PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

PROVINCIAL MUSEUM

OF

NATURAL HISTORY

FOR THE YEAR 1935

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1936.

To His Honour J. W. FORDHAM JOHNSON,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The undersigned respectfully submits herewith the Annual Report of the Provincial Museum of Natural History for the year 1935.

G. M. WEIR,
Provincial Secretary.

Provincial Secretary's Office,
Victoria, B.C.

PROVINCIAL MUSEUM OF NATURAL HISTORY,
VICTORIA, B.C., December 31st, 1935.

The Honourable Dr. G. M. Weir,
Provincial Secretary, Victoria, B.C.

SIR,—I have the honour, as Director of the Provincial Museum of Natural History, to lay before you the Report for the year ended December 31st, 1935, covering the activities of the Museum.

I have the honour to be,
Sir,
Your obedient servant,

F. KERMODE,
Director.

DEPARTMENT *of the* PROVINCIAL SECRETARY.

The Honourable Dr. G. M. WEIR, *Minister.*

P. DE NOE WALKER, *Deputy Minister.*

PROVINCIAL MUSEUM OF NATURAL HISTORY.

Staff:

FRANCIS KERMODE, *Director.*

I. MCTAGGART-COWAN, PH.D., *Assistant Biologist.* NANCY STARK, *Recorder and Botanist.*

MAUD P. HARTREE, *Stenographer.*

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REPORT *of the*
PROVINCIAL MUSEUM OF NATURAL HISTORY
FOR THE YEAR 1935.

By Francis Kermode, Director.

OBJECTS.

(*a.*) To secure and preserve specimens illustrating the natural history of the Province.

(*b.*) To collect anthropological material relating to the aboriginal races of the Province.

(*c.*) To obtain information respecting the natural sciences, relating particularly to the natural history of the Province, and diffuse knowledge regarding the same.

ADMISSION.

The Provincial Museum is open to the public, free, week-days, 9 a.m. to 5 p.m.; May 1st to October 31st, Sunday afternoons, 1 p.m. to 5 p.m.

The Museum is closed on all statutory holidays, except on notification through the press.

VISITORS.

The following figures show the difference between those who registered and those who were checked by the staff. While only 23,814 registered, the total of the check was 49,499.

	Registered.	Checked.
January	713	2,141
February	869	2,980
March	837	3,135
April	1,324	2,613
May	1,486	3,162
June	2,224	4,184
July	5,663	10,096
August	5,606	10,867
September	2,681	5,066
October	1,130	2,341
November	654	1,549
December	627	1,365
Totals	23,814	49,499

ACTIVITIES.

Considerable advancement has been shown during the year 1935, as money was voted in the estimates for an Assistant Biologist and Stenographer on the regular staff. The position of temporary attendant was made permanent, which afforded the opportunity to have the Museum open on Saturday afternoons throughout the year, as had been the custom for many years in the past.

Due to having extra help a great amount of work has been accomplished in the office and a start made towards bringing the study collections up to date. This work had been neglected for several years owing to the staff being reduced to a minimum, and it was impossible to keep up with the steady influx of work.

Although the position of Assistant Biologist was reinstated in April, it was not until July that I. McTaggart-Cowan, Ph.D., was appointed by the Honourable Provincial Secretary, Minister of the Department, to fill this position. The Director then instructed the Assistant Biologist to collect a series of ornithological specimens in the vicinity of Victoria. Arrangements were made to carry out this work through the able assistance of the Provincial Game

Department and Provincial Police, allowing the Assistant Biologist to accompany them into the surrounding districts.

The Director made arrangements for Dr. McTaggart-Cowan to undertake a short trip to the Lower Fraser Valley District, where considerable collecting was done. Later a trip to the Alta Lake region was carried out, an account of which is given in the article on " Mammals of the Alta Lake Region," by Kenneth Racey and I. McTaggart-Cowan.

Having extra assistance, it is the intention of the Department to make a biological investigation of the public park areas in British Columbia, with a view to recording the flora and fauna peculiar to the regions, and to publishing the results in the annual reports, so as to be available to tourists and others visiting the parks.

An article on " Insect and Plant Associations in the Chilcotin," by R. S. Sherman and Fred Perry, is also included in this report, and a brief account on " Notes on Vancouver Island Cerambycidæ," by G. A. Hardy.

Mr. T. W. S. Parsons, Assistant Commissioner of the British Columbia Police, has maintained his interest in the Museum and with the assistance of his staff has donated many specimens, particularly anthropological. Had it not been for this co-operation these would otherwise have been lost to us entirely.

Comparing this year's record of visitors, there is a noticeable increase from that of the previous year. Among those visiting the Museum during the year were a number of scientists from other institutions.

Considerable study material has been borrowed from other institutions and we in turn have loaned our material for a similar purpose. We wish to thank all who have favoured us with their co-operation and also those who identified specimens for us.

The Botanical collection has been added to and with the extra assistance it has been made possible to mount several hundred specimens which have been in storage for a number of years.

An added attraction to the Museum is the painting of the backgrounds of two large seal-cases on the main floor. This splendid piece of work has been done by Mrs. L. J. C. Sweeney. The background for the fur-seal case represents a scene from Pribilof Island, while a scene from Triangle Island was chosen for the hair-seal case.

For many years there has been a very interesting Ethnological collection on display at the University of British Columbia, which was presented by the late Dr. Frank Burnett.

At the request of the Board of Governors through Dr. L. S. Klinck, President, the Director of the Provincial Museum was called upon to place a value on this collection to use as a basis for negotiating fire insurance. A trip was made by the Director to inspect the collection with Dean Klinck, Mr. A. MacLucas, Bursar, and Mr. Bell, and it was agreed by the insurance company of Mitchell & Bell to accept whatever value the Director placed on it.

Before placing a value on the collection the Director suggested that it be recatalogued with the numbers running consecutively. This excellent piece of work was carried out by a special catalogue assistant and Mr. W. Tansley, the permanent curator.

During the month of July the Director and Recorder spent several days at the University going over the collection and placing a price on each specimen. When this was completed a final report was submitted on August 8th, 1935, to the Board of Governors through Dr. Klinck, which proved satisfactory to all concerned.

A second series of natural-history talks made possible by a grant from the Carnegie Corporation were started early in January, 1936, which still prove to be popular with the children.

In order to accommodate the large number of children who were so interested in these nature talks, two separate sessions each Saturday morning had to be arranged, the first from 9.15 a.m. to 10.15 a.m. and the second from 10.30 a.m. to 11.30 a.m., differently coloured tickets being used for each session.

Museum specimens and lantern-slides were used to illustrate the lectures, and also, during the last fifteen minutes of each session, motion pictures, further illustrating the subject, were shown.

The Director wishes to thank the National Museum of Canada at Ottawa and the Dominion Parks Commission for the use of several of their motion-picture films.

The lectures were as follows:—

Date.	Title.	Lecturer.	Attendance.
Jan. 11	Animals of the Forest	Dr. I. McTaggart-Cowan	535
,, 18	Birds, Resident and Migrant	Mr. F. Kermode	710
,, 25	Life Along Our Seashores	Mr. G. A. Hardy	515
Feb. 1	*Indian Handicrafts*	*Mr. F. Kermode*	.....
,, 8	Moths and Butterflies	Mr. W. Downes	163
,, 15	Our Forests	Mr. Mulholland	375
,, 22	Hawks, Owls, and Eagles	Dr. I. McTaggart-Cowan	255
,, 29	Our Coast Fishes	Mr. F. Kermode	404
March 7	Beetles and Other Insects	Mr. G. A. Hardy	381
,, 14	Horns and Hoofs	Dr. I. McTaggart-Cowan	359
,, 21	The Way of the Frog and Snake	Mr. G. A. Hardy	395
,, 28	Old Indian Village Sites	Dr. I. McTaggart-Cowan	423
April 4	Some of Our Native Wild Flowers	Mrs. Phyllis B. Munday	283

NOTE.—Owing to the death of King George V., the lecture on January 25th was postponed until February 1st, and the lecture for that date was cancelled.

A tremendous amount of extra work was created when the offices on the second floor were moved to the north end of the building. This necessitated a new arrangement for the exhibition-cases, but when completed proved very satisfactory, as it enabled us to have the Ornithological and Oological collections in the same section. The Ichthyological specimens and lower forms of marine life are now in close contact. The Palæontological, Entomological, and Reptilian specimens are also housed on this floor.

With the removal to the new offices additional space was given to the reference library. A great number of books hitherto unavailable for reference-work have been catalogued and placed on the shelves.

For some time the Director has appealed to the Public Works Department to have the well between the first and second floors filled in. This would give us much-needed exhibition-space. It has also been suggested that access be made to the attic and that it be floored to make a suitable room for storage purposes. This is greatly needed so that all specimens be housed in a fire-proof building.

Under the general supervision of the Director, Mr. Francis Kermode, the following work has been carried out and accessions made during 1935:—

I. McT. Cowan, Assistant Biologist; report to the Director:—

It is generally recognized that the foundation of all systematic work in zoology and botany lies in adequate collections made in the field. Without such specimens for detailed examination no progress can be made in the study of our fauna and flora.

Though from year to year considerable valuable and interesting material has been accessioned at the Museum, owing to press of other work and shortness of staff, much of the office-work necessary to carefully study, determine, and catalogue such material has had to be postponed. In the past six months, however, I have attempted to catch up some of the arrears in this work. The entire mammal collection, which, exclusive of mounted exhibition material, now numbers 1,560 specimens, has been worked over and identified in accordance with current nomenclatorial usage. A complete card reference catalogue for the collection has been prepared. The similar task for the bird-collection, which now numbers 5,247 specimens, is in progress and should reach completion in the next few months.

Several special studies have been begun. One on the Bats of British Columbia has led already to the discovery in the Province of a form hitherto not known to extend its range into the Dominion. A study of the distribution and variation of the Williamson Sapsucker (*Sphyrapicus thryoideus*) is in manuscript form.

Specimens of Townsend's Vole, Muskrat, and Mink have been mounted for exhibition to replace badly faded specimens now on display.

Of work carried out at the Museum of Vertebrate Zoology of the University of California prior to my appointment to the Provincial Museum, a distributional study of the White-footed Mice of the *Peromyscus sitkensis* group has been recently published in the University of California Publications in Zoology series. Galley proof of a paper on the Nesting Habits

of the Flying Squirrel (*Glaucomys sabrinus*) has just been read. Some time was spent in revising my manuscript, "Distribution and Variation in Deer (genus *Odocoileus*) of the Pacific Coast Region of North America." This manuscript is now being edited at the University of California.

In the Department of Entomology, the arrangement for display purposes of a large case of insects representing the orders Dermaptera, Orthoptera, Odonata, Neuroptera, Hemiptera, and Diptera brought our exhibition of representative insects of the Province to a fairly satisfactory condition. In this arrangement I was assisted by Miss N. Stark. In this regard thanks are extended to Mr. Andison and Mr. W. Downes, of the Dominion Entomological Branch, for certain identifications.

Field-work.

Thanks to the co-operation of the Provincial Game Commission through Game Wardens B. Cash, of Victoria, and J. W. Jones, of Saanich, it has been possible to make a fairly comprehensive survey of the avifauna of the southern portion of Vancouver Island.

Stomachs of all birds taken were preserved and later examined and the contents tabulated. Some clinical examinations of game birds were performed for the Game Commission.

Two short field-trips were made, one to the Lower Fraser Valley in November, at which time the ornithology of the region was studied intensively and several species new to the Provincial Museum collections secured.

The other field-trip was to the Alta Lake region adjoining the northern portion of Garibaldi Park. Collecting and observation on this trip served to supplement several years' sporadic work in the region, the results of which are published in this report. Though the present report deals largely with the mammals of the region, it is planned that a similar study on the birds will follow. The desirability of continuing and extending these biological investigations of our Provincial Parks is to be emphasized. As these areas are opened to tourist invasion the fauna and flora will inevitably become modified. It is therefore highly desirable that we should have accurate knowledge of the primeval conditions of these areas. which, when in later years compared with conditions obtaining after man's intervention, will form the basis for interesting and valuable conclusions concerning the effect upon the fauna of the modification of the environment. Then, too, if these faunistic studies could be made available to the general public, they would greatly enhance the interest of the regions to the tourist.

THE LIBRARY.

With the removal to the new offices it became possible to reorganize the collections of books and pamphlets comprised in the working library of the Museum, with a view to facilitating their use. Miss M. P. Hartree has spent considerable time at this task and the reorganization should be completed during the coming year. The following publications were received during the year:—

Publications received during the year (total)	355
By exchange—	
American Committee for International Wild Life Protection	1
Art, Historical, and Scientific Association of Vancouver, B.C.	4
Australian Museum, Sydney, Australia	1
Bernice P. Bishop Museum, Honolulu, T.H.	2
Biological Board of Canada, Ottawa	11
Biological Society of Washington	2
Boston Society of Natural History, Boston	5
Bristol Museum & Art Gallery, Bristol, England	1
Brooklyn Children's Museum, Brooklyn, N.Y.	7
Buffalo Society of Natural Sciences, Buffalo, N.Y.	2
California Academy of Sciences, San Francisco	12
Cambridge University Library, Cambridge, England	1
Carnegie Museum, Pittsburgh, Pennsylvania	1
Charleston Museum, Charleston, South Carolina	1
Chicago Academy of Sciences, Chicago, Ill.	6
Colorado Museum of Natural History, Denver, Colo.	5
Cornell University, Ithaca, N.Y.	45

Department of the Interior, Ottawa	4
Division of Fish and Game of California	2
Field Museum of Natural History, Chicago, Ill.	10
Geological Survey, Dept. of Mines, Ottawa	11
Illinois Natural History Survey, Urbana, Ill.	2
Indiana University, Bloomington, Indiana	6
Insular Experiment Station, Rio Piedras, P.R.	1
Kansas Academy of Science, Manhattan, Kansas	1
Leicester Museum, Leicester, England	5
Library of Congress, Washington, D.C.	1
Manchester Museum, Manchester, England	1
Musee D'Ethnographie du Trocadero, Paris	1
National Museum of Canada, Dept. of Mines, Ottawa	2
National Museum of Ireland, Dublin	2
National Museum of Wales, Cardiff	1
National Research Council of Canada, Ottawa	2
New York Zoological Society, New York	9
Nova Scotian Institute of Science, Halifax, N.S.	2
Ohio Agricultural Experiment Station, Wooster, Ohio	1
Oxford University Press, Oxford, England	8
Pacific Northwest Bird and Mammal Society, Seattle, Wash.	4
Peabody Museum, Yale University	3
Philadelphia Academy of Natural Sciences	1
Provincial Museum of Natural History, Regina, Sask.	1
Queen Victoria Memorial, Salisbury, Rhodesia	1
Rochester Academy of Science, Rochester, N.Y.	2
Royal Geographical Society of Australia, Adelaide	1
Royal Ontario Museum of Zoology, Toronto, Canada	5
Royal Society for Protection of Birds, London	2
San Diego Society of Natural History, California	12
Santa Barbara Museum of Natural History, California	2
Scripps Institution of Oceanography, La Jolla, California	3
Smithsonian Institution, U.S. National Museum, Washington	8
Staten Island Institute of Arts and Sciences	7
University of California, Berkeley, California	12
University of Colorado, Boulder, Colorado	2
University of Nebraska, Lincoln, Nebraska	3
University of Puerto Rico, Rio Piedras, P.R.	4
University of Toronto, Toronto, Ontario	1
University of Washington, Seattle, Washington	20
Vancouver Art Gallery, Vancouver, B.C.	6
Wagner Free Institute of Science, Philadelphia, Pa.	4
Zoological Society of Philadelphia	1
Zoological Society of San Diego, California	2

By subscription and purchase—

American Association of Museums, Washington, D.C.	23
American Ornithologists' Union, Lancaster, Pa.	4
American Society of Ichthologists & Herpetologists, Ann Arbor	8
British Museums Association, South Kensington, England	15
Cooper Ornithological Club, Berkeley, California	8
Cruises of the Steamer Corwin: Year of 1885	1
Mammals and Birds, Encyclopædia Britannica, Toronto	1
Moss Flora of North America, A. J. Grout, Vermont	1
National Museum of Canada, Birds of Canada, P. A. Taverner	6

We are indebted to the following for scientific separates received during the year: Mr. E. A. Goldman, Dr. T. H. Scheffer, Mr. Harlan I. Smith, Dr. Harold St. John, and Mr. L. M. Klauber.

ACCESSIONS TO THE MUSEUM.

Anthropological and Ethnological Collections.

By gift 15

Salishan (Island).

H. Smethurst, Sidney, V.I., B.C. Stone sinker.
H. H. Smith, Victoria, B.C. Flint arrow-head.
Const. Helmsing, B.C. Prov. Police, Victoria, B.C. Skull and incomplete skeleton.
H. K. Harrison, Parksville, V.I., B.C. Slate knife.
J. N. Evans, Duncan, V.I., B.C. Stone chisel.
E. C. Dawes, Victoria, B.C. Arrow-point.

Nootkan.

Mrs. C. Fidler, Victoria, B.C. Hat.
Dr. Walker, Victoria, B.C. Fur-seal spear.
J. H. Clarke, Refuge Cove, V.I., B.C. Whalebone mallet.

Tahltan.

T. W. S. Parsons, Asst. Commissioner, B.C. Provincial Police, Victoria, B.C. One gambling-bone; 1 obsidian knife.

Athabascan.

Sergt. G. H. Greenwood, B.C. Prov. Police, Fort St. John, B.C. Bone scraper.
J. Beatty, Hudson Hope, B.C., per Asst. Commissioner T. W. S. Parsons. One lump of jade; 1 large piece of very old pemmican.
T. W. S. Parsons, Asst. Commissioner, B.C. Prov. Police, Victoria, B.C. Piece of obsidian from Telegraph Creek District.

By purchase 2

Haidan.

Two 16-inch carved black-slate totem-poles purchased from E. G. Maynard, Victoria, B.C. These are particularly fine specimens and remarkable in that they are almost identical to one another.

Botanical Collections.

Miss N. Stark reports: Besides maintaining the seasonal exhibition of living wild flowers, the work in this department during the past year has been largely devoted to the replacement of faded exhibition material and to the office-work incidental to mounting and identifying the extensive collections already assembled. In addition, several collections have been identified for botanists in the Province and assistance given to many local students. Accessions in the department now total 9,647 sheets, an increase of 61 sheets during the year. Of particular interest among the accessions is the collection by F. Perry from the Chilcotin, a district hitherto unrepresented in the Herbarium.

By gift—

E. A. Cooke, Victoria, B.C. *Juniperus scopulorum; Heuchera cylindrica; Silene Scouleri; Anchusa officinalis.*
C. French, Victoria. *Bromus carinatus.*
Mrs. E. Cooke, Victoria, B.C. *Gnaphalium purpureum; Apocynum androsæmifolium.*
F. Saverman, Langford, B.C. *Setaria viridis.*
Mr. Haynes, Victoria, B.C. *Spergularia rubra.*
C. D. Orchard, Victoria, B.C. *Fatsia horrida.*
E. Lohbrunner, Victoria, B.C. *Campanula lasiocarpa; Polystichum Andersoni.* (From Alice Arm, B.C.)
F. Perry, Vancouver, B.C. *Pedicularis scopulorum; P. Langsdorfii; Sedum integrifolium; Habenaria obtusata; Orchis rotundifolia; Lappula diffusa; Campanula uniflora; Lupinus Lyallii; Astragalus alpinus; Senecio Howellii; Astragalus ? Mortoni.*
Miss M. Lacy, Victoria, B.C. *Hypopites Hypopites.*

By gift—*Continued.*

W. B. Anderson, Victoria, B.C. *Polystichum Andersoni; Polypodium* sp.

H. Warren, Victoria, B.C. *Solanum rostratum.*

By the staff—

Miss N. Stark 10

I. McT. Cowan 4

ZOOLOGICAL COLLECTIONS.

Mammals received and catalogued 71

Birds received and catalogued 143

Amphibians and reptiles received and catalogued 3

Fish received and catalogued 5

Insects and Arachnids received and catalogued 26

Other invertebrates received and catalogued 1

Mammals.

By gift 38

C. R. Weatherell, Saltspring Island, B.C. One muskrat; 1 weasel (*Mustela cicognani anguinæ*).

W. J. Bradford, Bridge Lake, B.C. Two Columbian Ground Squirrels.

Dan Leavens, Vedder Crossing, B.C. One Long-tailed Meadow Mouse (*Microtus mordax macrurus*); 9 Creeping Voles (*Microtus oregoni serpens*); 3 Townsend's Voles (*Microtus t. townsendi*); 1 Pack Rat (*Neotoma cinerea occidentalis*); 1 White-footed Mouse (*Peromyscus maniculatus oreas*); 5 White-footed Mice (*Peromyscus m. austerus*); 3 Jumping Mice (*Zapus trinotatus trinotatus*); 1 Townsend's Chipmunk (*Eutamias townsendi*); 1 Wandering Shrew (*Sorex v. vagrans*); 6 Bendire's Shrews (*Sorex b. bendirei*); 1 Gibb's Shrew Mole (*Neurotrichus g. gibbsii*); 1 Mole (*Scaponus orarius schefferi*); all in the flesh.

K. Racey, Vancouver, B.C. One Long-tailed Meadow Mouse in flesh.

By the staff—

I. McT. Cowan 33

Birds.

By gift 37

G. Richardson, Victoria, B.C. One Northwest Coast Heron (*Ardea herodea fannini*) skull.

Miss M. Holmes, Victoria, B.C. One Belted Kingfisher.

E. Cooke, Victoria, B.C. One Lutescent Warbler in the flesh.

Miss J. Cowan, Vancouver, B.C. One Tolmie Warbler (*Oporornis tolmiei*).

Dan Leavens, Vedder Crossing, B.C. Three Goshawks; 2 Sharp-shinned Hawks; 1 Cooper's Hawk; I Western Red-tailed Hawk; 3 Pigmy Owls (*Glaucidium gnoma grinnelli*); 1 Horned Owl (*Bubo virginianus lagophonus*).

W. McMillan, Victoria, B.C. One Albino Sooty Grouse in flesh.

Game Warden J. W. Jones, Victoria, B.C. One Cooper's Hawk; 1 Western Red-tailed Hawk; 1 Northern Shrike; 1 Greater Yellowlegs; 1 Horned Owl (*B. v. saturatus*); 3 California Quail.

E. G. Kermode, Victoria, B.C. One Fork-tailed Petrel in the flesh.

C. O. Mellor, Vancouver, B.C., per B.C. Game Commission. One Horned Owl (*B. v. lagophonus*) in the flesh.

K. F. Duncan, Duncan, B.C. One Melanistic Pheasant in the flesh.

Miss G. Maynard, Victoria, B.C. One Virginia Rail in the flesh.

K. Racey, Vancouver, B.C. One Raven.

T. T. and E. B. McCabe, Berkeley, California. One Old Squaw Duck; 1 Purple Sandpiper.

Mrs. R. Ivy, Ladysmith, B.C. One Long-eared Owl in the flesh.

Newcomb, Esquimalt, B.C. One Horned Owl (*B. v. saturatus*) in the flesh.

Dr. Price, Victoria, B.C. Nests of Gairdner Woodpecker and Yellow Warbler.

By the staff—

I. McT. Cowan 106

Amphibians and Reptiles.

By gift 2

J. W. Mawle, Victoria, B.C. One shed snake-skin.
A. Monks, Alberni, V.I., B.C. One turtle.

By the staff—

I. McT. Cowan 2

Fish.

By gift—

Constable Carmichael, B.C. Prov. Police, Victoria, B.C. One Willoughby Ragfish (*Acrotus willoughbyi*).
H. N. Olsen, Victoria, B.C. One Richardson's Cottus (*Rhamphocottus richardsoni*).
Sooke Harbour Fishing and Packing Co., Victoria, B.C. One Sunfish (*Mola mola*).
T. Spouse, Victoria, B.C. One Scaly Ragfish (*Icichthys lockingtoni*).
Don Hughes, Victoria, B.C. One Red Rock Trout (*Hexagrammus superciliosus*).

Insects and Arachnids.

By gift 19

By the staff—

K. Kermode, 2; Miss M. P. Hartree, 2; I. McT. Cowan, 3 7

Spiders.

H. Shallard, E. Burkmar, E. Attree, W. M. Hughes, H. I. Salmon, Mrs. Barbour.

Orthoptera.

L. F. S. Norris-Elye, East Sooke, B.C.

Odonata.

E. Cooke, Victoria, B.C.

Neuroptera.

E. Cooke, Victoria, B.C.

Coleoptera.

Mr. Haynes, E. Cooke, Mrs. S. Chater, F. Risser, G. Fraser, D. Leavens, F. Kermode.

Lepidoptera.

Mrs. Geo. Phillips, Victoria, B.C.

Marine Invertebrates.

G. E. Forster, Saanich, B.C. Rock Clam (*Pholadidea*).

PALÆONTOLOGICAL COLLECTIONS.

By gift—

D. Clarke, Shirley, B.C. One Rock Clam (*Pholadidea*).
G. Richardson, Saanich, B.C. One Pecten.
Robt. Kirk, Saanich, B.C. One Mollusc.
A. Vowles, Sooke, B.C. One Mollusc.

MAMMALS OF THE ALTA LAKE REGION OF SOUTH-WESTERN BRITISH COLUMBIA.

By Kenneth Racey and Ian McTaggart Cowan.

Fifteen years collecting and observation by the senior author, seven years by the junior author, together with the observations of many friends in the neighbourhood and a few published notes, form the basis for this report upon the mammals of the Alta Lake region of south coastal British Columbia.

The area under consideration in this report comprises approximately 225 square miles of mountainous and heavily timbered country on the west slope of the Cascade Mountains chiefly north of the 50th parallel and west of the 123rd meridian. It includes the summit of the divide separating the Lillooet River watershed from that of the Squamish-Cheakamus River system; that part of Garibaldi Park lying north of Garibaldi Lake, and the first line of mountains on the west side of the Cheakamus Valley.

The Cheakamus-Green River Valleys run in a general north-east, south-west direction and have their mutual summit (altitude 2,100 feet) at Alta Lake, a shallow, rather rocky lake with low shores—approximately 1½ miles long by ½ mile wide at the widest point. This lake drains south-west by a short turbulent stream into Nita Lake—a typical glacial tarn made milky for the summer months by the glacial silt from Mount London Glacier on the east. Nita Lake in turn drains west into Alpha Lake, a shallow, island-studded lake presenting considerable variety in littoral habitat. The waters from this lake find their way via Miller Creek into the glacial Cheakamus River some 10 miles from its source in the lake of the same name. This lake lies in the hollow overlooked on the north by Mount Whistler (London Mountain) and on the south by the spectacular Mount Corrie, with the fast-receding ice of Cheakamus Glacier clinging to its lower slopes. The Cheakamus River then proceeds south, receiving many tributaries from both sides, and joins up with the Squamish.

Alta Lake drains to the east by narrow, slow-flowing Alpha Creek, which, after uniting with the turbulent Twentyone Mile Creek, flows into Green Lake. This lake is fed by Fitzsimmons Creek from the east. The latter river arises in the glacier of the same name on the northern slope of Mount Overlord.

The main valley is narrow, presenting little arable land and only small areas of natural marsh. On either side the peaks rise abruptly to heights of from 7,000 to 8,000 feet. On many of the highest peaks snow persists in patches throughout the summer. In some of the hanging valleys small glaciers still exist. Timber-line is reached at approximately 5,500 feet and on some of the mountains, noticeably Garibaldi and London, the succeeding 2,000 feet present large areas of alpine meadow, in July and August clothed in a growth of flowers not equalled in North American ranges other than the Cascades.

Weather.

The weather in the immediate vicinity of Alta Lake is in the nature of a compromise between dry-belt and coastal conditions. Winter temperatures as low as —20° F. have been recorded, and summer temperatures occasionally exceed 90° F. The rainfall for 1934 (Climate of B.C., B.C. Dept. Agr. Rept. for 1934, p. 18) was 64.17 inches. The accompanying hythergraphs present graphic comparison of weather conditions at Lillooet, a dry-belt station on the east side of the Cascades; Britannia Beach, a coastal wet-belt station; and Pemberton Meadows, a station just on the north-east edge of the area being considered.

Zonation.

Three of the transcontinental life-zones are represented, the Canadian, Hudsonian, and Alpine Arctic, ranging from the valley-floor upward, each supplying a number of vertebrate habitats with their characteristic fauna and flora.

Canadian Zone.—The Canadian Zone comprises the valley-floor and the well-timbered slopes above. It reaches from sea-level up to approximately 3,500 to 4,000 feet, depending on the exposure, steepness, and soil-cover.

In the well-watered valleys the timber of this zone is characterized by a predominance of Douglas fir, western hemlock, giant cedar, red alder, black poplar, and willow. The shrubbery at lake-level is composed of salmon-berry, salal, high-bush cranberry, several varieties of vaccinium, wild raspberry, bramble, and false box. The heavily timbered parts

of this zone are characterized principally by western hemlock and Douglas fir, with cedar in the more moist areas. Shrubby growth is almost absent, but where present is largely vaccinium and western teaberry.

The Canadian Zone provides a variety of vertebrate habitats, the most important of which are the following:—

Lake.—The lakes of the district are of two main types. Alta, Green, and Alpha Lakes represent the type with low shores, set well back from the lake, allowing the maximum of sunshine to reach the waters and shores. While in most places the timber reaches to the

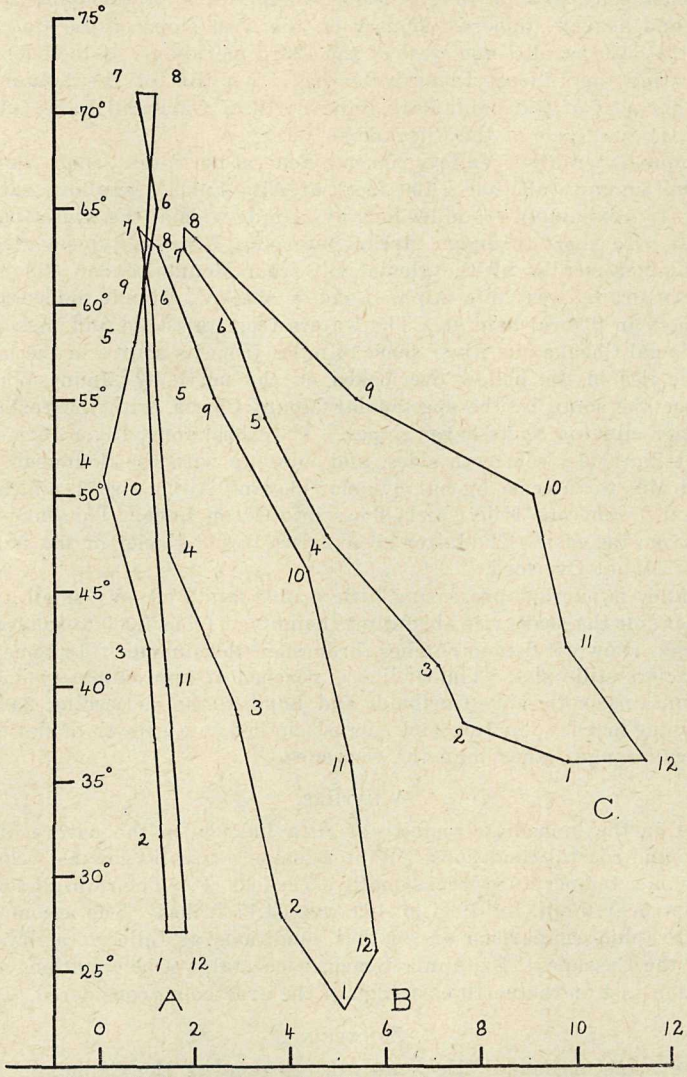


Fig. 1. Hythergraphs for A Lillooet, B Pemberton, and C Britannia Beach, based on average data of at least twenty years. Temperature is represented in degrees Fahrenheit, rainfall in inches. Numbers beside points on graphs represent months of the year.

water's edge, these lakes each have some low marginal ground supporting considerable deciduous growth. In nearly every case logging and human occupation have provided interrupted meadow in what was once heavily forested shore-line. Characteristic mammal inhabitants of the meadow-land are the jumping mouse, long-tailed meadow-mouse, and dusky shrew.

Nita and Cheakamus Lakes represent the second, or glacial tarn, type of lake. The steep banks come down to the water's edge; in many places the tumbled slopes of talus plunge directly into the water, eliminating even the usual narrow border of deciduous growth. These lakes in themselves provide very poor habitats and support only small numbers of vertebrates. All the lakes are stocked with rainbow trout (*Salmo gairdneri* ssp.) and Dolly Varden (*Salvelinus malma*); consequently they form suitable feeding-places for scattered pairs of loons, golden-eye ducks, kingfishers, and fish-hawks, as well as roving mink.

Natural Meadow.—Between Alta Lake and Green Lake there are several tracts of wild-hay land a number of acres in extent. The vegetation is mostly sedges and the food potential low. However, the surrounding margin of dense green alder (*Alnus sitchensis*) thickets provides suitable cover for several varieties of birds that use the meadows for feeding-grounds.

Running Water.—In consequence of their abundance, the streams in this, as in other parts of coastal British Columbia, are each of relatively little importance as primary habitats. To a certain degree, however, and this is particularly true in their lower reaches, they are the cause of seasonal concentration of many types of vertebrates that, directly or indirectly, look to the salmon-run for their subsistence. The dipper (*Cinclus mexicanus*) and the water-shrew (*Sorex p. navigator*) are the only vertebrates strictly confined to the stream habitat.

Coniferous Forest.—The greater part of the terrain in the section from the valley-floor to an altitude of 4,000 to 4,500 feet is covered by a dense coniferous forest, of which, at lower elevations, the Douglas fir, giant cedar, and western hemlock comprise the bulk, with mountain-hemlock, balsam-fir, and yellow cedar forming a progressively larger proportion toward the higher levels. Except in infrequent scattered openings, generally on the borders of marshy ponds, there is practically no deciduous growth—or, indeed, underbrush of any sort. Marshy bottoms present tangled jungles of devil's-club (*Fatsia horrida*).

The thick mossy carpet provides adequate cover for large numbers of red-backed mice, white-footed mice, and shrews, which, together with the Cascade squirrel, flying squirrel, weasel, and wildcat, make up the mammalian population of this habitat type. The avian inhabitants of the coniferous forest are largely dependent on the trees for subsistence. One group such as the crossbill, evening grosbeak, and pine siskin are directly dependent upon the seeds. Another well-marked group of birds, less closely dependent on the trees themselves, are those species whose food is the insects of the tree-tops. Of these the kinglets, chickadees, nuthatches, and creepers are resident, while the flycatchers and warblers move out of the district in the winter months.

Hudsonian Zone.—At 4,000 feet the timber begins to thin out in places; at 5,000 feet we enter the true Hudsonian Zone. In this life-zone we find open meadowlets, small heather-patches, blueberry (*Vaccinium macrophyllum*) thickets, tangles of *Rhododendron albiflorum*, streams and ponds interspersed with clumps of dwarfed trees with spreading decumbent bases. These trees are firs (*Abies amabilis* and occasionally *A. lasiocarpa*), mountain-hemlock (*Tsuga mertensiana*), juniper (*Juniper c. montanus*), and yellow cedar (*Chamæcyparis nootkatensis*). From the very diversity of cover type one would expect the zone to support a large vertebrate population. The scattered tree-clumps form ideal nesting-sites for golden-crowned and fox sparrows, varied thrushes, hermit thrushes, mountain bluebirds, and Clarke's nutcrackers, while all summer long the blueberry-patches are the favourite feeding-ground of hundreds of young sooty grouse. The mammalian population is not so confined, there are no species limited to the zone, but mammals of both the Alpine Arctic and Canadian Zones intermingle over almost the entire subalpine forest region.

Alpine Arctic Zone.—From where the last stunted fir is found the broad rolling meadows stretch upward to the jagged rocky outcroppings and tumbled boulder masses that form the peaks of the Cascade; here and there some mountain stream cuts its way through the forests and along these the alpine meadows find access to the lower altitudes. Of the three zones here considered, this is by far the best represented as regards indigenous bird and mammal life. Meadow-pipit, leucosticte, horned lark, and ptarmigan breed here exclusively, while alpine marmot, grizzly bear, synaptomys, phenacomys, and Richardson's vole are almost exclusively confined to the limits of its meadows. Several other types have their metropolis here. Wherever rodents are common, there also will the predator be most abundant; consequently, the golden eagle and sparrow-hawk by day and the horned owl by night, the coyote and the weasel abound.

The Mammals.

The Cascade Mountains in southern British Columbia from a faunistic standpoint provide a barrier of considerable magnitude. As a result of their climatic influence they separate the coastal wet belt from the interior dry belt, each of which has its own peculiar faunas.

In consequence of a geographic position almost on the Cascade Divide, the fauna of Alta Lake region contains several kinds of mammals that reflect in their external and cranial characters a transition from conditions usually associated with coastal races to conditions that characterize the dry-belt races of the same mammals. With the material available for the present study, it was possible to detect this state in six species of mammals; further material will doubtless add to this number.

Besides these, the fauna of the Alta Lake region includes five forms derived from the interior Transition Zone of British Columbia, seven forms ranging apparently unchanged from the coastal wet-belt forests, seven alpine forms peculiar to the Cascade Range to the south, one alpine form from the mountains to the north, and fourteen types of mammals with a much wider range.

Check List of the Mammals.

Sorex cinereus cinereus.
Sorex obscurus setosus.
Sorex palustris navigator.
Myotis lucifugus alascensis.
Lasionycteris noctivagans.
Nycteris cinerea.
Ursus (Euarctos) americanus altifrontalis.
Ursus kwakiutl.
Procyon lotor pacifica.
Martes caurina caurina.
Mustela frenata ssp.
Mustela cicognani richardsoni.
Mustela vison energumenos.
Gulo luscus luscus.
Lutra canadensis pacifica.
Spilogale phenax olympica.
Canis lycaon gigas.
Canis latrans incolatus.
Felis concolor oregonensis.
Lynx canadensis canadensis.
Lynx rufus fasciatus.
Marmota caligata cascadensis.
Eutamias amœnus felix.
Sciurus cascadensis cascadensis.
Glaucomys sabrinus fuliginosus.
Castor canadensis pacificus.
Peromyscus maniculatus oreas.
Neotoma cinerea occidentalis.
Synaptomys borealis wrangeli.
Phenacomys intermedius olympicus.
Clethrionomys gapperi caurinus.
Microtus pennsylvanicus drummondi.
Microtus mordax macrurus.
Microtus richardsoni arvicoloides.
Ondatra zibethica osoyoosensis.
Zapus trinotatus trinotatus.
Erethizon epixanthum nigrescens.
Ochotona princeps brunnescens.
Lepus americanus cascadensis.
Odocoileus columbianus columbianus.
Oreamnos americanus americanus.
Alces americana americana.

Account of the Mammals.

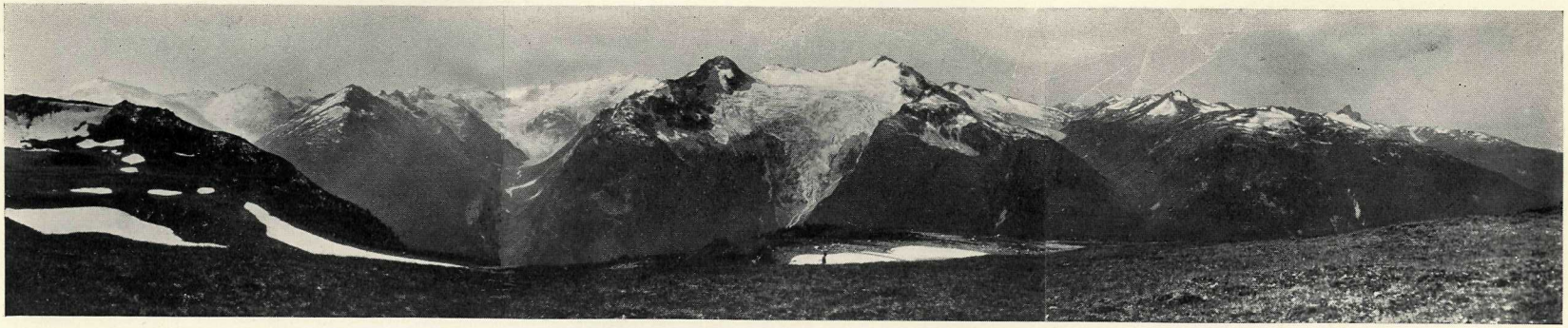
Cinereus Shrew, *Sorex cinereus cinereus* Kerr.

An abundant resident north of the Cheakamus, but not recorded to the south and east of that river. This shrew is most abundant in the marshy spots on lake-shores at valley-floor elevation (2,100 feet), but is fairly common in the heavy timber, where it frequents the rocky outcroppings. Abundant in 1924, scarce at Alta Lake from 1925–1932, since then it has increased in numbers until in 1935–36 it is once again numerous.

Eleven specimens, all from the vicinity of Alta Lake.

Olympic Dusky Shrew, *Sorex obscurus setosus* Elliot.

This typical representative of the south coastal fauna reaches its most easterly point of extension in the Alta Lake District. By far the commonest shrew at all collecting-stations. In the winter of 1935–36 twice as many dusky shrews as cinereus shrews were taken. While occasionally taken in the marshy spots, the species, however, has its metropolis in the dense forests. On June 26th, 1924, a single individual was taken on Mount Overlord at an altitude of 6,200 feet. The specimen of wandering shrew (*Sorex v. vagrans*) recorded by Hardy (Ann. Rept. B.C. Prov. Mus. for 1926, p. 26) from Parnassus Creek, on the Garibaldi meadows, proves on re-examination to be a rather small specimen of dusky shrew. Specimens to the



Looking south from Mount Overlord, Black Tusk at right, Mount Corrie and Cheakamus Glacier in centre.

Looking north from shoulder of Mount Overlord, peak of Overlord and Fitzsimmons Glacier at right, Mount Trorey at left—Hudsonian and Arctic Zones.

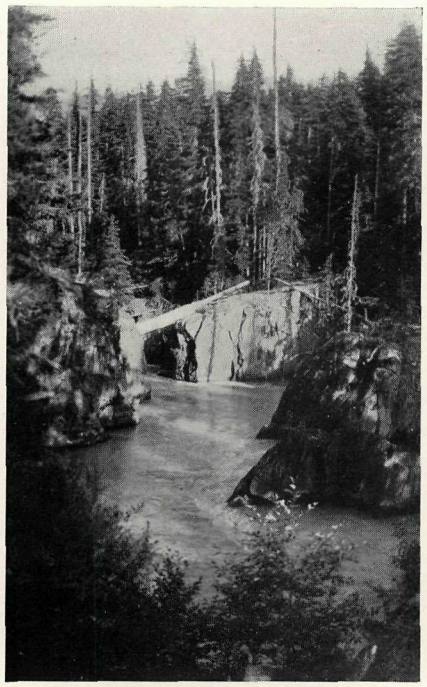
PLATE II.

Nita Lake, altitude 2,100 feet—Canadian Zone coniferous forest.

Timber-line in Avalanche (Singing) Pass, looking north; Blackcomb Peak in background across Fitzsimmons Valley.

Cheakamus Lake and Glacier.

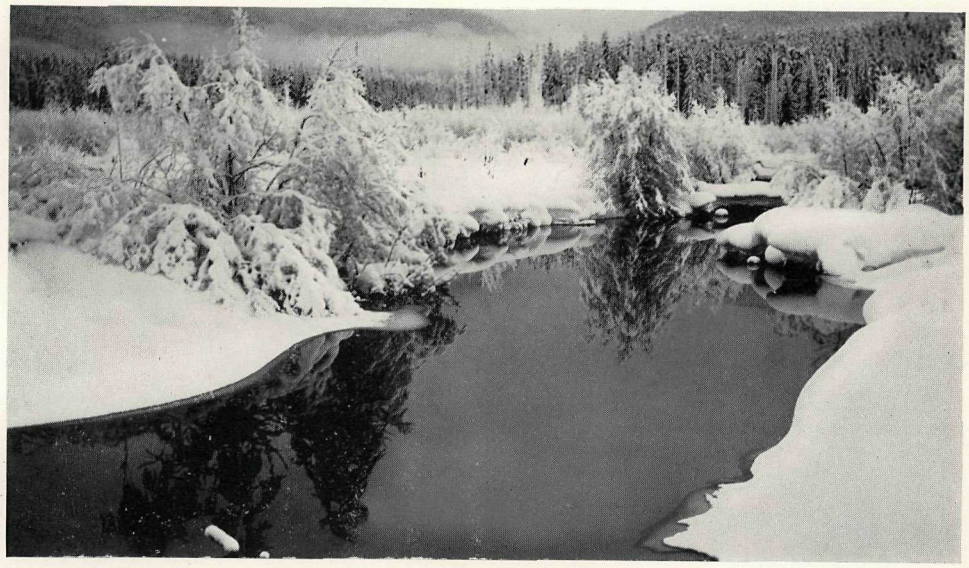
PLATE III.



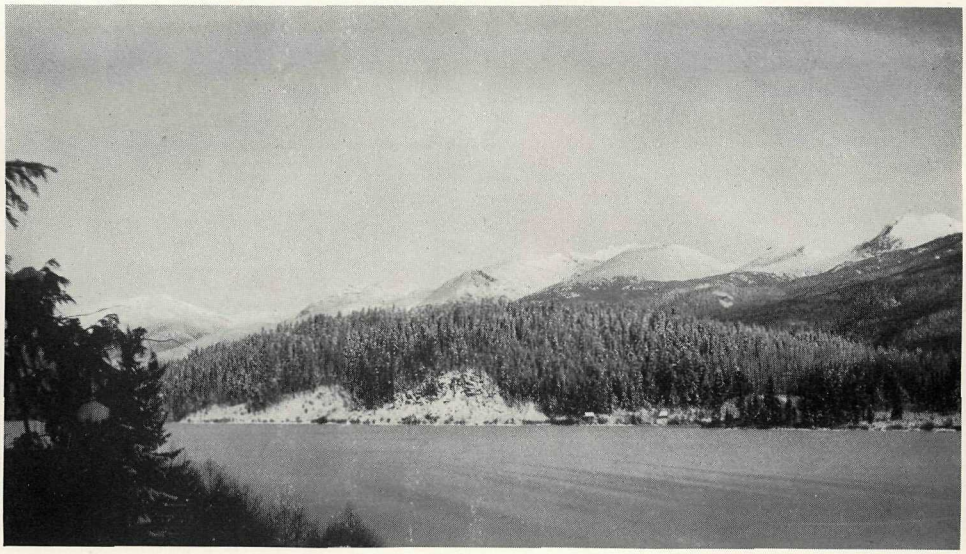
Cheakamus Canyon—Canadian Zone forest, western cedar and western hemlock predominating.

Devil's-club in Sitka spruce bottom-land—Canadian Zone.

PLATE IV.



Alta Creek and brushy meadow-land at north end of Alta Lake—brush is willow and red alder.



Alta Lake from the west, Wedge Mountain at extreme right.

number of forty-five have been examined, of which eighteen males and sixteen females in the K. Racey collection measure as follows:—Males: Total length, 118.9 (108.5–126); tail, 54.9 (49–61); hind foot, 13.4 (12–14.5). Females: Total length, 117.8 (113–126); tail, 54.6 (47–60); hind foot, 13.7 (13–14.5). These measurements are consistently smaller than those topotypical specimens and probably demonstrate a trend toward the neighbouring *S. o. obscurus*.

Specimens: Alta Lake, 42; Tenquille Lake, 1; Mount Overlord, 1; Garibaldi Meadows, 1.

WATER-SHREW, *Sorex palustris navigator* (Baird).

Rare but generally distributed at low altitudes. The only record above the floor of the valley is of a single specimen taken July 21st, 1930, at Tenquille Lake, Pemberton, B.C., at an altitude of 5,400 feet. There are specimens in the K. Racey collection from Mons Creek, Millar Creek, and Twentyone Mile Creek, and in the B.C. Provincial Museum collection from the east side of Alta Lake.

As regards the habitat preference, this shrew is strictly confined to the vicinity of running water, never being found on the parts of lake-shores removed far from stream-mouths. The following notes on this rare animal are taken from Mr. Racey's note-book, dated September 3rd, 1923, at Twentyone Mile Creek:—

". . . We noticed a movement in the water at the base of a tree the roots of which extended into the water. In a moment along came a water-shrew. It ran under a log on which we were seated and swam about a small pond behind us. It made a buzzing sound as it travelled rapidly over the water and then it would seize hold of partly submerged branches and run along these to the bottom of the pond. . . . In the centre of this pond was a tiny mossy island about 8 or 10 inches in diameter; on this sat a frog. With the approach of the shrew it showed every evidence of fright and crouched close to the moss on the opposite side to which the shrew approached. The shrew apparently did not see the frog and after hunting about for some minutes ran under some logs and into another small pond where I watched it catch a beetle, climb out on a log, and proceed to devour the insect. It did not touch the food with its feet but held its head high while eating."

If we may judge from measurements given by Jackson (N. Am. Fauna No. 51, p. 185), *S. p. navigator* averages larger in the Cascade region of British Columbia than in the Rocky Mountain region. A series of ten females and six males from Chezacut Lake, Chilcotin, B.C., in the K. Racey collection are particularly illustrative in this regard and average somewhat larger even than Alta Lake specimens (*see* Table 1).

TABLE 1.—EXTERNAL MEASUREMENTS OF *Sorex p. navigator*.

Locality.	No. and Sex.	Total Length.	Tail.	Hind Foot.
Chezacut, B.C.	6 m.	159.3	77.0	20.1
Alta Lake, B.C.	4 m.	154.0	76.9	19.6
Pahaska, Wyoming	4 m.	149.0	74.0	20.3
Chezacut, B.C.	10 f.	160.5	76.0	20.0
Alta Lake, B.C.	2 f.	157.0	78.5	20.3

ALASKAN LITTLE BROWN BAT, *Myotis lucifugus alascensis* Miller.

This is the only small bat we have taken in the Alta Lake region. Nine specimens have been examined, all from Alta Lake; one of these, a female shot July 18th, 1934, contained a single full-term fœtus. This would seem to be late in the year for the birth of young bats and is perhaps an unusually late record. While feeding, this bat skirts the shore-line of the lakes and does not hunt in the timber to any extent. It is an early flier, appearing soon after sunset.

SILVER-HAIRED BAT, *Lasionycteris noctivagans* (Le Conte).

Known from a single specimen taken August, 1927, near Rainbow Lodge by Morris M. Green.

HOARY BAT, *Nycteris cinerea* (Beauvais).

Only one specimen secured. This was taken in a hollow cedar-tree on the lower slopes of Sproat Mountain between Rainbow and Alta Lake Station by a logger, Jimmy Reil, on August

31st, 1927. No other individuals have been seen in the many years collecting. This bat, however, is a late flier, and tends to hunt high about the tree-tops and therefore might easily escape detection.

BLACK BEAR, *Ursus (Euarctos) americanus altifrontalis* Elliot.

The systematic status of the black bears of western North America is very imperfectly known and reference of the Alta Lake material to the race *altifrontalis* is only provisional.

Black bears and their various brown colour phases are common at low elevations. During the summer months they frequent the berry-patches about the lake-shores and also at timber-line. Here they feed until they hibernate. This usually occurs early in November, but in mild winters occasional individuals remain active until later. On December 16th, 1935, the tracks of a small individual were seen on the hillside east of Alta Lake. There was some snow at the time, but the winter was unusually open.

The situation as regards colour phases of the black bear in British Columbia is an interesting one. On Vancouver Island and in the vicinity of salt water on the adjoining mainland all the bears are black; in well over one hundred bears seen along the coast there has been not one brown specimen. However, at the heads of some of the deep inlets and in the Cascades generally there are occasional very dark brownish-black individuals, as one from Pemberton, in the K. Racey collection. Of even rarer occurrence in the Cascades are somewhat lighter brown bears. One such was seen July 23rd, 1932, near Rainbow Creek.

In the Rocky Mountain region, on the other hand, the dark-brown phase is practically unknown. Of approximately fifty bears encountered in the Jasper region in 1930, there was not a single dark-brown one; all were either black or the very pale brown known as cinnamon, in the proportion of approximately ten black to one cinnamon.

GRIZZLY BEAR, *Ursus kwakiutl* Merriam.

The grizzly occurs regularly in the district in the alpine meadows and adjacent timber.

On June 26th, 1924, signs of grizzlies were seen in Avalanche Pass, between Mount Overlord and London Mountain, altitude 5,500 feet. One of these animals was a female with a cub. In July, 1927, tracks were seen on two occasions in the same region, and in August, 1930, Mrs. Racey and a party of mountain-climbers saw a female with two cubs just above the cabin in Avalanche (Singing) Pass. In the same year John Bailiff shot a female near there that weighed about 400 lb. On December 5th, 1932, Bailiff saw tracks of a large grizzly crossing the hills above Alta Lake. This was the latest he had known grizzly to be out.

No specimens have been examined. The reference to *kwakiutl* is purely on a basis of geographic probability.

PACIFIC RACOON, *Procyon lotor pacifica* Merriam.

Does not occur regularly in the district. On two occasions only, tracks of racoons passing through the valley have been seen.

PACIFIC MARTEN, *Martes caurina caurina* (Merriam).

A typical inhabitant of the heavily timbered mountain-slopes, the marten has its metropolis in the upper Canadian and lower Hudsonian Zone forests. The marten annually furnishes the bulk of the fur-crop from the Alta Lake District. Their numbers vary somewhat from year to year, but do not exhibit the spectacular fluctuations of the more northerly races. This is perhaps explained by the relative stability of the food-supply, as here the number of rabbits only fluctuates to a limited extent, and no outstanding increases or decreases in numbers of squirrels have been observed.

The Pacific marten does not exhibit the very dark-colour phase that occurs in the British Columbia marten (*M. a. abietinoides*). All specimens examined show large patches of yellow on throat and breast and a general orange suffusion in the under-fur.

Specimens: Pemberton, 2; Alta Lake region, 10.

LONG-TAILED WEASEL, *Mustela frenata* ssp.

J. Bailiff and C. Chandler, who have trapped in the district for many years, report that, very occasionally, at high altitudes they take a specimen of " a giant weasel with a longer tail." These specimens may be large *M. cicognani*, but are probably long-tailed weasels. We have been unable to obtain either skins or skulls.

SHORT-TAILED WEASEL, *Mustela cicognani richardsoni* Bonaparte.

Common and widely distributed from valley-floor to alpine meadows. In this general distribution it has two seeming centres of abundance. Fair numbers occur at lake-level about Alta, Nita, Alpha, and Green Lakes. They are rather scarce in the lower timbered areas, but become abundant at and about timber-line, where they frequent the rock-slides and adjacent meadow-patches.

This distribution closely parallels that of the abundance of mice and the relation is doubtless a causative one.

Weasels in the Alta Lake region all assume a white winter pelage, occasionally marred by a few dark hairs on the shoulders, head, back, or tail.

Specimens: Alta Lake, 4; Nita Lake, 2; Sproat Mountain, 3; London Mountain, 1; Pemberton, 1.

PACIFIC MINK, *Mustela vison energumenos* (Bangs).

Fairly abundant at the lower altitudes, but does not range up to the alpine lakes. In the winter months the mink largely desert the lakes for the open water of the larger rivers. In December, 1933, J. Bailiff took one on the North Fork of the Cheakamus and another at Nita Lake. In July, 1934, a female with four young was repeatedly seen on the east side of Alta Lake. The young were about half-grown and swam well, following their mother both above and below the surface. When hunting together on land the female kept a few feet ahead of the young. These maintained a continual chirping noise plainly audible for a distance of 30 or 40 feet. Another female with five young was seen in 1935 by E. Droll in the same place.

The mink of this region are darker in colour and have softer fur than those which frequent the salt water. In 1931, P. Lineham, of Green Lake, liberated a number of Quebec mink from his mink-farm, and though he is of the opinion that none survived, the introduction should be considered in any discussion of the systematics of Alta Lake mink.

Specimens: 3, all from Alta Lake.

WOLVERINE, *Gulo luscus luscus* (Linn).

Three of these animals were taken by J. Bailiff on the North Fork of the Cheakamus River in 1911. There are no other records.

On geographic grounds the wolverine of south coastal British Columbia might be referred to *G. l. niediecki* Matschie, but the available specimens exhibit a range of individual variation more than covering the supposed racial differences. Pending a revision of the genus, then, we are referring the western animals to *G. l. luscus*.

PACIFIC OTTER, *Lutra canadensis pacifica* Rhoads.

The bulk of the otter population in coastal British Columbia breeds in the salt water and only rarely, and generally in the winter, do individuals ascend the rivers. In the winter of 1932–33 one came up the Cheakamus almost as far as the lake and went down-river again about a week later. Other sporadic occurrences have been noted by the trappers.

SPOTTED SKUNK, *Spilogale phenax olympica* Elliot.

One taken at Mile 36, P.G.E. Railway, in 1930, by Jean Jordan and two others in December, 1933, by J. Bailiff. The two latter were both males. One was taken at Mile 32, the other at Mile 34. To our knowledge these animals constitute the northernmost records for the genus in western Canada.

WOLF, *Canis lycaon ? gigas* (Townsend).

Every winter for the last few years the tracks of a lone wolf have been seen repeatedly in the vicinity of Alta Lake. On two or three occasions the animal itself has been seen.

Henry Horstman states that about twelve or fifteen years ago a female wolf raised a family on the lower slopes of London Mountain and was repeatedly seen at his ranch (now Jordan's Ranch) between Alpha and Nita Lakes.

Perhaps a dozen wolves are known to range the mountain-slopes around Pemberton Valley and the Alta Lake individual may be a straggler from there.

COYOTE, *Canis latrans incolatus* Hall.

Abundant throughout the district. On August 2nd, 1928, between Mount London and Mount Overlord at an altitude of 6,200 feet, we found a coyote-den in a rocky coulee. Three

coyotes that were loitering about the entrance ran off as we approached. Their course along the mountain could be followed long after they were out of sight, as marked by the alarm-notes of the whistlers. Remains of a marmot, apparently a coyote victim, were picked up in the same region on August 25th, 1932, and in Avalanche Pass on August 26th, 1932, Mr. Racey found the remains of a half-grown fawn. The place showed the signs of a prolonged struggle, the snow being covered with blood. Coyote-tracks were evidence of the killer's identity.

In the winter the coyotes descend to the lower levels where their tracks can be seen daily. In the winter at least they seem to feed largely on rabbits, though they do run deer. In the winter of 1932 F. Woods reported seeing two close on the trail of a deer in the Cheakamus Canyon.

A specimen from Pemberton, B.C., agrees in every respect with topotypical *incolatus*.

MOUNTAIN-LION, *Felis oregonensis oregonensis* Rafinesque.

Tracks of cougar are seen nearly every winter about Alta Lake. In July, 1932, Bob Williamson saw one cross the railway at Mile 34; on December 28th, 1935, fresh tracks were seen crossing the railway from Sproat Mountain towards Jordan's Ranch at Nita Lake and returning the same way.

CANADA LYNX, *Lynx canadensis canadensis* Kerr.

In the winter of 1916, J. Bailiff trapped eight in the valley of Alta and Green Lakes and on the North Fork of the Cheakamus. Another was taken by C. Chandler in 1917 on his Wedge Creek line. No more were taken until the winter of 1930–31, when Wm. Marsh trapped one on Wedge Creek. The year 1914 was a peak year for rabbits in western North America. During 1915–16 they died off and the following winter saw a remarkable southward movement of lynx (Hewitt, Conservation of Wild Life in Canada, 1921, p. 219). The plague that wiped out the rabbits of the Chilcotin in 1915–16 was probably responsible for the appearance of lynx on the west side of the Cascades.

BARRED BOBCAT, *Lynx rufus fasciatus* Rafinesque.

A characteristic inhabitant of the heavily forested parts of the district. The extensive home range of these cats restricts the numbers that can be supported by a district, so that numerically they are never abundant. If the small number of records we have can be given credence the sex ratio in adult bobcats is approximately four females to one male. In 1933, J. Bailiff took a female at Mile 34 on December 16th and a female on the North Fork on December 10th. In the same year C. Chandler took two at the south-west corner of Green Lake. Other specimens as follows: Two females, No. 978, Kenneth Racey collection, January 9th, 1932, at Mile 32, and No. 1442, K. R., December 31st, 1935, Sproat Mountain, measured: Total length, 738–760; tail, 150–140; hind foot, 164–170. Weight of No. 1442, K. R., 12½ lb. A large male from Alta Lake measured: Total length, 870; tail, 145; hind foot, 190; and weighed 23 lb. Stomach analyses of these three individuals showed exclusively rabbit-fur. One female had a porcupine quill embedded in its nose.

CASCADE HOARY MARMOT, *Marmota caligata cascadensis* Howell.

The hoary marmot, or whistler, is an abundant resident of the higher altitudes and sometimes even descends into the valley, where on July 27th, 1921, three were seen at 2,000 feet elevation along the railroad between Miles 31 and 32. A female was collected. In August, 1920, on a trip up Sproat Mountain, no marmots were seen, although old signs indicated that they had been present. Twelve years later, on July 21st, 1932, the animals were abundant in the same locality. Two taken on that date were still in prime winter pelage. The young were very small, but already were venturing forth short distances from the burrow. On London Mountain and Mount Overlord marmots were fairly abundant in 1927, but had increased markedly in 1928 and remain in numbers despite the increase of coyotes.

In the absence of any specimens that can be taken as typical examples of *cascadensis* it is not possible definitely to determine the status of the Alta Lake marmots. However, in comparing specimens from Avalanche Pass, Garibaldi, and Sproat Mountains with specimens from Cranbrook and Lillooet (*okanagana*), a number of differences are apparent. Our Alta Lake District material is in all pelage stages and presents a wide variety of coloration; however, on the average it differs from Cranbrook material in the more dusky coloration of the underparts, the darker tail, and the preponderantly blacker head. Cranially, specimens from the

two regions are inseparable as regards condylobasal length, palatal length, length of nasals, and length of tooth-row. However, the Alta Lake specimens have the skulls actually and relatively wider, as evinced by the zygomatic width and least postorbital width, ratio of zygomatic width to condylobasal length averaging 65.9 per cent. as against 63.3 per cent., and that of the least postorbital width to the postpalatal length averaging 95.7 per cent. rather than 90.4 per cent., as in the Cranbrook specimens. A further difference, and one in which there is no overlap in the present series, is the length of the postglenoid foramen. In Alta Lake specimens this averages 4.8 mm. (5.5–4.0) as opposed to 2.2 (3.3–1.7) in *okanagana*.

These characters seem to approach those assigned to *cascadensis* (Howell, N. Am. Fauna No. 37, 1915, p. 67, and Anderson, Canad. Nat. Mus. Ann. Rep. for 1931, pp. 112–119) more closely than they do those of *okanagana*, and we are accordingly making provisional reference of our specimens to that race.

Measurements:—Two adult females: Total length, 719–670; tail, 213–172; hind foot, 92–86. Two adult males: Total length, 702–628; tail, 230–207; hind foot, 95–91.

Specimens taken: London Mountain, 3; Mount Overlord, 5; Sproat Mountain, 2; Tenquille Lake, Pemberton, 1; Black Tusk Meadows, Mount Garibaldi, 1; Mile 32, 1.

MOUNT BAKER CHIPMUNK, *Eutamias amœnus felix* (Rhoads).

These attractive little animals are abundant in all suitable localities throughout the district. At Alta Lake they favour the rocky bluffs where wild raspberries, black-caps, brambles, snowberries, and bearberry, augmented by the seeds of many grasses and herbs, provide an abundant summer food-supply. On the mountain-peaks above timber-line they are less numerous, but we have taken them up as high as 6,600 feet on Mount London.

The chipmunks of the Alta Lake and Garibaldi region vary greatly in colour. Some specimens are typical *felix*, displaying the saturate pigmentation of that race; others seem at first glance to be identical with *ludibundus;* indeed, Howell (N. Am. Fauna, No. 52, 1929, p. 75) lists under that name specimens from Mons (now Alta Lake) and Nita Lake, and subsequently identified Garibaldi specimens as the same race.

However, in comparing series from Moose Lake, B.C., near the type locality of *ludibundus*, Indianpoint Lake, B.C., Lillooet, B.C., Okanagan and Lytton, B.C. (typical *affinis*), Alta Lake region, North Vancouver, and some other points on Burrard Inlet, it is immediately apparent that the series from Moose Lake and Indianpoint Lake differ from all others in the extreme greyness of the rump and lower back (a greyness approached only by certain specimens of *affinis*). August-taken specimens from Moose and Indianpoint Lakes have the rumps from neutral grey to light neutral grey (Ridgway, 1912, Color Standards and Color Nomenclature), while the series from the Cascades and Coast Ranges have the rumps nearer drab, approaching light drab in some instances. Though paler in *affinis* and darkest in coastal specimens typical of *felix*, in all cases the coloration is drab rather than grey. Other colour differences are apparent in the examination of series. The Alta Lake specimens as compared with topotypical *ludibundus* have the heads darker, face-markings more obscure through the darkening of the light stripes, the dark stripes of the back broader and darker, and the light stripes more brownish. As regards colour characters then, the populations at Lillooet and in the Alta Lake region are intergrading populations between *affinis* and *felix;* two specimens from Lillooet seem best referred to *affinis*, though not typical of that race; others are almost exactly intermediate between *affinis* and *felix*. Alta Lake and Garibaldi series are on the average closer to *felix*.

The cranial characters differentiating *felix*, *affinis*, and *ludibundus* are so slight as to be of little significance. However, the skulls of *felix*, *affinis*, and the intergrades between the two, differ from those of *ludibundus* in that when resting on the dorsal surface *ludibundus* has the occipital region noticeably more elevated.

Specimens: Alta Lake, 17; Alpha Lake, 1; Lost Lake, 1; London Mountain, 3; Black Tusk Meadows, Garibaldi Plateau, 4.

CASCADE SQUIRREL, *Sciurus douglasi cascadensis* Allen.

Always common, periodically extremely abundant. Found from timber-line to valley-floor almost indiscriminately. Food consists largely of cones of hemlock, spruce, Douglas fir, and balsam-fir.

Alta Lake specimens agree with North Vancouver specimens and differ from animals from south of the Fraser River and on certain of the coastal islands in several respects. Though there is considerable colour variation, they are paler dorsally and ventrally in both summer and winter pelages. In summer the yellow of the under-parts has a suggestion of white powdering to it when compared with the pinkish-orange of specimens from south of the Fraser. In winter the difference is not quite so striking, but the under-parts of Alta Lake specimens have no trace of the orange wash characteristic of the other specimens referred to. No cranial differences can be detected.

Specimens: Mons, 3; Alta Lake, 5; Alpha Lake, 1.

CASCADE FLYING SQUIRREL, *Glaucomys sabrinus fuliginosus* (Rhoads).

The nocturnal habits of this interesting squirrel enable it to escape detection. Although tolerably common, it is seldom seen except by the trappers. To them the flying squirrel is a nuisance as it continually gets into marten and weasel traps. During the early part of the winter of 1927–28, J. Bailiff caught twenty-eight flying squirrels in his trap-line on the North Fork and on the Cheakamus River toward the lake. These he froze and stored in his woodshed. Subsequently all were taken by a marten and hidden in a near-by rock-slide. In July, 1928, Mr. Racey found a female dead on the barbed-wire fence near Mile 39. They are seen every year around the cabin at Alta Lake. On July 27th, 1933, a nesting-site was investigated at lake-level. A hollow hemlock-tree had been filled with shredded cedar bark, each succeeding nest being built on the previous one. No less than fourteen nests could be discerned, of which only the top one was occupied. Another winter nest was found in a hollow cedar, December 22nd, 1935. This, too, was of shredded cedar bark. It was occupied by a single male.

The flying squirrel of the Alta Lake region is readily differentiated from the much smaller redder *orgonensis* that inhabits the coastal forests of the Lower Fraser Valley. Specimens from North Vancouver, while closer to the Fraser Valley specimens, nevertheless approach the Alta Lake specimens in slightly larger size, paler dorsal, and more dusky ventral surface.

Specimens: Sproat Mountain, 3; Alta Lake, 15; Cheakamus Lake, 2.

PACIFIC BEAVER, *Castor canadensis pacificus* Rhoads.

The beaver has been completely trapped out in the district for over twenty years. Signs of their former presence are, however, still in evidence. A small creek flowing into Twentyone Mile Creek at Mile 39 has two fine old dams across it, and considerable old beaver meadow above these. Several other beaver meadows lie between Alta Lake and Green Lake.

WASHINGTON WHITE-FOOTED MOUSE, *Peromyscus maniculatus oreas* Bangs.

Fluctuates markedly in numbers. Some years, as in 1924, the species was very abundant in common with all the other kinds of mice about Alta Lake. In 1925 they were virtually absent; in 1927 and 1928 still scarce. By 1932 they had become fairly numerous again; since that time they have declined in numbers, but not to the low ebb of 1925–26. These mice are found everywhere from the lake up to timber-line.

Specimens: Alta Lake, 10; Mount Overlord, 6; Black Tusk Meadows, 2; Alpha Lake, 1; Tenquille Lake, 1.

WESTERN BUSHY-TAILED WOOD-RAT, *Neotoma cinerea occidentalis* Baird.

Almost every rock-slide from lake-level to above timber-line has its population of wood-rats or, as they are popularly referred to, pack-rats. Here under some large rock a heap of sticks, branches, roots, leaves, moss, and miscellaneous objects, around which hangs a musky odour, is the pack-rat's nest. Often only one family to a nest, but sometimes several as evinced by five adult males trapped in the same nest on August 11th and 12th, 1928. Only one female was taken with the males, but there were other rats present that did not enter the traps. Most of the abandoned buildings in the region at one time or another are occupied, but seldom do they become permanent homes—more often just winter shelters. One large nest in a rock-slide east of Alta Lake has to our knowledge been occupied for the past eight years, and eight years ago it was large and gave evidence of antiquity. We have never here encountered nests of the beaver-lodge variety, built around the bases of trees, such as these rats build in the Chilcotin.

Specimens: Alta Lake, 6; Nita Lake, 1.

WRANGELL LEMMING MOUSE, *Synaptomys borealis wrangeli* Merriam.

In 1924 Mr. Racey found this scarce and elusive mouse abundant in Avalanche Pass at altitudes of 5,500 to 6,500 feet, and a number of specimens were taken. By 1927 lemming mice were extremely scarce and since that time they have not materially increased. In 1924, 1927, 1928, and 1932 these animals were encountered and studied by us. (Racey, Murrelet, 9, No. 3, p. 54.) The animals live in small colonies in patches of sedge bordering on small mountain streams. In these places the surface of the ground is netted with their tiny runways, and below the surface a maze of tunnels provide nesting-sites and shelter. Frequently the burrows traverse small streams.

Nests of two types were found—surface nests of fine grasses, built and used under the snow, and summer nests in underground chambers. Food consisted mainly of sedge, but small quantities of *Hieracium alpinum* (hawkweed), *Kalmia polifolia* (swamp-laurel), and *Potentilla flabellifolia* (cinquefoil) were found among the cuttings.

From July 31st to August 3rd, 1928, sixteen lemming mice were taken. Of these, five were adult males, five adult females, three half-grown females, and three half-grown males. From these figures it would seem that the sexes were evenly balanced in numbers. All the adult females taken were pregnant. Two had eight fœtuses, one had seven, and two had six. The young were all of approximately the same age and the fœtuses all at about the same stage of development. It would seem, then, that the lemming mice have rather more pronounced breeding seasons than is usual in the Microtinæ.

Specimens: 18, all from Avalanche Pass.

OLYMPIC PHENACOMYS, *Phenacomys intermedius olympicus* Elliot.

The phenacomys is the rarest mouse found in the Alta Lake region. It is known to us from two specimens—a sub-adult male, No. 678, I. McT. C., taken August 3rd, 1928, in Avalanche Pass, altitude 5,500 feet, and an adult male, No. 1064, K. R., taken at the same locality, July 21st, 1932. Both were taken in *Synaptomys* runways. We have found little as to the life-habits of this mouse. Here and there over the alpine meadows we have found among the heather indistinct runways and large middens. These differ somewhat from those of *Synaptomys* and it is our opinion they are the work of *Phenacomys*. If such is the case the preference is for white heather and sedge. We have not encountered any such workings in the red heather. A nest and midden on Sproat Mountain thought to belong to this mouse are illustrated here. (*See* Plate V.)

In comparison with series from Chezacut and Okanagan (typical *intermedius*), our specimens are found to differ in darker colour and larger heavier skull. In these characters they approach *olympicus* and we are accordingly referring the Alta Lake specimens to the latter race.

RED-BACKED MOUSE, *Clethrionomys gapperi caurinus* (Bailey).

A characteristic inhabitant of the forests, this species is found from timber-line to lake-level under fallen logs, moss-grown rocks, and in the timber-encircled rock-slides of the lower mountain-slopes. In common with the other mice, the red-backed mice were extremely abundant in 1923 and 1924; then suffered a cataclysmic decrease, since which they have been slowly increasing. In the winter of 1935–36 they were fairly common, but in nowhere near 1923 numbers. In a single night's trapping with sixteen traps, Mr. Racey on July 29th, 1923, caught thirty-nine mice, eighteen of which were *Clethrionomys*, the rest *Peromyscus*.

Three forms of red-backed mice have been described from southern British Columbia, none of them adequately characterized. Of these, *C. gapperi saturatus*, with Nelson, B.C., as type locality, appears to inhabit the dry interior of southern British Columbia as far west as the Chilcotin, north at least to Barkerville and Moose Lake, and east to the Rocky Mountains. Adequate material representing *C. g. occidentalis* (Merriam) and *C. g. caurinus* (Bailey) is not available. However, in comparing Alta Lake specimens with a small series from Bella Coola and Kutze Inlet and with a series of some thirty specimens from the Okanagan, it is immediately apparent that in the duller, less chestnut and more pinkish cast of the back, the restriction of the dorsal red band, slightly greyer face and head, and in smaller size, the Alta Lake specimens resemble the Bella Coola specimens and differ from those from the Okanagan.

Cranially, Alta Lake material differs from specimens from east of the Cascades in smaller skull, with flatter brain-case, shorter nasals, and less inflated auditory bullæ. Unfortunately the skulls of Bella Coola specimens are too badly damaged to be used comparatively. With these comparisons in mind we are provisionally referring Alta Lake specimens to *caurinus*. We are not convinced that *occidentalis* and *caurinus* both merit systematic recognition; should they prove to be indistinguishable, as the little available material indicates, *occidentalis* will take precedence on grounds of priority. It is our opinion that further study of the distribution of the genus in British Columbia will lead to the recognition of *occidentalis* as the form inhabiting coast-line and *saturatus* the interior of British Columbia.

Measurements:—Average, maximum and minimum of twenty-four adults from Alta Lake and vicinity: Total length, 134 mm. (160–115); tail, 35 (42–30); hind foot, 18.2 (20–17). The same for a series of nine adults from Chezacut in the Chilcotin District: Total length, 138 (152–121); tail, 39.2 (47–34); hind foot, 19.1 (20–18).

Specimens: Sproat Mountain, 10; Black Tusk Meadows, 3; Tenquille Lake 1; Alta Lake, 24.

OLYMPIC MEADOW-MOUSE, *Microtus mordax macrurus* Merriam.

This species penetrates the mountains along the watercourses at low elevations. In the Alta Lake region we have taken it for the most part in the Canadian Zone meadow areas between Alpha and Nita Lakes and at the north end of Alta Lake. It does not occur in the forests. In 1922 it was taken in small numbers; in 1924 it had reached abundance; since then there has been a return to approximately the former status.

The recognition by Swarth (Proc. Biol. Soc. Wash., 1933, p. 207) of *Microtus mordax littoralis* from south-eastern Alaska removed the grounds upon which *macrurus* had come to be recognized as a race of *M. mordax*. Since then, in view of the uncertain systematic position of this mouse and the absence of evidence of intergradation between *macrurus* of the coastal regions and *mordax* of the country east of the Cascades, *macrurus* has been regarded as an independent species.

Now, however, comparison of ten specimens from Okanagan, B.C., three from Lillooet, B.C., twelve from Alta Lake, B.C., and three from North Vancouver and the Fraser Valley with the description and measurements given by Merriam (Proc. Acad. Nat. Sci. Phila., 1898, p. 353) for topotypical *macrurus* demonstrates beyond possibility of doubt a grading series from east to west (Table 2). Not only is the gradation evident in comparison of external dimensions, but colour and cranial characters also show gradual change along the route through the Cascades.

TABLE 2.—EXTERNAL MEASUREMENTS OF *Microtus mordax*.

Locality.	No.	Total Length.	Tail.	Hind Foot.
Okanagan	10	(172–153) 161.4 mm.	(66–51) 60.4	(20–16) 19.3
Lillooet	3	(163–153) 159.0 mm.	(60–53) 56.0	(21–20) 20.0
Alta Lake	12	(203–173) 180.0 mm.	(81–62) 73.0	(23.5–20) 22.0
North Vancouver	3	(189–180) 185.0 mm.	(80–75) 76.7	(24–23) 23.3
Olympic Mountains	5	204.0 mm.	80.0	24.3

Inhabiting the Transition Zone at Okanagan we find a population of long-tailed voles known systematically as *Microtus mordax*. The individuals of this population are characterized by their size (*see* Table 2), their generally pale and brownish coloration, well-haired tail, and short hind feet. The Lillooet specimens are indistinguishable from these except in

PLATE V.

Winter nest of *Phenacomys olympicus.*

Alpine meadow habitat of *Phenacomys, Synaptomys,* and *Microtus richardsoni.*

the very slightly longer foot. The other extreme, known as *Microtus macrurus*, inhabits the low-lying coastal country in the Canadian Zone. It is characterized by its much larger size, with larger hind foot, sparsely furred tail, heavier skull with relatively broader rostrum, and the much greyer dorsal surface with pronounced black peppering. The population at Alta Lake, while more closely resembling the coastal form in colour, are in size and proportions strictly intermediate between the two and we think readily justify the conclusion that *M. mordax mordax* and *M. macrurus* are geographic races of the same species. The Alta Lake material, though intermediate, we are for convenience referring to *Microtus mordax macrurus* which it more closely approaches.

DRUMMOND VOLE, *Microtus pennsylvanicus drummondi* (Aud. & Bach.).

This vole is, in British Columbia, a typical member of the northern and eastern faunas and barely enters the district here dealt with. Two specimens taken by Mr. Racey, July 20th, 1930, at Pemberton Meadows, B.C., constitute the only records.

CASCADE MEADOW-MOUSE, *Microtus richardsoni arvicoloides* (Rhoads).

One of the most astonishing features of that banner mouse year 1924 was the discovery by Mr. Racey of a vast colony of these giant meadow-mice in Avalanche Pass at 5,200 to 6,000 feet altitude. To quote from Mr. Racey's diary: "June 24, 1924, snow beginning to disappear rapidly. . . . Thousands of burrows of these rodents can be seen. Runways and burrows everywhere. Animals could be seen running about in broad daylight. No suitable traps. Killed one with my hands, shot another, and a third was stunned by a mouse-trap." Wm. MacDermot visited the region in 1925 and reported an entire absence of these voles. In 1927, 1928, and 1932 they were present only in small numbers and in isolated colonies. In 1928 the broad (6 to 8 inches wide) beaten paths, relics of the departed hordes, could often be traced for several hundred yards, and for 500 feet above the valley-floor the partially filled burrows could be used as steps up the side-hill.

Favoured food-plants were purple lupine (*Lupinus ? polyphyllus*), golden ragwort (*Senecio Balsamitæ*), wood betony (*Pedicularis bractiosa*), and alpine arnica (*Arnica alpinus*).

A female taken August 18th, 1927, contained eight fœtuses; another taken August 25th, 1932, contained seven fœtuses about half-term; a third, taken August 1st, 1928, contained six fœtuses.

Specimens: Avalanche Pass, 7.

ROCKY MOUNTAIN MUSKRAT, *Ondatra zibethica osoyoosensis* (Lord).

As lately as 1932 small numbers of muskrats inhabited Alta, Alpha, and Green Lakes. Since that time we have not seen any sign of them in Alta and Alpha Lakes and only a few are still to be found in Green Lake. These lakes do not provide suitable habitat for muskrats. Those parts of the lakes that support stands of sedges and other aquatic plants are usually so shallow that they freeze solid in hard winters. Consequently the rats are in the winter confined to Twentyone Mile Creek and such parts of Green Lake as are kept open by the current of that stream.

Specimens: Twentyone Mile Creek, 1; Pemberton, 1.

NORTHWEST JUMPING MOUSE, *Zapus trinotatus trinotatus* Rhoads.

Jumping mice have been found to frequent the meadows between Alpha and Nita Lakes, at the north end of Alta Lake, and at Green Lake, often in considerable numbers. However, that they are not restricted to the valley-floor is evidenced by a specimen from Black Tusk Meadows (altitude approximately 5,000 feet) taken August 4th, 1926, and a sight record by Mr. Racey on July 29th, 1923, at 5,200 feet altitude on Sproat Mountain. It is strange that the many trap nights on Mount London and in Avalanche Pass failed to produce any specimens.

The jumping mice of Alta Lake region do not differ in a single salient feature from virtual topotypes of *trinotatus*. They in common with these latter specimens are readily distinguished from Lillooet and Barkerville specimens, by their more brilliantly coloured sides and sharper contrast with the dark dorsal area, the presence usually of a buff patch on the chest between the bases of the forelegs, and the absence of white ear margins. Cranially, *trinotatus* differs from the *Z. p. princeps* and *Z. p. kootenayensis* in the extremely small size of the posterior palatine foramina, the shorter incisive foramina, much broader interparietal, and in the

presence on the antero-medial margin of the zygomatic arch (when viewed from below) of a pronounced shelf-like extension into the orbital vacuity. It should be noticed that these differences are such as usually distinguish races rather than species in the genus *Zapus*. In coloration, in external dimensions, and in cranial characters *Zapus trinotatus* is patently a member of the *Zapus princeps* group. Furthermore, *trinotatus* appears to be the geographic complement of *princeps* on the Pacific Coast.

Additional collecting between Alta Lake and Lillooet and perhaps also up the main valley of the Fraser River will in all probability demonstrate gradual integradation between *Zapus princeps kootenayensis* and *Zapus trinotatus*. The condition as regards *Zapus hudsonius tenellus* of the north-western Transition Zone in British Columbia is entirely different; it has the pronounced specific characters of the species *Z. hudsonius*, and, furthermore, throughout its range it exists coextensively with *Z. princeps*.

Specimens: Alta Lake, 7; Nita Lake, 5; Black Tusk Meadows, 1.

DUSKY PORCUPINE, *Erethizon epizanthum nigrescens* Allen.

The porcupine is a scarce resident in the district. An adult female, No. 175A, K. R. collection, taken August 20th, 1927, just below timber-line on the trail to Avalanche Pass, is our only specimen record. In August, 1935, Stewart Racey saw another full-grown specimen on the shore of Alta Lake.

ROCK RABBIT, *Ochotona princeps brunnescens* Howell.

Rock rabbits, or pikas as they are often called, are among the common small mammals of the Alta Lake region. They are found in nearly all suitable rock-slides from 2,000 up to 6,000 feet. In the past sixteen years they have fluctuated somewhat in numbers, but our data are not sufficiently complete to reveal the presence or absence of any cyclic rhythm to these fluctuations. In 1920 they were abundant, as they were also in 1927–28 and again in 1932; in the intervening years they were somewhat scarcer.

Their hay-piles include a wide variety of local plants. At an altitude of 5,200 feet on Sproat Mountain, August 19th, 1920, they were cutting false hellebore (*Veratrum viride*). At 2,100 feet on August 25th, 1920, a fresh hay-pile consisted largely of raspberry-shoots, another of bracken and fireweed. A hay-pile examined in Avalanche Pass, August 1st, 1928, contained largely red heather. On January 2nd and 3rd, 1936, at Alta Lake we found that rock rabbits were tunnelling through the snow and cutting false box (*Pachystima myrsinites*) and bearberry (*Arctostaphylos uva-ursi*).

Our specimens from the Alta Lake region are in no way distinguishable from a small series from Mount Rainier and Scenic, Washington, kindly loaned us by Dr. Arthur Svihla, Chas. R. Connor Museum, State College of Washington, Pullman, Washington.

From Lillooet specimens they differ markedly. The most obvious difference is in colour of upper-parts, which in Alta Lake specimens are brown heavily sprinkled with black, rather than light greyish-brown as in the Lillooet specimens. Alta Lake specimens differ further in larger size, skull averaging larger, with narrower interorbital constriction.

Specimens: Alta Lake, 14; Sproat Mountain, 1; London Mountain, 2; Alpha Lake, 1.

CASCADE VARYING HARE, *Lepus americanus cascadensis* Nelson.

Numerous everywhere prior to 1933; since then the increasing numbers of coyotes and bobcats have thinned out the rabbits to such an extent that they are now barely holding their own. In 1922 they were abundant in the swamp between Alta and Green Lakes, where on September 2nd we found large areas of ground tramped down and covered with rabbit droppings. In the winter months they are most abundant in the second-growth hemlock thickets.

We have not noticed any such spectacular fluctuations in the rabbit population on the west slope of the Cascades as are characteristic in the dry belt of the interior of British Columbia.

The systematic status of the varying hares of southern British Columbia is imperfectly understood. *L. washingtoni*, *L. bairdi cascadensis*, *L. americanus columbiensis*, and *L. b. bairdi* have all been assigned places in the fauna without much attempt at definition of ranges or convincing differentiation of the races concerned.

In comparing series of specimens from points east of the Cascades in the Chilcotin and Barkerville Districts with specimens from Alta Lake, Green Lake, and Black Mountain, North Vancouver, the following differences are noted: The specimens from west of the Cascade summit are more brownish than those to the east and have the head rich reddish-brown, more sharply set off from the body colour than is the case in the Chilcotin specimens. In both areas some specimens have the feet brown, others white. Cranially, Alta Lake and North Vancouver specimens differ from Chilcotin specimens in that the former have the incisive foramina long and narrow, not constricted 4 to 5 mm. from the posterior end, as against relatively broad and constricted 4 to 5 mm. from the posterior end; the anterior supraorbital bar is absent in all but one specimen from west of the Cascade summit, and present without exception in Chilcotin and Barkerville specimens. No significant differences in external form or proportions can be discovered.

It would seem, then, that the specimens from the coastal slope are clearly referable to *cascadensis;* while the Chilcotin material is indistinguishable from Barkerville and Rocky Mountain material, and referable to *columbiensis*. However, with the assignment of *cascadensis* to the species *bairdi* we cannot agree. The nature of the differences existing between *cascadensis* and *columbiensis*, their apparent geographic complementarity, and, lastly, a series of twenty-one specimens from Okanagan Landing and Okanagan, B.C., that are plainly intergrades between the two, all point to the status of *cascadensis* and *columbiensis* as races of the same species. Accordingly we have here referred *cascadensis* to the species *Lepus americanus*. Further material is needed from Pemberton, Lillooet, and Merritt regions to complete our picture of the ranges and intergradation of *cascadensis* and *columbiensis* in south-western British Columbia and from the Lower Fraser Valley to determine the systematic relationship between *L. a. cascadensis* and *L. washingtoni*.

Measurements, average and extreme, of ten adults from Alta Lake region: Total length, 437.3 mm. (468–418); tail, 41.3 (44–35); hind foot, 133.6 (142–128); ear from crown, 89 (92–82.5).

Specimens: Between Alta and Green Lakes, 4; Alta Lake, 9; Sproat Mountain, 1.

COAST DEER, *Odocoileus columbianus columbianus* (Richardson).

A few deer remain about Alta Lake all winter, but the bulk of the population moves either north to the Green River or south to the Cheakamus River, the greater proportion wintering in the latter region. In the summer the centre of abundance is about timber-line where food is abundant and the cool breezes keep the flies off.

On August 25th, 1932, at 6,500 feet on Mount London, a large four-point buck was seen sunning himself on a sheltered ledge about 100 feet below where we were standing. After watching us for about ten minutes it rose and trotted out of sight over the mountain-side. In late July of 1928 we frequently noticed deer-tracks around the barren peaks 2,000 feet above timber-line. On August 25th, 1932, in Avalanche Pass we found the remains of a fawn that had been killed and eaten by coyotes.

In the southern part of the district the deer are typical *columbianus*. However, towards Pemberton and particularly on the east side of the Pemberton Valley occasional mule-deer (*O. hemionus hemionus*) occur and interbreed with the coast deer. Two specimens from Pemberton both show evidences of such intergradation; one specimen superficially resembles *hemionus*, the other *columbianus*.

MOOSE, *Alces americana americana* (Clinton).

The moose is a new arrival in the district and is not as yet firmly established. It first appeared in Pemberton in the winter of 1931–32, when three individuals were seen. Late the following year a moose was reported near Squamish, within a few miles of salt water. The appearance of moose in this region is further evidence of the phenomenal increase and spread of this huge game mammal in British Columbia during the past twenty years.

MOUNTAIN-GOAT, *Oreamnos americanus americanus* (Blainville).

A few goats remain on most of the less frequented peaks of the region. They are reported from Mount Garibaldi; a band variously estimated at from fifteen to thirty individuals ranges about Cheakamus Lake and the adjoining peaks, including Mount London and Mount Overlord. On the more remote ranges between Lillooet Lake, Pitt Lake, and the P.G.E. Railway they are reported to be numerous.

INSECT AND PLANT ASSOCIATIONS IN THE CHILCOTIN.

By R. S. Sherman and Fred Perry.

We left Vancouver for Williams Lake and points farther west, Monday, July 8th, 1935, taking the U.S.S. "Capilano" as far as Squamish, and the P.G.E. to the intersection of the Chilcotin Road with the historic Cariboo Trail. We spent the first night in refreshing sleep, lulled by the roar of rushing streams, and came to life just beyond Marne at the edge of the Dry Belt. Here the Yellow Pine, the Mountain Maple, and the Sumach have already come into the picture, along with the Sage-brush and the Cactus. A delay caused by a rock-slide gave us an opportunity to walk along the shore of Seton Lake, while we browsed and botanized. We noticed a Phacelia, a Pentstemon, a Gilia, the Prickly Lettuce, and the Edible Thistle.

By 9.15 we were at Lillooet, where bright sunlight prevailed and the vegetation was quite green and free from dust. From this point to Kelly Lake the scenery was equal to that of the Grand Canyon of Colorado, though the colouring was not quite so vivid. The depth and width of the Fraser Trench from the P.G.E. track speak of the enormous amount of material that has been eroded from the Interior Plateau and easily explains the formation of the flood-plains of the Lower Fraser Valley and the presence of the delta from New Westminster to the Gulf of Georgia.

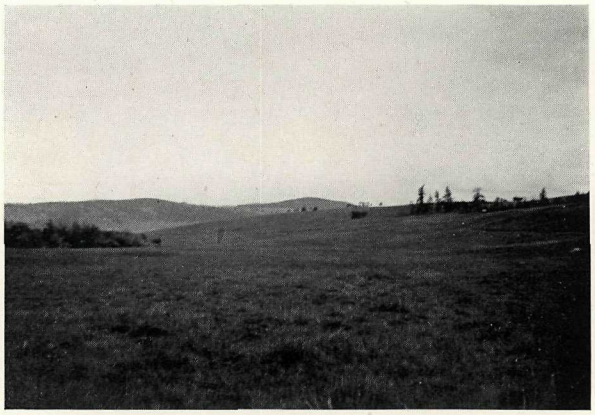
The flora from Shalalth to Kelly Lake was that of the dry interior, characterized by the presence of Yellow Pine, Sage, and Cactus. Near Pavilion and Kelly Lake fine clumps of the Golden Corydalis (*Corydalis aurea* Willd.) grew on the railway cutting. From Kelly Lake on through the great Interior Plateau to Williams Lake, *Pinus contorta* var. *Murryana* was the dominant tree, while the prevailing flowers seem to be Yarrow, the Northern Bedstraw, and the Paint-brush. Cottonwood (*Populus tremuloides* Mich.) or the Aspen, as it is more properly called, appeared either in regular stands or as a secondary tree among the evergreens. The Douglas Fir holds its own intermittently throughout the whole of our route. Engelmann Spruce lines the lake-shores. Where fires have occurred within recent times, the Lodgepole Pine seems to have replaced the Douglas Fir. Soopolallie, the Rose, and the Red-osier Dogwood are common shrubs, and *Spiræa lucida* raises its flat creamy corymbs beside the Yarrow. There is a decided dearth of the Ericaceæ, and the lack of Salal as an under-shrub is noticeable to one accustomed to the Coast woods. Alkali lakes appear at intervals along the railway-line to Williams Lake.

At this busy town we spent the night, and next day left on the mail stage for Tatla Lake, 154 miles westward, practically along the 52nd parallel of latitude. This is said to be the longest motor mail route in Canada. Crossing the creek that drains Williams Lake, we ascended a low ridge, heavily timbered with Douglas Fir, and descended to the Fraser River by many a twist and turn, passing on our way bright patches of the Bergamot Mint (*Monarda mollis*) and the Mariposa Lily (*Calochortus macrocarpus*).

After crossing the river on a suspension bridge we began the long tortuous climb to the Chilcotin Plateau. Along the roadside we noticed the common Flax (*Linum usitatissimum*) with its pale-blue flowers, no doubt introduced by the early settlers. The road that winds up to the rim of the plateau is very picturesque, with dense vegetation in the various depressions. Douglas Fir is the prevailing tree; the Yellow Pine from this point on yields her throne to the Lodgepole. Practically all of the Chilcotin country is in the arid Transition Zone, with a few intrusions from the Sonoran flora, such as *Opuntia polyacantha* and *Ceanothus velutinus*. The former occurred on the very driest slopes, while the latter could be found on the banks of creeks.

On reaching the rim of the plateau we were confronted with a landscape that seemed dropped from another world. A vast plain spread westward as far as the eye could see, swept by a cold wind from the south-west. Gone was the luxuriant vegetation, and every blade of grass seemed to cower to the earth in search of protection from invisible foes. Gaunt rocks, from giants weighing several tons to pigmies the size of pebbles, squatted on the plain, telling a tale of dead geologic forces. To relieve the monotony of empty plain there were groves of Aspen and Lodgepole Pine sheltered in the depressions. Alkali marshes and lakes dotted the landscape all the way to Riske Creek, a distance of 30 miles, and all the pasture-land within this range bore evidence of being badly overgrazed.

PLATE VI.



Chilcotin Plateau—range-land near Riske Creek.

Cactus—*Opuntia polyacantha.*

The flora of a salt marsh at Riske Creek was very characteristic of salt marshes all over the world, whether they exist in Siberia, the Chilcotin, or on Burrard Inlet. *Potentilla anserina*, the Silver-weed; *Ranunculus cymbalaria*, the Sea-side Crowfoot; and *Grindelia macrophylla*, one of the gumweeds, were dominant forms. Here, too, in the shelter of the shallow valley the first insects appeared. Two butterflies were fairly common—the Great Parnassian, a form of *Parnassius smintheus*, and one of the various forms of *Ascia napi*. Ten days later, when we returned this way, the air was filled with grasshoppers.

We stopped at Hanceville for over an hour while the stage made a side-trip to the Chilco Ranch. This gave us a chance to botanize a section of woodland watered by a fair-sized stream. In the dense shade afforded by some willows, Red-osier Dogwood (*Cornus stolonifera*), Choke-cherry (*Prunus demissa*), Black Twinberry (*Lonicera involucrata*), and the Douglas Thorn (*Cratægus brevispina*), we collected or observed the Lady's Slipper (*Cypripedium parviflorum*), the Sarsaparilla (*Aralia nudicaulis*), the Wintergreen (*Pyrola asarifolia*), and the Baneberry (*Actæa arguta*). On dry banks along the roadside grew the Cactus (*Opuntia polyacantha*), the Woolly Knees (*Eriogonum heracleoides*), the Northern Yarrow (*Achillea borealis*)—one of the commonest forms throughout the Cariboo and the Chilcotin—and the Russian Thistle (*Salsola kali* var. *tenuifolia*), which is eaten by the cattle when it is young, but is spurned even by the goats when it is mature.

We arrived at Alexis Creek at 7 p.m., a time that permitted us daylight to explore the near-by fields and copses. The most interesting plant recorded was the Strawberry-blite (*Chenopodium capitatum*), which graced with its presence the edges of the irrigation-ditches. It seems to hate close association with other plants, and its strawberry-coloured fruiting-clusters stood out in welcome contrast to the clay-coloured soil.

The following morning at 9 a.m. we arrived at Redstone, so named after a prominent outcropping of red rock in the vicinity. This is claimed to be the coldest place in Canada, 72 degrees below zero being recorded at the store last winter. From this point on to Tatla Lake is a rolling country, with scrubby Lodgepole Pine on the ridges and Aspen in the hollows. At places belts of Willow and Red-osier Dogwood relieved the bareness of the flats, with dark trails intersecting them, the work of cattle and moose. In a small bog we met with the Blue-eyed Grass (*Sisyrinchium angustifolium*) and the Sea-side Crowfoot (*Ranunculus cymbalaria*). Here, too, the Peat-bog Birch (*Betula glandulosa*) was among the common shrubs. Before emerging on a steep dry slope that shields the Graham ranch-house, barns, corrals, post-office, and store, we crossed a long stretch of wet hay lands infested with mosquitoes. The house itself is situated close to a small lake, where we found the Water Knotweed (*Polygonum amphibium*), whose bright-red flowers were used by the Indians for fish-bait, growing in profusion, along with the Bur-reed (*Sparganium simplex*) and the Mud-disk (*Cotula coronopifolia*).

That fish of some sort lived in the lake seemed evident from the presence of a Common Loon or Great Northern Diver (*Gavia immer*) and a White Pelican (*Pelicanus erythrorhynchos*). The loon appeared to have a mate or companion, but the pelican was quite alone. The lake was fringed with willows, dogwoods, and aspens, except where man had wielded an axe. Ten to 20 feet from the shore there were no trees and the "salt grass" grew so short and sparse as to scarcely afford food and shelter for the grasshoppers, the only insects in evidence except the ubiquitous mosquitoes; while in clear view from the lake, on a side-hill, grew clusters of cactus in full bloom.

At the Graham ranch we had to decide whether to carry out our original plan and push through to Bella Coola or to make a side-trip to the southward and return by Williams Lake. Earlier reports as to the impassable condition of the streams to the westward were amply confirmed—bridges were down and the rivers flooded. After scanning the horizon for possible Alpine fields and canvassing the local authorities, we decided to go southward to Mr. L. Butler's place near Bluff Lake. Here we arrived after a harrowing trip in a closed car, having covered the 15 miles in four hours. It was a rolling country, with pine-woods on the ridges and willows in the hollows, where lurked treacherous sloughs filled with black muck and mosquitoes. We passed several lakes, each of which harboured a flock of ducks, though the water was said to be alkaline. Snipe and Kildeer Plover bowed and peeped to us as we floundered along. Of plants, the most notable were the Wind-flower (*Anemone multifida*) and the Plumed Avens (*Geum triflorum*), both in fruit. Dragon-flies hawked along the air-lanes. The Tiger Swal-

lowtail (*Papilio glaucus*), the Clouded Parnassian (*Parnassius smintheus*) in one of its forms, two species of Silver-spots, the Western Sulphur (*Eurymus emilia*), the Wood-nymph (*Cercyonis œtus*), and a Checker-spot (*Euphydras anicia*), all came to gladden our eyes as we bumped and swayed and swung along the rocky road to Mr. L. Butler's.

We arrived at Mr. L. Butler's about 2 o'clock, which gave us time to pitch our tent and stroll down to Bluff Lake before supper. Both here and at our camp we obtained entrancing views of the surrounding mountains. To the east and the west were pine-clad slopes reaching to patches of rapidly melting snow; but to the south were two peaks of unequalled grandeur—the Black Horn and Saddle Mountain, with 3,000 feet of snowfields trailing from their summits, reaching 9,000 and 10,000 feet respectively above sea-level.

The flora around our camp was quite typical of the Chilcotin country, consisting largely of the Northern Bedstraw (*Galium boreale*), the Northern Yarrow (*Achillea borealis*), the Timber Milk-vetch (*Astragalus campestris*), *Rosa nutkana*—a form that seemed very variable—and a species of Aster. These plants were ever present in this country, were closely associated, and in the dry clay soil of the Interior Plateau flourished abundantly.

While the botanist of the party made a two-day trip into the mountains in search of alpines, the entomologist contented himself with wielding his net in an abandoned garden, whither he was led by a boy of 4, the heir-apparent to the house of Butler. This area had two advantages—it was irrigated, and it was surrounded on three sides by the native forest. The best collecting was in the morning, before the wind and the sun became too strong. In the afternoon the entomologist lay on his blankets and collected Tabanids from the tent-wall. *Tabanus sonomensis* was the commonest visitor, though *Hæmatopota americana* seemed fairly common. The Deer-flies, *Chrysops noctifer* and *Chrysops excitans*, preferred to attack you in the open. The best way to capture them is to swing a net violently about one's head. Another visitor to the tent was the Cottontail Bot, *Cuterebra fontinella*.

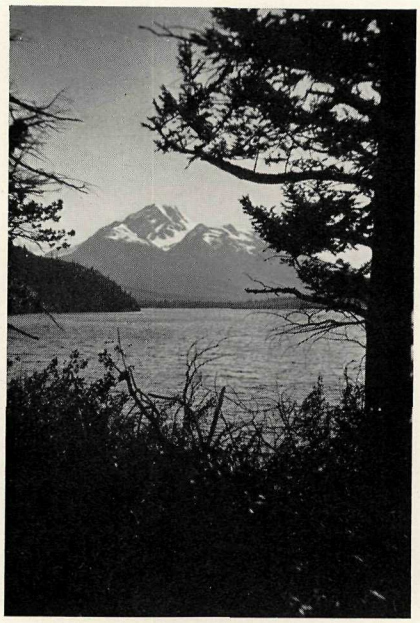
In the abandoned garden were profuse masses of Red Clover and the common garden parsnip in full bloom. The latter attracted many species of Diptera, particularly Syrphus flies, and Cerambycids. To the former came the Bumble-bees and Clearwing Moths of the genera *Hemaris* and *Proserpinus*. The bumble-bees and the clearwings hunted together and it was hard to distinguish them until they were in the net. A large *Eristalis* (*Eristalis flavipes* Walk.) closely resembled a small bumble-bee that frequented the same flowers. Other *Syrphidæ* taken on Yarrow, Aster, or Parsnip were: *Chrysotoxum derivatum* Walk.; *Heliophilus similis* Macq.; *Criorhina armillata* O. S.; *Arctophila flagrans* O. S.; *Parhelophilus* sp.; *Chilosia hoodiensis* Bigot; *Melanostoma stegnum* Say; *Syrphus ribesii* Linne; *Syrphus ovinator* O. S.; *Syrphus umbellatarum* Schiner; *Syrphus americanus* Wied; *Syrphus arcuatus* Fallen; *Syrphus protritus* O. S.; *Syritta pipiens* Linne; *Sphærophoria cylindrica* Say; *Paragus tibialis* Fallen; *Eristalis tenax* Linne; and several other species of *Eristalis* undetermined.

Though most *Bombyliidæ* or Bee-flies come to flowers, they are more frequently taken when resting or ovipositing on the ground. The beautiful fly *Exoprosopa dorcadion* O. S. or *capucina* Fabr. revelled in the bright sunlight and lit on the hottest parts of the trail. Three species of *Anthrax* were also common; and in a country so plagued by grasshoppers it was not surprising to find the golden-haired *Systœchus candidulus*, which preys on their eggs. Robber-flies or Assassin-flies (as they are now called) were not so numerous as one might expect. *Asilus astutus*, *Bombomima astur*, and *Diogmites* sp. were captured. Two Conopids, a *Physocephala* and a *Zodion*, and several Tachinids, including *Gonia capitata* De Geer, complete the list of Diptera taken.

The following beetles were captured from umbels of the Parsnip or corymbs of the Yarrow: *Pachyta armata*, *Leptura chrysocoma*, *Judalia instabilis*, *Leptacmæops longicornis*, *Acmæops pratensis*, *Asemum atrum*, *Xylotrechus annosus* (?), *Phymatodes dimidiatus*, *Dichelonyx backii*, *Trichodes ornatus*, and *Hippodamia 5-signata*. On or under logs were taken *Eleodes cordata*, *Upis ceramboides*, *Saprinus lugens*, *Buprestis maculaventris* var. *rusticorum*, and *Anthaxia æneogaster*. Near the shores of Bluff Lake were found an Ephemerid, a Caddis-fly, and a Snake-fly or Rhaphidian.

Throughout the Chilcotin we found that bark-beetles had attacked the Pine to an alarming extent. The hillsides were covered with vast red patches of the dying trees. Though porcupines were seen, their work was not so evident to the eye as were the depredations of the Indians, who strip the inner bark in the spring.

PLATE VII.



Chilcotin District—Bluff Lake and Saddle Mountain.

The Cascades as seen from an altitude of 7,500 feet, west of Bluff Lake.

On July 13th Mr. Fred Perry left with Mr. L. Butler and two horses for a mountain due west of our camp. For 4 miles they passed through pine-woods; then skirted Sapi Lake, where they found the Mountain Balm or Snow-brush (*Ceonothus velutinus* Dougl.) and the Silverberry (*Elæagnus argentea* Pursh.). There followed some swampy country, much infested with mosquitoes, where they found a Rein Orchid (*Habenaria obtusata* Richards) and two leguminous plants, the Alpine Milk-vetch (*Astragalus alpinus* L.) and *Astragalus mortoni* Nutt. (?)

For four hours they struggled up a very steep mountain trail, with no water, but with the tantalizing sound of a rushing torrent far below them. After a stretch of dry flats they dipped into a hollow where both men and horses refreshed themselves at a pleasant stream. There soon succeeded a line of mosquito-infested swamps, where grew the Crowberry (*Empetrum nigrum* L.) and the Mountain Bilberry (*Vaccinium membranaceum* Dougl.).

On the floor of a long valley having low dry ridges on either side, where the Lodgepole Pine was the all-pervading tree, grew the following plants: The Stonecrop (*Sedum integrifolium* (Raf.) Nels.); the Globe Flower (*Trollius albiflorus* Rydb.); the Mountain Marsh Marigold (*Caltha leptosepala* D. C.); the Swamp Laurel (*Kalmia polifolia* Wang.); the Northern Anemone (*Anemone parviflora* D. C.); the Mountain Buttercup (*Ranunculus Eschscholtzii* Schlect); the Peat-bog Birch (*Betula glandulosa* Michx.); the Alpine Butterburr (*Petasites frigida* (L.) Fries); the three-fingered Cinquefoil (*Potentilla flabellifolia* Hook); and the Burnet (*Sanquisorba sitchensis* Meyer). On the dry hummocks in this valley are found the Alpine Avens (*Dryas octopetala* L.), the Greek Valerian (*Polemonium humile* R. & S.), and the Beardtongue (*Pentstemon procerus* Dougl.). Skirting the edges of the swamps, the party came to halt at a trapper's cabin near the end of the valley. After viewing the interior of the building they decided it would be better to camp outside. The horses were relieved of their packs and tethered, after which the botanist and his companion pressed on toward the mountain-top, the apex of a huge area several square miles in extent. The last timber was passed at about 6,250 feet and its border was very abrupt, probably due to the fact that the party had emerged from a protected valley to an exposed wind-swept slope. The trees seemed to have been cut off sharp, and immediately the Arctic flora began. There was no Elphin scrub, and the area from timber-line to the peak was very extensive. A few patches of snow lingered in the hollows, and on the wet banks of the little streams that drained from this snow the following plants were in bloom: *Lloydia serotina* Reich.; *Phacelia sericea* Gray; the Moss Campion (*Silene acaulis* L.); the Bluebell (*Campanula uniflora* L.); the Alpine Avens (*Dryas octopetala* L.); *Sedum integrifolium* (Raf.) Nels.; the Crowberry (*Empetrum nigrum* L.); the Cinquefoil (*Potentilla villosa* Pall.); the Fleabane (*Erigeron uniflorus* L.); two Louseworts (*Pedicularis scopulorum* Gray) and *P. Langsdorfii* (?); and the Alpine Forget-me-not (*Myosotis alpestris* Schmidt).

After much wandering over these flowery slopes they came to what appeared to be the summit, at an elevation of about 7,500 feet. Here they obtained an unobstructed view of the long, serrated Coast Range and intervening valleys of stupendous proportions. On their way back to camp they occasionally passed one of the Loco-weeds, *Oxytropis monticola* Gray.

After a sleepless night, spent in fighting mosquitoes, they set out on their homeward journey at an early hour. Though in no mood for observation, they saw several moose in the valley-bottom. These animals, which are browsers and not grazers, feed almost entirely on Red-osier Dogwood (*Cornus stolonifera* Michx.), known to the settlers as Red Willow.

A striking feature of the flora on this mountain trip was the almost complete absence of many trees and shrubs that are common on the Coast Range. They saw one miserable specimen of our White Rhododendron (*Rhododendron albiflorum* Hook.); only one species of blueberry; very rarely an occasional *Cassiope* or *Phyllodoce;* no *Cladothamnus* or *Menziesia glabella;* no Cedar or *Chamæcyparis;* and in the swamps only an occasional Mountain Alder, mingled with the Birch and Red-osier Dogwood. The flora seems to approach that of Alaska, for nearly all of the species mentioned here as occurring in the mountains are recorded from Alaska.

Our next excursion was a walk to the southern end of Bluff Lake, along the eastern shore. The dominant plant in the swampy margin of the lake at its northern end was the Black Twinberry (*Lonicera involucrata* Banks). The trail, the only traffic outlet for a group of settlers, follows the water's edge closely, except where it zigzags up the face of some steep bluffs, which

give to the lake its name. On these dry bluffs we found *Saxifraga bronchialis* L. var. *cherleriodes* Don.; the Alum Root, *Heuchera parvifolia* Nutt.; and the nest of a Junco, built in the angle formed by two rock-faces, from which the young took flight at our approach. In the bog below the bluffs we saw the False Solomon's Seal, *Smilacina racemosa* L. and *Habenaria borealis* Cham. In the sunny intervales we noted the Tiger Swallowtail (*Pailio glaucus* L.), the Sylvan Wood-nymph (*Cercyonis oetus* Edw.), and the Banded Purple (*Basilarchia arthemis* Dru.). In sandy parts of the trail Bee-flies were settling to sun themselves or hovering while they dished out little conical holes.

We saw a solitary wasp trying to carry off a caterpillar twice as long as herself. She did not succeed in lifting it, but dragged it along the ground, her legs astride of her prey. For some time we observed red-banded solitary wasps digging like dogs in the earth, throwing out the soil very rapidly from between their hind legs. When the pile got too large behind a wasp, she would clear it away and then resume her labours.

Nearly all the asters in the neighbourhood of Bluff Lake were attacked by a grub, of which we took specimens. These grubs, about four in number to each head, are fat rotund creatures that feed on the disk flowers of the aster, leaving an ugly greyish-green patch. One of these grubs or its parasite pupated and came to maturity as a minute hymenopterous fly, whose identity has not been determined.

In side-trips or on our return journey we took the Single Delight, *Moneses uniflora* (L.) Gray, at Sapi Lake, and the Poison Camas, *Zygadenus chloranthus* Rich., near Tatla Lake. The Marsh-grass of Parnassus, *Parnassia palustris* L., was found growing near the Chilanko, a tributary of the Chilcotin River.

The poison-plants of the immense range-land of the Chilcotin deserve a note as a result of our observations. *Astragalus campestris* appears to be eaten with impunity after it has been attacked by the frost. Everybody that we spoke to on the subject agreed that the number of poison-plants has increased to a very great extent in the last twenty-five years, and that every year the losses of horses and cattle are increasing. We believe that the recent increase of the poison-plants is not accidental, but can be directly traced to the steady decrease and impoverishment of fodder-plants. Overgrazing has removed the chief competitors of the poison-plants, which, like the grasshoppers, had been there long before the coming of cattle into the Chilcotin. Vigorous growth of pasturage had kept the poison-plants in their place. The very avoidance of these poisonous forms by the cattle would ensure their increase. Vast areas of range, especially around Riske Creek, have been depleted of practically all fodder-plants. Fencing of large tracts has intensified the overgrazing of the open range. At certain seasons of the year cattle get so hungry that they finally succumb to their appetites by surrendering their sense of discrimination, and eat the poison-plants with disastrous results.

In conclusion, we wish to express our thanks to Mr. Robt. Wilson, the Executive Assistant of the Pacific Great Eastern Railway; to Mr. Harold Brown, the General Manager of the Union Steamship Company; and to Dr. A. R. Thompson, who made our trip into the Chilcotin possible; and we are also indebted to Mr. F. Kermode, Miss N. Stark, and Mr. G. H. Larnder for their kind co-operation in identifying doubtful specimens.

NOTES ON VANCOUVER ISLAND CERAMBYCIDÆ.

By G. A. Hardy.

During the year 1935 entomological field-work on Mount Arrowsmith, V.I., and in the vicinity of Saanich, V.I., B.C., led to the discovery of several species of Cerambycidæ (long-horned beetles) previously not known to occur on Vancouver Island. I wish here to acknowledge my indebtedness to Mr. R. Hopping, of Vernon, B.C., for his kindness in verifying the identity of the following species:—

Pachyta armata Lec. Taken August, 1934, on Mount Arrowsmith, V.I., B.C., by J. Lohbrunner, where it was found on blooms of Cow-parsnip (*Hieracleum lanatum*). This fine alpine species, of purely western distribution, has a wide range on the Pacific slope of North America, where it extends from British Columbia to California. Though well known at altitudes of 4,000 to 5,000 feet on the Mainland Coast, it has not been previously recorded from Vancouver Island. Represented in the Provinical Museum collections by a fine series of specimens from Garibaldi, B.C.

Gonocallus collaris (Kby.). At 5 p.m. on June 17th, 1934, the author found this species at rest on Douglas-fir slash in Saanich, Vancouver Island. This is a small elongated cerambycid with blue elytra and red thorax, closely resembling certain Telephoridæ (Soldiers and Sailors). While a species of continent-wide distribution through the northern coniferous forests, it is, however, of seeming rarity on Vancouver Island, a rarity which is possibly explained in part by the nocturnal habits imputed to it by Kirk and Knull. These authors record the species as " taken at light " in Pennsylvania. Represented in the Museum collections by a specimen from Copper Mountain, British Columbia.

Monochamus obtusus Csy. This distinctive species of the genus was taken by the author on the trunk of a newly felled Grand fir (*Abies grandis*) in Saanich, Vancouver Island, July 29th, 1934. A western representative of a widely distributed genus, this species seems to be of infrequent occurrence on the Pacific slope of North America. It has been recorded from California, but the only other authentic British Columbia record is that of a specimen taken at Creston, B.C.

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