three entered upon a similar sisterhood until it spread throughout the whole of the five tribes of the confederacy. At some public festival, or meeting of the council, three girls would join hands before the keeper of the record, *Konwahtjohontyon*, and hear her proclaim the rules of the sisterhood; that each girl must live in peace, in love, and in charity with her two sisters, must help them at all times, and must observe the same conduct towards other sisterhoods or groups of three. Each girl then made her vow in front of all the people.

The sisterhoods never formed an organized society; they remained voluntary groups of three, all separate, but all bound by the same rules. Today the young Iroquois girls no longer follow the customs of their parents or wish to enter into such sisterhoods; and the record no longer

functions. Throughout its history, however, there was never any occasion when the rules were broken, so that the wampum record remains exactly as when it was first put together, with no dark bead intercalated among the white.

The second, fourth, and fifth of the long white strings, counting from the left, represent the three "sisters", A, B, and C, respectively. If A had misconducted herself a dark bead would have been intercalated in the first white string; if B had misconducted herself, in the third white string; and if C had misconducted herself, in the sixth white string.



Three Iroquois wampum records

THE ETHNOGRAPHY OF THE GREAT BEAR LAKE INDIANS

By Cornelius B. Osgood

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INTRODUCTION

This monograph is based on investigations undertaken for the National Museum of Canada between May, 1928, and September, 1929. The material was gathered principally during a fourteen months' stay among the natives of Great Bear Lake region, Mackenzie district, Northwest Territories.

The writer reached Norman early in July, 1928. At that place during the following fortnight an epidemic of influenza killed a large part of the Indian population. By July 23 a temporary residence was established near the site of old Fort Franklin on Great Bear lake, and the following five weeks were spent in visiting Dease and McTavish bays. The autumn was passed at the fishing settlement at the west end of the lake, and at Christmas time a trip was made with the Indians who celebrated at Norman and returned to the lake before the year was out. Another journey early in April afforded contact with the Mountain Indians who had come into Norman for supplies, but an attempt to reach their main camp in the Rockies west of the Mackenzie failed after several days' travel, because

the condition of mountain snows threatened to cut off a retreat. On return again to Great Bear lake it was found that the Indians had scattered because the fishery at the head of the river had given out, so after substituting a sled for a toboggan, it was decided to visit some of the spring camps of the natives. The first stop was made with Dogribs at the foot of Bear mountain, near the mouth of McVicar bay. This place afforded a profitable visit. A second followed at a fishing camp a few miles distant in the direction of Johnnyho river. The natives, however, seemed uncertain, due to their fear of another epidemic, whether to return to Norman or to go to Rae on the north arm of Great Slave lake. Since it was impracticable for the writer to go to the latter place he decided to move northward while it was still possible to travel with dogteam, with the expectation of finding another band of hunters on the east side of the lake. Four days were consumed in getting to the north shore of McTavish bay because of the bad condition of the ice and pressure ridges over which it was not possible for one man to manœuvre a sled. Several days of hunting resulted in finding nothing but abandoned tent sites. The Caribou Point people had moved. The search was then pushed on in the belief that they had gone to the fishing grounds on the north side of Dease bay, but this also availed nothing. After coasting the north shore of the lake into Good Hope (Smith) bay, the dogs were directed homewards. After sixteen days of search, during which time not a single person was seen, the writer was greeted hospitably at his destination by both the Dogribs and the Caribou Point people.

At the end of June the annual summer visit was made to Norman to meet the steamer. Some satisfactory work was done during the following weeks, but it was interrupted by another, milder, epidemic of sickness. The last part of the stay in the Mackenzie region was made at Good Hope where very interesting data were obtained.

The writer is particularly indebted for assistance given him by A. W. Boland, Esq., of Great Bear lake, without whose advice and aid it would have been impossible to surmount the physical difficulties of residence in that region. To the same gentleman credit is due for his services as interpreter and as an informant contributing many exact accounts of the country and its people. All was done in the spirit which over a large area has made his name a synonym both for generosity and for honesty. Acknowledgment must also be rendered for the kindnesses of the Rev. Father Houssais of the Roman Catholic Mission at Norman, and to Mr. and Mrs. N. Roberts. To the others whom space does not permit to name, a sincere appreciation is expressed for many favours.

To Mr. Diamond Jenness credit should be given for aid in preparing this manuscript and his unfailing consideration as Chief of the Division of Anthropology. The writer wishes to thank Professors E. Sapir and F.-C. Cole, of the University of Chicago, for the inspiration and guidance without which the work would not have been undertaken. 001

THE NORTHEASTERN ATHAPASKANS

Great Bear lake is the focal centre of four tribes well known in the history of northern Canada, Dogribs, Yellowknives, Hares, and Slaves. Excepting the littoral held by the Eskimo, these tribes occupy or periodi-

cally hunt over most of the country from Great Slave lake to the Arctic ocean and from Mackenzie river to Hudson bay. In the centre of this area exists a fifth tribe or politically autonomous unit, the Satudene or, translated, Great Bear Lake people. It is uncertain whether they were always an independent group or whether they have become such during the past hundred years, due to conditions created by European contacts. In either case the Satudene are probably more closely related to the Hares than to any other tribe and may have at one time been one of a number of Hare bands. Today they are politically, socially, and linguistically differentiated from the Hares and more often associate and intermarry with the Dogribs.

This group of tribes cannot have formed only one cultural unit in pre-historic times. There were, probably, considerable differences between them, though the remnants of aboriginal culture have been rendered similar by European influences which brought the tribes into much closer association. For this reason, and also because it is hard to be sure which of these tribes are referred to in early literature, all the available information is here set forth as critically as possible.

Dogribs. The Dogrib tribe (kli tco go t'ine—dog-rib people) comprises four bands which trade into Rae, on the north arm of Great Slave lake, and a fifth band which has become disassociated, living in Satudene country and trading into Norman since 1914.

The first Dogrib band inhabits the country close to Rae (Figure 1). A subdivision of this first group hunts in the country west of the north arm of Great Slave lake to within 75 miles of Mackenzie river. The second band inhabits the country around lac la Martre and lac Grandin which are a part of a good canoe route north from Great Slave lake. The third band occupies the country on both sides of the canoe route between Great Slave lake and McTavish bay. It does not come closer to Great Bear lake than lake Clut, south of Conjuror bay. It is from this band that the present Bear Lake Dogribs emigrated. Band four lives east of band three (Figure 1). The information about the Dogribs is from A. W. Boland, who lived for many years at Rae and Good Hope and who speaks the native language fluently.

Yellowknives. The Yellowknives are located to the east of the Dogribs, ranging east and north to Eskimo territory and south to the Caribou-eaters. No information is available on their social organization.

Hares. Trading out of Good Hope on Mackenzie river is a tribe called Hare Indians (ka tco go t'ine—big-willow people). The name is not literally Hare People (Ga tco go t'ine—big-rabbit people) as might be expected because of their common appellation. The similarity of the roots for 'rabbit', 'arrow', and 'willow' have led people into confusion over the terminology. The Hare Indians are divided into five bands.

The first band (ka' tco go t'ine—big-arrow people) inhabits the territory 50 to 100 miles east of Mackenzie river (Figure 1). Part of this group hunts to the west of Good Hope up to the Great Divide and in late years has crossed over by two trails to the Lansing Creek trading post

on Stewart river. This is probably the band that traded under the same name at Fort Franklin, at the west end of Great Bear lake, in 1812 (See Keith, G.,¹ par L. R. Masson, 1890, II, page 117 ff). The second band (probably ne la go ti ne—end-of-the-earth people) hunts to the north and east of the first about to Lockhart and Anderson rivers. Only ten men were left in 1913 and the band is now practically extinct. The third band (possibly ta la go ti ne—meaning uncertain) is southeast of the

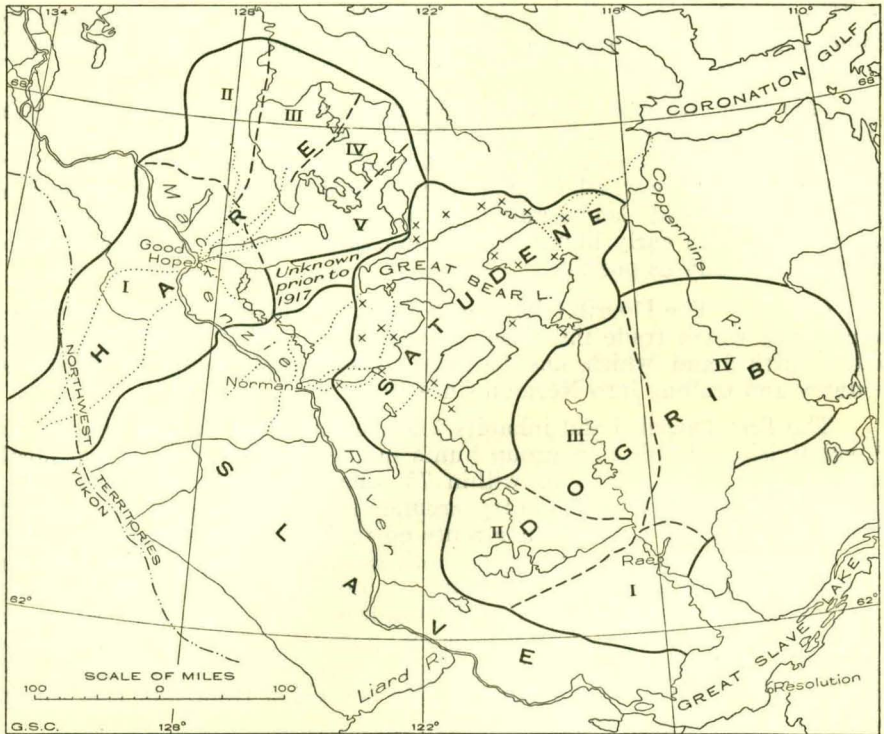


Figure 1. Ethnographic map of Great Bear Lake region. Ranges of various tribes indicated by heavy solid line; Indian camps by crosses; and main routes of travel by dotted line.

second and extends to the edge of the timber a few miles beyond Anderson river. A line drawn from Good Hope to Anderson river and between lakes Bezitcho and Niwelin would separate band three from band four. The fourth band (du ta go ti ne—among-the-islands people) lives adjacent to the third and the fifth band (ta tci ne go ti ne—meaning uncertain) extends to Hare Indian river. On some occasions in the winter the latter three bands extend their activities to the barren grounds northeast as far as Horton river.

Slave. The Slave occupy the country around the western end of Great Slave lake and bordering Mackenzie river as far down as Norman.

¹For complete reference See list of papers quoted at the end of this work.

A branch of this people is referred to sometimes by early writers as Beaver Indians. Whether the Slave originally formed one people with the Beaver until driven northward by the Crees or Chipewyans into the country which they have occupied since first known by the whites, or what their actual relationship with the Beaver of Peace river was is not determined.

Satudene or Great Bear Lake Indians. This people (sa tu go ti ne—literally translated Bear Lake Indians), inhabit all the country around Great Bear lake between the Dogribs and the Hares, except a comparatively small area south of Hare Indian river. The Satudene occupying the country between Great Bear lake and the Mackenzie do not go north of an approximately straight line drawn from the end of Smith bay to the Mackenzie at 65 degrees 30 minutes. The intervening country is said to have been unknown to the Indians of both tribes until one, more daring than the rest, navigated to the headwaters of Hare Indian river in 1917. The boundary of the Satudene on the northeast is Copper mountains, between Dease bay and Coronation gulf. The Satudene trade into Norman.

These tribal boundaries represent the extreme ranges of the respective bands, who at no time occupy and hunt over more than a very small section of them. The specific location of the people is very apt to change somewhat from year to year according to the hunting. There is practically no overlapping of areas, but there are a few places where tribes sometimes meet each other such as among the little lakes between lac des Bois and Great Bear lake, where the Satudene come upon the Hare.

GEOGRAPHY

The lake from which the Satudene take their name is one of the largest in the world, and fourth in size in America. The edges are timbered, but except at the western end the timber soon gives way to tundra. There are several ranges of low mountains, and from the south shore of McTavish bay the rocks rise precipitously for several hundred feet and are cut into by numerous fiord-like bays. The timber is for the most part spruce, which becomes smaller and stunted as it approaches the northern timber limits. Poplar is also common and tamarack frequent; birch is much more rare. Willows are found around the smaller lakes and rivers.

The range of temperature is very great, from more than 60 degrees below zero Fahrenheit in winter to above 80 in the summer. Snow falls in September to stay for the winter and disappears in May, except for patches. The big lake freezes generally during November and is frozen over, except for the edges, until July. Franklin mountains, lying between Great Bear lake and Mackenzie valley proper, make a thermal line, the climate being distinctly milder in the valley proper.

The fauna of the Bear Lake country includes the woodland and barren ground caribou, muskox (not seen for a number of years and considered extinct in this region), moose, the black bear and Richardson bear, foxes of various types, mink, otter, fisher, wolverine, Canada lynx,

marten, beaver, and wolves. There are also such smaller animals as the ermine, muskrat, hares, rabbits, squirrels of several varieties, and mice. Among the birds are owls, hawks, grouse, ptarmigan, sandpipers, and gulls. Great quantities of ducks and geese appear seasonally and loons are common.

HISTORY AND SOURCES OF MATERIAL

Sources of information concerning the northeastern Athapaskans are limited to the comparatively few written records of the early explorers and fur traders and to later accounts of missionaries and sportsmen. Hearne, travelling from Prince of Wales Fort in 1769 to the mouth of Coppermine river, was one of the earliest to enter the country. In his account he gives some information about the customs of the Copper Indians, better known as Yellowknives. Mackenzie in 1789 ventured to the mouth of the river which bears his name and in writing of his experiences makes some interesting comments on the life of the natives, but they were for the most part results of casual observation. About 1800 the first fur trade post was established on Great Bear lake and from this place George Keith, writing letters in answer to the questions of Roderick Mackenzie, gathered what is probably the most valuable information on the culture of the surrounding natives. At the same time, W. F. Wentzel was also writing letters from the Beaver (Slave) country. These, too, form an excellent source of material. Sir John Franklin, in his expedition to the Arctic coast in 1819 and to Great Bear lake in 1825, also gives some description of the natives, and Richardson, on the Arctic Searching Expedition in 1849, does even better, but none of these men was particularly interested in the customs of the natives or familiar with the problems involved in a scientific description. Later, in the second quarter of the century, we have the accounts of such explorers as Back, King, Simpson, McClean, and Hooper, but here again little but a repetition of the most obvious aspects of culture is found. Thus passed the first seventy-five years of white contact, the fur trade already undermining the material culture with the tools and implements of the civilized world.

By 1860 the first Christian missions were established on the lower Mackenzie river and the conversion of the Indians of this region was undertaken with the religious zeal and daring that still characterize the activities of the Oblats de Marie Immaculé (*See* Duchaussois, 1923, pages 196, 214, 226, 254, 267). The Reverend Father Petitot travelled and mapped the country of the northeastern Athapaskans during the last part of the century. His researches in primitive linguistics followed by the publication of his grammar and comparative dictionary were of inestimable value. His books of travel contain many intimate glimpses of native life, but much of his ethnography is of questionable value because of the influence of dominating theories and personal prejudices.

After a hundred and fifty years of strong external influences it is not strange that the difficulties of gaining authentic information make the ethnologist feel at times that he is usurping the field of the archæologist.

FOOD

Fundamental Aspects of the Food Problem. Travellers through the Athapaskan country since the earliest times have spoken of the life of the northern Indians as a constant struggle to procure sufficient food; they are always facing the bitter odds of hunger and cold, always starved and woe-begone in seeming consciousness of the inevitable. The natives invariably pleaded want of food and ate voraciously of what was given them. There were few examples of foresight, no plentiful supply of fish laid up for the poor seasons, as among the people of the Pacific coast. Even their Eskimo neighbours to the north lived in comparative security, showing hospitality to the chance visitor, but the Athapaskan offered not even a word of greeting. If the newcomer were hungry he might help himself if fish or meat were in evidence, or wait until a meal was cooked, then to compete for the satisfaction of his appetite.

Numerous cases of cannibalism have been instanced by early writers, but only under stress of starvation as severe as that which is known to have produced the same result among civilized people. A few years ago a family of Great Bear Lake Indians were forced to the end of their endurance while on a journey. The father dropped behind with a young daughter whom he sacrificed for the need of sustenance. When he rejoined his family immediately afterwards he found that during his absence his wife had killed a moose. Such an incident pathetically characterizes the tragedy of extreme privation. McClean (1849, II, page 248) makes the statement that "cannibalism is more frequently known among the Slaves and Rabbitskins [Hares] than any other of the kindred tribes". This may be accepted as true, since these people had the least dependable food supply.

When food was plentiful gormandizing took place. Hearne (1795, page 79), travelling with the Chipewyan Indians in the eighteenth century, records his displeasure at the fact that the people feasted night and day while the food lasted and that for fourteen days they were so indolent, wasting fish caught in the nets, that they were nearly in the same distress as before. The incident is typical of all the northeastern Athapaskans. The amount of food which an Indian can eat at a meal is quite unbelievable to one who has not witnessed such a performance, and gives rise to stories so exaggerated as to be amusing.

The true picture of the Satudene's life in relation to his food problem is nevertheless not one of either gormandizing or cannibalism. Undoubtedly he will take advantage of plenty, which is characteristic of peoples whose food supply is not absolutely dependable, and certainly he has known the trial of hunger, but he worries little about either. Hunger to the civilized man has become a symbol of suffering, a physical and social tragedy which he will avoid at any cost, but should he be forced to experience it occasionally, he might well be shocked to discover that it is less unpleasant than many trivial illnesses. The Indian knows the natural resources of his food supply, moves in bands from one fishing place to another, or seeks for game in favourable places. If asked why he does not prepare for an unknown future, it is hard to get more than the sly look of amusement for an answer, but one comes to realize an unsuspected feeling of security which is denied the casual traveller. There are a number of

reasons for the lack of regard for the future. First of all, the Satudene is migratory by necessity and the essentials of his existence are not all procurable in one place. He fishes in the winter in one location, in the summer in another, and he hunts the skins for clothing somewhere else. Why, therefore, should he amass food beyond his needs, since he has no facilities for carrying such quantities when he travels? He must have skins for clothing and his tipi, and when he kills the caribou for this purpose he has also the meat. But it would be foolish, if not impossible, to attempt to depend entirely upon game throughout most of the Satudene country, so he returns to some fishery. In the second place, the communistic aspect of Indian life would ill reward any individual effort. At the present time there are one or two families who have taken it upon themselves to live with greater security by increase of effort, but in so doing they are in a sense ostracizing themselves and in order to prevent demolishment of their supply are forced to live apart, which is an unsocial tendency probably made possible only by the recent contacts of civilization. Finally, an Indian has an awareness that tomorrow he may be dead and any idea that deals with an enrichment beyond the possibilities of his personal enjoyment is relegated to the ridiculous. Thus he lives on very much from day to day, his particular problem of getting food accentuating his disregard of possible starvation; and he is not altogether discontented, either on account of lack of food or because he is almost universally considered lazy by the whites.

The whole interior of the Mackenzie River basin abounds in fish and game, and wild-fowl are plentiful in the spring and autumn. For the most part the people treat their struggle for existence lightly. They believe in a natural equilibrium of supply and demand. Now that there are fewer Indians, they do not think it strange that there is less game than formerly.

Fishing. Fish is the principal food of the Satudene and of most of the tribes of the northern Athapaskans. Great Bear lake is a great fishing place holding an abundance of whitefish, herring, and trout. Besides these there are bluefish, loche, dorys, jackfish, and tullabeas. The whitefish is the most important, and is commonly called by the word-root meaning "fish". Its distinguishing term is thlue wa, wa meaning "original" and thlue "fish".

The fish are taken principally in gill nets which are set in the ordinary manner with floats and stones. During the growth of the ice in the autumn it is impossible to use the nets for a certain time, which often causes hardship, but as soon as the ice is strong enough to support the weight of the fisherman, the nets are again set, and by the following method. A hole is made in the ice by means of the ice chisel and the debris cleaned out with an ice scoop. A needle of gargantuan proportions, made out of several spliced spruce poles, is then inserted under the ice, carrying with it a long line attached to one end. This needle is pushed along as far as possible in the direction in which the net is to be set. Then another hole is cut and the needle forced farther along by tugging the line first backwards and then forwards. This process is repeated until the line stretches between two holes separated by the distance required for the net. Finally the net is attached to the end of the line and drawn under the ice, where it is stretched by means of floats and stones as in summer fishing. It is taboo to

use dogs at the first setting of the net and also for a woman to cross on the ice above the net. To prevent the net from freezing when being hauled, a basin is cut in the ice next to the hole through which the net is drawn. This basin fills with water, and the fish are extracted under water in this basin. It is a bitter occupation in extremely cold weather; chilled hands ache as though ice were being pushed into the fingers underneath the nails. The old nets of willow fibre have been entirely supplanted by the common white twine net. No record of skin-line nets, except for beaver, could be found among the Bear Lake people today. Hearne (1795, page 265) has described fish-nets made from lines of deerskins among the northern Indians, however.

The common method of catching trout in the spring is through a hole in the ice with hook and line attached to the end of a willow sapling a few feet longer than the thickness of the ice. This willow takes the place of the line in going through the hole, so that a slight stroke of the chisel does not cut the tackle. The line under water is about 8 feet long, but an additional 20 or 30 feet is coiled up to the willow in such a way that it is automatically released when the bait is taken. A piece of whitefish or herring is preferred for bait. Modern steel hooks have completely displaced the old ones of wood and bone.

Spearing fish through the ice was a common practice among the Satudene and is still done occasionally at the mouth of Great Bear river. Fish-weirs were formerly made of either stones or brush, but trapping baskets were apparently unknown. Fish are also sometimes caught by snagging them with a hook on the end of a long pole.

Fish are either eaten fresh, or dried in the sun after cutting. The commonest method of cooking in prehistoric times seems to have been roasting before the fire on sticks. Boiling is now more frequent, apparently because it is easier. Metal kettles have, even in the memory of the people, supplanted the use of hot stones in water-tight baskets of woven spruce root. Salt was formerly not used as seasoning, and even today has little attraction. The liver and eggs of the loche are eaten and the large intestine of the trout is roasted as a delicacy, having somewhat the flavour of a clam.

There is no individual ownership of fishing places.

Moose and Caribou. Moose and caribou form a food supply for the Satudene second only to fish. Moose are indigenous to the entire bush country surrounding Great Bear lake and follow a few rivers almost to the coast. The barren ground caribou are restricted to the barrens and edges of the timber. The woodland caribou are found as far north as the Sans Sault rapids of the Mackenzie (between Norman and Good Hope). Bear mountain, between Keith and McVicar bays, is about their eastern limit in this area. Far more are found to the south of Bear lake than to the northwest. The mountain caribou live in the Rockies west of the Mackenzie and in the foothills, but do not come to the river.

The Great Bear Lake Indians take moose generally by shooting, principally in the spring when the hunter can run over the light crust on snow-shoes while the moose is impeded by the deep snow, or else in the summer when the flies drive the moose to the rivers. They know the habits of the moose astonishingly well, at what time and where it will be likely

to lie down, and how it will act if trailed. The custom in the winter is to follow the moose trail by making a series of wide semicircles from its tracks, since before it rests it will loop back on its own course to come up wind of any pursuer. If the moose is found, it is approached with great stealth, the natives oftentimes removing a good part of their clothing to keep from making any noise.

Richardson (1852, page 257) tells of a small breed of dogs which were used along the Mackenzie river for moose hunting, holding the animal at bay until the Indians came up on their snow-shoes. The use of dogs for hunting is a common practice, but it is probably impossible today to distinguish any special small breed of dog from the packs of underfed mongrels. The Indian dogs are notably small, supposedly because they are put in harness as small pups as well as being often starved. At least white men say that the same dogs would grow much larger if well taken care of during their first year.

The dry shoulder blade (scapula) of the moose is used to call that animal during the rutting season. This is done by rubbing the bone against willows, in imitation of the sound caused by the moose when it rubs off the velvet from its horns. Scapulimancy also occurs among the Dogribs, a complete description of which is best taken from Whitney (1896, page 262):

"Everybody was in good humor that night in the lodge, and I was very much interested in watching the development, out of a caribou shoulder blade, of an Indian hunting talisman. The shoulder blade when finished becomes at once talisman and prophet. It is scraped clean of its flesh, and then with a piece of burned wood the Indian pictures upon it, first, the points of the compass, and then one or more hunters, with caribou in the distance. When his drawing is complete the blade is held over the fire, and the dark spots that appear in the bone indicate the direction in which the game will be found. Where several hunters are represented in the drawing, that one nearest the spots is hailed the lucky individual."

When a moose is killed the Bear Lake Indians cut off its ears and throw them into a tree. The moose is then skinned. In former times the hunter returned to his companions and sent one of them for the meat, to whom it was given, and he in turn having brought it in, distributed it among the camp. According to Father Ducot, the Indians when lucky in the chase, leave a bladder full of blood, to be found by the wolverine, whose good will they value (*See Duchaussois, 1923, page 259*).

Caribou were formerly killed in great quantities on the barren grounds. The methods included stalking, decoying, impounding, snaring, and spearing. The hunting was done generally by a band or group as a communal affair initiated by either of the two most important men, the best hunter, or the oldest man. Whatever meat was procured was given to the latter for distribution. The Indians stalk the caribou as near as possible, then run after it in full pursuit. This method was largely a matter of chance, unless the snow was deep and soft, in which case the hunters on snow-shoes had easily the advantage. If they were on the barren grounds, where the snow was hard, the Indians depended on a fortunate shot to drop an animal, which often caused the herd to split up and part to turn directly into the face of their enemies. Sometimes even the sound of firing produced this effect. In such cases slaughter was comparatively easy. If not enough meat was secured the hunters went on again, knowing that caribou will stop to feed if let alone. The whole process was then repeated.

Caribou were decoyed by means of the skin of a head and pair of front legs of that animal. The caribou head skin was put over that of the hunter and the protruding fore parts of the face were allowed to hang down as naturally as possible. The hunter looked through the eye-holes of his disguise. Horns attached to sticks were also held above the head and used to simulate the animal's characteristic movements while eating and watching. When close enough, the prey was killed with the bow and arrow. The use of horns as a decoy is also described for the Beaver (Slave) by Wentzel (Wentzel, par L. R. Masson, 1890, I, page 81) and for the Hares by Simpson, Richardson, and Petitot (*See* Simpson, 1843, page 208; Richardson in Appendix to Franklin, 1828, page 275; and Petitot, 1893, page 283).

Impounding was contrived by building a long fence of trees and brush which led into an enclosure. The women and children then drove the animals in the proper direction, where they were speared or shot with bows and arrows. In snaring, the same type of fence was used except that at convenient openings snares were set. For a good description of impounding by Dogribs in early days *See* King, 1836, volume I, page 155 ff.

Spears were used most effectively against swimming caribou. Lakes in which the animals sought protection from the flies were watched, and at the proper time, the natives attacked them from canoes.

An interesting note on the taming of caribou is found in McClean (1849, II, page 274). He says:

"I have been informed that the Yellowknives, and some of the other tribes inhabiting these desert tracts, have the art of taming the fawns, which they take in great numbers while swimming after their dams so that they follow them like dogs till they see fit to kill them."

Although there is no further evidence on this point from Great Bear lake, such occurrences are not impossible.

The hunter on killing a caribou cuts out the tongue for himself and then sends a friend for the rest of the meat, as in the case of a moose. It is taboo for dogs or menstruating women to touch the kill. A taboo against hitting a caribou with a club was known, at least by the Yellowknives (*See* Back, 1836, page 212). The unborn young of animals are considered great delicacies, as are various parts of the viscera.

Meat is either dried, boiled, or roasted fresh. The dried meat is often pounded into a fibrous powder, which is eaten after being dipped into melted grease. Pemmican is also made by mixing pounded meat with grease. Moose nose, though rubbery, is considered a great delicacy. Keith (1890, II, page 108) says that it was taboo for women, but either this taboo was only periodically effective or it is no longer in force, for moose nose is esteemed today by members of the female sex. Pike (1892, page 56) reports the taboo for the Dogribs, however, saying that it is believed that a woman who eats the gristle of the nose will grow a beard.

There is no individual ownership of hunting grounds. McClean (1849, II, page 250) makes this statement for the Slave also.

Minor Meats, Game Birds, and Vegetable Foods. Meats that form a minor part of the native diet include rabbits, lynx, ground squirrels, muskrat, beaver, musk-ox (now extinct in this region), and bear. White

fox are known to have been eaten in times of starvation. Beaver are an important article of diet during the spring. They are taken by shooting after their houses are destroyed, also by traps and in babiche nets. Muskrats are only eaten in the spring, but are much esteemed when fat. Rabbits and lynx are roasted whenever caught. Rabbits are found throughout the whole of the timber country. They are naturally most important for food where other game animals are rare, and particularly where there is a scarcity of fish, as on Mackenzie river. For the three-year periods when they were the scarcest, the people there had what were called 'starvation years'. The natives also eat the Arctic hare when possible. Lynx vary in numbers according to the number of the rabbits. Bears are not held in great esteem. They are a popular 'medicine' animal and, consequently, tabooed to those who have acquired that 'medicine'. Black bears are found everywhere within the timber limits during the summer. Richardson bears live on the edge of the timber, in the barrens, on Big point, and in Bear mountains. They are seldom attacked because of their reputed fierceness and potent 'medicine', but are shot if discovered during hibernation. Both the wolf and the dog are strongly tabooed as food.

Of the game birds, ducks, loons, and geese are eaten whenever killed, but they are hunted chiefly in the spring when there is a shortage of fish. Ducks are by far the most important. They arrive at Fort Franklin about the first of May, the fish ducks coming last. Ducks are killed most easily in the spring, when they are forced to collect on what little open water near shore they can find. They are also available during part of the summer and autumn, but are harder to get. In the autumn they collect in flocks for their southward flight, notably at Willow lake (25 miles true north of Norman), at the foot of McVicar bay, and, to a lesser degree, in the lakes between Deerpass and Bell bays, where they are not so molested by the Indians. The ducks also collect in great flocks on the main lake, where the natives have no adequate means of reaching them. Three eider ducks are known to have been killed at Fort Franklin.

The general information applying to ducks relates also to loons, geese, and swans. The catch of geese and swans on Great Bear lake in an average year is probably less than one per cent of the game birds consumed. Geese, however, are killed in some quantities at Willow lake during the spring, when there is an opportunity to get close to them, but the number is undoubtedly small as compared with ducks.

The minor birds eaten include spruce hens (Hudson's grouse), prairie chickens (pinnated grouse), ptarmigan, and owls. Gulls are said to be 'thrown to the old women'. Fort Franklin is the eastern limit for spruce hens. Ptarmigan are not found on the Mackenzie nor in the timber in the summer since they breed on the barrens, but occur at the edge of the timber at Dease bay. Owls also breed on the barrens, but migrate to the timber, particularly in hard winters.

Birds' eggs, especially those of waterfowl, are much sought after and eaten in the spring. A superstition regarding egg hunting is that if a Canada jay's nest is found with an egg in it, the finder's relatives will all die. It is a peculiarity of that bird, of course, that whereas it is common, its eggs are seldom seen.

Berries are eaten during the summer months, but do not form an extremely important object of diet. The most important are the cranberry, raspberry, and crowberry. Richardson (1852, page 135) says of the Hares that the "Hedysarum boreale furnishes long flexible roots, which taste sweet like liquorice, and are much eaten in the spring by the natives, but become woody and lose their juiciness and crispness as the season advances". This information was verified by informants at Good Hope where the root is called 'Wa^c'. Franklin (1828, page 19) mentions another food eaten in the area of Great Bear lake.

"The banks likewise contain layers of a kind of unctuous mud, similar, perhaps, to that found on the borders of the Orinoco, which the Indians, in this neighbourhood, use occasionally as food during seasons of famine, and even, at other times, chew as an amusement. It has a milky taste, and the flavour is not disagreeable. We used it for whitening the walls of our dwellings; for which purpose it is well adapted."

This type of food was not seen on Great Bear lake but the natives are fond of chewing spruce gum.

DRESS

Summer. The natives say that the original summer dress consisted of only a breech-clout and moccasins, probably referring to the minimum or basic costume. Moccasins are the one article of dress which have continued in use and have not been changed greatly by intrusive culture. They are made of tanned moose skin and trimmed with white caribou skin. Moccasins made entirely of caribou skin are considered a mark of great poverty. The body of the moccasin is made of one piece of skin sewn together along the middle of the foot and across and down the heel. An upper flap about 5 inches long, which wraps around the ankle, is sewn on to the body of the moccasin, and over the arch of the foot is an oval insert generally re-covered with white caribou skin and decorated with porcupine quills and moose hair. Around the heel there is always a narrow band of skin which is scalloped at the lower edge and often decorated. The moccasin is fastened on with long strings of tanned skin which are wound around the ankle. The women's moccasins are the same as the men's but have less decoration.

The use of leggings of tanned skins goes back to an early date. They extended from the ankles to above the knees and were fastened to a belt at the waist. Although now entirely disappeared, as late as 1894 pairs were collected and described by Russell (1898, page 171) from McPherson and Good Hope.

Leggings, the writer believes, are correlated chronologically with the use of moccasins, both following, if not developing directly from, the earlier one-piece lower garment with footwear attached which is a characteristic of the Alaska-Yukon Athapaskan area. Keith (1890, II, page 121), early in 1800, says of the Big Arrow people (a Hare band) that their summer dress consisted of "an old caribou dressed shirt, a pair of leggings of the same material, and generally an old thread-bare caribou robe for a blanket", and since he does not mention moccasins, the writer is inclined to think that these leggings had the footwear attached. This belief seems borne out in another place (Keith, 1890, II, page 109) where he states, speaking of the Great Bear Lake Indians: "Their dress in make is simple, much

similar to that of the Mackenzie or Grand River Indians, consisting in winter of caribou dressed skins, with hair on for their robes as well as for their shirts, and leggins, and their shoes are generally sewed to their leggins”.

An exact description of the early form of shirt is wanting. Richardson (1852, page 248) says that men's summer shirts were made of caribou skin, tanned beautifully white. “A shirt of this material, cut evenly below, reaches to the middle; the ends of cloth, secured to a waistband, hang down before and behind”. In another place (page 211) he remarks of the pointed shirts of the Kutchin that “they have not been adopted by the Hare or any of the Chipewyan tribes, who in common with the more southern Indians cut their shirts or frocks evenly round at the top of the thigh”. The shirts worn until recently by the women were somewhat longer than the men's, and there were added skirts which reached from the waist almost to the knee and were decorated with a single band of bone or tin ornaments. The use of skirts is at least as early as Richardson's time (page 249).

Of decoration, Keith (1890, II, page 121) says of the Hares that “their dress is seldom susceptible of the least ornament,” but of the Great Bear Lake people, he remarks (page 109) that “their shirts, in particular, are ornamented with coloured beads, dyed porcupine quills, and small feathers of striking or rare colours. But their women are by no means so ingenious or elegant and neat at this kind of work as the Slave women.”

In recent years trousers of tanned moose or caribou skin have been used, but they appear to be copies of the common trade article. Coats of tanned mooseskin, open down the front, worn especially by the métis, may also be the result of imitation. These were highly decorated with fringes, porcupine quills, beads, and embroidery, and were common until very recent years.

Very few instances of caps are known, but children and old men are said to have sometimes worn them. A band of tanned skin with the hair left on was the common head-dress. Feathers were also worn. Richardson (1852, page 248) mentions as equipment for the chase, a bandeau of white hareskin, or of the belly part of a caribou skin.

Winter Dress. In the winter, caribou skin capotes, coat-like garments with hoods that cover the head, are still worn by a few Indians. Three skins, tanned with the hair, preferably from young animals as they are lighter and better looking, are used in making the capote, one for the back, another for the front, and the third for the sleeves and hood. In recent years velvet is often substituted for the hood and used for facing along the open edges of the front and around the cuffs. A fringe of caribou skin hangs several inches from the seams of the shoulders. The edge of the hood, outside and in, is trimmed with wolverine fur. Formerly, in place of the velvet facing of the front, the natives sometimes used white caribou skin, decorated with porcupine quills and trimmed with such furs as ermine and marten, and strings of tanned skin took the place of the colourful wool tassels that now fasten the coat. Capotes of beaver and marten fur are also known. The Mountain Indians of the country west of Norman use the same coat except that they make it of the skins of the Rocky Mountain goat and are apt to use more decoration.

How long these open fur coats have been used is not certain. The hood itself is not fitted to the head, as in the case of the Western Eskimo parka, but is rather pointed behind. There may be a genetic relationship between this type of hood and an early type used by the Mackenzie Eskimo. Keith (1890, II, page 121) says that the Big Arrow Indians (Hare) had a hood sewed to a shirt for winter wear and that this, with the addition of the natural hair of the skins, constituted the difference between winter and summer dress. Nevertheless, a few sentences afterwards, he mentions a double dress used to advantage in winter by those who could afford it.

As for lower garments, Keith (1890, II, page 121) states that leggings with footwear attached were used in winter by Bear Lake Indians. Since that time trousers of caribou skin with the hair on are known to have been worn. Short leggings were used with them, the flaps of the moccasins wrapping around the bottom. These trousers may well go back in use to an early date, again a conformation to the Alaska-Yukon Athapaskan culture. To support this supposition is Wentzel's statement (Wentzel, 1890, I, page 87) concerning the Beaver (Slave) woman's winter costume: "Their leggings are long and made like trousers except in the front where an aperture is left to attend the calls of nature."

Winter moccasins were of the same type as summer ones, but larger, to permit the insertion of the duffel, which was commonly the whole skin of a rabbit turned inside out, the foot of the man being pushed into the head of the rabbit skin. Caribou skin duffels were also used, preferably young skins sewn with sinew and worn with the hair inside.

Mittens were made of tanned moose skin without the hair and trimmed with beaver or other furs. A single line of tanned moose skin passed around the neck supported them, and pieces of rabbit skin loosely placed inside served as duffel. Gloves were probably unknown until recent years.

Rabbit skin clothes were worn by the natives on the lower Mackenzie and particularly by the Hares who lived on the river. The dress was of the same type as that of the Satudene except that it was woven from twisted rabbit skins. Caribou skin clothes were always preferable. Children were more apt to be seen wearing rabbit skins. At the present time it is difficult to find even a blanket of this material.

In former times robes were an essential part of the dress of the people. These were made of tanned caribou skins sewn together in blanket form. Young skins were preferable, with the hair slightly longer than for capotes. Robes of plaited rabbit skin were used, but probably those of caribou skin were preferred. Musk-ox robes are also said to have been used. These robes served the purpose of bedding also, and large size, untanned caribou skins, with the hair up, were used under them.

At the present time among the tribes of Great Bear Lake region, the clothing, except for moccasins and mittens, is the result of recent contact. The hooded shirt of wool or blanket-parka, now worn almost exclusively, was undoubtedly borrowed from the Eskimo and introduced by white men. The high boot resembling the Eskimo mukluk has probably travelled from the same source, but it can by no means be said to have supplanted the moccasin. For the rest of the costume, European wools and silks have displaced tanned skins and furs.

Personal Appearance. The personal appearance of the Satudene, early writers say, was never attractive except for a few days after a new dress was put on. The clothing soon became dirty and ragged, no doubt being hurried by the application of grease. The expression be-ke-kle (grease on him) is still used to mean "he is well dressed," and the opposite connotation is given to be-ke-tu (water on him). Simpson (1843, page 243) wrote, in the eighteen-thirties, of Indians at Fort Confidence (east end of Great Bear lake) that "some of them even learned to take off their caps in the house, and to wash instead of greasing their faces." Thus we are able to date the beginning of this civilized custom, which has unfortunately degenerated in certain cases to passing around a shallow food plate containing water in which each and every member of the party performs his ablutions, one after the other.

The ornamentation of the dress was meagre as compared with that of other Athapaskan tribes, and few articles of pure adornment were seen or can now be remembered. Petitot (1876, page 62), however, reports the use of nose ornaments.

The hair generally received no special attention. By both sexes it was allowed to grow long and was dressed by running greasy hands through it. At times coloured feathers were added. A few of the oldest men still wear their hair cut just above shoulder length. Hair plucking is unknown and the Indians seem proud of a little beard. Wentzel (1890, I, page 88) says of the Beaver (Slave) men that before a dance they loosened their hair, greased it, and strewed swansdown on their heads. He also says that they rubbed a little vermilion on their heads and faces. The custom of painting the face red before dancing was also mentioned by informants at Good Hope. Richardson (1852, page 248) reports that the Hare men painted their faces and wore ornaments on festive occasions, whereas the women seldom took so much trouble, but were generally tattooed on the chin or at the angles of the mouth.

Previous to the last thirty years, tattooing was common among the Satudene, chiefly among the women as a mode of beautifying themselves. Generally three lateral lines were used across the nose and the cheeks. Vertical lines were made on the forehead above the nose, and in many cases four or five on the chin. The method was that of puncture by a bone needle. A blue colour made from berries was the most popular, but charcoal was also used. Cases are known in which gunpowder was substituted. Children were not tattooed.

SHELTER

Open Camps and Brush Lodges. When travelling in extremely cold weather, a lodge would probably be erected hastily for a temporary shelter, but usually an open camp is made. This is formed by clearing out the snow to the ground. Spruce brush is laid on the clearing and small trees and boughs are piled up on three sides, facing the fire. The fire is built on top of the snow to leeward, but soon melts to the ground, making a warm pocket of the camp. If the snow were not cleaned out before the brush was laid, the fire would soon melt its way almost out of sight, and give insufficient heat. The small trees and brush on the three exposed sides of the camp keep the snow from falling in or from thawing and they act as

windbreak. In case of snowfall at night, a lean-to is built by slanting poles from the back and covering them with whatever is at hand. Sleeping on top of the snow is only done at times of emergency, in which case it is advantageous to pile some more snow on top of one's covering.

Two kinds of brush shelters are remembered by the Satudene. One was in the shape of a 'V' tent, and the other in the form of a tipi. Neither moss nor leaves were used. Young spruce boughs were matted on poles placed fairly close together, thus serving to keep out the snow; but they were not used in the summer, being ineffective against rain. The tipi type was like the skin structure except that the poles were placed more closely together. The brush was laid on with tips pointing downwards. This type of structure was used as a menstrual lodge.

A 'split-log' lodge in tipi forms exists east of Rae on the Fort Enterprise trail. It is said to have been constructed by Dogribs. No other case, nor the age of the custom, is known to the Great Bear Lake Indians.

The Loucheux formerly constructed lodges semicircular in ground plan and built in pairs with a fireplace of raised mud between them. Two families lived opposite each other, sharing the common fire. This type of dwelling has not been found among the Satudene, but two tents have been occasionally observed placed close together with a fire between.

The sudatory, or sweathouse, is not known or remembered at the present time among the Great Bear Lake Indians. Hooper, however, describes it on Great Bear lake in the form of a tightly closed tent in which water is thrown on heated stones. After the bath, it is said to have been not unusual for the performer to dash into ice cold water (*See Hooper, 1853, page 318*). Richardson (1852, page 231) refers to the sweathouse among the Chipewyan.

Skin Tipis. The skin tipi was the common form of lodge among the Great Bear Lake Indians half a century or more ago. Barren-ground caribou skins were used in this region, where that animal was formerly plentiful. In the winter the skins were used with the hair outside, but in summer skins were used with the hair removed. The erection of the tipi was begun with several poles, either tied together or held by a fork at the end of one. The additional poles were spaced from 18 to 36 inches apart at the base, depending on the quantity available. The size of the lodges varied greatly, depending particularly upon the ability of the hunter, since the best skins are only available in the autumn. Summer skins are full of grub holes. The tipi was open at the top and without the typical attached wings of the plains Indians. Sometimes in case of strong winds, a wing-like protector was put up with the aid of separate skins and poles. The lodges were cold, and in them was a bad eddy of wind and smoke. The skins were dressed and sewn with fine babiche or sinew. When caribou skins were not available, moose skins were used. After the snow was cleaned away, the ground was covered with spruce brush and the fire made in the centre. The fireplace was usually protected from the brush by flat poles, which gave an appearance of neatness. Cross poles were suspended horizontally from the lodge poles for the drying of fish, meat, and clothes. If the weight on these was too great, supporting poles were put in. Poles were driven from the inside underneath the edge of the snow and cross

pieces laid on those to make a narrow rack for the support of personal objects. Outside the lodge, snow was heaped around the edges of the skins to give protection from the wind.

The summer lodge was the same, except that skins with the hair removed were used. The rack, however, was dispensed with, since the need for it was diminished and its erection made difficult by the lack of snow.

The winter lodge served also as a travelling camp when hunting musk-oxen on the barren ground. The poles of the lodge were carried, as well as firewood, and served the latter purpose on the return journey, thus gradually decreasing the size and stability of the lodge. Caribou skin tipis are now practically obsolete in Great Bear Lake region.

The camps were ordinarily erected at suitable locations by the women, although in some instances the men assisted.

Hooper describes a conjuring tent which, if he saw it on Great Bear lake, and apparently he did, is interesting. He says (Hooper, 1853, page 319) the "tent is constructed of poles, inclining to each other at the top, which are encircled by hoops at different heights, and the whole is then covered with leather, when it presents a shape like the frustrum of a sugar-loaf. The top is open and to the upper hoop is stitched a blanket, which falls down as a funnel". No information concerning conjuring lodges was gained from informants, although it was stated that some shamans, now living in modern tents, erected old fashioned tipis for the purpose of practising medicine. On the other hand, certain individuals among them were known to conjure without constructing a special shelter.

Log Houses and Tents. Shelters constructed of logs appear to post-date the coming of the whites. A large number of families now own cabins, however, either at the forts or on Bear lake. They are only used while the families are in residence and sometimes left vacant after death has taken place in them.

The Mountain Indians (shi-ta-dene), 'People-among-the-mountains' who inhabit the country between Norman and the headwaters of Gravel river in the Rocky mountains, have used a so-called 'cabin-lodge', made in the form of a cabin with the logs 'squaw-notched'. The sides sloped slightly inwards and the roof was constructed of poles with a covering of sod. A square hole was left in the top for smoke. This type of lodge was used in the mountains and at fish lakes in the autumn when transportation forbade movement of heavy loads (the ordinary lodge is heavy). It is not found among the Great Bear Lake Indians, but Good Hope Indians (Hares) are known in a few cases to have made them within the last quarter of a century. These statements are borne out by references from Keith's and Wentzel's letters (Wentzel, 1890, I, page 90). The latter says, referring to the Mackenzie River Beaver (probably Slave Indians):

"The habitations of these people are built in oblong figure, of pieces of wood placed upon one another, the roof of which is thatched with sapin and the sides cemented or rather calked with moss; an aperture is left at each end to take in large trees for fuel, and another at the top to let out the smoke."

As though in reiteration, speaking of the Filthy Lake and Grand River Indians (Marten lake and Mackenzie river, probably actually speaking of Slave people), Keith (1890, II, page 116) says:

"Their huts, in winter, are generally of an oblong square form, and covered only with fir branches or moss, with a pretty wide space in the middle of the roof as an outlet for the smoke. The square is only about $2\frac{1}{2}$ to 3 feet high, with an almost flat roof."

Keith is here probably speaking of the Mackenzie River Indians, for there is no reason to believe that he was ever on Marten lake. He acknowledges that the Grand River and Filthy Lake Indians consider themselves different tribes, but himself assumes their culture to be identical. In the case of log houses, he may have been mistaken, as the Marten Lake Indians were probably Dogribs.

Of the habitations of the Big Arrow people (a Hare band), he says (Keith, 1890, II, page 121):

"The same poverty, nastiness and sloth distinguish their habitations, which are generally of an oblong square form, entirely built of pieces of wood piled one upon the other until the square is about 2 or at most 3 feet high; the wood is placed perpendicularly at the gable ends and a little higher than the sides of the hut. All this is interlaced or covered with the branches and tops of the fir tree, leaving a pretty large space in the middle, the length of the roof, for the smoke, an almost unnecessary precaution as the smoke would easily find its way anywhere through the many chinks of this miserable and frail building. A hole is left at each end to creep out, and they shut up one and sometimes both in bad weather. The hut being in general no more than 8 feet in breadth, with the fire in the middle, it is hard to conceive what misery and inconvenience the inhabitants will suffer. Sometimes a couple of men and women with three or four children will heap themselves up in a diminutive hut of this description."

But of the Bear Lake Indians he (Keith, 1890, II, page 109) says:

"Their habitations are circular lodges or tents, covered with dressed animals' skins, to screen them from the inclemency of the weather, and the fire is made in the middle."

From all the meagre information on this subject, it appears that the log house was not used by the tribes east of the Mackenzie, but was certainly widely distributed south of the Kutchin among tribes who occupied the mountain regions and by the people of the river proper.

At the present time the Indians of northern Canada live mostly in the common wall tent imported by the traders. These are easier to acquire than caribou skins and do not have to be protected from dogs. Small cast iron stoves are set up inside with stovepipes let through a fire-protecting rim of tin pie plate. It is a familiar picture to see the husband lying on a dirty blanket smoking his pipe, while the woman pokes in the brush for some piece of handiwork dropped while preventing a half-clothed child from falling on the stove.

TRANSPORTATION AND TRAVEL

Packing. The most primitive form of transportation among the Satudene was human packing. Women bore the heaviest burdens, since the men, even while travelling, required freedom of movement for hunting. To this day men seldom carry more than a rifle. Loads were suspended from a shoulder strap made of braided babiche or of a strip of tanned moose skin. Small sticks of wood were sometimes inserted parallel to the arm

muscles where the straps crossed to prevent chafing. Tump-lines across the forehead are in use at the present time and the custom is apparently quite old. The tump-line is not as common, however, as it is farther to the south, and is used to balance a load rather than to support it.

It seems probable that only a century or two ago, dogs were not used as pack animals by Bear Lake Indians. During the spring and summer, dogs are used now as beasts of burden either in conjunction with canoes or without them. When travelling from one camp to another, the hunting canoes may be used if a series of lakes is followed, and if dogs are taken along they are generally packed to carry a share of the equipment. The dog packsacks are simply two bags with a single back which are thrown across the dog and fastened by a line that passes around the dog's neck and crosses itself between the legs.

Canoes. During the summer the Satudene rely chiefly upon water routes, formerly using canoes which were constructed of birch bark sewn over spruce frames. Their canoes were of two types, the Gitsi-tco, or large travelling canoe, and a small hunting canoe, Ela-ja. Specimens of these primitive canoes, now rare, were observed at the extreme end of McTavish bay, Great Bear lake.

Gitsitco, or travelling canoe: the specimen of this type was 23 feet long and 4 feet beam at the widest point, tapering to the ends. Ribbs about 1 inch wide and 6 to 8 inches apart supported the outside covering, which was made up of five longitudinal rows of birch bark, one on the bottom and two on each side. The ends of this canoe were distinctly peaked, the canoe there attaining a depth of 32 inches, though rapidly lowering to a depth of 18 inches for the body of the canoe. There were six evenly distributed, crosswise struts about 2 inches wide. The gunwale was made with side pieces and with a flat piece on top about 2 inches wide and 1 inch thick. Lengthwise, lying loosely on the inside, were slats of wood about 2 inches wide on the average, and from 1 to 10 feet long, which served to distribute the weight of the occupants. The sewing of the birch bark was done in the usual fashion by means of a simple diagonal stitch of split spruce root, the ends being inserted back under two or three stitches for fastening. The stitches were $\frac{1}{2}$ to $\frac{1}{4}$ inch long, and on the outside, underneath the stitches of each overlapping section of birch bark, a length of root was inserted to tighten the sewing. Over all the sewing and junctions of the bark, a light coating of spruce gum was smeared for waterproofing. It was noted that of the patches that had been put on none had the inserted root under the stitches of the sewing.

Ela-ja, or hunting canoe: this specimen was 17 feet long with a maximum beam of $2\frac{1}{2}$ feet. The greatest depth of the canoe was only 14 inches, the ends being distinctly not raised. There were thirty ribs and five evenly spaced struts. On the floor of the canoe were 2-inch boards placed lengthwise, but not as many as in the travelling canoe, where these supporting boards extend part way up the sides of the vessel. The bark covering was made up of irregularly put together, rectangular sections of birch bark sewn in the usual fashion.

Franklin (1828, page 21), on his second expedition, admired the Hare canoes, which he said were larger than those used by the Chipewyans and had the forepart covered with birch bark to fit them for navigation

on Mackenzie river, where the waves are often high. This statement was verified by informants on Great Bear lake. The average hunting canoe was 16 feet long, but only the width of a man. The widest part was aft of amidship. The bow was covered over on top from $2\frac{1}{2}$ to 3 feet aft, and the stern $1\frac{1}{2}$ to 2 feet. The Slave canoe was said to be the same, but had practically no lengthwise supporting boards. The travelling canoe varied in length from 16 to 24 feet and was well reinforced with lengthwise boards.

Canoes are almost always made in the spring. The women collect the birch bark and spruce roots and sew the canoe covering, while the men prepare the framework, hewing and cutting the spruce pieces entirely with the ax and the drawknife. The spruce gum is collected by the women and is smeared on after being masticated. The paddles are generally hewn from spruce, and like most Satudene handiwork are crude and simple. They are between 5 and 6 feet long, with a narrow blade. At the end of the handle is a very slight knob to prevent the paddle from slipping out of the hand. The travelling canoes are paddled by two or more people and apparently without any of the subtle adeptness of Indian peoples who spend more of their time on the water. The hunting canoes, which are generally so small as to offer precarious lodgment for more than one person at a time, are paddled in a more distinctive fashion. The paddler sits on his legs and ankles with his feet flattened inward together behind him, taking two strokes first on one side and then on the other, carrying the paddle in an arc above his head and reversing his hands as he does so. These cranky craft are managed with ease and considerable speed by the natives.

Lightness is the great advantage of the hunting canoe. It is used a great deal for visiting nets, and is carried overland, especially in the spring when the little lakes and watercourses through the bush are free of ice and facilitate hunting game birds while the great lake is frozen.

The travelling canoes, capable of carrying the whole equipment of the family, are used in moving from place to place on Great Bear lake. Generally the shore is followed, but at some places crossings of from 5 to 10 miles are made. Sails, formed from parts of blankets or pieces of canvas, are now used with favourable winds, but there is no evidence that anything except paddles were used previous to European contact. The square sail was rigged from a mast in the middle of the boat. Hunting canoes were also sailed by lashing them together with poles and erecting an inverted V-shaped mast by joining two poles, one supported from each canoe. The two slender craft were spaced apart to keep them from swamping. Travelling canoes are also used on the larger rivers, such as the Mackenzie and Great Bear. Going upstream they are 'tracked', that is, hauled by means of a light line from the shore. The tracking line was formerly made of babiche. Travelling canoes are usually left in the autumn at the cache where the winter equipment was stored the spring before. These primitive birch-bark canoes have been almost wholly replaced by common canvas canoes of corresponding size and the use of outboard motors is not uncommon.

Rafts are sometimes constructed of a few dry logs for crossing some stream or the water that separates the shore from the main body of lake

ice in the springtime, or again for hunting wild fowl on small lakes when no canoes are available. They are of the crudest manufacture and were probably always fastened as they are now by any pieces of line which might serve the purpose.

Cases are known of the Satudene constructing skin boats like those of the Shi-ta-dene who inhabit the mountains west of Norman. These boats are capacious and adapted for the descent of large, fast, and shallow rivers. They vary in length from 20 to 40 feet. The rather heavy frame of spruce is covered with untanned moose skins, eighteen or twenty being used for a boat 30 feet long. The craft depends largely on the current of the stream for its motive power, although oars are used and also a large sweep which, with its oarlock made of a curled spruce root, lends distinction to the whole appearance. As has been stated, this type of boat has been known to be constructed by members of the Satudene on rivers that flow into Great Bear lake, but it is an example of cultural borrowing for the sake of experimentation rather than for any need for this craft as it exists among the Mountain Indians.

Snow-shoes and Toboggans—Winter Travel. Snow-shoes are used throughout a great part of the year and are of three general types, which differ in size though each varies to some extent with the size of the wearer. The smallest type is used almost exclusively for following in a trail or breaking trail when there is comparatively little snow.

Typical specimen of small snow-shoe or trail-shoe: the shoe is made of birch, is 38 inches long, and is turned up $5\frac{1}{4}$ inches in front. The side pieces vary in thickness from $\frac{3}{8}$ inch where they are spliced together at the ends to $\frac{7}{8}$ inch in the middle of the shoe; they vary in width from $\frac{1}{2}$ inch at the turned up ends to $1\frac{1}{4}$ inches in the middle. There are three cross struts of which the first is inserted at the place of turning at the front of the shoe $34\frac{1}{2}$ inches from the rear end. The second strut, which is directly in front of the toes when the shoe is worn, is $6\frac{1}{2}$ inches long, $1\frac{1}{4}$ inches wide, and $\frac{1}{2}$ inch thick. The third strut, which is directly behind the heel, is 5 inches long, 1 inch wide, and $\frac{1}{2}$ inch thick. The second strut is $26\frac{1}{2}$ inches from the rear end of the shoe, and the third is 14 inches. Such shoes are always made of birch or spruce, the former being preferable. The average Indian workman can make a pair of such snow-shoe frames in about three hours. An Indian has been seen to return from the woods during the winter with two green spruce poles about 6 feet long, which were leaned against the fire to thaw; then with a drawknife he rapidly stripped them of their bark and gave them shape, oblong in section and without corners, thinning them down to about half an inch at one end. He next tested the flexibility of the ends over his knee and trimmed them to his satisfaction. He then made notches a few feet from the thinned ends to secure a cord. After putting the thinned ends in the fire for a minute, he bent the last 6 inches around the ball of his foot until an arc of about 90 degrees was formed. This was attained by considerable effort, several attempts being made before the angle was satisfactory, but finally he made fast the cord mentioned before. He matched one side with the other until both were bent evenly and then deeply incised the outside of each tip, closing the notches slightly by biting them with his teeth. The insides of the tips were trimmed slightly at an angle and

the two ends tied together with babiche. The method of tying was to make a slip knot which was pulled tightly around the notched tips, followed by several clove hitches and a final simple knot at the end of the strand to prevent loosening. The other ends were fastened temporarily in the same manner except that a spread hitch was used. This being finished, the foot was inserted between the two pieces and they were stretched to receive any small stick of suitable length that will hold the shoe at the desired width. Before this stick is inserted, however, a cord is tied near the front of the shoe, where the little strut goes in place. This is a loose loop of cord, so that the shoe will not stretch more than it should at that point. In the spreading, two sticks were used successively, the first being shorter than the second, since too much effort was demanded to secure the entire spread at the first attempt. After this is done the frames are hung up to dry for several days before the insertion of the struts. At a later time when the three struts are inserted, holes are made for the fastening of the babiche lacing by diagonal insertions of an awl around the inside surface of the frame, and then the snow-shoes are passed to some woman for lacing. The medium-sized snow-shoe was used for breaking trail and also for hunting when the snow depth was intermediate. It is almost obsolete, probably because there is less hunting now than formerly.

The hunting-shoe is from 5 to 6 feet long and is intended only for hunting, at which time its great surface supports the wearer on the snow. Since the disuse of the medium-shoe, it serves also for breaking trail in the spring when the snow is very deep.

Typical specimen of hunting-shoe: the shoe is 5 feet 9 inches long and upturned 9 inches high in front. The side pieces vary in thickness from $\frac{3}{8}$ inch where they are spliced together at the ends, to 1 inch in the middle of the shoe. The width of the frame varies from $\frac{1}{2}$ inch at the ends turned up, to $1\frac{1}{4}$ inches in the middle. There are five struts, of which the first is inserted only $1\frac{1}{2}$ inches behind the greatest extension of the shoe. This strut is $6\frac{1}{2}$ inches long and $\frac{5}{16}$ inch wide. The second strut which is only $2\frac{1}{2}$ inches behind the first is $9\frac{1}{2}$ inches long and $\frac{1}{2}$ inch wide. The third strut which is directly in front of the toes when the shoe is worn is $12\frac{1}{2}$ inches long and $1\frac{3}{4}$ inches wide. The fourth strut which is directly behind the heel is $11\frac{1}{2}$ inches long and $1\frac{3}{4}$ inches wide. The fifth strut which is only $7\frac{1}{2}$ inches from the end of the shoe is only $4\frac{1}{2}$ inches long and $\frac{5}{16}$ inch wide. The third strut is 46 inches from the rear end of the shoe, and the fourth strut is 33 inches.

Lacing of the snow-shoes, which is done entirely by the women, follows a definite pattern. In the middle section of the shoe, which supports the foot, a loose webbing of heavier babiche is used to prevent snow from clotting under the foot in spring time.

The oval-toed snow-shoe is used occasionally by the Satudene, but is evidently intrusive. Snow-shoes used by women were of the same shape as the men's but may have had the point rounded off; now they have exactly the same shape. Yet, though a young man might borrow a woman's snow-shoes he would resent any woman borrowing his. Diminutive snow-shoes are made for children, who begin to use them soon after they are able to walk. Simpson (1843, page 237) tells of a Hare (?)

boy scarcely two years old who "was so fond of these painful appendages that he hugged them as a plaything, and bawled lustily when his mother attempted to take them from him."

Toboggans were constructed of two or three hewn boards of birch, necessarily narrow because of the lack of large timber. They were shorter and narrower than the imported toboggan now in use and the head was less upturned. The original breed of dog in this region was very small, and not used for dragging the toboggans. When larger breeds were introduced in post-European times, three dogs were considered sufficient for a team, but now five or six are used. To drive fewer would be to lose caste. The harness is of the type used for horses and is obviously not of native origin. The dogs always are hitched tandem.

In the springtime on the great lake sledges now partly supplant the toboggans for use on the glare-ice. The sledge consists simply of two heavy runners from 4 to 12 feet long, connected by boards or slabs of wood. These cross boards, which give the sledge a width of from 2 to 3 feet, are tied in place with rope or babiche. Flat iron runners, purchased at the trading post, finish the construction of the sledge, for there is no framework above the carrying platform. The Greenland sledge may become common in the future as it was introduced by white men in 1928. Sledges have certain definite advantages; they raise the carrying surface out of the slush of melting snow, are capable of carrying greater loads with less traction, and do not suffer so much mutilation from rough ice as do the surfaces of toboggans. If toboggans are used in the spring, runners are always added.

Travel is by no means easy, even with the aid of dogs. The snow in the timber country does not bear the weight of the toboggan except for a few days in the spring when the daytime thaw freezes to a supporting crust at night. Consequently, it is necessary ordinarily to go ahead of the toboggan and break out a trail with snow-shoes, an arduous performance. New trails require considerable cutting of timber and since the Indians cut no more than is absolutely necessary, considerable manipulation of the toboggan is demanded to keep it from smashing or catching on trees and stumps. Thus travel under adverse conditions is limited to a very few miles a day, whereas on the glare-ice of the lake in the spring, 75 miles is not impossible. When the men go alone they travel much faster than when accompanied by their families. All trails are divided into "spells," a distance that varies greatly but averages about 5 miles. Generally, at the end of each spell, the order of travel is changed so that the leading team is rested.

Trails are blazed, but very indistinctly, the native making use of his memory in a way that seems uncanny to white men who find only monotony in the endless timber. A gnarled tree or a clump of bushes is a distinctive sign post for the Indian and he feels assurance while in his own country that he cannot go very far without recognizing his location by some familiar land mark.

The extent of travel among members of the Satudene group has probably increased in recent years with the assured peacefulness of their neighbours. A fair number have visited Rae, on Great Slave lake; some have been to Coronation gulf, on the Arctic coast; and quite a few have hunted in the country west of the Mackenzie for a season.

TOOLS AND IMPLEMENTS

Lines. The manufacture of lines seemed to be outstanding in the implemental culture of the Satudene, although no information was gained that suggested any connected ceremonialism. Fourteen types of lines were recorded.

(1) Single babiche line—made from a wet semi-tanned moose or caribou skin. Two women work together; one holds the skin, the other cuts with long strokes, gauging the width with the thumb. The lines are stretched and dried. This type is widely used, particularly for snow-shoe lacing and the binding on implements.

(2) Edges of tanned skins—these lines (really semi-tanned) were used when no great strength was required.

(3) Braided rope—made of babiche plaited in the form of a flat tape of any width or strength required. It was used for headlines of toboggans, for sled and sled-wrapper lines, for tying on loads, and almost anywhere a rope was required except in the water, as for fish-nets, where skin lines soften and stretch.

(4) Rawhide rope—made from moose skins cut in strips with no treatment except rough cleaning and chipping. This is the common baling line of the fur traders and is little used by the Indians themselves.

(5) Sinew lines—made from the tenderloin sinew of moose or caribou. These lines were plaited round, but not twisted as a rope. They never were of less than four strands and had one particular use, that of ice-lines.

(6) Sinew thread—used for sewing. Strands were torn out of the tenderloin sinew of moose or caribou and rolled over the knee.

(7) Twisted sinew line—made of twisted sinew thread and used for bow-strings.

(8) Willow twine—made of the inner bark of the willow. The outer bark was torn off and the inner stripped from the outer while green. This was torn into strips of nearly equal width, the ends split for joining, and rolled by hand singly and then in pairs over the thigh. Willow twine was used particularly for nets.

(9) Willow line—made in the same way as willow twine but from more and thicker strands. It was used for net-backing and trout-hook lines. Willow twine and line lose strength out of water.

(10) Twisted babiche lines—made of several strands of babiche twisted and used for bear snares.

(11) Tanned moose or caribou skins cut into lines—were used for pack lines, snow-shoe straps, mitten strings, and where pliability and no great strength were needed.

(12) Spruce-root twines—were used for sewing canoes, and birch-bark utensils.

(13) Whole-willow lines—made of young pliable willows and used for tying rafts and baling fish or meat.

(14) Trout fish-skin babiche—made and used only because of a shortage of true babiche.

Fishing Utensils. Fish-nets were made of willow twine, with a backing of willow line, in the same manner as European nets except that only one backing was used, on which the net was loose so that it could move easily. This may have been to keep it from breaking. There was backing on the top and bottom of the net, which was set and visited as is the European net of twine employed at the present time. Willow nets are known among most of the northern Athapaskan tribes but are no longer used.

The net measure was a thin, rectangular block of spruce wood cut to the length of the desired mesh. The willow-net netting needle was made of a thin piece of spruce about 8 inches long and $1\frac{1}{2}$ inches wide. Square notches were cut in the ends about 1 inch deep and 1 inch wide. This is a simpler form of needle than that used in making thread nets, the latter probably not being suitable for the dry, less flexible willow twine.

Nets made out of babiche are used for taking beaver. They are about 15 feet long and are set much after the fashion of fish-nets. The attaching lines are put through a sliding piece of bone so that when the beaver is entangled its exertions draw the net into a sort of bag and the animal is easily drawn to the surface.

Fish-hooks were made by attaching a piece of bone, generally part of the jaw of a trout, to a short wood haft with sinew. A short piece of babiche was attached to this hook so that the fish could not bite through the willow fibres which made up the rest of the line. Hooks were baited by sewing on a piece of fish skin.

Spears of several types are known by the Satudene. Perhaps the commonest is the herring spear with a haft about 6 feet long, split at the end for the insertion of a moose-bone point. Two barbed tines about 8 inches long made of fire-hardened birch are spliced on around the pointed end of the haft. The width of the tines is gauged by the palm of the hand. A copy of the Eskimo double spear is also used, with upturned wooden barbs lashed on the tines. A spear with a single metal blade is employed to catch jack-fish spawning in the spring around lakes whose edges are free of ice. This spear seems to be a copy of an early form, for Wentzel says (1890, I, page 90) that the spear made by the Beaver (Slave) was about 9 feet long with a bone blade at one end, furnished with a row of barbs. A drag-spear made of a long spruce pole with a fish-hook on the end is pushed under fish idling against the current, and they are pulled ashore.

The ice-chisel is a simple instrument composed of a sharpened piece of moose humerus about 10 inches long, hafted into a 7-foot spruce pole left thick at the hafting end for the advantage of weight. The handle was split and then bound with babiche after the long, tapering bone was inserted. Eskimo ice-chisels of native copper were in use by the Dogribs at Rae in 1913. King (1836, I, page 152) mentions caribou horn chisel points in 1836 among the Dogribs and he was impressed by the wide use of this material.

The ice-scoop used for straining the fishing hole free from ice is made of a single piece of spruce or willow bent in the shape of a tennis racket and bound with babiche. One specimen was 28 inches long. The scoop proper is about 8 inches across and constructed of near-parallel strands of babiche running from the throat to the periphery. A few alternating cross-strands of babiche give firmness to the strainer.

The ice-bag is constructed as is the ice-scoop except that the shaft is much longer and the scoop frame much smaller. The bag was probably made originally of skin and sewn to the frame with babiche. This implement is to extract the broken ice cut with the ice-chisel from the bottom of fish holes through thick ice, which may be 6 feet deep before water enters to float the loose ice for removal with the ice-scoop. The bag itself is 6 to 8 inches deep and the frame is often a willow doubled into a loop and bound to a pole. This implement is especially used in trout fishing in the spring when holes are cut through ice, which at that season is exceptionally thick.

Fish-weirs of a very simple type were constructed formerly, but there was no use of baskets or boxes as an associated trap. Dam-like structures were made of stones or trees and with a small opening where fish could be easily taken with spears.

Cutting Tools. Drawknife blades never exceed 8 inches in length. The blades are now made out of old saws, trap springs, but most commonly from old files. Presumably in ancient days they were made of bone or horn. They are straight with a curve at the end as in farriers' knives. The handles are usually cut so that the thumb may be extended easily outwards from the palm for easy and efficient grasping. Handles were chiefly made of bone, although wood is common today. The natives regard use of the latter material as evidence of laziness and poor workmanship.

Stone adzes disappeared among the Satudene generations ago. A description of one, however, is borrowed from Keith's letters to Roderick Mackenzie in 1812 (Keith, 1890, II, page 122). Speaking of the Hare natives who visited his post at old Fort Franklin on Great Bear lake, he says:

"The hatchet is made of stone pointed at both ends something like a wedge, and attached to a wooden handle with a line, all of which from their frail material and construction, require infinite patience and labour to enable them to perform their several offices. To fell timber with this hatchet they must always chop against the fil du bois, and after raising a few splinters, the tree is soon knocked down."

A better description of an adze seen among the Beaver (Slave) is given by Wentzel (1890, I, page 90).

"Their axes were of stone shaped in the form of a pickaxe, the middle of which was scalloped in order to fit it to the end of a stick, which, when well fastened, answered the purpose of a handle; thus arranged, they could hew or rather hack down the largest tree."

Adzes of various shapes and structures no doubt existed formerly among the Satudene, but to discover them today is the work of an archæologist. One specimen described to me from memory was said to be about 6 inches long and 2 inches wide. There was a single, not very distinct groove for hafting. The stone was dark blue or grey, and showed the poor workmanship that is generally distinctive of these Indians. Tree cuttings, undoubtedly made by means of stone adzes, are recognizable on the north shore of Keith bay. Probably, however, the Indians did not possess many stone adzes at any time, depending more on fire for felling trees.

One stone blade, probably a scraper, found at the head of a grave, was slightly over 3 inches wide and about $2\frac{1}{2}$ inches deep at the centre of the arc. The chipping of the scraping edge was of a very primitive type.

The blade would be almost round were not the upper part broken off as though for hafting. There is no evidence for the actual type of hafting. Hafted beaver teeth are said to have been used as adzes for smoothing wood.

Knives of stone, bone, horn, or perhaps native copper may have been used as protective daggers. Their manufacture would have conformed to the methods commonly employed in making knife-like implements, namely, the simple hafting of the blade in horn or split wood and binding with sinew.

Awls are of two distinct types, one for sewing, the other for boring wood. The sewing awls were formerly made from the leg bone of a loon hafted in a larger piece of bone. The awl was quite small, the blade being from 1 to 3 inches in length and the round straight handle the same. Some handles were curved. Boring awls used in making snow-shoes had a fox tooth for a point, and many of the handles were semi-lunar in shape to bear the pressure. Such awls are now made with a nail filed off to a flat, small edge which serves to clean the hole as well as to bore it.

Skin scrapers were made from the leg bones of the moose cut off above the distal enlargement and sharpened at one end, the edge frequently being serrated. One specimen taken from a grave was about 10 inches long. Another type of scraper was made by splitting a large bone longitudinally and using the sharp edge. Sometimes stones with sharp edges were used for skin scrapers.

Birch-Bark Basketry and Weaving. Birch-bark baskets were made of all sizes for collecting and storing food. The bark was folded in the usual Indian fashion and sewn with spruce roots. It seems certain that woven baskets were used in former times although they are now forgotten. The last one known was a large basket said to be in the possession of a Brother at the Roman Catholic Mission at Good Hope at the end of the last century. It is said to have held water, as it was smeared on the inside with a glue of spruce gum and fish oil. It was thought to be made of spruce roots. Keith confirms the use of this type of basketry, in a letter written from Great Bear lake in 1812 (Keith, 1890, II, page 120):

"Their boilers (their little exertion cannot procure them brass kettles) are made of wattap, interlaced with willow so closely and neatly that the least sediment, with the swelling of the wood, makes it very tight. Into this vessel, they put the quantity of water required, after which they heat this water almost to the boiling state with stones heated in the fire amongst ashes."

Rabbit-skin blankets and clothing were formerly woven of lines made from tanned rabbit skins with the hair on, cut spirally so that each line ended in an eye-hole by means of which one length was attached to the next. These lines were twisted with the hair outside and woven, starting with a series of loops on a stick the width of the piece to be made. The second row of loops was made through the first with the line passing around its own part with each loop. Such blankets though loosely woven were very warm. Rabbit-skin blankets made by actual weaving on a frame are reported for some of the Athapaskan tribes in British Columbia, but no use of a frame is remembered at Great Bear lake.

Moose-skin Work. Moose skins or caribou skins are tanned by native women, who first remove with a bone scraper all the adhering traces of

fat or flesh. The hair is also removed, if so desired. This is done most easily when the skin is frozen, with the aid of a serrated end scraper; otherwise, the skin is soaked and scraped with a knife. The skin is then repeatedly soaked in water mixed with moose brains, alternating with stretching and pulling. It is probable that a hollowed-out log about 6 feet long and 1 foot in diameter was used for this purpose; one was found in a probable camping spot on McTavish bay. When the soaking and stretching are finished, the skin is smoked and dried over a fire of dried willow and afterwards rubbed with a stone scraper and pulled to softness. Caribou skins are whitened by allowing them to dry and bleach in the sun instead of smoking them. If a yellow colour is desired, which is generally the case with moose skins, the skin is sewed up so that smoke is concentrated from a fire of rotten wood.

Bags of various descriptions are made from these skins. One of the most common was the old fire-bag, a small decorated pouch, which carried the flint and steel, tobacco, and a small knife. These bags were of various patterns and had decorations of porcupine quills or moose-hair. Moss-bags for carrying babies were made of tanned skins without hair, although in winter they were generally lined with rabbit skins. The child was put in the bag immediately after birth and the bag was laced. The child was thus carried on the back and seldom taken out during the first year except to change the moss. Despite the suitability of the moss-bag, it has practically gone out of existence, a diaper of moss being now used. Bags of all sizes, made of loosely woven babiche with a band of decorated skin around the top and perhaps the sides and bottom, were used for carrying game and were very strong and light. They were carried by a line over one shoulder.

Gun cases and quivers were made of tanned skins ornamented with fringes and bands of porcupine quills. Carrying straps, particularly used by women for carrying babies, are highly ornamented, in modern times with beads and embroidery. They are generally about 4 feet long, tapering from a middle width of about 4 inches.

Whips vary in length from about 5 to 7 feet. A whole tanned caribou skin is used in their construction and they are braided smoothly round. About a foot of the upper part is tripled and twisted. The cracker is about 1 foot long and is made of three-ply twisted strips of tanned skins, knotted in various places. The handles are about a foot long, sometimes carved in a fashion introduced by the métis, but more often at the present time only decorated with wool and tassels which hold the whip on the surface of the snow if dropped, making it easy to find. When not in use, the whip is often hung around the neck.

Dog-shoes are used in the late winter and spring, especially on the great lake where the ice candles and cuts the feet. They are little bags of tanned skin with tie-strings attached. They have been largely replaced by copies in canvas, which are not efficient because they quickly wear out and are a continual nuisance to the driver, who must stop and change them on a long trip.

Snares and Traps. The snares still used are principally for rabbits. These are made of twisted sinew and are set in the rabbit runs in a number of slightly different ways, but all so that the loop, which is spread by

twigs, if once pulled releases a sprung willow or branch of a tree, thus strangling the rabbit. The bottom of the loop, which has a simple slip knot, is raised a palm-width from the ground. When the rabbits are in season immense numbers can be caught with ease by this method. Snares for lynx are made in much the same fashion, only babiche is used instead of sinew and the snares are more protected at the side by brush to force the animal to enter at the right place. Caribou were formerly snared in the openings of long brush fences. Three-ply twisted babiche was used for this purpose and the animals were killed outright by the natives who awaited them. Bear snares are made of twisted babiche of many strands, but it is considered somewhat dangerous to catch them by this method.

The steel trap has been adopted almost exclusively as a practical substitute for all other kinds. Only for marten does one occasionally see the prehistoric deadfall. This type, on a slightly different scale, presumably served for other animals. Two trees of about 6-inch diameter are felled and cleaned of brush. One is laid on the ground near the tracks where the trap is to be set and the other is put on top of it, separated at the mouth of the trap about 8 inches by a vertical stick. A small brush shelter or lean-to is built behind this stick so that the animal can only take the bait through the separated logs. The bait is on the end of a horizontal stick which extends into the trap-house. This bait stick also holds up the vertical support of the raised log, and the whole is so arranged that when the animal takes the bait he upsets the vertical stick, and the upper log, which is weighted with one or more cross logs, falls and crushes him. An experienced native can make a trap of this kind in a few minutes. A piece of dry fish is usually the bait.

A peculiar trap for foxes is sometimes used on the great lake. A large block of ice is held from falling by a frozen fish, generally a herring about a foot long. When the fox pulls the fish out, the block of ice falls and crushes him.

Eating Utensils. Eating utensils form a very limited part of the implemental culture of the Satudene. Spoon-like ladles were made out of musk-ox horn, cut, and expanded by the use of heated stones. Mountain sheep horn, also, was used for this purpose. Food was placed on mats of birch bark, for it was said that devils would hold the food if not placed on something. Food was eaten for the most part only with the aid of the fingers, but occasionally with the assistance of a knife.

Metal Working. It is possible that the Satudene used native copper before the coming of the white man and not unlikely that they procured some of it themselves on trips to the country of Coppermine river. Native copper may have been used for arrowheads and for decorations. The Chipewyans are known to have collected copper (*See Mackenzie, A., 1802, page 75*), and at the time of Mackenzie's descent of the river of the same name, the Loucheux were obtaining iron from the Eskimo, who got it in turn probably from the Russians (*See Mackenzie, A., 1802, page 45*).

Fire Making and Smoking. The Indians today have forgotten the most ancient methods of making fire, but it is highly probable that iron pyrites was used. Keith gives us the earliest and most authentic account of fire

making among the Hares. He says (Keith, 1890, II, page 122): "They make use of two pieces of metallic ore, with a kind of spongy substance found upon the bark of the smooth poplar tree, to make fire." This method is also mentioned by Wentzel (1890, I, page 79) as being used by the Beaver (Slave) at the same period. Fire steel and flint ore early took the place of the original method. For touchwood the Indians used a fungus from birch trees or, according to Keith, from poplar. Nothing may be found today but matches.

Smoking appears to be an intrusive art among the northern Athapaskans. Mackenzie says (Mackenzie, A., 1802, page 31) that the natives did not appear to know the use of tobacco. There is no record of any stone pipes among the Satudene, but Russell (1898, page 180) reports having seen and collected, during his trip among the Dogribs, two, one of which was of fine-grained sandstone. King (1836, vol. I, page 123), speaking from his camp on the north shore of Great Slave lake, comments on seeing "a variegated marl of greenish grey colour, in all probability washed from the rock whence the natives obtain their pipe-stone, situated according to the Indian's statement, in a direction due north of our station." It would thus appear that smoking was definitely established by 1835. The Satudene today, if necessary, will make a pipe out of spruce or willow wood. It is said that they smoke the dogwood plant, but Pike says (1892, page 29) that the Slave Lake Indians (probably referring to Dogribs) prefer the inner bark of red willow.

Snow Glasses. No aboriginal form of snow glasses could be found among the Satudene or surrounding tribes, although the natives are not immune to snow-blindness. It is said that wooden ones of Eskimo type were formerly used by the Hare Indians at Good Hope. Simpson (1843, page 235), however, speaking of Indians who probably belonged to the Hare tribe, says that, unlike the Eskimo, they had contrived no precaution against ophthalmia and that almost everyone who arrived had it. Whitney (1896, page 286) figures a pair of snow glasses which may have been in use by Dogribs. They appear to be simply two wooden disks with a T-shaped aperture cut into them, held in position over the eyes by narrow bands of soft leather in the fashion of heavy motor goggles, but there is little evidence to believe them an Indian adaptation.

Weapons. The Satudene used the bow and arrow, and knives and spears pointed with bone and possibly with native copper. The bows were made almost exclusively of dried willow and were generally about 5 feet long. They were about $1\frac{1}{4}$ inches wide, concave on the outside surface, and flat on the inner. All bows among these people, except toys of the children, carry a guard about $\frac{1}{4}$ inch thick, the width of the bow, and $1\frac{1}{2}$ to 2 inches long. The bows when at rest have very little arc, so that the bow-string lies against this guard. The bow strings are made of twisted sinew or, less commonly, of a single strand of light, twisted babiche. The sinew is wetted, rolled on the knee, and then attached to the opposing V notches at either end of the bow. The bow-string becomes rough with use and it is common to see the men who are about to shoot the bow licking with their tongues the little dry ends of sinew.

The bow is generally held in the left hand, palm upwards, at an angle nearer horizontal than vertical. The arrow is held against the bow-

string by means of the thumb and first three fingers, thumb above the string and fingers below. This grasping position has a dainty appearance and requires more adeptness and strength of fingers than can usually be applied by one unfamiliar with the art. The extreme range is possibly 200 yards; 193 yards was recorded in a competitive test, but the maximum range for accurate shooting is little more than half that distance.

Arrows are made of a particular kind of spruce when obtainable. It is clear-grained, whitish, and probably second growth. The arrows are $2\frac{1}{2}$ to 3 feet long and are made with the drawknife. A final smoothing is obtained by rubbing them between two flat pieces of dry wood. The diameter of the arrows is between $\frac{3}{8}$ and $\frac{1}{2}$ inch in the thickest part, and they taper to both ends. The thickest part is generally a little closer to the front. The arrow is notched for the bow-string and the tips protrude a little to facilitate grasping, except in children's arrows, which are not constructed carefully in this respect. The notch itself is slightly more than string depth. Next to the notch are three lines of cut and split feathers, trimmed, and stretching in straight lines from $2\frac{1}{2}$ to 3 inches. In order to get these of proper stiffness they are taken near the bottom of the natural feather. The feather is split in half and the heart or thick part is shaven off. The cut and trimmed feathers are tied on at their ends with sinew. Eagles' feathers are preferred, but those of any big birds such as hawks or geese are used.

In recent years nails have been employed for arrow-points, or files cut into heart-shaped blades. The nail is put into a bored hole, and the wood tapered down and bound with sinew. The heart-shaped head has a pointed haft and is attached to the arrow in the same manner. A blunt head in the form of a chisel was also used as preferable against certain small birds such as ptarmigan and spruce hens. The shocking power was an asset, and not so many arrows were lost. In ancient times, it is said, a bone point, such as is used in the fish spear, took the place of the nail, and the heart and chisel-shaped blades of iron are copies of stone, bone, or native copper pieces. The arrows were carried in a skin quiver suspended under the left arm. Wentzel says (1890, I, page 90) that the Beaver (Slave) bow, which was also made of willow, had fixed in the end a small, pointed bone furnished with a barb, and also that their arrows had flint points.

A spear was probably also used as a weapon.

No memory of any armour or shields is to be found among the Satudene today, nor are they mentioned by Keith at Great Bear lake. Wentzel (1890, I, page 92), however, says of the Beaver (Slave) that "from their neck down to their thighs, they wear a mat made of willow switches; it covers the whole front and guards against arrows, as it is close matted for that purpose. Besides this, they carry a shield on their left arm; this is a board 10 inches long." He also says that they wore "a cap decorated with feathers before and behind" and that "sometimes bear claws sewed to a piece of leather served the purpose." It may be interesting to note, also, that shields are mentioned as being used by the Chipewyan companions of Hearne, and Mason was informed that plates of native copper were buckled together and used by the Yellowknives as armour in fights against the Eskimo (*See* Hearne, 1795, page 176, and Mason, MSS.).

The rifle has, of course, for many generations, supplanted all other weapons, being one of the first implements in general use after white contact.

WAR

The northern Athapaskans have been described as having led constantly a life of incredible bloodshed in early times, and also as a very unwarlike people. Considering the struggle for existence under northern conditions, the isolation of the tribes of so large an area, and the difficulties of travel, the latter view seems the more credible. Their treachery in combat has been widely recognized and one writer indeed says that they should be called murderers rather than warriors. Precedence in the status of bravery has been accorded to numerous different tribes by various commentators, but such judgments are of questionable accuracy.

The Chipewyans are the traditional enemies of the tribes living north of them. The Satudene have vague memories of several massacres in their struggles with wandering bands of Chipewyans. Mackenzie (1802, page 17) said that the Chipewyan pillaged the Yellowknives so often that the latter gave up the hunting of beaver as a profitable enterprise.

The best authenticated feud between tribes of Great Bear Lake region was that which ended in the almost complete annihilation of the Yellowknives by the Dogribs, perhaps in conjunction with the Hares. It is said that the Yellowknives habitually tyrannized over the Dogribs, robbing them of their goods and their women, until finally, about 1830, the Dogribs retaliated so successfully as to remove all danger from that quarter (*See* Franklin, 1828, page 9; Simpson, 1843, page 317; Richardson, 1852, pages 208, 251; Back, 1836, page 457). Dogribs also fought with the Slave, and Richardson (1852, page 98) mentions a place that was named because of a massacre of Dogribs by a war party of Beaver (Slave) Indians.

Like neighbouring tribes, the Satudene have had more or less conflict with the Eskimo. It is a well-known fact that during historical times down to the last few years they followed the southern route through McTavish bay in their journeys to upper Coppermine River country rather than risk encounters with the Eskimo who hunt southwards to the neighbourhood of Dease bay. An old woman of about seventy years remembered that as a child the sight of Eskimo smoke was a sign to move from the vicinity. She said the Eskimo raided the Indian camps and took the children. The Satudene Indians did not always run away from the Eskimo, for they boast a willingness to engage them if necessary even to this day. Hearne's story of the massacre of Eskimo at Bloody falls, near the mouth of the Coppermine, is probably the best known of such examples. Richardson reports (1852, page 161) that the Hares of Good Hope told of meeting Eskimo, probably on Anderson river, whereupon a quarrel ensued and several of the latter were killed.

Causes of warfare included the desire to capture women, and one of the first signs of hostility was the sending away of wives and children. Blood-feud, perhaps accidentally started, was also reason for war, and the belief of a group that another was maliciously using 'medicine' against them probably likewise initiated conflict. Sometimes fighting occurred over the occupation of good hunting territory.

Leaders were undoubtedly chosen to head the war parties, but lost their authority as soon as the raiding was over. Wentzel thus describes the war chiefs of the Beaver (Slave). He also states that scalps were not taken but that the dead were stripped of their clothing, which served as tokens to show on the warrior's victorious return to their own families. The Slave also, for their own protection, felled trees around their camps to make a barricade of sharpened branches. As a sign of peace, a cut of meat was hoisted on a long stick (*See* Wentzel, 1890, I, page 92). When prisoners were taken, the men were probably always killed and the women and children adopted into the tribe. Père Petitot reports (1876, page 60) ceremonial cannibalism among the Hares.

"Jadis, dans la tribu des Peaux de Lièvre, on traitait les prisonniers de guerre à peu près comme en usaient les anciens Mexicains, les modernes Sioux, les Chinois et les Celtes. Après les avoir étendus sur le dos, on les fichait en terre au moyen d'un pieu aigu qui leur traversait le nombril, on leur ouvrait la poitrine avec un couteau de silex, et, après leur avoir arraché le coeur, on le donnait aux femmes qui, avec rage, le mâchaient tout palpitant."

The Satudene at the present time seem to have no recollection of this custom. With the establishment of the fur posts warfare gradually disappeared among the Mackenzie River tribes and taking of human life is today extraordinarily rare.

ART, MUSIC, AND AMUSEMENTS

Art. The Satudene can be characterized by the meagreness of their attempts at decorative art in all its forms. Primitive decorative designs were used on articles of clothing, particularly on footwear, but except for the latter, examples of the aboriginal art are now almost non-existent. Various types of bags, especially the moss-bag and fire-bag, and the carrying-strap were artistically treated, principally with porcupine quills. The designs were geometrical, to which form quills most naturally lend themselves, and the diamond was the commonest figure. The process shown in moccasins by which the porcupine quills were sewn on was extraordinarily simple, a quill being laid down on the surface of the skin to be decorated and sewn across at the point that was to be the edge. It was then doubled back and sewn at the opposite edge. Another quill was added by placing it under the preceding before the last sewing of the latter, thus leaving the end of each quill underneath and unseen. At the present day among the Satudene porcupine quill work is limited practically to moccasins. The colouring is variegated, but is most often made up of blues and reds. The dyes are purchased from the traders.

The only moosehair work done for decoration among the Satudene today is the piping around the decorated area of the moccasins, and for that purpose imported horsehair is generally substituted. The excellent moosehair work that is done by the Indians of Providence on upper Mackenzie river is unknown at Great Bear lake, and it seems almost certain that in the latter place neither porcupine quill nor moosehair work approached the artistic development that it did in other regions.

Painting and Dyeing. Primitive painting or drawing is unknown among the Satudene today. Russell (1898, page 168) says that among the Dogribs the two circular seams of the tipi were decorated with a band of

red ochre an inch wide. Keith (1890, II, page 101) reports the natives of Great Bear lake to be in the habit of painting their faces with some kind of ore which is about the size of very fine sand, is found in various parts of the mountains, and has a colour resembling black lead. A group of Indians from the Norman district during the first half of the last century are said by McClean (1849, page 250) to have rushed into Good Hope with their naked bodies blackened and painted after the manner of warriors bent on shedding blood, and with the avowed intention of plundering the establishment.

Dyes are used for colouring skins and porcupine quills. Black dye was formerly made from charcoal; yellow was extracted from alder bark; red was derived from currants or red ochre; and blue from blueberries. Paint was made from charcoal or red ochre mixed with fish oil. Wentzel (1890, I, page 79), speaking of the Beaver Indians of Mackenzie river (Slave) said that

"the dyes made use of by the Indians to stain porcupine quills and feathers, which are the only thing they stain, are the roots of a plant that the Canadians call Savoyan; its colour is of an orange cast. This root boiled with cranberry dyes a beautiful light red; the dyes for yellow are another small root which they gather in marshy plains."

Keith (1890, II, page 102) confirms the use of roots for making dyes, saying that "there is a small, fine root for dyeing a pale or dirty colour, and another root, something like stick liquorice, with which the [Great Bear Lake] natives make a pretty bright yellow". Mackenzie (1802, page 91), while going down the river of his name, also comments on dyes as follows: "The beach was covered with coals, and the English chief gathered some of the softest he could find, as a black dye; it being, the mineral, as he informed me with which the natives [Hares] render their quills black".

There has been a considerable introduction of art work by the métis population of the Mackenzie. It takes the form of silk work on moccasins, gloves, mittens, and other articles of dress, of painted and tasselled snowshoes, of elaborately decorated carioles, of carved wooden whip handles with whorls and varied designs, of carved drawknife handles with animal heads at the ends, of tuppies (dog-blankets) elaborately embroidered with silk or wool on stroud, of standing irons of dog collars decorated with the tails of fur-bearing animals or with woollen tassels, and of ingeniously designed hat bands. Most of this métis art is disappearing; the decorated carioles are entirely gone. A few carved whip handles are seen among the Satudene today and also a few with coloured wool. Tuppies are used to some extent, especially when visiting a trading post at Easter or Christmas. Canoe paddles were also carved by the métis, but none was seen on Great Bear lake. The silk work takes the form of flower patterns, realistic when made by the women who have been to the schools or lived much in the forts, and tending toward the conventional when made by women with fewer white contacts. Bells on dog harness are almost universal, and it is believed that dogs increase their speed when so equipped.

Signs. No picture writing is known among the Satudene. Occasionally the Mission syllabary is seen written in the snow beside the trail. Sometimes a time sign is made by drawing an arc in the snow, with a straight line to designate the position of the sun. This is left to tell the

time of departure of one party for the benefit of another following. Richardson (1852, page 198) speaks of recognizing a smoke signal among the Hares which he answered with another, which in turn was acknowledged by a third column. Guns are used at the present time by travellers to announce their approach. Some families fire a fixed number of shots in succession which is a prearranged signal. Mackenzie (1802, page 91) speaks of seeing in the Hare country several Indian marks consisting of pieces of bark fixed on poles. These marks were used to designate the beginning of a trail on the river bank.

There are no carved monuments in the Great Bear Lake country.

Scientific Knowledge. Only a few of the names of the months were transcribed and these were from Good Hope Hare:

April—	γα	xo		γα	se	le	—	Lesser snow blind month
								lesser
May—	γα	xo		γα	de'		—	Greater snow blind month
								greater
June—	bε	mε		tε	g'q	xι	—	Melting month
								melting
July—	ε	yε		gq				sa
								—Egg month
								eggs in that month
August—	e	cu		gq				sa
								—Moulting month
								moulting in that month

Russell (1898, page 165) also lists some of the native names of the months. For the Dogribs he gives:

January—	Et-se	sa	—	Cold sun
February—	Nit-se	sa	—	Small wind sun
March—	Nit-se-cha	sa	—	Big wind sun
April—	Win-di-thi-che-ko	sa	—	When the dogs travel with tails up sun
May—	Ne-wik-un	sa	—	Sore eyes sun
June—	Wen-a-ki	sa	—	Egg sun
July—	Wen-a-chy-ko ⁿ	sa	—	When the wing feathers are moulted sun
August—	Wen-at	sa	—	When the caribou enter the woods sun, or
	Wen-di-e-in-e-ti	sa	—	When the berries are ripe sun
September—	Wen-a-cha	sa	—	When the caribou are abundant in the woods sun
October—	Ek-ola-chin-co	sa	—	Paddle shoulder sun. (Alluding to the practice of striking a scapula against trees in luring moose at this season)
November—	Wen-de-to ⁿ	sa	—	When the ice sets fast sun
December—				

For the Slave he gives:

January—	E-toz-in-e-cho-ke	sa	—	New-year's sun
February—	Ni-tsyã	sa	—	Small wind sun
March—	Te-to ⁿ	sho	sa	—Eagle sun
April—	Ni-tsyã-cho	sa	—	Big wind sun
May—	Be-ken-ot-o-to-ni-no ⁿ -ta	sa	—	The geese arrive sun

June—Chi-me-ab-e-ya sa—Ducks are laying sun
 July—Bek-ke-chi-e-ya-ten-ne-ti sa—Berries ripen sun
 August—Colo^a-ye-ken-ak-e-ne-i-a sa—Moose rutting sun
 September—
 October—Thlu-i-ka-tse-de-ti sa—Fishery sun
 November—
 December—

According to Petitot (1876, page 34), the Hares began the year in March with the spring equinox, but the younger generation claim to have forgotten these things.

The day period, however, according to informants, was spoken of in twelve terms, which served to describe the time. These, in free translation, were: daylight appears; sunrise; after sunrise; before noon; noon; after noon; late afternoon; evening; daylight disappears; night; midnight; and after midnight.

Some peculiarities in the recognition of body parts were discovered among the Satudene. Forty-one terms were compiled, most of which corresponded to those in English. An exception appeared in the use of a word for the thumb, one for the combination of first, second, and third fingers, and another for the little finger. This grouping was also true of the toes.

Directions were ascertained at night by the north star and the Big Dipper, and in the daytime by the sun; the wind served as a compass in the rain.

Music. The tambourine drum is the only native instrument used by the Satudene. It is constructed by bending a strip of birch, about $1\frac{1}{2}$ inches wide and $\frac{1}{2}$ inch thick, into an approximate circle and sewing the ends with babiche which overlap from 3 to 4 inches. Drums vary from 1 to 2 feet in diameter and are covered with caribou skin parchment sewn to the frame by means of babiche, over which are stretched two or three snares of finely twisted sinew. The drum is covered only on one side and is held by the converging parts of from four to six radiating babiche cords. The parchment is beaten by a single stick about a foot long with a very slight curvature at one end. There is sometimes a very slight knob on the handle and two or three lightly incised lines parallel with the stick at the other end. A description of a Dogrib drum of the identical type is given by Russell (1898, page 176). The parchment of the drum must be heated to bring out the necessary volume of sound. This is done by holding the surface close to the fire or stove for a few minutes, and testing it from time to time. The stick is held in the palm of the hand, extending out between the thumb and first finger. The drum is particularly used for dancing and the old gambling game. For the dancing the beat is single, gradually increasing in speed to thirteen strokes in fifteen seconds. Two or three drummers generally perform at the same time. For the gambling game, a double beat is used.

Rattles are made, but are used principally as a plaything by the children. They are constructed of a narrow strip of spruce or a willow which is bent into a complete circle from 3 to 6 inches in diameter. This

is covered with caribou parchment and filled with stones, or more recently with shot. Russell (1898, page 180) also describes such a specimen, which he got from Dogribs.

A sort of crude whistle is made by the children by drawing the bark covering whole from a green willow. One Indian said that loons are called by such a whistle.

Whistling with the mouth is an art in itself among the Satudene, who, like most Indians, are keen imitators of the sounds of the wild birds and small animals, the muskrat in particular.

Singing is common among the people and especially during the dancing. Few of the songs have real words, being made up for the most part of a reiterated "he—ha". Besides the dancing songs, there are gambling songs, mourning songs, medicine songs, and love songs. Petitot (1876, page 47) also mentions these types of songs and links the medicine songs with those for war. They are generally not considered attractive to the European ear, but to one accustomed to the strangeness, it is pleasant to hear the crying melody of a love song through the still cold of an Arctic night. The songs of love and mourning are distinguishable from the others, even to an untrained ear, by differences in the rhythm.¹

Dancing. Dancing is one of the favourite activities among the Satudene and very little excuse is necessary to start a performance. In the summer the dances are held in the open around the fire, but in the winter during recent years the people dance around the stove in an available cabin. Children, soon after they are able to walk, join in the performance, to the amusement and satisfaction of their elders. The older form of the dance is said to consist of a simple side step in time to the drums, the whole party, both men and women, joining hands in a circle around the fire, singing, and the men moving a great deal more than the women, who take only short steps.

Petitot (1893, page 13) describes a ceremonial dance performed by Hare Indians following the killing of a bear. Unfortunately, no similar dance was described at Great Bear lake, nor was it possible to get a confirmation of the spectacle here quoted.

"Mes compagnons voulurent m'y donner le spectacle de la danse de l'Ours, cérémonie superstitieuse que ces Danites arctiques accomplissent, paraît-il, chaque fois qu'ils ont tué un de ces plantigrades sans être accompagnés par des Européens. Ils eurent le soin de m'avertir que, dans le présente occasion, ils n'étaient pas mus par le même sentiment, mais seulement par le désir de m'être agréables en m'instruissant d'une coutume de leurs ancêtres.

A cette fin, ils placèrent une pierre plate sur les charbons ardents de notre foyer, et sur cette pierre une de rotules de l'ours. Puis ils se mirent à danser autour de feu en se frappant la fesse droite avec une des pattes de l'animal. Ils vociféraient en même temps:

—Mèni n'ayétri? Mèni n'ayétri? Ehiyanhè éhiyanhe! Qui t'a arraché de ta bauge? Tra la la la!

Alors la rotule, chauffée et commençant à griller et à se recornir, siffla, se mit à geindre, puis à se mouvoir par un mouvement de va et vient, comme un vase placé sur un poêle rouge et sous le fond duquel quelques gouttes d'eau auraient coulé. C'était l'effet naturel de l'évaporation de la graisse ou du périoste qui avaient fondu, ou bien celui de la

¹ Records were taken of the various types of songs and it is hoped that they may be analysed at some future time.

contraction des tendons humides. Mais mes gens, mis en belle humeur par ce phénomène naturel dont ils ignoraient la cause et qu'ils attribuaient à la puissance de l'ours, s'écrièrent avec ravissement :

'Vois-tu, Père, vois-tu comme l'ours se fâche? Il est irrité de ce chant qui lui donne le change sur les auteurs de sa mort.'

Et ils continuèrent leur danse de plus belle, en se frappant le derrière avec la patte de l'ours. Ils ne purent m'expliquer si cette percussion de la fesse est un signe de deuil ou d'allégresse."

A few years ago, it is said, a couple who had recently died appeared at a dance. They told the people that it was good to give one's partner a present and that this should be done without any feeling of loss. Thus the gift-dance was inaugurated. Each man and woman picks a partner and they dance in rows of four around the fire. When the dance is over, the one who did the choosing gives his partner a present which may vary from a match to a house, according to the feeling and wealth of the individual. Silk handkerchiefs are probably the most commonly given article. It is said that those who really know the dance never return the same present. It is truly surprising how much emotional enthusiasm may be aroused by the performance of such a dance continuing for an indefinite length of time. In the winter when ten or fifteen families gather in the single room of a cabin where the noise of the heated drums is deafening, individuals work themselves almost into a frenzy. The room will become hot and the dancers drip with perspiration. Some rest while others dance, and children sleep on the floor in the corners. Laughter and talking are lost in the thunder of the drums. Old men with grey hair sit quietly on boxes watching the others, until one will rise and seriously lead a dance with some old and individual variations, thus gaining obvious respect and admiration from the crowd. Then he retires to his box and adds smoke to the already unbreathable air. It is on such nights as these that the Satudene are glad.

Gambling and Games. The Satudene are exceedingly fond of gambling. In recent years, playing cards have been substituted for the primitive forms of gambling, the games played being either rummy or a very much simplified poker.

Udzi is the tribal form of the widely spread guessing game. Four men usually played on a side, each one concealing a short stick in either the right or left palm. One man of the opposing side was chosen to decide which hands held the sticks and his choice was signified by gestures made with his thumbs. While this was in progress, drums were beaten and songs sung. As each side was outguessed, ten counting sticks passed back and forth until all were won by either party.

The ecagoo, or ring and pin game, was known among the Satudene, both as a gambling game and as a toy. One specimen was made of five conical bones from the foot of a caribou, strung on a string, at one end of which was a piece of tanned caribou skin, and at the other a sort of needle about 3 inches long. The object of the game was to catch as many of the cones upon the needle as possible, each one hooked being worth so many points. There were also holes in the skin at the end which, if caught, had a certain value. The Indians no longer play this game, and although recognizing it as something which was formerly a part of their culture, do not remember how the score was counted. Russell

(1898, page 181) describes a Dogrib specimen that had only three cones and a peace of leather. The scoring was as follows: for the leather, one point; first cone, five points; first and second cones, ten points; all three, fifteen points; and for the second and third cones only, twenty points.

Keith (1890, II, page 108) speaks of a game in imitation of dice, but only says that it was performed in a dish with a few eagle or bear claws. This is probably the same game that King saw at Resolution. He described it (King, 1836, vol. II, page 177) as

“a sort of dice of the claws of a bear, cut flat at their large end, into which a small quantity of lead is introduced; lines are then traced thereon, and in playing, the manner in which they happen to alight on the barked dish or platter indicates the number of counters the player is to receive from his adversary, those that remain in an erect position reckoning the most.”

This game has not been seen recently on Great Bear lake.

Bow-and-arrow shooting and wrestling are occasionally indulged in by the Satudene today. The former having been such an important factor in the economic life of the people, that practice became an essential and natural pastime. Wrestling probably did not hold such an important place among the Satudene, however, as it did among some Alaskan tribes.

SOCIAL ORGANIZATION

The Family. The family is the fundamental unit of Satudene society. The members of a family share the same shelter, have a common larder, and to some degree use the same tools and equipment. Often two closely related families will live in the same tent, and hunting and trapping relationships are generally based on family affinity. The relationship of individuals is extremely friendly and they seldom proceed to violence in their disagreements. There is very little authority exercised by anyone and the people are more often amused than offended by any individual variation of social usage, as long as tribal traditions are not flaunted. The members of the family have considerable regard for each other but their affection is understood rather than indicated in a way which is obvious to the observer. Their treatment of guests is misunderstood easily by strangers, since they are not accustomed to the courtesy of offering food and shelter. Among themselves it is taken for granted. A feeling of nervousness towards strangers is apt to be more deep than apparent, but to deny them a very real sense of hospitality would be ungracious. The people rise rather early in the morning, and after eating and drinking, go to the fish net. There are now generally meals at noon and at night, but the older custom of eating when hungry shows itself in their aptitude for drinking tea and eating dry fish or dry meat off and on during their waking hours. The Indians, especially the men, take a refined enjoyment in spending a great deal of time in reclining, contemplation, and smoking.

Sexual Division of Labour. The sexual division of labour as it formerly existed is difficult to judge by conditions today. The position of the women was often described as miserable because of the work that they were obliged to perform. Richardson's account of the Hare Indians, taken from his observations during the first half of the nineteenth century (Richardson, 1852, page 249), is interesting in this light:

In early infancy the boy discovers that he may show any amount of arrogance towards his sisters, who as soon as they can walk are harnessed to a sledge, and inured betimes to

labours which are inevitable to them through life; while the future hunters strut in their tiny snow-shoes after the men, and ape their contempt of women. The women drag the sledges alone or aided by dogs, clear the ground for the tent, cut poles to extend the lodge or tent skins upon, collect firewood, bring water, make all the dresses and shoes, clean the fish, and smoke or jerk the venison for its preservation. They also cook both for themselves and their husbands.

Richardson adds that the women were not, however, generally, discontented with their lot and were not without influence over the male sex. The attitude of the boys which he mentions is of little significance, as it would appear to be an attribute of age rather than of any particular people. It is undoubtedly true that women carried the most of the burdens, but the hunting, which was the most essential occupation for life, was carried on by the men, and precluded the carrying of heavy packs. In the erection of a tipi or tent, for example, the man cleaned away the snow and brought in brush for the floor. Then he went away to hunt while the woman put up the tent. If there were plenty of meat, however, he stayed and helped her. McClean (1849, page 244), speaking of the Mackenzie River tribes as a whole, says that the men performed all the drudgery that usually falls to the women and speaks of the women as finally assuming supremacy. He contrasts them with the Chipewyans in this respect. McClean's viewpoint may be a considerable exaggeration, but even to this day the women are said to be in authority in some matters, at least among the Satudene. If there is a choice of food to be prepared, the women choose, and it is said that the women tell the men when to locate and pick up their traps.

At present, probably a great deal less work is done than formerly when the natives were entirely dependent upon their own resources, and it is particularly the men's work that has lessened. It is not unusual today to see men hauling wood or cutting it up, but very often they tell their sisters to do the latter. The men have no occupations except those in connexion with hunting, trapping, and fishing, and at the present time they engage in these very listlessly.

Ownership. The concept of ownership is very weakly developed among the Satudene. Women own practically nothing except their clothes and snow-shoes, the men having all the rest. When a son becomes old enough to use things, he apparently assumes control over what he appropriates. A case in example is that of an Indian boy named Antoine who drives his father's team of dogs. He goes off on trips with other Indians while his father remains at home, and the people speak of Antoine's dogs. If he sells one, his father has nothing to say. Trap lines are not owned except in the sense that the person, or generally partners, who set the traps have a monopoly on the line, and even this is not very closely respected. If the line is given up for the season, it is open to any one who wishes to use it. It is said that formerly beaver lodges were not owned; they are now marked in passing by the man who finds them, and he assumes the ownership or hunting right, at least until the first season when the beaver are prime. Pike (1892, page 102) has pointed out that a band of musk-ox was the property of the discoverer among the Yellowknives and that only friends were granted the privilege of killing them without payment. Seton (1912, page 150) says of the Chipewyans that there was an ancient, unwritten law by which the whole country was divided

among the hunters, each having usually a river valley which was his exclusive and hereditary property. The Satudene deny that any such idea was held by them, saying that any man may hunt where he pleases; and they laugh at the idea of ownership by individuals.

The people as a group have a very strong feeling of communism, and freely give and ask for things among themselves. Morice ("Anthropos", vol. 1-5, page 643) expresses the same attitude for the Carrier of Stuart lake, one of whom he quotes as saying, "We people, we are not a set of mercenaries like the whites, who speak of nothing but selling and purchasing. We simply give away our goods." The changes due to modern conditions of life often give the opposite impression of the Indians but on analysis it would appear that formerly, at least, this was their real attitude.

Morality. Undoubtedly the standards of morality among the various tribes of northern Canada previous to white contacts varied considerably in different groups. They have been described by some writers as having the greatest virtue and by others as being grossly immoral, but all such views are necessarily comparative and based on the moral ideas of the cultures to which the observers belonged. Probably the majority had little regard for chastity but without deserving the charge of licentiousness. Sexual relationships between the unmarried were overlooked and it is unlikely that adultery was regarded as a sin. In the case of the latter, if there was any punishment, it was accorded to the woman, and not very severe. Where the seducer was a married man, the idea of retribution was probably embodied in the perpetration of a similar act by the injured husband. Incest was also not uncommon.

In recent years, a feeling of the immorality of certain acts is growing among the Satudene, due to the influence of Christian missionaries, and ancient custom is struggling with imported ideas of right and wrong.

Murder, in the true sense, is notably rare among the Satudene. Hearne (1795, page 144) remarks of the Chipewyan that, "A murderer is shunned and detested by all his tribe, and is obliged to wander up and down, forlorn and forsaken even by his own relatives and former friends." He also adds, perhaps humorously, that an unlucky blow from a husband to a wife is not considered murder. The idea of blood revenge, however, was not uncommon. Capt. Back was told by two Yellowknives that they had killed a Chipewyan, but nothing would come of it since he was an orphan (*See King, 1836, vol. 2, page 140*). Formerly a bond of blood brotherhood was established between individual hunters on Great Bear lake and those of other tribes. This, called *si-kli*, was fundamentally a guarantee of personal protection from other tribes, since a murder by them would be avenged by the dead one's blood brother in the offending tribe. Since conflicts for some years have been non-existent, the *si-kli* organization has been disappearing. Justice for lesser wrongs was probably as impartially dispensed as might be expected from a people without an organized system of law, and material payment for injury seems to have been customary.

Treatment of Dependents. The treatment of children is very kindly among the Satudene. They are very seldom punished for any misdemeanor, and then only very mildly by perhaps a slap from the father. The

people display the greatest affection toward the children, laughing at their antics and sympathizing with their sorrows. They will seldom force a child to do anything if it cries, and the child is its own doctor when there is a decision to be made in the matter of taking medicine.

The sick and aged are humanely treated within the limits of their guardians' understanding and the possibilities of the circumstances. Grey hair is comparatively infrequent among the Satudene and apparently has no particular significance.

Lying. Lying is one of the most talked of characteristics of the northern Indians and one of the most disliked by white commentators, since they are apt to be placed in an unpleasant, if not dangerous, position as a consequence. Richardson says (1852, page 148) of the Hares and Dogribs that they can scarcely be said to esteem truth a virtue, which is probably more true than he realized. As Morice has already pointed out ("Anthropos," vol. 5, page 22) "a Dene is never supposed to tell the truth in his first account of anything." A Satudene hunter or trapper will always first say that he has not killed anything, although his bag may be filled. This type of story telling is considered an art, but can hardly be said to mislead another Indian. The man's wife may exhibit signs of sorrow and put the kettle on at the same time, but it is much more difficult for the stranger to know what is implied, and in some cases the native has undoubtedly learned how to use this trait to his own advantage. If an Indian visits for a definite purpose and the reason is asked, he will answer "ekuri"—no reason—but a few minutes later he may say that he wants medicine for a child that has badly cut itself.

The use of the word "sondi" is interesting in this regard. The word is forced to convey three meanings, "I know"; "perhaps"; and, "I know but I will not tell you." An enjoyment of the climactic effect of anti-thesis seems to be fundamental.

Despite this characteristic lying, the people cannot be truly said to be dishonest, and it is interesting to note that the same Richardson who considered the lying as darkening the Indians' character, comments on their strict honesty and compares their regard for the property of white people as differing favourably from that of their northern neighbours, the Eskimo, and their southern, the Crees (*See Richardson, 1852, page 253*).

Tribal Organization. The tribal organization of the Satudene is extraordinarily simple and their existence as a tribal entity may not be very old. There is undoubtedly a great deal of admixture from the various Hare bands to the north and the Dogribs to the south. At the present time there is living, in close contact with the Satudene, a band of Dogribs known as the Bear Lake Dogribs, who left Rae in 1914 as a result of an epidemic of sickness there. They had previously hunted as far as the south shore of the lake and even across McVicar and McTavish bays. They have not since returned to Rae as a group, and will probably become more mixed with the Satudene. It is also possible that some of the Yellowknives mixed with the Satudene. Most likely the basis for the tribe as it exists today was a group living in the country between Keith and Smith bays and known as the eta-teo-dene, "People of Big Point."

Both the Hares and the Dogribs are divided into bands, the former into five and the latter into four. Each band has a large area in some part of which it hunts each year and to which it is restricted. The Satudene, on the other hand, split into groups irregularly, oftentimes families changing from one group to another several times during the course of a single winter. Tracing the movements of various families in historical times makes it evident that the Satudene groups have no stability, nor are families limited to any large area. Cases are known of Satudene families going to live in what is distinctly Mountain Indian country, but they generally return after a short time.

The Satudene recognize their name as distinct from, and having about the same weight as, ka-tco-dene (Big Willow people, i.e., Hare), kli-tco-dene (Dogribs), or shi-ta-dene (Mountain Indians). The band names of the Hare are apparently recognized by the Satudene as definite units, but the numerous names heard among the Satudene such as eta-tco-dene (People of Big Point), kai-lon-dene (People of Willow lake), tu-le-ta-dene (People of Fort Norman), are simply place names applying to any native who at the present time or formerly lived in one or the other of these specific localities. Satudene informants could never call themselves ka-tco-dene (Hares) or shi-ta-dene (Mountain Indians), but they may insist that they are eta-tco-dene, tu-le-ta-dene, and many others as well. Probably most important of all, there are distinct dialectic differences between the Satudene, the Dogribs, the Hares, and other neighbouring tribes.

It must be said then, on the existing evidence, that the Satudene form a tribe not broken up into true bands, and that the fundamental unit is the family which has developed neither clan nor gens affinities.

Chiefs. Chiefs, such as are among more highly organized tribes, probably never existed among the Satudene. Authority lay with such heads of families as were the best hunters, generally older men whose experience was considered necessary for the guidance of the group. Through courage, prestige in hunting, and leadership, head men came to exercise, for a time presumably, the authority of chiefs, but that authority was probably neither officialized nor inherited.

An informant at Good Hope indicated that formerly there were two types of chiefs among the Hare. The first was the 'Oldest Man' and it was unlucky not to obey him. The second was the 'Best Hunter' of moose and caribou. When the 'Oldest Man' gave inadequate advice, then the 'Best Hunter' was turned to, but the latter never equalled the first chief in power.¹ Keith, however (1890, II, page 123), writing of the Big Arrow Indians (a band of Hares) in 1812, said that they had no leaders of any note or authority. Other sources say the same of the Slave, Dogribs, and Yellowknives (*See* Wentzel, 1890, I, page 89; Wheeler, 1914, page 47; and Mackenzie, R., 1890, I, page 36).

Since the coming of the fur traders, chieftainships have several times been inaugurated by them, thus creating a position through which the Indians can be reached. The office is characterized by a blue coat and cap, some gold braid and brass buttons, but very little else. Russell (1898,

¹It is regretted that more is not known on this subject since dual chieftainship is clearly indicated among Alaskan Athapaskan tribes.

page 164) speaks of these chiefs among the Dogribs striving to increase their prestige by liberality in sharing the gratuities received from the traders. There seems to be some resentment among the Indians at the formalizing of the chieftainship and several of the chiefs have said that the office brought bad luck.

Undoubtedly, the medicine men had considerable influence, more perhaps than other individuals, since all were subject to the fear of shamanistic power.

SOCIAL CUSTOMS

Birth. Birth is a comparatively easy process for Satudene women, as with most primitive peoples. The mother continues her normal activities up to the time immediately before birth takes place. The necessary period of rest following birth is extraordinarily short and cases are known in which a birth on the trail has delayed the party less than a day. Richardson (1852, page 295) cites an instance in which a woman of this region gave birth to her first child and set out two hours later dragging a sledge and with her newborn baby suspended between her shoulders.

The idea of reincarnation is common, the newborn child being spoken of as 'natli' (born again). The child is considered the reincarnation of some individual generally designated by an old man or woman or the parent who recognizes the characteristics of the deceased. This belief is mentioned by Petitot (1893, page 277), who writes that the first child conceived after a decease in the tribe (Hare) is considered as a reincarnation of the dead one. Reincarnation is clearly stated as a concept accepted by the Beaver (Slave) according to Wentzel (1890, I, page 88). Mackenzie says the Chipewayans also had some notions of transmigration, believing that if a child is born with teeth it is the reincarnation of some person who lived to an advanced age and who has assumed a renovated life with these extraordinary tokens of maturity (*See Mackenzie, A., 1802, intro. page cxviii, and Petitot, 1876, page 59.*)

There were probably in former times a great many taboos and prohibitions connected with birth, only a few of which continue to the present. It was considered a very bad omen for a woman during pregnancy or for her husband to kill an animal or bird with claws. If a man did not stay away from his wife for eight days after childbirth, his luck would be spoiled for everything. Richardson speaks (1852, page 295) of a Great Bear Lake woman following birth as being forced to break a new trail through the snow, lest ill-success in hunting or some other calamity would beset an Indian who incautiously should tread in her footsteps. Ross ("Notes on the Tinneh . . .", page 305) gives the custom among the Hare and Dogribs of not giving nourishment to babies for the first four days, that they might better be able to endure the starvation periods of future years. He also says that the nails of female infants were not cut until they reached the age of four years, it being believed that the girl on arriving at womanhood would not be lazy and could embroider well in porcupine work. Wentzel says (1890, I, page 305) of the Beaver (Slave) that, "whenever the women bring forth a male child, they have a rule of pulling its legs every night

and morning, and squeezing its thighs, hoping by some superstitious notion to procure him a pair of long shanks necessary for a hunter, as being greatly conducive to his becoming a great runner". These customs, if formerly prevalent among the Satudene, have now entirely disappeared.

Petitot (1893, page 241; 1876, page 78) has said that the Willow Lake Indians (his Kkray-lon-gottinè) and the tribes of the vicinity in general circumcised male infants with a piece of flint. No information except to the contrary could be discovered, however.

Infanticide was practised by the Satudene, particularly in the case of female children. Keith (1890, II, pages 107, 119), Franklin (1828, page 64), Simpson (1843, pages 187, 202, 323), Hooper (1853, page 319), and Petitot (1893, page 110), all cite female infanticide as an accepted practice. Insufficient food was generally given as the cause, and the last writer reported that the children were considered happier in the land of the souls. Children born out of the marriage relation were probably especially liable to destruction. The most recent cases that have occurred were of this kind. Infanticide is now comparatively rare; Wentzel, over a hundred years ago, commented that it even then was wearing away. Beaver (Slave) women are reported by Wentzel (1890, I, page 86) at that time to have often killed their female children, giving as their reason "that it is a great deal of trouble to bring up girls, and that women are only an encumbrance, useless in time of war, and exceedingly voracious in time of want". Although from another Athapaskan culture area, the writer thinks even more true is the statement of Hardisty ("Notes on the Tinneh", page 312) that Loucheux women told him they killed their children to save them from the miseries and hardships of life and that not to do so would be almost an unnatural crime. Several cases of twins among the Satudene in recent years have not been considered strange or provocative of infanticide.

The Satudene always speak of a married person as the father or mother of the eldest child. Unmarried or childless people are called by their given names which are supplied shortly after birth by someone in the group. At the present time a woman speaks of her husband as 'se-dene', my man. Formerly she said 'se-ra-weta', he sits close to me. A man speaks of his wife as 'se-tsekwi', my woman, or by the abbreviated expression 'se-ere', from 'se-tere', my sister. The band of Hares known as the Gens du Large at Good Hope speak of their daughters as 'se-tsali', my frog. There follows an incomplete list of relationship terms.

- 'ε ta' —my father
 - εw ε· —my mother
 - se ta γε —my sister
 - son De —my brother
 - se tce le' —my younger brother
 - se' ε' —my father's (or mother's) brother
 - se nou —my father's (or mother's) sister
 - ε tse' —my father's (or mother's) father
 - ε tsu —my father's (or mother's) mother
- (Great grandparents, the same as grandparents)
- se' ya (·) —my son
 - se' twe (·) —my daughter
 - se' tca' —my son's or daughter's child

Puberty. Puberty customs for girls among the Satudene were very rigorous. A little spruce brush shelter was made at some distance from the family tipi, to which the girl retired with an ax and a pail, to boil little pieces of meat. For the first four days the girl was not supposed to eat or drink but might chew some spruce bark (not birch). After this period the mother left a little boiled meat or broth near the shelter. The girl wore a caribou-skin hood which hung over the face and she was not permitted to speak to or look at anyone. It was said that she had the evil-eye and for that reason was put away. The story is told that two rocks near McPherson (lower Mackenzie river) are two brothers at whom a sister who was having her first menstrual period looked, at her mother's behest, because the boys were killing too much game.

The mother or father told a daughter when she might return to the family tipi, but even then the girl might not talk to or look at anyone for from two to four months. During the entire period, she used special eating utensils and drank water through a swan's bone. The period of isolation in a separate tipi generally lasted from six weeks to two months. The time may have been originally longer.

Women undergo numerous taboos at recurrent periods. They must not touch animals at such times, since the game would be offended and not permit itself to be caught; for the same reason, they were not allowed to walk on rivers or lakes where men were fishing or hunting beaver. Should an animal see any menstrual blood, that animal could no longer be killed by any hunter. The taboo most commented upon in the literature is probably that of forcing the women to break new trails with their snowshoes rather than walk in the trails used by the family. This caused great hardship, as may be appreciated only by those familiar with the labour involved in making fresh trails. Women lived apart at these periods, or at least in a separated section of the tipi. Keith noticed (1890, II, page 91) among the Beaver (Slave) of lower Liard river that the women in breaking new trails dropped branches on the road as a warning to a stranger coming behind, that he might not follow in the trail under penalty of suffering sore legs (For accounts of menstrual customs, *See also*: Keith, 1890, II, page 107; Back, 1836, page 214; Petitot, 1893, page 378; Russell, 1898, page 163; Morice "Anthropos", vol. V, page 976).

The puberty customs have disappeared to a great degree in their obvious forms among the Satudene. If there were puberty ceremonies for boys they seem to be no longer remembered. It is significant that word of a girl's coming of age is said to travel faster than any other news among the natives.

Marriage. Children were given in marriage very young (before puberty) and the married couple stayed with the bride's parents until the girl was old enough to do the household work of the family and the boy to provide food. Keith comments on the early marriage and adds that the ages were from ten to twelve years. He speaks also (Keith, 1890, II, page 114) of the lack of regard paid to the welfare or happiness of the couple involved, thus accounting for the later liberties taken by the girl in choosing a new husband for herself. Petitot (1876, page 32) sums up years of experience among the people when he makes that amusing, if acidic, comment on married love: "Si vous voulez prêter a rire, parlez

d'amour conjugal aux Dènè-Dindjie". And yet, as with most generalities, there are exceptions. There was little ceremony apparently, and divorce was easy and common. King (1836, vol. 2, page 43) records certain customs among the Yellowknives (?). He says that the father of the girl absented himself while a new tent was erected and then pretended astonishment on his return, that there was a formal announcement made by the mother at a feast, and that complimentary speeches were made. According to Petitot (1876, page 32), the northern Indian considered in marriage only the material characteristics of the woman, her aptitude for work, and potentiality for bearing children.

At Good Hope it was said that when a young man wished to marry he went to the father of the girl he had picked out and asked him for his daughter. Then the father spoke to the suitor very roughly and tried to make him angry, even going so far as to threaten him with a club. This being expected, the boy continued patiently to ask for the girl. Sometimes a year passed in this way, but eventually permission would be granted. The bridegroom then went to live with his father-in-law. In a case where the wife was of another band or tribe, the couple lived with the girl's father for a year or two and then returned to the husband's people. Parent-in-law taboos were unknown. Pike (1892, page 121) says that among the Yellowknives, a man is supposed to hunt for his father-in-law after marriage.

Wives were also taken by capture, both from other tribes and one's own, sometimes literally dragged away by the hair (*See* Keith, 1890, II, page 107). Medicine men are supposed to have been particular offenders since the parents dared not object through fear of spiritual attack. Richardson (1852, pages 256, 296) gives several instances of a stronger man carrying off a weaker man's wife among the tribes that frequented Great Bear lake. In one case the man who carried off the woman considered it a manly action, and in the other, the offended party took the situation as to be expected and went off to find another mate. Franklin (1828, page 290), however, remarks on the murder of a Great Bear Lake man by the husband whose wife he carried off. The woman saved herself by pushing aside the muzzle of the gun, whereupon her husband knocked her senseless with the stock. She was saved, the story goes, by the cries and entreaties of their only child. In cases of separation, the children followed the fortunes of the mother.

Wives were also gained by wrestling, and accounts given to Richardson on Great Bear lake were to the effect that any man had the right to challenge another, and if he won, to carry off the prize, who looked on with composure and impartiality. It is said that in this case the father might retain the children if he so desired, generally taking revenge by seeking the wife of another man weaker than himself (*See* Richardson, 1852, page 256). A further account of this custom, taken at the same place, is borrowed from Hooper (1853, page 303), who says:

"With them, if a man desire to despoil his neighbour of his wife, a trial of strength, of a curious nature ensues: they seize each other by the hair, which is worn long and flowing, and thus strive for the mastery, until one or another cries, 'peccavi.' Should the victor be the envious man, he has to pay a certain number of skins for the husband-changing woman, who has herself no voice in the matter, but is handed over like any other piece of goods, and generally with the same unconcern."

Polygamy was accepted by the Satudene but probably the proportion of cases was small, on account of the difficulties involved in the support and protection from attack of more than one woman. The custom is mentioned by almost all the early writers; and even within the memory of some of the oldest Indian informants today a few of the best hunters had several wives.

Polyandry is reported of the Beaver (Slave) by Wentzel (1890, page 86), who mentions one case by two or three brothers. Keith (1890, II, page 69) also mentions a case of the Slave. This was denied by Satudene informants but the information being over a hundred years later than Keith's observations, it becomes very difficult to discover how much change has been brought about by European contact, and especially that of the missionaries.

Wife-lending was never practised by the Satudene according to informants, who also proclaim that they never heard any old men mention such a custom.

The degree of affinity that the Satudene permitted in marriage in former times is questionable, but incest was not uncommon and was not regarded as criminal or indeed with any great disfavour.

Death. The greatest proportion of deaths within the last one hundred and fifty years has probably been due to disease, and in the past few years the death rate has been exceptionally high due to epidemics that come in during the summer. Tuberculosis seems to have taken considerable hold of the people and causes the most deaths.

Starvation no doubt caused many deaths in the past, but cases are comparatively rare now. The imputation that the Satudene abandoned their aged and infirm is only to be judged upon realization of conditions that make such procedure necessary for the continued life of the group. It appears not to have been the ordinary occurrence but one brought about in circumstances approaching those that induced cannibalism, and it was more often by their own request that the aged were left to die. Numerous cases of care and consideration have been, and might be, cited to show tenderness for the infirm, and such treatment invariably means sacrifice among a primitive, nomadic people.

Suicide is not common at the present day, yet Franklin says (1828, page 301) that he discovered it to be not so rare as he imagined and was informed of two cases that occurred in the year 1826, around Great Bear lake.

The Indians apparently are very much afraid of death when they are enjoying good health, but when they are about to die, or feel certain that death is near, they are singularly fearless, often joking at the prospect. One old man, when he was dying, showed his jesting ways and happy spirit. As he was breathing his last, he said, "I guess it is a long trail to God. You had better put in a tea pail and a little tea so that I can make fire on the way." The expression "to make fire" is synonymous with stopping and eating.

Several types of treatment of the dead are recorded for the Satudene and neighbouring tribes. Hearne said (1795, page 323) of his Chipewyan companions that they left the body to be devoured supposedly by beasts

and birds of prey, and adds that this is the reason for not eating foxes, wolves, ravens, and other scavengers. Under certain conditions, as for instance winter travel on the barren grounds, this exposure would be necessitated, even among the Satudene.

According to Keith (1890, II, pages 96, 109), both the Lower Liard and the Great Bear Lake Indians placed their dead on scaffolds. Petitot says (1876, page 47) that among the tribes of Athapaskans who have retained their ancient customs, the dead were placed in rough coffins elevated from 3 to 7 feet above the ground. This statement was corroborated at Good Hope.

Mackenzie (1802, intro. page cxvii) records the use of ground caches among the Chipewyan. McClean says (1849, vol. II, page 249) that among all the Chipewyan tribes (probably speaking of Mackenzie River Athapaskans), the body was laid at full length in a tomb made of wood, but Satudene informants say that the body was flexed, a cord being placed around the neck and under the knees and drawn until the neck cracked. Excavations of an old burial in such a log ground cache near Great Bear lake showed the body in a tightly flexed position lying on the left side. At the head was an old tea pail and the remains of a birch-bark basket with the remnants of what probably was food. The weapons and tools in daily use were distributed at the side of the body. Wentzel (1890, I, page 87) also describes for the Beaver (Slave) what seems to be a ground cache, or perhaps something verging more toward the true burial house.

The oldest mortuary custom remembered and described by Satudene informants was burial in pits, in an upright sitting position, the body flexed as has been described. In winter, the pits were said to have been excavated in the thawed ground under the fireplace of the tipi, the dwelling and the location then being abandoned.

To summarize the aboriginal methods of disposal of the dead among the Satudene, it can be said that: (1) abandonment necessarily has been practised always under certain conditions; (2) scaffold burial is well authenticated; (3) interment in a reclining flexed position in ground caches during the nineteenth century is proved by excavation; and (4) pit burial in an upright flexed position is almost equally certain from the statements of informants.

In recent times, the European method of burial in the ground has been substituted for all the older forms except perhaps occasional abandonment, and the destruction or interment of personal property has decreased, due to the influence of Christian missionaries; but there is still a distinct element of fear in associating with the objects of the dead. The feet and face of the dead are washed and the body dressed in the best clothes available, clothes for this purpose often being supplied as a last gratuity by the traders.

It is difficult to get a gravedigger. Formerly the person performing that office was subject to certain restrictions for three or four days following the burial. These purification taboos, formerly in vogue, consisted chiefly of carrying a walking stick and going to the various tents each morning and building the family fire.

There is no knowledge of cremation among the Satudene.

Mourning. The mourning for the dead followed a definite social pattern. The relatives of the deceased cut, bit, or scarified their flesh and ostentatiously destroyed an amount of property varying according to the degree or distance of the relationship, the intimate family, in case of death of the father, abandoning practically everything (See Keith, 1890, II, page 109). The taboo on using the property of a dead father, though materially diminished, is still very obvious. Wentzel says (1890, I, page 87) of the Beaver (Slave) that some carried their self abuse to such an extent as to cause their own death. According to Petitot, the Dènè (presumably of Great Bear Lake region) put a man's canoe with the grave objects, or else launched it in the current. All the other things belonging to the man which could not be hidden with him were burned, thrown into the water, or hung in the trees. The same writer says that the faces of the corpses were covered with masks and that long poles with suspended streamers of various colours were erected above the tombs for the amusement of the dead one's soul in order to keep it with the body (See Petitot, 1876, page 47 ff).

It was the custom for the elder son, or perhaps some other near relative, to give a feast in honour of the departed. Within the memory of recent people, this feast was given after the arrival of the family at the trading post. Petitot reports that in certain tribes the family of the dead were reunited around the burial cache a year after the interment and the decayed remains were exposed to view. The family mourned and intoned the songs of the dead, and afterwards sat silently around feasting. This he observed at the site of Fort Franklin and the people were undoubtedly Satudene. He also mentions that at the same time sticks, stones, and pieces of turf were thrown on the grave after it was closed up (See Petitot, 1893, pages 119, 121). One of my informants stated that as a child she was told by her mother to throw willow twigs on a grave they were visiting, but she was not told the reason. At Great Bear lake in 1928, several sons of a man deceased about four years previously feasted at his grave, but it is not known that the remains were exposed to view.

Wailing is undertaken by the female relatives of the deceased at certain periods, for an extended length of time. According to modern informants, the time for these demonstrations is rather sensed than actually defined. It has been observed that the arrival at the trading post, and presumably at another camp, requires a demonstration of weeping. If it is not forthcoming, the other women will ask the reason for the negligence, but it appears of no consequence for the woman to interrupt her own crying with jokes and laughter. Keith states (1890, II, page 109) that among the Yellowknives who visited Fort Franklin, wailing took place every morning at dawn, and also at sunset, for more than a year.

RELIGION

Animism. The religious concepts of the Satudene are of the simplest type. The people are definitely animistic, living in a world of multitudinous spirits which influence or control their destinies. These spirits animate all the elements of nature such as fire and wind, the rivers, and the aurora borealis. Besides these impersonal spirits there are the souls of the dead

who live in a vaguely defined land of the hereafter where life is much the same as it is on earth. The living are little bothered by these ghosts, but occasionally one returns to the country of life where it may be seen. An old woman walking through the mist along the shore of a bay saw such a ghost (ϵ we*l*) and returning to her people, she told them of the occurrence. The following day she died. It is always thus, the people say, for to see the ghost of the departed is a certain warning of death.

Two spirits seem to be definitely recognized as associated with good and evil. There is Newetsini ($n\epsilon$ we ts*l* ni), the good spirit whose name is associated with the creation, and Kitsili (ki ts*l* l*l*), the bad spirit, who is more likely to scare people and play evil tricks than to do serious harm. By some it is said to be Kitsili who whistles in the fire.

The custom of feeding the fire still shows up among the Satudene children, who, noticing the peculiar hissing that occurs when a pocket of moisture in a log burns, throw in bits of food, while their parents refrain, either censuring the children or laughing, if the action is observed. At Good Hope, the purpose of putting food in the fire was said to be to feed the dead, and the following incident was given as explanation. Long ago a man who was hunting killed a moose. Then he made a camp and built a fire. Before long, the spirits of his brothers who had been killed in war came to him and said, "Why do you not see us and give us something to eat?" But he could not see them because they were spirits, nor could they take the meat. Then he dropped some in the fire and the spirits ate it. Hence, when the Indians hear the peculiar whistling, they know the spirits are hungry and they burn some food for them. If this were not done, bad luck in hunting would follow. All feasts were said to have been formerly begun in this way.

The animals that occupy the universe are thought to share most human characteristics. Petitot says (1893, page 353) that he was told by the Indians at Great Bear lake that the caribou were ancient men, and that his informant said these inexplicable transformations often occurred. Whitney (1896, page 263) states that the Dogribs also strongly believe that men and women after death are reincarnated as wild beasts of the country, and for that reason the musk-ox and caribou understand what Indians say (*See also*: Pike, 1892, page 104). Pike mentions the idea (1892, page 55) that caribou on some occasions vanish into the ground or disappear into the air. Animals were reputed to keep warm by means of fires which were visible only to the shamans. There are a great many taboos relating to the treatment of animals killed, most of which have myths as explanation. Lynx, for instance, when trapped, must not be killed with a stick but choked with a snare. Otherwise, it is said, the animal will be very angry. Lynx feet must not be burned, or it will never permit itself to be caught. An Indian accidentally burned the foot of a lynx while thawing the carcass and in the following fifteen years he killed only three more lynx. Dogs must not be allowed to eat marten or the marten will refuse to enter a trap. The noses of beaver are stopped with sticks and the nostrils of game birds with feathers lest they smell offensive blood. If dogs eat the feet of ptarmigan, the birds will never come back. Such taboos were probably very numerous in ancient times.

Of the animals, the most important position is taken by the wolf and dog which are held to be sacred, and it is said that even in the worst

straits of hunger, the people will not eat them. It is believed that the relationship between the Indians and the Dog-people is very close and some myths tell of unions with dogs from which the present bands of Indians are descended. Killing of dogs is one of the strictest of taboos and it is believed that to do so would render the weapon used worthless thereafter (*See* Petitot, 1893, page 405). There is also a special reference paid to the bear and to the musk-ox which custom probably developed out of the belief that both have unusual power, thus making them exceptionally common medicine animals. King says (1836, vol. 2, page 168) that among the Dogribs, the bear is always propitiated by speeches and ceremonies when killed and that a woman will not touch the skin nor step over it. The wolf, bear, and musk-ox are likewise considered the most courageous of animals.

Petitot (1876, page 65) attributes a belief in Heaven and Hell, and in a trinity composed of a father, mother, and son, to the Hares. Paradise is placed, he says, at the south pole but toward the west at the junction of the firmament and the earth; hell is placed at the north pole. As he says in another place, in truth, almost all the northern Indians are Christian and Catholic.

Franklin, however (1828, page 294), quotes an Indian (Dogrib?) as saying,

"We believe that there is a Great Spirit, who created everything, both us and the world for our use. We suppose that he dwells in the land from whence the white people come, that he is kind to the inhabitants of those lands, and that there are people there who never die; the winds that blow from that quarter (south) are always warm."

Wentzel says (1890, I, page 88) the Beaver (Slave) also "allow the existence of a Supreme Being whose invisible jurisprudence over them they positively deny". Keith says (1890, II, page 113), "they do not comprehend, much less acknowledge anything of a Supreme Power", yet even in his denial, he seems uncertain. Almost all later writers mention a belief in a supreme being, though with varying comments on its antiquity; by analogies with the Alaska-Yukon Athapaskan area, the writer believes it can be shown to be of pre-European origin.

At the present, the ancient beliefs that have not been guarded for posterity by connexion with some material manifestation, have slipped from the memories of the people. The nominal duties of the church are carried out, but there is an underlying mixture of beliefs and superstitions which leaves an impenetrable maze of animism and Christianity.

Medicine Beliefs. Medicine beliefs are in a primitive stage among the Satudene. It seems evident that formerly every man stood in special relationship to some animal. This connexion in some cases was acquired during youth by a period of fasting and communion with the spirits. One informant said that the relationship to a particular animal was inherited from father to son and that communications from the animal were gained through dreams. An association once made, the medicine animal was a source of power and protection and it was taboo for the individual to kill or eat it. The dissolution of this idea has reached the point where a particular animal is said to be "like" a certain man, but does not enter into the former relationship. It is now sometimes possible to kill the medicine animal. An informant dreamed that he killed a beaver which

was his medicine animal. When he went to take it, the body of the beaver turned into that of his own child. Later, in similar dreams, the beaver turned into the body of a white trader's children. These dreams meant bad luck and he lost five children. When he dreams again and the beaver does not change, he will kill beaver once more.

Petitot in discussing this medicine animal relationship among the tribes of Mackenzie River valley (Petitot, 1876, page 36) notes three characteristics: first, a relic of the animal which has been revealed in a dream, is carried on the person; secondly, the man performs some secret practice that is meant to please the medicine animal which has shown in a dream that it wishes to possess the individual; thirdly, there is a taboo against injuring, killing, and, particularly eating, the medicine animal.

Out of these general individual relationships develop the medicine men proper, who to the Satudene are no more than men, and sometimes women, whose power is obviously greater than ordinary. The best shamans are those who have acquired their power before birth, and this they can transfer to none but their sons. One old doctor said that before he was born he saw in a star all the medicines that have power over man. These were falling to earth like rain. Thus he found the medicines which if burned attract moose and marten. He concluded by saying that later in life he had a dream in which an angel (sic) appeared and asked him, "What have you there?" When the angel saw the medicines, it told him to leave them entirely alone lest he use them to bad ends. So he threw them all away.

The shamans have the ability to work all manner of conjuring, may swallow knives, transport themselves and their companions invisibly in the shape of their medicine animals, and are invulnerable before weapons. A band of Indians seeking caribou in a place where they expected to find them, were told by one medicine man that another had raised an invisible wall which kept the game out of the country. Cases are cited in which a whole band was carried secretly underground to a trading post in starvation times by a great medicine man. Another shaman, it is said, shows the scars on his breast and back where a bullet passed through his body without harming him. Some medicine men are extraordinary seers and prophets, foretelling all types of things, from death to the arrival of a boat. Sometimes medicine is conceived of as an object that can be handled and thrown through space. One medicine man at Great Bear lake threw his medicine at a Dogrib chief near Rae with the intention of killing him, but fortunately the chief was being visited by another shaman of Bear lake, who saw the danger coming as a white ball of fire, and was able to catch the medicine and hurl it back at the owner. Without a doubt, such things are accepted in good faith, for it taxes even a stranger living intimately among them, not to be caught in the snare of necromancy.

Some medicine men perform cures, certain of them specializing on children, some on old people. Their methods of cure are of a widespread type, consisting of sucking and blowing on the affected part until the disease is extracted in the form of some object that is represented as causing the trouble. Keith (1890, II, page 118) mentions the sucking out of small fish, frogs, and hair. Simpson (1843, page 327) comments on a cave near the end of McTavish bay which was used for shamanistic practices.

The medicine man was the constant adviser of the people, telling them the future, curing their diseases, killing their enemies, or protecting them from the malign influences of others. In all such cases, payment was absolutely necessary. The first recompense was always tobacco, for a piece of chewed tobacco was placed in the ground from which a curative root was abstracted. When the informant was asked what was used before tobacco was supplied by the whites, he blandly replied that before that time the Indians were never sick and, consequently, had little use for roots. Payment, of course, induced a certain amount of rascality in the profession. One old woman at certain periods demanded tobacco in the name of the dead, but it was perfectly obvious that her requests actually coincided with her personal needs. Keith says (1890, II, page 127) that among the Big Arrow band (Hare) when the natives were in violent pain or fear of death they would unbosom themselves publicly before a medicine man and declare all their evil doings. Previous to the confession, a mystical cord ornamented with loon necks, strips of skins, claws of the eagle, and birds' feathers, was stretched across the tipi a little above the ground, and the penitent from time to time threw himself across it on his stomach, the medicine man enacting his rites during the process.

In the actual care of diseases by herbs, their knowledge seems very limited or forgotten. A few unidentified roots are said to have been used as emetics and for headache. Keith's statement to the contrary (1890, page 102) is probably an error. An informant at Good Hope said that he cured himself of syphilis by a mixture of seven roots taken just before sunset. He had not the roots with him, however, for fear some menstruating woman would spoil their efficacy. Likewise it was stated that bear gall and water when drunk was a good remedy for the same disease. Willow roots were used for indigestion, and another, unidentified, for fever. Medicinal roots were always gathered in August, as at other times they contained too much juice. Moosehair is put on a wound to stop bleeding, and broken limbs are mended by the use of splints. Sometimes modern introductions are not so successful, as instanced by the case of a girl who was badly infected by a salve which turned out to be stovepolish.

Nakani Belief. The belief in the Nakani or "Bad Indian" was so vividly real to the Satudene, and also to the Hare and Dogrib, that the people even to this day show considerable fear. They will not venture away from the camp at night alone and any unexpected human sound such as whistling will scare them if the source is not soon discovered. The Nakani to them is a human being, generally an Indian, who has taken on certain supernatural qualities. He is described as being dressed either in the fashion of an Indian or a white man, but wears tremendously large boots which are noted by the tracks he leaves in the mud. The secrecy of his actions distinguishes him from a mere stranger. Formerly the Nakani travelled in numbers but now alone. They have no boats, which gives the people a feeling of safety when camping on islands. The threat of the belief that a Nakani is in the vicinity is known to have moved with considerable loss of property a whole camp into the protective vicinity of a trading establishment. One old man claimed to have shot a Nakani, but he did not stop to make certain.

In winter there are no Nakani, which is a considerable comfort to the natives. When asked why there were none at that season, the Indians said that it would be useless for anyone to try to be secretive when his trail would always appear in the snow.

The characteristics of the Nakani, such as stealing suddenly upon the hunter who has gone incautiously into the darkness beyond the light of the camp-fires, with the purpose of killing him, as it is believed, or in the case of a woman, of carrying her off mysteriously, strongly suggests the raiding of unfriendly natives. As might be expected, more cases of escape from this danger than actual injuries are to be related. Some unaccounted for track in the neighbourhood of the camp may give rise to a Nakani story of incredible proportions, as when a woman claims to have pulled herself free from the actual hands of her attacker, ascribing a superhuman appearance to him. The source of such a story might lie in purposeful or playful attack of a recognizable nature, or more possibly in the fear of such an attack.

Another incident serves to define some of the characteristics of the Nakani. The sled trail of a white man who during the spring was traveling alone with fast dogs and with the impetuous custom of not stopping to use fire in the preparation of his meals, led Indians to believe that the trail was that of a Nakani since, as they said, this individual left in his trail no sign of enjoyment of rest or food.

Thus is seen in the Nakani the purposes of killing men and stealing women joined with the characteristics of superhuman strength, ability to go unusual lengths of time without food, and an association with summer and the idea of the 'unseen'. This complex of traits suggests in so many ways the former raiding of other Indians that one is led to believe these raids are the source of an attitude that has been exaggerated through fear. It should be noted that Ross ("Notes on the Tinneh", 1879, page 309) has held the same opinion on the origin of the Nakani or 'Bad Indian' among the eastern Athapaskan.

No informant had heard of the Windigo belief nor apparently was the Nakani cannibalistic.

Feasts. Petitot reports a spring festival among the Hares at the new moon of the native month of the rut of the caribou (March-April). At nightfall, he says, in each tent meat is cut up and cooked, then divided and put into the hunting bag of each man. The men, armed with cudgels, then gather in one tent. They leave the tent in a procession, walking in a stooped position as if succumbing under the load of meat, and singing a special song. They visit all the tents, stopping for a few minutes at each one and feasting, until they have made the whole round of the camp (See Petitot, 1876, page 95). There is some corroborative evidence, including a phonograph record of the probable song for this ceremony, but no one was found among the Satudene who could or would recall the details.

The song for another ceremony among the Satudene, apparently very much the same, was recorded on the phonograph, in connexion with the eclipse. It is said that the eclipse itself may mean starvation, sickness, or disaster. As soon as the eclipse started, the men put on pack sacks

and went outside the tipis carrying walking sticks. A dance and a special song were performed, and as they visited each tent they were presented with some food, a piece of meat or fish. By this symbolic offering it was thought the hungry spirit that was devouring the moon would be placated.

A special feast for the spirits was described at Good Hope. For this ceremony skins and other goods were collected for many years and a large supply of meat was stored up. When the feast finally was made, everything was divided. This was done, according to the informant, in order to show sorrow. In some cases the celebrants burned their hair and dressed themselves to look as ugly as possible.

Feasts were also made after a burial, a marriage, after the first pelt of value was caught by a boy, and when he killed his first moose or caribou. When meat was plentiful in the camp, especially when one man had made a successful hunt and others not, a feast was given. Also the head of a camp gives a feast for strangers. Pike (1892, page 153) mentions this latter obligation occurring in an instance when the chief of the Yellowknives was bound to give a feast to his guests, a band of Dogribs.

Messiah Cult. A new religious cult reached Great Bear lake in the winter of 1925-26. It was introduced by the Rae Dogribs by way of Marten lake. A message was sent by their chief to the Bear Lake chief apprising him of the importance of the new cult and he has acted since as its leader in that vicinity. The cult activity is principally a dance. Before starting the ceremony, everyone must wash and dress his hair. Both men and women dance in a single circle to the accompaniment of a beaten drum before which each of the dancers bows in passing.

The cult is supposed to have originated with a man of supernatural power who lived at Providence on the upper Mackenzie river. When one of the Indians was ill with an epileptic fit, this shaman was called in. He thereupon hit the ground with his stick and told the man to rise, which he immediately did, completely cured. So great did his fame become for this and other deeds that he was called a 'Messiah'. How the ceremony became part of the cult, no one seemed to know.

The 'Messiah Cult' is widespread among the Indians but it may be only of temporary significance, especially since so much sickness and death have appeared concurrently.

MYTHOLOGY

The Satudene are fond of telling stories, and have a great mass of mythological lore. The commonest type of story is scarcely describable as a myth, but rather as a more or less exaggerated narration of events, many of which have a historical basis. These stories, even more than the actual myths, are in extreme Rabelaisian style and the Satudene find them greatly amusing.

The Satudene do not tell riddles.

Myths of origin, flood legends, and tales of monsters, vary from tribe to tribe, and from individual to individual. On the whole, there seems to be less tendency to formal accounts and development of detail among the Satudene, than among surrounding tribes. From Good Hope come the cycle of legends about the First Brother.

Among the origin myths, the descent from a woman and a medicine man who assumed the form of a dog is common, particularly among the Dogrib tribe. There are also stories of a migration from the west which are chiefly connected with the myths of the First Brother. The present tribal divisions are accounted for by saying that in the days of the first Indians when all the people lived together, two children fought over the possession of an owl. As a result their parents commenced to fight and there was so much blood lost that the water of a small lake at the north side of the Satudene country became red in colour, which it remains to this day. After the battle the people separated and became the present tribes. The Eskimo are said to have fled at the same time but in such haste that they forgot to take the means of making fire with them, hence the Satudene say that the Eskimo live without fire and eat raw meat. There was an attempt to reconcile the tribes, but it was unavailing because the sight of wounds from previous battles inflamed them to combat, and so until the coming of the white men there was always warfare.

There are several flood myths, in a very simple form, among the Satudene. Probably the best known is that of a beaver, an otter, and a muskrat that sailed an endless sea in a canoe. They decided that they wanted some land, so each in turn dived for the bottom. The beaver and the otter were unsuccessful, but the muskrat came up with a handful of earth between his paws. From this the world was reconstructed.

In the days of the first Indians, the Satudene say, there was no sickness and no death except that caused by war. The first man killed by other means was drowned, after falling out of his canoe. He was carried ashore by the people, who believed him to be asleep. After a while he began to decay and the people went away, leaving him his possessions and some food. Children in that early time ate neither fat nor berries, but only dried food. They grew up very quickly, not slowly as they do today. It was in those early days that the boy went to live in the moon. There was a great musk-ox hunt and one child cried for the fat but was refused, so he said that he would run away to the moon. Before he went he gave the people a song which he said they should sing at the eclipse, to avoid bad luck and to bring good fortune. He then made a big wind and disappeared in it. Afterwards the people discovered their cache of musk-ox meat was gone. The boy can now be seen in the moon. If he had not gone the country of the Indians would have been the richest in the world. The boy in the moon can be seen holding a dog on leash in his left hand.

Myths about fabulous monsters hold a considerable place among the stories of the Satudene. A big eddy below Good Hope is said to be caused by the mouthings of a whale-like monster whose tail forms part of the hills to the east of that place. There are several groups of islands on Great Bear lake which the natives fear. One is said to contain burning sulphur and large natural caves of limestone. A Satudene informant said that there once lived on this island a great 'worm' which devoured people passing by. The customary Indian canoe route to the McVicar Bay portage lies behind this island, but one year a group of Indians decided to pass in front. Suddenly all the canoes except one, which had been unable to keep up, were engulfed in a whirlpool and disappeared. This was assumed to be the action of the 'worm'. The origin of such stories seems quite obvious and perhaps one may show an earlier stage of development.

The same informant, quite casually talking about fishing, said that his brother had caught the largest trout on Great Bear lake; it was longer than a toboggan and correspondingly gigantic in all details. Then, almost as a last effort, he depicted the trout as having horns on its head. Some months later the story had definitely established itself.

Great Bear lake is said to have taken its name from a fabulous bear which lived near the shore of Bear mountain. The Satudene state that once upon a time an Indian near that place shot a bear cub and, putting it into his canoe, started to paddle away. While he did so a Great Bear appeared and said, "Give me back my child". This the Indian refused to do, so the Great Bear warned him, "Then never camp alone". The Indian always remembered and obeyed this injunction until one night long afterwards when he was forced to camp by himself, having become separated from his party. He camped on an island, but it had no sooner become dark than the Great Bear appeared and stood over the sleeping man. "Now I am going to kill you", he said. The Indian awakened, and answered him shrewdly, "Then do so without making me suffer. Take my head in your mouth and crush it with your jaws." This the Great Bear agreed to do, but no sooner had it taken the Indian's head in its mouth than the native's medicine, which was the Northern Lights, began to work in such a fashion that the man's head swelled, and the Great Bear was unable to crush it. Further, the Northern Lights, radiating from the native's head through that of the Bear, paralysed the memory and demented the great animal, whereupon the Indian extricated himself from his predicament and made a hurried departure in his canoe, only hesitating to make the sarcastic remark, "I thought you were going to kill me?"

The myths of the First Brother form what would appear to be a definite cycle. They seem to be of Alaskan origin, having spread eastward, and being now known with variations among the Hare. The following are excerpts taken in camp-fire conversations and put together in some semblance of order.

Long before the time of the Two Brothers, the people were living in a land far west of the mountains, and they were starving. The father killed a bear. The mother told the children, and the father cut off the mother's head, which went flying around in a circle. The father gave the children two pieces of stone and told the children to flee, dropping pieces of the stone as they went, and to tell the mother's head to go into the mountains. Then they were safe.

Long ago, two young brothers came on the back of a seagull from an unknown land. One of the brothers founded the whole race of northern Indians; the other was killed by wild beasts. At first all the northern Indians were one people.

When the two brothers first came to this country, the younger one was afraid and began to cry. The older made a ball out of skins for the younger brother to play with. The ball went into the water and an old man in a canoe picked it up and told the younger brother to come and get it. He did this and the old man carried him away. The last words of the younger brother were, "I shall return in the form of a wolf".

The First Brother married the Morning Woman and the Night Woman. They travelled a good deal. One of his wives was killed by wild beasts

and the other was left behind when he crossed Mackenzie river. With her she had black stones for scraping skins. (Which accounts for the many black stones on the bank of the river below Good Hope.)

The Morning Woman and the Night Woman were spirits. Morning Woman was destroyed by a wolf which the First Brother killed. Night Woman went up the river and taught the people beautiful quill work. That is why the people on the upper Mackenzie excel in that art.

Before the coming of the First Brother, the land was inhabited by giants and monsters, the former being killed off entirely by the First Brother. The giants always slept after hunting, and while they slept the First Brother stole their food so that they all starved except one who fled away and never returned. It is said that he went far to the east, leaving his canoe, now an island in the Ramparts, and his picture on the rocks at the foot of the Ramparts. He also killed his wife and boiled her, feeding his child on the soup. Later he killed and ate his child. The Ramparts of the Mackenzie (near Good Hope) were built by a monster beaver whose house was at the south side of the Sans Sault rapids. The last giant, just before he fled, killed the monster beaver and its family and stretched their skins on Bear rock (obvious oval red deposits on Bear rock, Norman).

When the First Brother came to the country, he was starving and killed a bear. After this he lost his power of communicating with the animals, which is only regained through special associations and dreams. The First Brother was called 'brother' by all the animals before he killed any of them.

The First Brother made the first arrow. He got the feathers for his arrow by going into the mountains where he discovered a nest with two young eagles. He asked the first eaglet if he would tell that the First Brother was there and the eaglet said "yes", so the Brother killed him. Then he asked the other eaglet who agreed to keep silent. The brother hid himself. After a while the mother eagle came to the nest with part of a body of a man. She asked the young eaglet whether there was a man around, saying that she smelled one. The eaglet replied that it was her own burden that she smelled. While she rested the First Brother put a piece of his fire-metal in her soup; this killed her. When the father eagle came home this process was repeated. Afterwards the First Brother cut the beak of the young eagle and said that henceforward he should not eat men, but lemmings. Then he took feathers for his arrows and went home.

The First Brother made the first canoe by trying to cross a river in a birch-bark basket.

In the time when men and animals were friends, the First Brother came upon a great flock of geese. He persuaded them to play at blindfold. When they had all blindfolded themselves he slaughtered a great number. At last one looked and warned the whole flock, which immediately flew away. Hence they are now very hard to kill.

One day the First Brother was travelling through the woods. He met a bird which took its eyes out of its head, threw them up into the air, caught them again, and replaced them in its head. The First Brother, not to be outdone, did likewise, but when he had thrown his eyes into the

air, the bird caught them and swallowed them, and the First Brother lost his sight. He then went to a spruce tree and squeezed it until some of the gum came out. Of this he made new eyes (which accounts for the difference between the Indian's and the white man's eyes). The reason that there are so many twisted spruce in the country is due to the squeezing of a spruce by the First Brother when he wanted some of the gum to make new eyes.

The First Brother once tried to kill all the wolverines because they ate men. He killed all save one. When he shot at this wolverine with his bow, the arrows turned aside. When he caught him in a deadfall, as soon as he would lift up the log, the wolverine would escape and climb a tree. The wolverine told the First Brother: "Beware of me for I shall destroy your caches and rob you". He broke the First Brother's ax and put out his fire.

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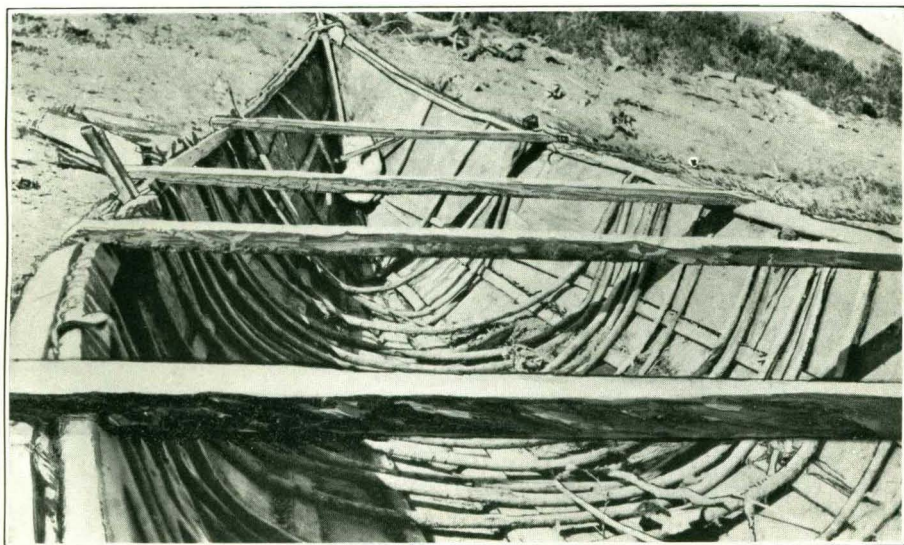
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1) Bear Lake Indian with typical drum. (2) Wife of Bear Lake chief, with baby. 3) Mountain Indian boy.



Skin boat of Mountain Indians, Norman.



Skin boat of Mountain Indians (Interior), Norman.



Indian houses and uncovered tipi poles.



Three girls, with dogs, Great Bear lake.

FIVE NEW MAMMALS FROM BRITISH COLUMBIA

By Rudolph Martin Anderson

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INTRODUCTION

An objective of the Biological Division of the National Museum of Canada is to form a collection of all the species of animals and plants found in the Dominion. To accomplish this plan, field parties have been sent from time to time to areas where the fauna and flora have not been thoroughly investigated. British Columbia is one of the largest provinces and offers the greatest diversity in physiographic conditions, and consequent greatest differences in the forms of animal and plant life. Though small local collections were made for the Museum at various times since 1885 by G. M. Dawson, John Macoun, J. M. Macoun, William Spreadborough, and others, the mammal specimens from the province in the museum up to 1919 totalled only 1,060 specimens and vast areas remained untouched.

The southern part of the province along the International Boundary appeared to be the most promising field for work, as it is much cut up by alternating mountain ranges and valleys with resultant differences in climatic conditions.

The mountain barriers were known to separate various ecological associations of animals and plants. Systematic, intensive field work was begun at the coast in the spring of 1927 and carried on, for four field seasons, across the province to the foothills of the Rocky mountains. As a result the total number of British Columbia mammals in the National Museum collection increased to 3,950 by 1932. The collection includes some species heretofore known only from the United States side of the border, but which were found to extend their range up some of the valleys into British Columbia. The large series of some groups brought together enabled adequate comparisons to be made and showed several local geographic forms which, according to modern usage, and for convenience in reference, appear to deserve naming as new species or subspecies.

Since beginning active work on the British Columbia mammals, the writer has had opportunity to compare some of the British Columbia material with border-line specimens and other Canadian material in the United States National Museum at Washington, the Philadelphia Academy

of Natural Sciences, the American Museum of Natural History in New York, and the Field Museum of Natural History in Chicago, and thanks are due to the officers of these institutions for permission to study the collections, and to the United States Biological Survey for the loan of specimens for study. Thanks are also due to Mr. Kenneth Racey, of Vancouver, for frequent loans and gifts of specimens and for many interesting notes on the ecology of the species; also to Mr. H. M. Laing, of Comox, for numerous manuscript supplements to his valuable field reports while working for the National Museum.

DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES

Perognathus laingi new species

Anarchist Mountain Pocket Mouse

Type. Male adult, skin and skull, No. 9200, National Museum of Canada; Anarchist mountain, near Osoyoos-Bridesville summit, about 8 miles east of Osoyoos lake, at about 3,500 feet altitude, latitude 49° 08' north, longitude 119° 32' west; August 29, 1928; collected by Hamilton M. Laing; original No. 956. *Allotype:* female adult, skin and skull, No. 9201, taken at same place and date; original No. 957.

Geographic Distribution. Known only from type locality; living in dry Transition zone habitat at higher elevation than *Perognathus lordi*, which inhabits dry Upper Sonoran zone lowlands of same district.

Diagnostic Characters. A medium-sized pocket mouse, with comparatively dark, ashy coloration, the blackish tips of dorsal guard hairs giving a prevailing dark ashy tone to the coat, instead of the paler and more clayey colour of *P. lordi* and the still more ochraceous wash of *P. parvus*. External measurements and cranial measurements average smaller than *lordi* and larger than *parvus*; ratio of interparietal width to condylo-basal length averaging 26.4 mm. in males and 26.3 in females.

Colour. Upper parts glossy, uniformly mixed dusky greyish from face to base of tail, hairs plumbeous at base, slaty buff in middle section, and generally tipped with black; top of crown and mid-dorsal region slightly darker than sides, but with no well-defined median line; nose buffy grey, bordered posteriorly by an obscure blackish V with apex above tip of nose and arms extending laterally along cheeks and merging with the ashy of shoulders; ears small, dull grey, with obscure whitish edgings; area around eye pale greyish; sides lighter coloured than back, with a very faint buffy line where the flanks merge with the pure white of under parts; tail bicolour, pale greyish above, white below; under parts entirely white; fore feet and hind feet white.

External Measurements. Type: total length, 191 (mm.); tail vertebræ, 102; hind foot, 25. Average of four adult males (topotypes): total length, 175.5 (191.0-158.0); tail vertebræ, 90.3 (102.0-69.0); hind foot, 23.8 (25.0-22.5). *Allotype* (female): total length, 165; tail vertebræ, 88; hind foot, 22.

Skull. The skull of *P. laingi* has the general characters of the *P. parvus* group, with greatly projecting nasals extending 3.5 mm. beyond plane of anterior edge of upper incisors; broad, flat interorbital region; cranium slightly arched, but greatly depressed in occipital region, sloping downwards from frontal-parietal suture; lambdoidal ridge indistinct; incisive foramina much aborted, short and narrow, from 1.5 to 2 mm. long. Molars three in each side of upper and lower jaws, rather wide and short, and upper molars sloping backwards; premolars one on each side, the anterior column of upper premolars narrow and sloping sharply backwards; upper incisors sharply curved backwards; mandible short with incisors sloping forward. Audital bullæ large and rounded, nearly meeting at anterior ends; zygoma very slender, the jugals parallel with main axis of skull, sometimes slightly incurved in middle part; interparietals roughly pentagonal in shape, considerably wider than long.

Skull Measurements. *Type* (male): condylo-basal length of Hensel, 20.0; occipito-nasal length, 27.5; mastoidal breadth, 14.5; least interorbital breadth, 5.0; interparietal length, 4.0; interparietal width, 5.0; length of nasals, 10.0; length of incisive foramina, 2.0; ratio of interparietal width to condylo-basal length, 25.0. *Allotype* (female): condylo-basal length, 19.5; occipito-nasal length, 26.2; mastoidal breadth, 6.5; interparietal length, 3.5; interparietal width, 5.0; length of nasals, 10.2; length of incisive foramina, 2.0; ratio of interparietal width to condylo-basal length, 26.3. For averages *See* table of comparative measurements.

Comparisons. The skull of *P. laingi* is intermediate in size between *P. lordi* and *P. parvus*, with interparietals slightly wider than in *lordi* and with shallower notch made by occipital, narrower than in *parvus*, the ratio of interparietal width to condylo-basal length in *laingi* averaging 26.4 in males, and 26.3 in one female, the same ratio in *lordi* being 25.3-25.5, and in *parvus* 28.6-31.4 in specimens examined and measured. Rostrum in *laingi* is somewhat shorter than in *lordi*; audital bullæ large and rounded, slightly smaller than in *lordi* and larger than in *parvus*; incisive foramina very short and narrow, nearly obliterated.

W. H. Osgood, in his key to species and subspecies¹ separates the forms of the "parvus group" into two sections as follows:

"Interparietal narrow, ratio of its width to basilar length of Hensel² about 25 *lordi*, *columbianus*.

Interparietal wide, ratio of its width to basilar length of Hensel about 27 *alticola*, *magruderensis*, *parvus*, *olivaceus*, *mollipilosus*."

Perognathus laingi has the above ratio about intermediate between the two sections of the "parvus group," averaging slightly nearer the section including typical *parvus*, with at least one specimen having ratio as large as in *parvus*. When Osgood monographed *Perognathus* he examined 131 specimens which he referred to *P. lordi*, 34 of them being from British

¹"Revision of the Pocket Mice of the Genus *Perognathus*"; North American Fauna, No. 18, p. 14 (1900).

²The basilar length of Hensel is measured from the anterior margin of the foramen magnum to the posterior rim of alveolus of the middle incisor.

Columbia (Ashcroft, 14; Kamloops, 6; Okanagan, 12; Vernon, 2), but records only 5 skulls as being used for his table of comparative measurements.¹

In measuring 55 adult skulls of *P. lordi* in the National Museum of Canada, from British Columbia, the writer has found the interparietals very variable, the ratio of width to condylo-basal length of 24 males being 25.3 (28.6-20.0), and of 31 females 25.5 (28.1-23.7). The use of this ratio as given in the key is thus found to be of little value in determining individual specimens, nor does it seem tenable as a basis for separating groups of species or subspecies.

The eleven available specimens of *P. laingi* were taken within three days (August 29 to 31) and, consequently, show no seasonal differences. A nearly grown juvenile is coloured substantially like the adults, and four younger specimens have a soft, slaty blue appearance similar to juvenile *Peromyscus* specimens of the same age. The juveniles of different age seem to show that at least two litters of young are produced in a season. *Perognathus parvus* (Peale) is said by Osgood² to show dichromatism which is evidently not due to age, sex, or season. For comparison, six Oregon specimens of *P. parvus* were obtained on loan from the United States Biological Survey (two of the grey phase, Nos. 222285 and 222287, taken at Voltage, Sept. 10 to 13, 1916; four of the ochraceous phase, Nos. 57103, 57107, 57111, taken at the Dalles in November, 1893; and one, No. 206709, at Willows in April, 1915). The colour differences were found to be slight but distinguishable, the grey phase resembling *P. lordi* in colour, but the ochraceous phase being yellower than the British Columbia specimens.

Our series of sixty-four British Columbia specimens of *P. l. lordi* show great uniformity in colour of specimens taken at the same season, but thirty spring specimens, taken on both sides of Osoyoos lake in May and early June, are considerably more ochraceous than twenty-three specimens taken in late August and September, the latter having a pale slaty appearance. A series of eleven specimens, adults and juveniles, from vicinity of Keremeos (Ashnola creek, 1,500 feet altitude, and Paul (Terebasket) creek, 1,350 feet altitude) in latter part of June and early July, have a slightly different appearance, being in thin, short-haired moulting pelage, very pale greyish in colour with a faint buffy tinge. There appears to be no approach to dichromatism in any of the *lordi* specimens, the changes in colour being entirely seasonal and caused by shedding, growth of new hair, and fading. Late spring specimens still in the winter coat show no apparent sign of wear or abrasion, and Mr. Laing states that the pocket mouse in southern British Columbia is not much in contact with vegetation and does not ramble through runways like *Microtus*. A series taken by William Spreadborough at Osoyoos lake in 1905 show no more signs of fading than the series taken in the same region by H. M. Laing in 1928 and 1929.

In size and general colour characters *P. l. lordi* (Gray) seems intermediate between the small, pale ochraceous *P. p. parvus* (Peale) and the large, blackish *P. laingi*, whereas in certain cranial characters *laingi*

¹ *Ibid.*, p. 62.

² *Ibid.*, pp. 34, 35.

seems to be between *parvus* and *lordi*. There are some good reasons for supposing that all the *Perognathus* forms of southern British Columbia and northern Washington are varieties of a single species, which by priority would be *Perognathus parvus* (Peale)¹, making *Perognathus lordi lordi* (Gray)² a subspecies of *P. parvus*. However, there are still some wide gaps in the ranges of these forms which are biologically little explored, and in the present state of our knowledge it seems best to consider *Perognathus laingi* as a distinct species of the *parvus* "group."

Remarks. Mr. Laing informs me that the area where *P. l. lordi* was most abundant was at lake-level of Osoyoos lake (913 feet altitude), and the workings gradually lessened as the timbered summits were approached both on the east and west sides of the lake. There may have been a gap between the lake-level form (*P. lordi*) and the form (*P. laingi*) from near the summit of Anarchist mountain, but it was not very extensive, although there may be a gap of several wooded miles where it would be difficult to find this mouse. The difference in habitat is very striking. The floor of the valley of Osoyoos lake is the most desert spot in Canada, with whole flats covered with antelope brush (*Purshia tridentata* D.C.), whole benches and slopes a little higher covered with rabbit brush (*Bigelovia graveolus* Nutt.), and nearly every clump of either of these plants had a mound of *P. lordi* at its feet—new or ancient.

There was also a great deal of sagebrush (*Artemisia* sp.) and the pocket mice were in this, too, but not to the same extent. On the other hand, the colony of the blackish form (*P. laingi*) was found on the southern face of Anarchist mountain, using the roadside ditch, the usual groove at roadside made by scraper, to kick out their mounds the same as the others did at low elevations, but this was a different type of country, with wheat fields on either side of the road, where dry-farming has been practised for years. The elevation here in the woods showed the western larch (*Larix occidentalis* Nutt.), Douglas fir (*Pseudotsuga taxifolia* (Lamb.) Britt.), yellow pine (*Pinus ponderosa* Dougl.) association.

In the interior of southern British Columbia an increase in altitude generally means more precipitation and more luxuriant vegetation, and as pale colours in birds and mammals are usually associated with aridity, the darker colours of *P. laingi* as compared with *P. lordi* of the lower levels seem to reflect the altitudinal and climatic conditions.

Thanks are due to the Chief of the Biological Survey, United States Department of Agriculture, Washington, for the loan of specimens of *P. parvus* for comparison.

Specimens Examined. Eleven from Anarchist mountain, British Columbia (topotypes): four adult males, one juvenile male, one adult female, five juvenile females, taken August 29, 30, and 31, 1928; all in collections of National Museum of Canada, Ottawa.

¹*Cricetodipus parvus* Peale, U.S. Expl. Exped., VIII, Mamm. and Ornith., pp. 52-54 (1848).

²*Abromys lordi* Gray, Proc. Zool. Soc. London, p. 202 (1868).

Comparative Measurements of *Perognathus Parvus* Group

Average, maximum and minimum (in millimetres)

Species	<i>Perognathus laingi</i>		<i>Perognathus lordi</i>		<i>Perognathus parvus</i>	
	Males	Females	Males	Females	Males	Females
No. specimens	2	1	24	12	5	1 (immature)
Length (total)	175.5 (191.0-158.0)	165.0	183.7 (197.0-172.0)	171.7 (181.0-162.0)	163.2 (170.0-152.0)	163.0
Tail vertebrae	90.3 (102.0-69.0)	88.0	95.2 (107.0-87.0)	89.0 (97.0-79.0)	87.6 (93.0-81.0)	85.0
Hind foot.....	23.8 (25.0-22.5)	22.0	24.9 (25.5-23.0)	22.7 (24.0-21.5)	22.1 (23.0-21.0)	21.0
No. skulls measured....	4	1	31	9	5	1
Condylo-basal length of Hensel.....	19.2 (20.0-18.8)	19.5	18.9 (20.5-18.1)	18.5 (19.0-17.5)	17.8 (18.8-16.8)	17.5
Occipito-nasal length.....	26.9 (27.5-25.8)	26.2	27.1 (28.5-25.1)	25.1 (27.0-24.5)	24.8 (25.5-23.8)	25.5
Mastoidal breadth.....	13.6 (14.5-12.5)	14.0	13.9 (15.0-13.0)	13.4 (14.0-11.0)	13.2 (13.9-13.0)	12.8
Interorbital breadth.....	6.1 (6.5-6.0)	6.5	6.1 (6.5-6.0)	5.8 (6.0-5.0)	5.8 (6.1-5.5)	6.0
Length of interparietal	3.8 (4.0-3.5)	3.5	3.5 (4.0-3.0)	3.3 (3.8-3.0)	3.4 (3.5-3.2)	3.5
Width of interparietal	5.0 (5.2-5.0)	5.0	4.9 (5.2-4.1)	4.7 (5.0-4.2)	5.1 (5.5-5.0)	5.1
Length of nasals.....	9.4 (10.0-9.0)	10.2	10.6 (11.8-9.0)	10.1 (10.8-9.2)	9.7 (10.0-9.0)	9.5
Length of incisive foramina.....	1.7 (2.0-1.5)	2.0	1.7 (2.0-1.5)	1.8 (2.0-1.5)	1.9 (2.0-1.5)	2.0
Ratio of interparietal width to condylobasal length.....	26.4 (27.6-25.0)	26.3	25.3 (28.6-20.0)	25.5 (28.1-23.7)	28.6 (30.6-26.5)	31.4

***Synaptomys borealis artemisiae* new subspecies**

Similkameen Lemming Mouse

Type. Male adult, skin and skull, No. 7952, National Museum of Canada; Stevenson creek, southwest of Princeton, British Columbia, on Hope-Princeton trail, east slope of Cascade range, about 2,400 feet altitude, latitude 49° 23' north, longitude 120° 35' west; October 4, 1927; collected

by Hamilton M. Laing; original No. 555. *Allotype*: Female adult, skin and skull, No. 7953, taken at same place and date; original No. 556.

Geographic Distribution. Known only from Similkameen valley, eastern slope of Cascade range in British Columbia, from the dry Transition zone country near Princeton at 2,400 feet altitude, to head of Whipsaw creek just east of the Cascade Mountains divide at 5,600 feet elevation. Probably ranges south into northern Okanagan county, Washington, along heads of Similkameen and Ashnola rivers.

Diagnostic Characters. A small subspecies, paler and duller in colour and smaller than any other known form of the subgenus *Mictomys*. Skull smaller and shorter, with rostrum short.

Colour. Upper parts uniformly dull brownish grey from nose to tail, in some specimens slightly more brownish in mid-dorsal region; sides very slightly lighter coloured than back; under parts uniform silvery grey, with hairs silvery tipped and deep plumbeous at base. Tail bicolour, dark fulvous above, paler below. Feet fulvous.

External Measurements. *Type*: total length, 119 (mm.); tail vertebræ, 22; hind foot, 18. Average of six males (four topotypes): total length, 117.4 (120-115); tail vertebræ, 22 (23-21); hind foot, 18.4 (18.5-18). *Allotype* (female): total length, 115; tail vertebræ, 22; hind foot, 18. Average of three females: total length, 116 (120-113); tail vertebræ, 22 (23-21); hind foot, 17.3 (18-17). (*See also table.*)

Skull. Similar in shape in both sexes and noticeably uniform in the series at hand; females averaging slightly smaller. Anterior convexity of upper incisors projecting 1 or 2 millimetres beyond the tip of nasals, making the greatest length of skull slightly more than the occipito-nasal length; the greatest length of skull being somewhat less than in *S. b. chapmani* Allen, and considerably less than in *S. b. wrangeli* Merriam. Rostrum comparatively shorter and cranium slightly flatter.

Skull Measurements. *Type* (male): occipito-nasal length, 24; condylo-basilar length, 21.5; palatal length, 13; rostral length, 6; rostral breadth, 3; interorbital breadth, 2.5; zygomatic breadth, 14.2; lambdoidal breadth, 11.5; mastoidal breadth, 11; incisive foramina, 4; maxillary molar row, 6.5; mandibular molar row, 7.5; length of nasals, 7.0; height of skull, 9.5. *Allotype* (female): occipito-nasal length, 23.2; condylo-basilar length, 21; palatal length, 12.5; rostral length, 5.5; rostral breadth, 3.5; interorbital breadth, 3; zygomatic breadth, 14; lambdoidal breadth, 11.5; mastoidal breadth, 11.5; incisive foramina, 4; maxillary molar row, 6.5; mandibular molar row, 7.5; length of nasals, 6.5; height of skull, 9.0 (*See table of comparative measurements.*)

Comparisons. The closest relationship of *S. b. artemisiae* appears to be *S. b. chapmani*, its neighbour on the east, but colour of *artemisiae* is more greyish, paler, and duller, and both external and skull measurements are smaller. An adult male specimen taken by the writer on July 18, 1929, near summit of Green mountain, near Rossland, B.C., in Columbia River valley, southwest of the hitherto mapped range of *chapmani*, is

definitely referable to *chapmani* by colour and measurements. *S. b. wrangeli* from the west side of the Cascade mountains is considerably larger and colour is much darker. *S. b. wrangeli* is considered to intergrade with *S. b. dalli* in northwestern British Columbia, and *dalli* is assumed by A. B. Howell¹ to intergrade with *chapmani* in the mountains of northern British Columbia, but he states that there are too few specimens from the region to allow this statement to be made without qualification. In the present state of our knowledge, *S. b. artemisiae* may be taken to occupy a small area in the interior dry belt of southern British Columbia between the ranges of *chapmani* and *wrangeli*, not heretofore known to be inhabited by *Synaptomys*, which in general is an inhabitant of moist or boggy ground.

Remarks. The subspecific name is given from the sagebrush (*Artemisia*) habitat of the type locality, which Mr. Laing states is one of the driest places in the dry belt country of southern British Columbia, a habitat of typical Transition zone bad lands, sagebrush, and pine grass, with only an occasional yellow pine (*Pinus ponderosa*). During the last days of September, 1927, vole runways and fresh middens were found in the grassy cover at the foot of heavy sagebrush on southeast slope above camp at about 2,400 feet elevation. There was absolutely no water near the place where the specimens were taken. The locality where the other specimens were taken was not more than 12 to 15 miles to the southwestward, near the head of Whipsaw creek, another tributary of the Similkameen, on the east side of Hope-Princeton Summit pass over the Cascade mountains, at about 5,600 feet elevation. This is in Canadian or Hudsonian zone territory, open country typical of that range, with Engelmann spruce (*Picea Engelmanni*), subalpine fir (*Abies amabilis*), etc., with abundant ground vegetation—valerian (*Valeriana sitchensis*), false hellebore (*Veratrum viride*), western anemone (*Anemone occidentalis*), dwarf huckleberry (*Vaccinium* sp.), lupin (*Lupinus*), etc., and the low (waist-high) willow thickets harboured nearly all of the mice. Timber here grew to higher elevation than on the western summits, due to the greater dryness, this ridge being the dividing line between the humid west coastal slope and the dry belt country of the interior valleys. Mr. Laing states that there was no sagebrush at that elevation, but that it may have occurred not far below, as the dryness of that slope in normal seasons is attested by the altitude to which the yellow pine attains. Later in the season, Mr. Laing hunted deer on Twelvemile mountain, where yellow pine reached 4,000 feet, and sagebrush was noted on the southerly slope of a mountain 500 feet higher west of that point. He also noted sagebrush at 5,000 feet above the south fork of Ashnola river, from 35 to 40 miles southeast of the above points in 1928, with vole work in open vegetation, but no trapping was done on that trip. This subspecies probably ranges south into the northern part of Okanogan county, Washington, along the heads of Similkameen and Ashnola rivers.

Specimens Examined. Nine from the following localities:

British Columbia: Stevenson creek, 2,400 feet, near Princeton (4 males, 1 female); near head of Whipsaw creek, 5,600 feet, east side of Hope-Princeton Summit pass (2 males, 2 females).

¹Howell, A. Brazier: "Revision of the American Lemming Mice (Genus *Synaptomys*)"; North American Fauna, No. 50, p. 25 (1927).

Measurements of Five Subspecies of *Synaptomys Borealis*

Average, maximum and minimum of adult specimens (in millimetres)

Subspecies.....	<i>Synaptomys b. artemisiae</i>		<i>S. b. chapmani</i>		<i>S. b. wrangeli</i>		<i>S. b. borealis</i>	<i>S. b. dalli</i> ¹
	Males	Females	Males	Females	Males	Females	Males	Sex (?)
No. specimens measured.....	6	3	10	3	2	2	2	3 skins 4 skulls
Length, total.....	117.4 (122.0-115.0)	116.0 (120.0-113.0)	123.5 (132.0-114.0)	118.0 (122.0-114.0)	132.0 (133.0-131.0)	134.5 (140.0-129.0)	121.0 (127.0-115.0)	131.0
Tail vertebrae.....	22.0 (23.0-21.0)	22.0 (23.0-21.0)	19.7 (26.0-17.0)	17.0 (17.0-17.0)	21.0 (22.0-20.0)	20.0 (20.0-20.0)	22.0 (24.0-20.0)	19.0
Hind foot.....	18.4 (18.5-18.0)	17.3 (18.0-17.0)	18.8 (20.0-17.5)	19.0 (19.0-19.0)	19.5 (20.0-19.0)	18.5 (19.0-18.8)	18.0 (18.0-18.0)	19.0
Condyllo-basilar length.....	21.3 (22.0-21.0)	21.0 (21.2-21.0)	22.4 (23.0-21.5)	23.0 (23.0-23.0)	24.3 (24.5-24.0)	23.8 (24.5-23.0)	21.0 (21.0-21.0)	24.1
Occipito-nasal length.....	24.1 (24.5-24.0)	23.0 (23.5-23.2)	25.4 (26.8-23.8)	25.8 (25.8-25.8)	26.5 (27.0-26.0)	25.2 (26.5-24.0)	24.0 (24.0-24.0)	
Rostral length.....	6.0 (6.5-5.7)	5.8 (6.5-5.5)	6.1 (6.5-5.5)	5.5 (5.5-5.5)	6.8 (7.0-6.5)	6.2 (6.5-6.0)	6.0 (6.0-6.0)	6.1
Rostral breadth.....	3.3 (3.5-3.0)	3.3 (3.5-3.0)	3.5 (4.0-3.2)	3.4 (3.8-3.0)	3.2 (3.5-3.0)	3.3 (3.5-3.2)	3.5 (3.5-3.5)	4.9
Zygomatic breadth.....	14.2 (14.5-14.0)	13.8 (14.0-13.5)	14.6 (16.0-14.0)	15.0 (16.0-14.5)	16.3 (16.5-16.0)	16.3 (16.5-16.0)	14.8 (15.5-14.0)	15.5
Mastoidal breadth.....	11.8 (12.0-11.5)	11.1 (11.2-11.0)	11.5 (12.2-11.0)	11.0 (11.0-11.0)	12.0 (12.5-11.5)	12.0 (11.0-12.0)	12.0 (12.0-12.0)	
Incisive foramina.....	4.8 (5.5-4.5)	4.5 (5.0-4.0)	5.0 (5.5-4.0)	4.9 (5.2-4.5)	5.8 (6.5-5.5)	5.3 (5.5-5.5)	5.1 (5.2-5.0)	4.9
Length of nasals.....	7.0 (7.0-6.5)	6.7 (6.7-6.5)	6.9 (7.5-6.5)	6.8 (7.0-6.5)	7.3 (7.5-7.0)	7.0 (7.0-7.0)	7.0 (7.5-6.5)	
Height of skull.....	9.0 (9.5-8.0)	9.0 (9.0-9.0)	9.4 (10.0-9.0)	8.8 (9.0-8.5)	9.3 (9.5-9.0)	9.3 (9.5-9.0)	9.3 (9.5-9.0)	9.3

¹The writer has examined the large series of *S. b. dalli* in U.S. National Museum in 1931, but did not take measurements. Measurements for *dalli* are quoted from A. B. Howell's "Revision of the American Lemming Mice (Genus *Synaptomys*"; North American Fauna, No. 50, p. 24 (1927). Specimens of *S. b. wrangeli* were loaned from Kenneth Racey collection, Vancouver. All other measurements are taken from specimens in National Museum of Canada, Ottawa.

Zapus princeps kootenayensis new subspecies

Kootenay Jumping Mouse

Type. Female adult, skin and skull, No. 10020, National Museum of Canada; near summit of Green mountain, head of Murphy creek, about 10 miles north of Rossland, West Kootenay district, British Columbia, at about 6,000 feet altitude; latitude $49^{\circ} 13'$ north, longitude $117^{\circ} 52'$ west; July 18, 1929; collected by R. M. Anderson; original No. 24. *Allotype:* male adult, skin and skull, No. 9828, taken at base of Old Glory mountain, 7,000 feet altitude, about 5 miles southwest of type locality, July 26, 1929, by H. M. Laing; original No. 1346.

Geographic Distribution. Interior of southern British Columbia, from eastern summit of Cascade mountains, Similkameen, Okanagan, Kettle, Columbia, Kootenay, and Moyie River valleys as far east as Purcell range of Selkirks; found in more humid parts of the Transition and Canadian life zones.

Diagnostic Characters. Similar in size to *Z. princeps princeps* of the Rocky Mountains region of western Alberta and eastern British Columbia, but with colours noticeably paler and duller in tone, and the general appearance dusty; lighter in colour than *Z. p. oregonus*, with median dorsal area less streaked with yellow hairs; averaging larger and more greyish in colour than *Z. c. cinereus* (of Utah), and *Z. p. curtatus* and *Z. p. palatinus* (of Nevada).

Colour. Upper parts dull ochraceous, lightly sprinkled with blackish; dorsal band broad, mixed yellowish brown and black, in some cases fairly well marked, in others obscure; sides paler than back, due to fewer blackish tips to hairs; a distinct dull yellowish lateral line separating sides from pure white of under parts; tail distinctly bicolour, pale brownish above, dull whitish below; ears blackish brown with very narrow, indistinct pale edgings; feet white.

External Measurements. *Type:* total length, 261 (mm.); tail vertebræ, 150; hind foot, 32.5. *Allotype (male):* total length, 235; tail vertebræ, 140; hind foot, 31. Average of nineteen adult males (including sixteen topotypes): total length, 226.1 (235.0–207.0); tail vertebræ, 135.2 (142.0–127.0); hind foot, 30.8 (33.0–28.0). Average of twenty adult females (including fifteen topotypes): total length, 245 (261.0–216.0); tail vertebræ, 140.5 (152.0–125.0); hind foot, 30.5 (33.0–29.0). Females considerably larger than males.

Skull. The skull of *Z. p. kootenayensis* has the general characters of the *Zapus princeps* group. The shape of skull is essentially the same as in *princeps* from Colorado (type locality), Alberta, and eastern British Columbia, but with brain case and breadth of zygomatic arches noticeably narrower than in *Z. p. oregonus*. The incisive foramina in *kootenayensis* are narrower throughout than in *oregonus*, curved outwards, and not noticeably broadened posteriorly in most specimens, not showing the great posterior enlargement typical of *oregonus*.

Skull Measurements. *Type* (female): condylo-basal length, 19; zygomatic breadth, 12.5; mastoidal breadth, 12; interorbital breadth, 4.7; incisors to postpalatal notch, 10.5; foramen magnum to postpalatal notch, 9.0; fronto-palatal depth at middle of molar series, 8.0. *Allotype* (male): condylo-basal length, 18; zygomatic breadth, 11.5; mastoidal breadth, 12; interorbital breadth, 4.8; incisors to postpalatal notch, 9.2; foramen magnum to postpalatal notch, 8.8; fronto-palatal depth at middle of molar series, 7.5.

Comparisons. *Z. p. kootenayensis* is readily differentiated from *Z. p. princeps* of the Rocky Mountains region by its paler, dusty colour. Compared with a large series of *Z. p. oregonus* (including topotypes), *kootenayensis* is noticeably duller and paler in colour, both in average appearance and in nearly all individual specimens. The *oregonus* specimens superficially look more like specimens from western Alberta (Waterton Lakes, Banff, and Jasper parks). Topotypical specimens of *oregonus* have head and mid-dorsal area more finely flecked with the yellowish colour of the sides. *Z. p. kootenayensis* also averages larger and more greyish than the three subspecies recently described by Dr. E. Raymond Hall¹, *Z. p. cinereus* (Utah), and *Z. p. curtatus* and *Z. p. palatinus* (Nevada). Twenty-five specimens from Oregon (including two topotypes), and twenty-four specimens from Idaho, in collections of United States Biological Survey, referred to *oregonus*, were examined and compared with our specimens of *kootenayensis*, in 1931. The cranial characters of *Z. p. oregonus* as given in Preble's monograph² are as follows:

"Compared with *Z. princeps* from Colorado, the skull of the present form differs as follows: brain case more rounded, especially shorter and more rounded behind; zygomatic shorter; incisive foramina larger and very much broader behind; audital bullae smaller."

The only one of the above characters that seemed to hold good in a considerable number of specimens (Preble had only nine specimens—eight from Oregon, and one from Nevada, when he described the subspecies *oregonus*) was that the incisive foramina were larger throughout in *oregonus* and very much broader posteriorly. The incisive foramina in *kootenayensis* are much narrower throughout and not greatly broadened in most specimens, although *kootenayensis* shows some signs of intergradation with *princeps* and *oregonus* in this as well as in some other characters. No particular difference could be detected in roundness of brain case posteriorly, but Kootenay specimens have skulls noticeably narrower both in brain case and breadth of zygomatic arches. No specimens were taken from Osoyoos Lake country in southern Okanagan valley, possibly because the local conditions were too dry, but a series from Oroville, Okanagan county, Washington, are apparently referable to *kootenayensis*. A single female specimen was taken on Meadow creek, near Yahk, East Kootenay district, a few miles north of the Montana-Idaho-British Columbia corner, September 1, 1929, which is distinctly referable to *kootenayensis*, but a series of ten specimens taken in May, 1930, near Newgate, at edge of Tobacco Plains, on east side of Purcell range, are plainly referable to *Z. p. princeps*.

¹Critical comments on mammals from Utah, with descriptions of new forms from Utah, Nevada, and Washington; Univ. California Publ. in Zoology, vol. 37, No. 1, pp. 1-13 (April, 1931).

²Revision of the Jumping Mice of the Genus *Zapus*; North American Fauna, No. 15, p. 24 (Washington, D.C., 1899).

Remarks. *Z. p. kootenayensis* is a pale race of jumping mouse, of a somewhat bleached appearance, which apparently inhabits the more humid districts of the semi-arid region of southern British Columbia. Its habits are similar to those of other forms of the genus. It shows no sign of intergradation with *Zapus trinotatus trinotatus* of the western slopes of the Cascades. In the Columbia valley it was found at edge of mountain rills in shelter of heavy vegetation, false hellebore (*Veratrum viride* Ait.), *Delphinium*, valerian (*Valeriana* sp.), etc., whereas the Yahk specimen was taken under tall grass overhanging the edge of a dry channel of creek in open meadow. It is apparently as sensitive to cold as its congeners, as the last specimen was taken on September 1, and no others were observed after the first sharp frosts.

Thanks are due to officials of the United States Biological Survey for the privilege of examining large series of various forms of *Zapus* in their collections, and particularly to Mr. E. A. Preble for assistance in comparing specimens; also to curators of mammals in American Museum of Natural History, New York, and Philadelphia Academy of Natural Sciences, to Dr. E. Raymond Hall, curator of mammals in Museum of Vertebrate Zoology, University of California, for loan of specimens of his three new subspecies of *Zapus princeps* from Great Basin region, and to Mr. Arthur Svihla, curator of The Charles P. Conner Museum, State College of Washington, for loan of two *Zapus* specimens from states of Washington and Idaho.

Specimens Examined. Forty-seven specimens of *Zapus princeps kootenayensis* from British Columbia, all in collection of National Museum of Canada, as follows:

- Hope-Princeton summit, east side, 5,600 feet, 1 ♀
- Hedley (Stirling creek), 1,700 feet, 1 ♀
- Fairview-Keremeos summit, 3,000 feet, 2 ♂'s, 4 ♀'s
- Midway, Kettle river, 1,800 feet, 2 ♂'s
- Westbridge, Kettle river, 2,075 feet, 1 ♂
- Rossland, 4,000 feet; Green mountain, 6,000 feet; Old Glory mountain, 7,000 feet, 18 ♂'s, 17 ♀'s
- Yahk, Meadow creek, 3,500 feet, 1 ♀.

***Peromyscus maniculatus interdictus* new subspecies**

Vancouver Island White-Footed Mouse

Type. Male adult, skin and skull, No. 11432, National Museum of Canada; Forbidden plateau, near eastern edge of Strathcona park, north of mount Albert Edward, about 17 miles west of Comox, Vancouver island, British Columbia, at about 4,200 feet altitude; latitude about 49° 42' north, longitude 125° 25' west; July 5, 1932; collected by Hamilton M. Laing. *Allotype:* female adult, skin and skull, No. 11433, taken near same place, 4,500 feet altitude, July 15, 1932.

Geographic Distribution. Known only from mountains back of Comox, Vancouver island, west of strait of Georgia, and from Nootka sound on west coast of Vancouver island; probably also occurs at higher elevations across the central and northern part of the island.

Diagnostic Characters. Resembles *P. m. oreas* Bangs more closely than any other form, but considerably larger and slightly darker than *oreas* on back and with richer shade of rusty or cinnamon on sides; much larger and not as dark in colour as *P. m. austerus* (Baird).

Colour. Upper parts greyish brown, darker along median line; face greyish, slightly washed with reddish; a blackish spot at base of whiskers, and a sooty ring around eye; feet white; forearms dusky; ankles brownish; tail dark brown above, whitish below; under parts white.

External Measurements. *Type:* total length, 215; tail vertebræ, 115; hind foot, 22.5; ear (from dried skin), height 20, greatest width 12. Breeding specimen, with testes 10 by 7 mm. Average of two male topotypes: total length, 209.5 (215.0-204.0); tail vertebræ, 111.5 (115.0-108.0); hind foot, 22.5. *Allotype* (female): total length, 218; tail vertebræ, 115; hind foot, 22.

Skull. Proportions similar to those of *P. m. oreas* of similar age, but somewhat larger.

Skull Measurements. *Type* (male): occipito-nasal length, 28 (mm.); condylo-basal length of Hensel, 21; zygomatic breadth, 13.2; interorbital breadth, 4.2; interparietal length, 3.5; interparietal breadth, 9.5; length of nasals, 12; shelf of bony palate (from posterior end of anterior palatine foramina to anterior border of interpterygoid fossa), 5; palatine slits, 5; diastema (from anterior border of upper molars to posterior base of incisors), 7.2; postpalatal length, 9.5; maxillary tooth row, 4; mandibular tooth row, 4; height of skull, 9.5. *Allotype* (female): occipito-nasal length, 26.5; condylo-basal length, 20.5; zygomatic breadth, 13; interorbital breadth, 4; interparietal length, 3; length of nasals, 11; shelf of bony palate, 4; palatine slits, 5.5; diastema, 7; postpalatal length, 9.5; maxillary tooth row, 4; mandibular tooth row, 4.2; height of skull, 10.

Comparisons. The only white-footed mouse hitherto reported from the mainland of Vancouver island is *P. m. austerus* (Baird), and *austerus* is easily differentiated from *interdictus* by its much smaller size and shorter tail (length usually not over 190 and tail not over 95, usually much less), and by the sooty mid-dorsal region of *austerus*. *P. m. interdictus* is also much larger than *P. m. saturatus* Bangs, known only from Saturna island in the strait of Georgia, and *P. m. hollisteri* Osgood, known only from San Juan island, San Juan county, Washington. *P. m. interdictus* bears the closest resemblance to *P. m. oreas* Bangs, but the latter is not known to occur off the mainland of British Columbia and the State of Washington, and *interdictus* is larger and darker in colour than *oreas*.

Remarks. The National Museum of Canada has two specimens taken by William Spreadborough at Nootka, on west coast of Vancouver island (No. 1304 ♀, May 30, 1907, and No. 1306 ♂, June 3, 1907), without skulls or measurements, but which the writer for some time had placed with *P. m. oreas* from evident large size, length of tail, and approximately similar colour. Mr. H. S. Swarth¹ records 203 specimens of *P. m. austerus*

¹Report on a Collection of Birds and Mammals from Vancouver island; Univ. of California Pub. in Zoology, vol. 10, No. 1, p. 95 (February 13, 1912).

(from Vancouver, Nanaimo, Parksville, Little Qualicum river, French creek, Errington, Alberni, Golden Eagle basin, Tahsis canal, and Friendly cove), and states:

"The Nootka Sound specimens are appreciably larger than those from the east side of the island. Comparative measurements are as follows: average of nine adults from Tahsis canal and Friendly cove [Nootka sound], length 191.8, tail 103.3, hind foot 22.6; average of nine adults from the vicinity of Parksville [about 16 miles northwest of Nanaimo]: length 167.4, tail 84.1, hind foot 20.6."

When Mr. Laing sent me a specimen of the large white-footed mouse from Comox with his letter of July 12, 1932, he stated: "This is not the common *Peromyscus* at low elevation, which is a smaller, greyer animal, so-called *austerus*. . . . The specimen which I am sending came from 4,200 feet elevation inland." Mr. Laing later sent in two additional specimens, male and female, taken near the same place, at about 4,500 feet elevation, on July 15, 1932. Further comparison of these specimens with a series of over thirty specimens of *oreas* from the mainland and over two hundred specimens of *austerus* from the mainland and Vancouver island showed their distinctness from *oreas* and *austerus* as well as the apparent relationship of the Comox specimens with the Nootka specimens.

Specimens Examined. Five in National Museum of Canada, eight in Kenneth Racey collection¹, British Columbia (Vancouver island):

Comox (inland, 4,200-4,500 feet elevation), 2 ♂'s, 1 ♀
Nootka, 1 ♂, 1 ♀.

***Marmota caligata raceyi* new subspecies**

Chilcotin Hoary Marmot

Type. Male adult, skin and skull, No. 11430, National Museum of Canada; Itcha mountains, Chilcotin plateau, range 3, Coast district, latitude 52° 45' north, longitude 125° west; altitude, 6,500 feet; August 14, 1931; collected by Kenneth Racey; original No. 860. *Allotype:* female adult, skin and skull, No. 11431, taken in Caribou valley, same region, altitude 6,000 feet, August 16, 1931; original No. 869.

Geographic Distribution. Known only from type locality, on Chilcotin plateau between east slope of Coast mountains and upper Fraser river.

Diagnostic Characters. A rather large marmot characterized by pelage being mostly of black and white hairs, both above and below, and with little brownish colour in coat except a slight wash of ochraceous on rump and with distal parts of tail hairs ochraceous-tawny. Skull narrower than in neighbouring subspecies.

Colour. General colour of upper parts mixed black and white, giving a grizzled effect. Top of head and orbital region black, extending from each ear back to shoulders in a gradually tapering black stripe; an indistinct band of scattered white hairs crossing forehead between eyes; nose and lips white, bordered posteriorly by black; cheeks faintly brownish due to dull brownish tips of some hairs; mantle pale greyish, the white much

¹Tofino (Clayoquot sound), 6; Cowichan lake, 1; mount Arrowsmith (4,000 feet), 1.

obscured by black tips of guard hairs; middle and posterior part of back blackish, the hairs dull fuscous at base, whitish grey medially, and glossy black at tips; rump and base of tail faintly washed with dull ochraceous; tail with hairs deep vandyke brown at base, distal part largely ochraceous-tawny, and lightly tipped with brownish black; forelegs light silvery grey, running into black on feet; hind legs similar but slightly more dusky; under parts uniform dull greyish, the hairs black or dusky at base, some with white mesial portion, and some with white and some with black tips, the colour of under parts varying slightly on account of wear on hair tips; no brownish tint on under parts. Specimens of both adults and young are quite uniform in colour.

External Measurements. *Type*: total length, 757.0 (mm.); tail vertebræ, 212.0; hind foot, 98.0; weight, 25 pounds. Average of three adult males (topotypes): total length, 739.0 (757.0-710.0); tail vertebræ, 209.3 (214.0-202.0); hind foot, 99.6 (102.0-98.0); weight 19.0 (25.0-10.0) pounds. *Allotype* (female): total length, 714.0; tail vertebræ, 190.0; hind foot, 96.0; weight, 25 pounds.

Skull. Quite uniform in size and proportions in specimens of same age, males and females showing little difference. Skull similar in size to that of *M. c. oxytona*, but narrower and tapering more anteriorly, and jugals very much broader. Nasals rather long and constricted posteriorly, extending some distance back of ends of premaxillæ; posterior ends of premaxillæ considerably expanded. Skull lighter than in *M. c. okanagana*, proportionately longer and narrower, and with zygoma forming less abrupt angle with rostrum. Molars rather large and heavy.

Skull Measurements. *Type* (male): condylo-basal length, 101.5; palatal length, 51.0; postpalatal length, 43.0; length of nasals, 41.0; zygomatic breadth, 64.0; mastoidal breadth, 47.5; least interorbital breadth, 25.0; rostral breadth, 23.5; maxillary molar row, 23.5; height of skull, 37.0; ratio of zygomatic breadth to condylo-basal length, 63.1. *Allotype* (female): condylo-basal length, 102.0; palatal length, 51.0; postpalatal length, 41.0; length of nasals, 44.5; zygomatic breadth, 64.5; mastoidal breadth, 47.5; least interorbital breadth, 27.0; rostral breadth, 24.0; maxillary molar row, 23.0; height of skull, 38.5; ratio of zygomatic breadth to condylo-basal length, 63.2.

Comparisons. The Chilcotin hoary marmot differs from all other known forms of the *caligata* group in much greater amount of black in the coat, less white on shoulders and anterior part of back, and absence of brown on under parts. *M. c. oxytona*, which ranges to the east and north of this form, has much more brownish on upper parts and more whitish below. *M. c. cascadenis*, of the Cascade mountains of southwestern British Columbia, has more or less brown above and below, and colours are more mixed and dingy. *M. c. okanagana* of the southern interior has more brown on the back and under parts are more whitish, in some cases shading into brown. *M. c. nivaria* of the Rocky mountains of northwestern Montana, northern Idaho, and southwestern Alberta (probably also extreme southeastern British Columbia), is much whiter both above and below, and *M. vancouverensis* is a uniformly brown insular

form. In skull characters, *M. c. raceyi* differs little from *cascadensis* except in having wider jugals and generally broader nasals; from *okanagana* in having much narrower and more tapering zygomatic arches; and from *oxytona* in having broader jugals and with zygomatic arches considerably less bowed outwards (See Plate V). The specimens which are nearest geographically to the Chilcotin range are three from McGillivray creek, Lillooet district, and *raceyi* resembles these more closely than any other form, but the skull characters put the Lillooet specimens definitely with *okanagana*. There is probably intergradation between *raceyi* and *okanagana* in the intervening region, and possibly also with *oxytona* or *caligata* to the northward. (See tables of skull measurements.)¹

This subspecies is named in honour of Mr. Kenneth Racey of Vancouver, well known for his work as a field naturalist in western British Columbia, whose energy in carrying on an extended field exploration in the little-known Chilcotin region, resulted in collecting the type and other specimens of this new form.

Specimens Examined. Eight from the type locality: three adult males, two half-grown males, one adult female, one subadult female, and one half-grown female, from collection of Kenneth Racey, Vancouver, British Columbia, taken August 13 to 16, 1931.

¹Measurements of *M. c. nivaria* taken from "Revision of the American Marmots"; N. A. Fauna, No. 37, 1915, p. 73. All other figures are from measurements made by the writer.

Average Measurements of Seven British Columbia Forms of the Marmota Caligata Group

Average, maximum and minimum measurements (adult males)

Species and subspecies.....	<i>M. c. raceyi</i>	<i>M. c. okanagana</i>	<i>M. c. cascaden-sis</i>	<i>M. c. oxytona</i>	<i>M. c. oxytona</i> <i>x caligata</i>	<i>M. c. nivaria</i>	<i>M. vancouver-ensis</i>
No. specimens.....	3 Chilcotin	2 Rossland, Lillooet	1 Lihumitson park	2 Jasper park, Alta.	4 Teslin lake, Yukon	1 Glacier park, Mont.	2 Vancouver island
Length, total.....	739.0 (757.0-710.0)	755.5 (801.0-710.0)	680.0	742.5 (749.0-736.0)	695.3 (736.0-673.0)	755.0	630.5 (631.0-630.0)
Tail vertebrae.....	209.3 (214.0-212.0)	220.0 (225.0-215.0)	205.0	206.0 (228.0-184.0)	229.0 (242.0-216.0)	250.0	197.5 (203.0-192.0)
Hind foot.....	99.6 (102.0-98.0)	106.5 (113.0 100.0)	97.0	102.0 (102.0-102.0)	92.5 (96.0-89.0)	110.0	101.0 (102.0-100.0)
Weight.....	19.0 lbs. (25.0-10.0)		11.5 lbs.				6.5 lbs.
No of skulls measured.....	3	2	1	2	8	1	2
Condyl-basal length.....	100.3 (101.5-98.0)	103.0 (104.0-102.0)	102.0	101.6 (106.0-98.0)	96.5 (101.5-89.5)	92.0	88.5
Palatal length.....	52.8 (54.5-53.0)	55.0 (56.5-53.5)	53.0	54.5 (57.0-51.0)	57.3 (54.0-47.2)	49.0	48.8 (49.0-48.5)
Postpalatal length.....	41.3 (43.0-39.0)	44.0 (45.0-45.0)	39.0	43.5 (47.5-41.0)	40.6 (43.0-37.0)	31.0	36.0
Length of nasals.....	41.0 (42.0-40.0)	43.5 (43.5-43.0)	37.5	42.5 (43.0-41.5)	39.9 (42.5-37.5)	38.5	36.9 (37.0-36.8)
Zygomatic breadth.....	63.2 (64.0-62.5)	68.5 (70.0-67.5)	63.0	66.3 (67.0-65.5)	61.9 (66.0-58.0)	57.5	58.5 (60.0-57.0)
Mastoidal breadth.....	47.2 (47.5-47.0)	46.8 (49.5-44.0)	45.0	46.0 (47.2-45.0)	42.6 (44.5-39.0)	40.0	40.0

Average Measurements of Seven British Columbia Forms of the Marmota Caligata Group—(Contd.)

Average, maximum and minimum measurements (adult males)

Species and subspecies.....	<i>M. c. raceyi</i>	<i>M. c. okanagana</i>	<i>M. c. cascaden-sis</i>	<i>M. c. oxytona</i>	<i>M. c. oxytona x caligata</i>	<i>M. c. nivarica</i>	<i>M. vancouverensis</i>
No. specimens.....	3 Chilcotin	2 Rossland, Lillooet	1 Lihumitson park	2 Jasper park, Alta.	4 Teslin lake, Yukon	1 Glacier park, Mont.	2 Vancouver island
Interorbital breadth.....	24.6 (25.0-24.0)	26.0 (26.0-26.0)	25.0	25.6 (26.5-25.0)	23.7 (25.5-21.5)	22.0	22.0 (23.0-21.0)
Rostral breadth.....	23.3 (24.0-22.0)	23.0 (24.0-22.0)	21.0	22.9 (23.2-22.5)	21.1 (22.0-17.5)	19.0	20.0 (20.5-19.5)
Maxillary tooth row.....	22.9 (23.0-22.2)	23.3 (24.0-22.5)	29.0	22.5 (23.0-22.0)	22.1 (23.0-21.0)	20.5	21.0 (21.0-21.0)
Ratio of zygomatic breadth to condylo-basal length.....	63.6 (64.0-63.1)	66.5 (68.6-64.4)	61.8	65.0 (66.9-63.2)	64.4 (66.6-61.6)	62.5	64.4

Average Measurements of Seven British Columbia Forms of the *Marmota Caligata* Group—(Contd.)

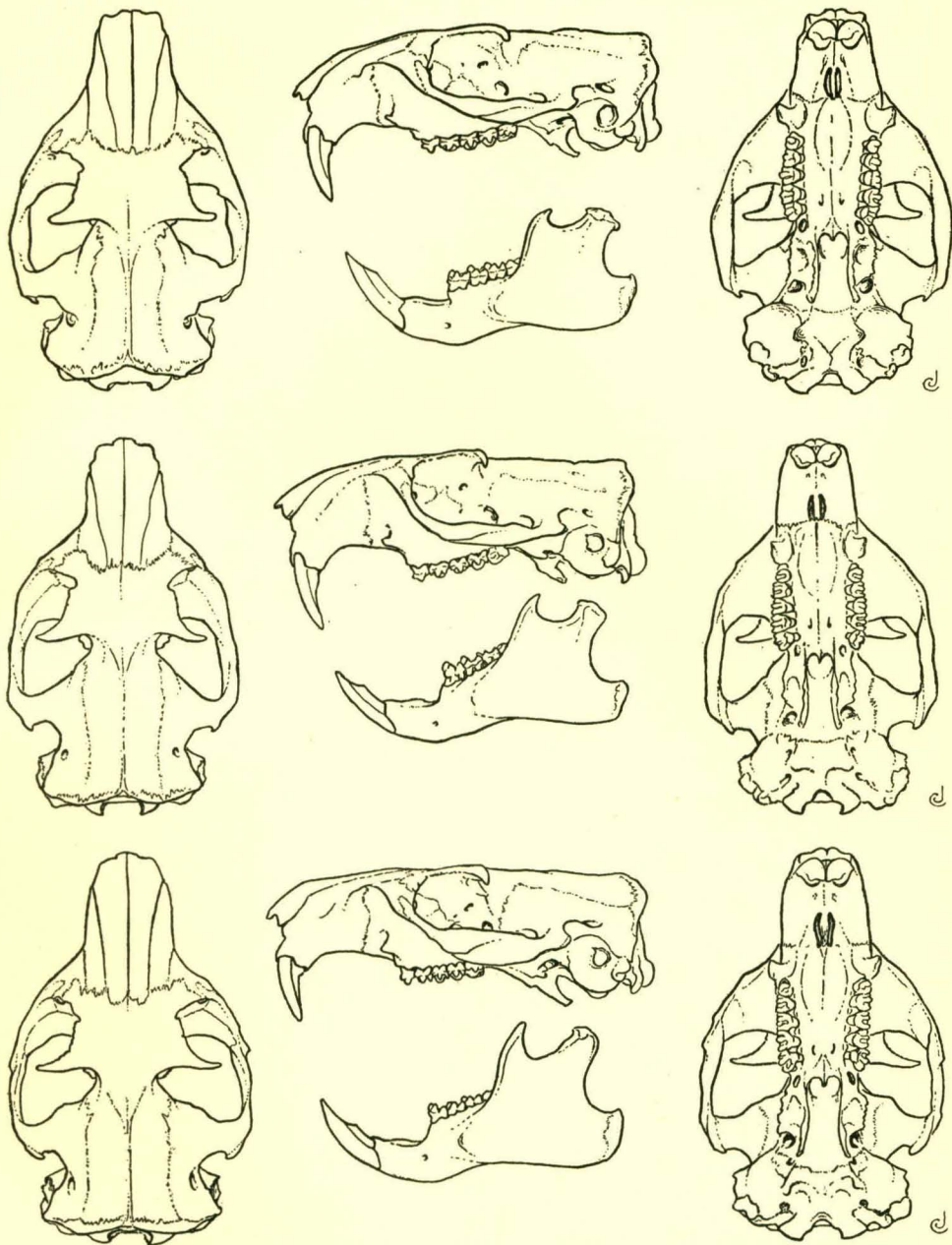
Average, maximum and minimum measurements (adult females)

Species and subspecies.....	<i>M. c. raceyi</i>	<i>M. c. okanagana</i>	<i>M. c. cascaden-sis</i>	<i>M. c. oxytona</i>	<i>M. c. oxytona</i> <i>x caligata</i>	<i>M. c. nivaria</i>	<i>M. vancouver-ensis</i>
No. specimens measured.....	1 Chilcotin	3 Rossland, Lillooet	6 Cascades and Mount Baker range	2 Jasper park, Alta.	3 Teslin lake, Yukon	4 (topotypes) Glacier park, Mont.	3 Vancouver island
Length, total.....	714.0	698.5 (750.0-647.0)	714.0 (765.0-680.0)	733.0 (736.0-730.0)	628.3 (635.0-622.0)	751.0 (820.0-700.0)	695.7 (702.0-690.0)
Tail vertebrae.....	190.0	198.5 (212.0-185.0)	219.0 (247.0-195.0)	235.0 (242.0-228.0)	229.0 (242.0-210.0)	224.0 (245.0-200.0)	196.7 (200.0-190.0)
Hind foot.....	96.0	90.0 (95.0-85.0)	99.0 (107.0-94.0)	92.0 (95.0-89.0)	86.7 (92.0-79.0)	105.0 (113.0-95.0)	103.0 (105.0-102.0)
Weight.....	25.0 lbs.	9.0 lbs.
No. of skulls measured.....	1	3	7	6	6	4	3
Condylal-basal length (of A. H. Howell)...	102.0	94.5 (94.5-94.5)	98.8 (102.5-95.4)	98.4 (103.0-94.5)	95.1 (99.0-92.0)	102.0 (106.5-99.5)	93.5 (94.0-93.0)
Palatal length.....	51.0	51.0 (51.0-51.0)	57.7 (59.0-56.3)	50.6 (54.0-46.5)	49.8 (52.0-48.0)	59.4 (61.4-58.0)	50.8 (52.0-50.0)
Postpalatal length.....	41.0	39.3 (40.0-38.5)	37.7 (39.0-34.0)	41.3 (42.5-39.0)	40.5 (44.5-36.5)	38.2 (39.6-37.5)	36.8 (37.0-36.5)
Length of nasals.....	44.5	39.0 (40.0-38.0)	41.7 (44.0-37.8)	40.0 (42.8-38.0)	39.9 (42.0-38.0)	42.2 (43.9-40.6)	39.6 (40.5-39.0)
Zygomatic breadth.....	64.5	64.3 (66.5-62.0)	65.8 (68.4-64.2)	63.4 (66.5-61.0)	61.2 (62.5-59.5)	65.7 (66.6-64.0)	61.7 (63.0-61.0)
Mastoidal breadth.....	47.5	43.3 (43.5-43.0)	46.7 (49.4-44.9)	43.4 (46.0-41.0)	42.9 (45.2-41.0)	45.5 (45.7-44.8)	43.5 (46.0-42.0)

Average Measurements of Seven British Columbia Forms of the Marmota Caligata Group—(Contd.)

Average, maximum and minimum measurements (adult females)

Species and subspecies.....	<i>M. c. raceyi</i>	<i>M. c. okanagana</i>	<i>M. c. cascaden-sis</i>	<i>M. c. oxytona</i>	<i>M. c. oxytona x caligata</i>	<i>M. c. nivaria</i>	<i>M. vancouver-ensis</i>
No. specimens measured.....	1 Chilcotin	3 Rosslund, Lillooet	6 Cascades and Mount Baker range	1 Jasper park, Alta.	3 Teslin lake, Yukon	4 (topotypes) Glacier park, Mont.	3 Vancouver island
Interorbital breadth.....	27.0	23.8 (24.0-23.5)	23.8 (24.6-22.5)	24.7 (26.5-23.5)	22.9 (24.0-21.5)	25.5 (27.2-23.3)	23.0 (24.0-22.5)
Rostral breadth.....	24.0	21.3 (21.5-21.0)	21.2 (22.7-19.3)	22.6 (24.5-21.0)	21.1 (22.0-20.0)	23.0 (25.0-21.6)	20.7 (22.0-21.0)
Maxillary molar row.....	23.0	21.5 (22.0-21.0)	22.1 (23.2-21.0)	22.0 (24.0-21.0)	21.6 (22.8-20.5)	22.9 (24.4-22.2)	23.6 (24.0-23.1)
Ratio of zygomatic breadth to condylo- basal length.....	63.2	68.0 (70.4-65.6)	66.6	63.0 (64.8-63.4)	64.3 (67.4-63.1)	64.4	65.3 (65.4-64.9)

Skulls of hoary marmots. ($\frac{1}{3}$ natural size)

Upper: *Marmota caligata raceyi* Anderson (type). Male adult. No. 11430 (860). Itcha mountains, B.C.
 Middle: *Marmota caligata cascadenis* Howell. Male adult. No. 7847. Lihumitson park, New Westminster district, B.C.
 Lower: *Marmota caligata okanagana* (King). Male adult. No. 2701. McGillivray creek, Anderson lake, B.C.



