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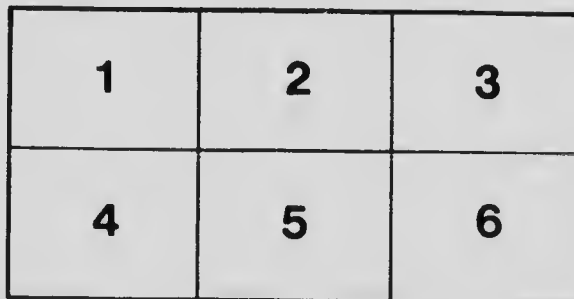
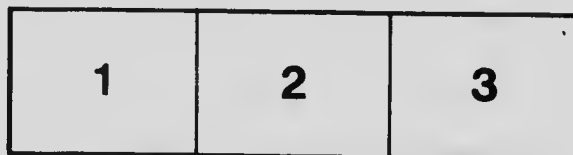
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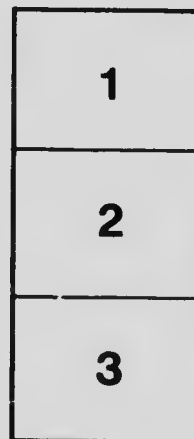
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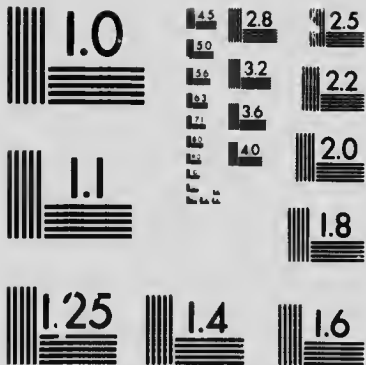
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Faunas of Canada

BY

P. A. TAVERNER, Department of Mines, Ottawa

*AUTHORS' REPRINT from the
CANADA YEAR BOOK, 1915*



OTTAWA

PRINTED BY J. DE L. TACHÉ
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1916



Fig. 1. WILLOW PTARMIGAN IN THE MOUNTAINS OF BRITISH COLUMBIA.



Canada Year Book, 1915.

Photo by P. A. Taverner.

Fig. 2. GANNET OR SOLAN GOOSE.

FAUNAS OF CANADA.

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Whether the fauna of the western hemisphere was derived from that of the eastern, or *vice versa*, as is contended by various authorities, there is a close relationship between them, and one of these contentions is certainly true. Geological evidence shows that in previous ages the northern circumpolar life was even more homogeneous than to-day, and types now found in but one of the great continental circumpolar divisions were once common to both. Old and now submerged land connections between the continents have been postulated both from zoological and geological evidence, and a more or less complete continuity of land throughout the northern hemisphere, in former times, must be acknowledged before present American biotal conditions can be thoroughly understood. That this connection was in the far north and in that is now arctic or sub-arctic climate did not prohibit a continual interchange of warmth-loving species, for the presence of coal in very high latitudes points to milder if not tropical or subtropical conditions where now we find perpetual snow and ice. We must therefore conceive of a pre-glacial time when tree-ferns and other luxuriant coal producing forests occupied extreme northern lands, and such species as elephants, horses and other warmth loving species could spread from one continent to the other.

At this time the entire northern hemisphere was probably peopled by an essentially similar population developing along approximately parallel lines through a more or less free interchange of individuals. These conditions, however, were interrupted by the breaking down of the land connecting the continental areas and the occurrence of the glacial epochs¹, when solid ice covered a large part of the northern hemisphere in North America south to below the Great Lakes. Probably this resulted, over the whole of Canada, in conditions closely approximated to those at present found in Greenland, and a temperate climate did not occur short of the Gulf States. Though these arctic conditions prevailed gradually they none the less inevitably blotted out the original population of the subtropical north.

The species that were of too inflexible a nature to adapt themselves to new conditions, or forsake their ancestral habitats, became extinct and perished entirely; some more adaptable, while they retreated before the face of the oncoming ice, became hardier and capable of living in temperate or sub-arctic climates, and others more easily moved were driven far south, perhaps into South America, where in competition with forms already resident they either triumphed at their expense or

¹Though here treated for convenience and clearness as but one single occurrence, it should be borne in mind that the glacial epochs were composed of a number of advances and retreats, more or less complete, of the ice cap with various intervals between. This, however, does not seriously alter the zoological results here stated.

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succumbed, as the case might be. The survivors under new and various influences evolved into numerous new forms and differentiations more or less distinct from the original stock. These conditions prevailed for what can be historically regarded as great periods of time in the process of which an originally continuous and fairly homogeneous world population became a number of isolated units, differentiating along independent and often divergent lines. Some forms in each hemisphere disappeared, specializations of old ones arose, and the bases of the peculiarly characteristic Faunas of the two great continental areas were laid.

On the gradual retreat of the great ice barrier to inter-continental communication at the beginning of the present geological era, many descendants of the species that had been driven south gradually returned, following as closely upon the edges of the withdrawing ice as their natures and requirements permitted. Some were satisfied with their acquired southern homes or were more able to retain them in competition with their neighbours; they remained and probably became the ancestors of our present typically southern genera; but others seized with avidity upon the opportunity to occupy the gradually opening countries to the north, where competition was relaxed, and each succeeding spring advanced as far into them as climatic conditions permitted or competitive necessity demanded. Thus the north again became repopulated, but not with similar forms in both continents. On the contrary, each was supplied with forms made widely dissimilar through their enforced disconnected residence and divergent development.

During this reoccupation a number of interesting things happened. High elevation is comparable in the condition it originates to high latitudes, and mountains, even in the tropics, if high enough, are covered with perpetual snow. High mountain and arctic conditions are similar and have little variety. Consequently, as the glacial ice withdrew first from the warmer lowlands some species adapted to the colder climate, instead of following the retreat along the valley lines northward, merely climbed adjacent slopes and there found acceptable habitats. If the mountains were too low to retain their arctic character in sufficient degree, those forms perished and were replaced by the next succeeding association until a permanent population was at last secured. If the elevation were greater the arctic forms survived as isolated communities, and hence to-day we sometimes find arctic forms on high table-lands and mountain ranges separated by many hundreds of miles of warm climate from their nearest allies.

It is obvious that these cold loving "relicts" of a previous order should, in the natural state of things, have been the last to break their connection with the European or Asiatic continent and the first to come again into contact with their old allies. In some cases probably the very hardiest never completely lost touch with each other across the frozen wastes of separation. Arctic conditions are remarkably similar the world over, and these forms just clinging to the edge of habitability existed under like conditions and with far less stimulus to divergent progress than those in the warmer and more varied south. Evolutionary development is slower in the colder than the warm climates; generations

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are, on the average, slower of development and slight departures from a narrow successful groove are more ruthlessly weeded out; in fact there is less latitude between success and failure and fewer chances of departures from type being beneficial. All these reasons worked to the single end that the northern or arctic fauna was during the glacial epoch much less differentiated in the eastern and western hemisphere, and to-day we find that while in the extreme south the forms are now widely divergent, those of the northern areas are remarkably similar, and the circumpolar fauna is nearly identical throughout the circle. So in America we have a distribution of life closely related to European and Asiatic forms in the north, but gradually and regularly differentiating into peculiar and special forms as we proceed south.

Having considered the history and consequent relation of North American life to that of the world in general we can take up the details of its distribution on our continent. The general trend of geographical distribution in Canada is from southeast to northwest. Ocean currents have much to do with this. Our east coast is chilled by the cold arctic current coming directly down from the polar ice fields through Davis strait, and the west coast is warmed by the grateful temperature of the great final sweep of the Japan current. When we realize that the barren Labrador coast of the Gulf of St. Lawrence is in almost the same latitude as southern British Columbia and is slightly south of the most southerly point of the British Isles, we can see what a great and fundamental influence these ocean currents have on the distribution of life upon our continent.

The general outline of zonal life distribution is well known. All are familiar with the fact that tropical life differs from temperate and from arctic. Close study however shows that besides these broad and obvious associations are minor ones. Various attempts have been made to map them out, and perhaps the most successful and generally accepted one for our purpose is that by Dr. C. Hart Merriam. This divides North America into three regions, a Boreal, Austral and a Tropical one, with the first two each divided into three life zones: the Arctic, Hudsonian and Canadian zones for the Boreal Region and the Transition, and Upper and Lower Austral zones for the Austral Region. In Canada we have five of these zones represented from the north: the Arctic, Hudsonian, Canadian, Transition and Upper Austral. These extend across the continent, roughly agreeing with latitude, but thrown out of regularity, as previously indicated, by local conditions and agreeing closely with the mid-summer isotherms or temperature belts.

The Arctic Zone is the barren land of the far north, treeless and almost shrubless, and extends south to include all the north shore of the continent as well as the islands above. The distinctive land mammals of this zone are the Polar Bear, the Musk Ox, Barren Land Caribou, Arctic Fox, Arctic Hare and Lemming. Amongst the characteristic birds are Snow Buntings, Ptarmigan, Longspurs, Snowy Owl and the Gyrfalcons. This is the great nesting ground for many of our waders and more northern ducks and geese. There are few residents, as most forms migrate in winter.

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Photo. by Harlan I. Smith.

Fig. 2. Moose in the Rocky Mountain National Park, Banff.

side by the Alaska Pan-handle which has an intrusive Canadian fauna. On the other hand, it works down the Rocky mountains in a narrow band and scattered isolated spots to across the United States boundary. This zone can be considered more as a transition between the Canadian and Arctic zones than a primary division itself. It contains species whose centres of abundance are on either hand and a few peculiar to it. Musk Oxen, Caribou and Ptarmigan range into it in winter from the north, and it forms the extreme northern distribution of Woodland Caribou and Moose. Its most characteristic birds are the Rough-legged Hawk, Great-gray Owl, Northern Shrike, Pine Grosbeak, White-winged Cross-bill and Fox Sparrow.

The Canadian Zone occupies the greater area of Canada and can be roughly defined as the heavy coniferous forest belt. It includes practically all the remainder of the Dominion except the inner shores of the Nova Scotia peninsula, southern Ontario and Quebec in a narrow strip from about Montreal to just below Georgian bay on Lake Huron, the prairies, a small irregular fringe along the Pacific coast opposite Vancouver Island and a few mountain valleys penetrating the southern boundary of British Columbia. Beyond our borders it extends irregularly south on mountains and high land near both coasts, including the south shore of Lake Superior, and penetrates the Hudsonian Zone on the north along the valleys of the Mackenzie and Peace rivers and runs up most of the Alaska Pan-handle. This is the first land fit for systematic cultivation. The characteristic life is more numerous than

The Hudsonian Zone is the land of scrub forests, small stunted trees, mostly coniferous, and scattered dwarf willows and poplars. The southern boundary of this zone extends from the north shore of the Gulf of St. Lawrence to near the mouth of James Bay, thence in a wavy curve to Great Slave Lake where it drops south suddenly to a latitude about on line with the lower point of the Alaska Pan-handle, and thence to near the coast. It thus includes the southern Ungava peninsula, a narrow belt extending northwest from James Bay, the Yukon, northern British Columbia and southern Alaska. It is penetrated from the north by the Arctic Zone which persists on the mountains of the Yukon and from the south by the Canadian Zone which follows up the valleys of the Mackenzie and Peace rivers. It is shut off from the sea on the Pacific

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in the preceding zones and includes the Moose, Woodland Caribou, Lynx, Marten, Porcupine, Varying Hare, White-throated Sparrow, numerous warblers, Olive-backed Thrush, Three-toed Woodpeckers, Pileated Woodpecker, Spruce Grouse and Canada Jay.

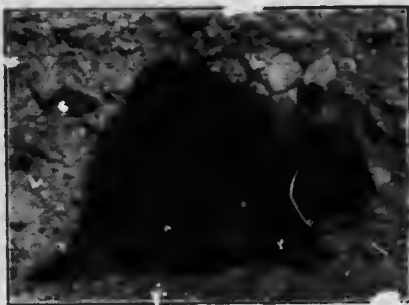


Photo. by P. A. Taverner.

Fig. 4. Canada Porcupine.

The Transition Zone is agriculturally the most important Canadian faunal division. It lies just along the southern border, including most of both shores of the Bay of Fundy, Quebec below the Gulf of St. Lawrence, a narrow belt following the north shores of Lakes Ontario and Erie, all of the western prairies and intrusive valleys into the south of British Columbia and the shores of the Strait of Georgia. The name Transition well describes this fauna.

It contains comparatively few distinctive species, but is where many northern and southern forms meet. Except in the prairies it is the country of the hardwood forests where many of the temperate and hardier fruits, vegetables and cereals reach their highest perfection and is the northern limit of some of the tenderer ones. Its southern limit lies in the United States below, striking almost squarely across the continent on a line with the lower points of the Great Lakes, with excursions southward along the mountain ranges east and west and penetrated by extensions of the Upper Austral fauna along warm lowland valleys in the west. It forms the northern limit of range of the Cotton-tail and Jack-Rabbits and the American Elk, and is just touched upon by the Varying Hare from the north; the Common Mole of the south meets the Star-nosed and Brewers Mole of the north and the Wild Cat partially replaces the Canada Lynx. Amongst birds, the Wild Turkey, Bob-white, two Cuckoos, Towhee, Wood Thrush and Yellow-Vireo are at the northern limit of their ranges, and the Baltimore Oriole, Bluebird, Catbird and Bobolink overlap the solitary Vireo and Wilsons Thrush.

The Upper Austral Zone in Canada is small in area but important in production. It just crosses our borders in a narrow shore belt along Lake Erie extending to the south side of Lake Ontario including the Niagara Peninsula. It forms the famous Ontario fruit belt and is comparatively strongly marked by quite a number of characteristic forms especially amongst plants. It extends south as far as the northern borders of the Gulf States, variously dotted and cut into by intrusive branches of the neighbouring faunas from either side, especially in the broken country of the west.

There are not many peculiar mammals that are well known to the general public, and perhaps the Opossum is the most distinctive. Among birds we have the Yellow-breasted Chat, Mockingbird, Carolina Wren, Carolina Chickadee, Orchard Oriole, Barn Owl, a number of distinctive southern warblers and southern subspecific forms allied to more northern variations.

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Photo by P. A. Taverner.

Fig. 5. Chipmunk.

These make the latitudinal or thermal divisions of our faunal life. Outside of the species mentioned are numerous forms that extend over the whole area, but show in different zones variations recognizable to the expert but stopping short of specific distinction. A good example is the Hairy Woodpecker. This bird breeds over all the wooded parts of North America, but the birds from the Lower Austral zone are quite separable by the trained eye from those of the Upper Austral and Transition and these from the large northern form of the Hudsonian. This is but one case of many where a northern and a southern race exist in the same species and which we designate subspecies. Some of these geographical races are so slightly differentiated as to require an expert to separate them while others are marked and striking. The critical difference between a full species and a subspecies is the fact that the latter intergrade and blend into each other gradually. With species the break between is sudden, and intermediates do not occur.

With this zonal distribution and a variation of life groups depending basically upon temperature, we have another system of distribution east and west, depending largely upon physical conditions of habitat—the arrangement of land and water or mountain ranges forming barriers or highways of migration and leading certain forms in certain directions while barring them from others—and the comparative rainfall and humidity of climate. This has a primary direct influence upon the forms of life we are considering, as well as a secondary and indirect one through the plants and insects which give them food or shelter.

The principal divisions east and west are divided by the Rocky mountains, which successfully cut the Pacific coast off from close contact with eastern forms. This great backbone of the continent extends in a northwesterly direction and forms the political boundary between Alberta and British Columbia. An extension of this line until it strikes the centre of the main Alaska-Yukon boundary roughly approximates the dividing line of the east and west faunas, leaving a triangular patch to the west including British Columbia, southern Yukon and southern Alaska as the western or mountain fauna, and cutting through three of the trans-continental zones, the Transition, Canadian and Hudsonian with fragments of the arctic on the higher elevations to the north.

The mountain district is characterized by an abundant rainfall, a high average humidity and a greatly diversified and rugged topography, forming a succession of mountain ranges with deep valleys between, paralleling the coast, facilitating intercommunication in this direction but obstructing it from east to west. These topographical conditions continue to the south well into Mexico and enforce migration routes and conditions and associations more or less isolated. The marked humidity

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of the climate, especially near the coast, also causes or encourages special physiological changes in numerous organisms tending as a rule to produce larger size and browner or richer colouration. These differences in physical conditions and the isolation formed by the barrier mountains have produced a great number of forms peculiar to the trans-mountain district. In fact, comparatively few species, either of birds or animals, extend across the mountains from the east unmodified, and the native population can be divided into three heads: subspecific variations of eastern forms, species confined to the area and forms of evident mountain origin but spreading from them a certain distance eastward. Typical amongst the first may be mentioned the Moose and Woodland Caribou, the Oregon subspecies of the Ruffed Grouse, Harris', Rocky-Mountain and Gairdner's Woodpeckers, Northwest Flicker, Dusky and Streaked Horned Larks, many forms of the warblers and sparrows and others.

Of full species confined to this fauna are: Douglas Squirrel, Black-tailed Deer, Pica, Yellow-bellied Marmot, Bushy-tailed Wood Rat, Little Stripped Skunk or *Spilogale*, Blue and Franklin's Grouse, Band-tailed Pigeon, Red-breasted and Williamson's Sapsucker, Stellar's Jay, Black and Vaux Swift, Black-chinned and Rufus Hummingbirds, Clark's Nutcracker, Northwestern Crow, Dipper, Chestnut-backed Chickadee, Varied Thrush and others. Of forms typical of the mountains but spreading a little way east are: Hoary Marmot, Mule Deer, Grizzly Bear, Red-naped Sapsucker, Lewis's Woodpecker, Red-shafted Flicker, Hammond's and Wright's Flycatcher, Black headed Grosbeak and many more.



Photo by P. A. Taverner.

Fig. 6. American Sparrow Hawk (female).

The Eastern fauna is comparatively homogeneous across the continent in a diagonal direction from the Atlantic coast to Alaska, with but slight variation in physical aspect, except in the prairie region of the central west. It is a country of low, even topography with good rainfall and covered with a uniform forest of little variety except such as is due to latitude and zonal distribution, but into it project the upper limits of the Great Plains characterized by great dryness, near-desert conditions and almost an entire absence of trees. This penetrates the moist continental fauna as a semicircular extension of the Transition Zone, its chord on the international boundary extending from the eastern Manitoban line to the mountains and north to Edmonton and Prince Albert.

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The general tendency of the prairie fauna is towards small size and pale bleached colouration. Such species as are characteristic of it are those like the Prong-Horn Antelope, Bison, Coyote, Gopher, Prairie Chicken, Sage Hen, Burrowing Owl, Leconte's Sparrow, and Lark Bunting whose open country requirements debar them from wooded land. The remainder of its fauna is similar to that of the eastern country but generally subspecifically differentiated from it through the dryer climate and desert-like conditions. Some species that can be exemplified under this division are Western Horned Owl, Say's Phoebe, Desert Horned Lark, Pale Goldfinch, Clay-coloured Sparrow, Dacotah Song Sparrow, Prairie Marsh Wren, etc.

The true Eastern fauna, though generally similar from the far north-west to the Atlantic coast, does show a slight tendency to variation north of these plains, but the influence is slight and in broad treatment can be disregarded. Many species extend unmodified throughout the area, or when modification occurs it can usually be attributed to either thermal differences or the influence of the closely allied neighbouring prairie forms it comes into contact with in migration or on its edges. In general, most of the subspecific forms mentioned as prairie or western are represented by type subspecies in this great eastern fauna, which is perhaps the typical fauna of Canada and which gives distinctive character to our biotal resources.

ILLUSTRATIONS.

The illustrations of the preceding article are from photographs furnished by the Geological Survey of the Department of Mines, Ottawa. Fig. 1, Willow Ptarmigan in the Mountains of British Columbia, is a species representative of extreme arctic conditions extending south from the mountain tops. Fig. 2, Gannet or Solan Goose, is a maritime species illustrating the close relationship between Europe and America; it inhabits both sides of the North Atlantic. Fig. 3, Moose in the Rocky Mountain National Park, Banff, is a species illustrating the life of the woodland areas of the Canadian Zone from New Brunswick in the east to the interior of Alaska. Fig. 4, Canadian Porcupine, is a large rodent of the Canadian Zone woodlands. Its quills are much used by the Indians in embroidery of birch bark and other crafts. Fig. 5, Chipmunk, is a common rodent of the eastern Transition and Canadian Zones and southward. To the west it is replaced by closely allied forms. Fig. 6, American Sparrow Hawk (female), is a common species ranging right across the continent throughout the wooded and prairie areas and southward.

