

friends and neighbors to foregather at my home in Massachusetts on New Year's eve, and, together, see the Old Year out and the New Year in. As part of the decorations there is always hanging from a beam in the front hall a sprig of mistletoe. Now mistletoe grows luxuriantly about Corpus Christi, and one day while with Priour, I told him of our custom, and wished that I might have, on these occasions, just such a wonderful clump as we happened to be looking at, to hang in my hall. Nothing further was said about it at the time, and I had forgotten the incident until, a couple of days before New Year's, a large box was received from Texas containing just such a clump of mistletoe. And each year since then, such boxes have arrived. Not only that, but before he died the old man asked his daughter to continue the custom, because I had been his friend.

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## ENDEMISM AND THE AMERICAN NORTHWEST

BY T. T. MCCABE

The speculations to which this paper is devoted are based upon the empirical belief that geographic populations of the higher vertebrates are reasonably certain to show endemic variations in proportion to one or more rather vague environmental considerations, such as the homogeneity and individuality of the environment in question, its size, its isolation, or its age. These vague conditions, often more easily perceptible to the casual observer than to the cloistered student of the physical data, somehow actuate or correlate with precise agencies still far beyond our grasp. But throughout the general failure of field ecology as an exact science, especially for land areas, there recurs the stubborn conviction that regions which we empirically sense as natural units are in the vast majority of cases reflected in endemic racial or specific variations of a significant number of the more plastic vertebrate forms. In general, such endemic conformity conveys a sense of distinction from other types of variation of diverse historical or genetic origins. It is the basis of the study of incipient evolutionary change in the higher vertebrates today. So regular is its occurrence that we are justified in emphasizing the fact and seeking an explanation when a striking exception appears. Such considerations may justify a few paragraphs of rather loose descriptive comment on certain areas of northwestern North America whose conformation and recent history throw light upon the nature and rate of cer-

tain of the phenomena which vertebrate zoologists group under the name of "geographic variation".

The splendors of the northwest coast gain by the suddenness of their beginning, by the dreariness of the stage which the mountains above Vancouver back like an azure drop. The delta of the Fraser River, in the immediate foreground, is one of singular lack of interest. Southward, the long straight coast from Cape Flattery to San Diego is for the most part in an unsatisfactory state of middle age, without the savagery of geologic youth or the gentler beauties of alluvial maturity. Over and over again the elements recur, bulky headlands and "haystack" off-shore rocks of yielding conglomerates and sandstones, too weakly sculptured by the trampling Pacific and the deluges of the fog-belt, narrow barrier beaches, and small lagoons of little charm.

Over a thousand miles of such reiteration ends in the gateway whose pillars are Vancouver Island and the southern shoulder of the coast range, where the mountains withdraw from the measureless embrace of the North Pacific—where the offset and break occurs between the Coast Range and the Cascades. Perhaps no one has had the audacity to calculate in miles the length of the shore line of British Columbia. Farther south, a thousand miles has meant more than the Pacific coast of the United States. Now it is not impossible to follow such a length of ragged shore, of polished rock steeped in clear sea water, of tortuous inlet and island, and find one's self again at the starting point. The coast from Vancouver north is perfectly unlike anything else on the continent.

Regardless of underlying geological distinctions, the surface of the new setting is dominated by a single theme. Rising through the accidents of the present landscape, obscured but never lost under sheltered forest or wind-racked scrub, the ice-motive is never absent. From the fringe of "boat-bottomed" rocks, rounded and polished until they seem to float foam-like on the surface of the water, to the peaks whose scoured crowns are hardly shadowed by the patina of oxidation, there is the sparkle of fresh stone-cutting. The unfinished masonry lies as over a holiday. The complete transformation in topography and physiography coincides with the southern extension of the Cordilleran ice-cap.

The dreaded off-shore wind is the breath of retreating ice and carries a sinister promise of return. Withdrawn to the cirques and cols, flashing blue and green where the thin sunshine and warm winds maintain, for the moment, something better than a state of equilibrium

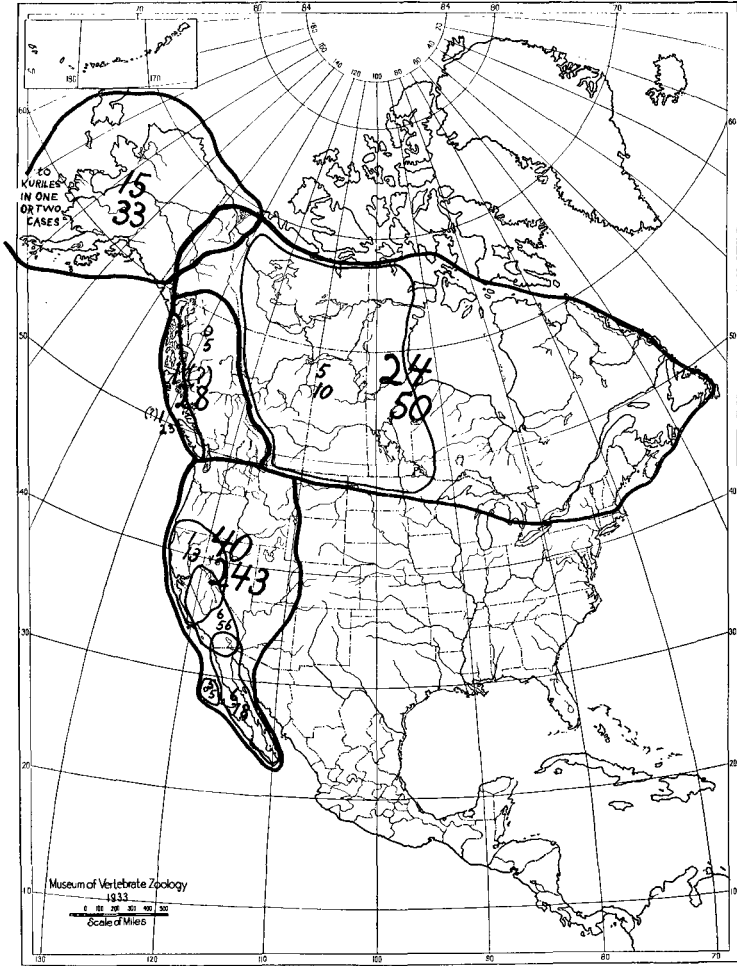


FIG. 49. Numbers of endemic birds in certain regions. Upper numbers represent species, lower numbers geographic races.

with the ponderous ice-creep, the ancient foe remains imminent. The fate of an epoch may hang very delicately in the balance, the little more or little less serving to turn the climatic scales. Let the cold breath sharpen ever so little, let the snowfall gain imperceptibly on the melting and evaporation, and the random cannonading of the slides will swell with the sounds of a main advance. New offspring of the ancient ice will press down the darker gorges to meet and accumulate until a single pale declivity, pierced by rare wedges of naked rock, slopes westward from the mainland peaks to over-ride the outer islands and resume the old line of equilibrium with the warm sea.

But for the day at least the omens are favorable. Life is in the ascendant, and promises, before a new retreat occurs, to effect the conquest of new territories and found new dynasties of living things. In this living promise lies the charm and inspiration of the new environment. For the most part, what we call natural history is, in point of fact, an oppressively finished and static affair. For us, the great changes belong to a realm of ideas rather than to reality. Here, on the contrary, dwells a sense of unfinished surroundings, of obvious and creative change. Something of the expectancy of the northern spring lingers in this greater springtime of a reviving age. Life presses in, with a roster of forms which, intelligently read, tells the story of the immediate past almost as clearly as does the geology—a seemingly chaotic aggregation, which, the key once found, falls into order with startling completeness, while the degree to which the new environment has impressed its stamp upon the pioneers offers one of the most illuminating lessons of the geography of life.

Since during Recent time the sea level has been such as to make low-lying islands of the outer foothills and plateaux of the coast range, the withdrawal of the ice first revealed a fringe of naked stepping stones, destitute of life or the promise of life, larger copies of the offshore reefs of today. There were here no gathering grounds for till or drift, which was washed directly into the channels. No plant could live unless upon air-borne nourishment. Yet mysterious agencies serve to repopulate even such desolate spots with surprising speed. Coming we know as yet neither how nor whence, mosses and alpine plants found nourishment in the dust of lichens and water-borne organic matter, washed or blown into crevices. These laid down their own soil as they advanced, and so, stage by stage, type by type, the present incomplete vegetation has been attained. These suggestions of newness and incompleteness are by no means intended to be fanciful or figurative, but to describe a condition as concrete as the

stage of reversion of a plowed field or the scar of an avalanche. In the interior of the outer islands are great fields of polished rock where the rate of blanketing by felt-like mats of half-rotted vegetation might be measured, year by year, flat wandering drainages where rock pools need the increment of a few more years or centuries to become bogs, well-sheltered areas of cedar and hemlock scrub waiting the slow accumulation of more soil to become cedar and hemlock forests and to offer their hospitality to spruce and balsam. At present monotonous forests line most inner shores, while the rest, hidden, like the white outer beaches, from travellers of the "inside passage", offers a meager foothold for hemlock, cedar, and yew. These cover the bulk of the outer islands with grey skeletons of dwarfed forests, valueless, lacerating, often impenetrable, which reflect the tones of the changing northern days with unearthly radiance, and are not less haunting in form than the dreadful thickets which Dante animated with the souls of suicides.

The living pioneers, selective products of so bitter a history, yet fall heir, in a sense, to all that the latitude can bestow. The fragments of scoured rock, in the shadow of the withdrawing ice, lie also fair in the path of the western wind drift or Japanese current, whose warm waters surround them, are deflected north and south by their shores, and cast upon their beaches a flotsam of bamboo and tropical woods and the lost gear of old-world fishermen, so that Siwash children play with glass balls that once floated Japanese nets. As the waters bring warmth so the sea winds bring rain, warm and moderate compared to the cold deluges which, like grey curtains, shut off the mountainous inner islands. In spite of edaphic poverty the stepping stones of crude rock have become gardens of the gods.

As compared to what lies south of the ice-cap glaciation, and incidentally south of the international boundary, the flora is different enough in the species involved, but profoundly different as to emphasis, distribution, appearance,—that general character so apparent to the eye but so difficult to analyze and define. Numbers of forms are small. Even the color and luxuriance of the outer "muskeg" islands in early summer covers a numerical poverty which reaches its extreme on the outer mainland. The disgusted Oregon timber-cruiser who returned from miserable days in the sodden forests of Queen Charlotte Sound to report nothing but "salal trees and cedar brush" was guilty of exaggeration, but the picture of rough slopes with stunted cedar half-buried in *Gaultheria* and *Vaccinium*, animated with

the songs of *Hylocichlas* and little else, the underlying sphagnum or naked mould shining with the trails of giant slugs, represents a vast zone of nook-shotten coast line.

Because the basic workmanship is more exposed, the brilliant newness of the coast is more spectacular, more suggestive of the terrestrial springtide, than that of the adjacent interior between the Coast Range and the Rockies, which, in its present aspect, is perhaps actually younger. The intricate coastal sculpturings of hard diorite and granodiorite are more strange than the piles of tortured glacial drift, the eskers, morainal dams, and clean-cut benches of the interior, which in turn are better concealed by a vegetation that found fertility and shelter ready-made, as well as surroundings and an atmosphere which made possible high extremes of summer heat. The reclaimed areas offered a wider range of hospitality to the plants and animals which pressed upon the southern front. The various changes, as the habitable frontier moved northward, were less abrupt and less fundamental.

Here, between the mountains, and north of the southern limits of glaciation, stretching far into northern British Columbia, lies an anomalous plateau country, full of familiar elements but in its entirety quite unlike prairies, mountains, or coast,—high, rather flat, very cold in winter and hot in summer, a land of sparse aspen and lodgepole pine shading into balsam and spruce on the eastern and western mountain rims, dotted with shallow lakes, sometimes of great size, and studded with a few clusters of small volcanic peaks. Here to northward lay the gathering ground of the Cordilleran ice-cap whose smaller arms created or deepened through-valleys westward to the sea such as those of the Kleena-Kleene, the Hotnarko, the Skeena, and the Stikine, and extended its terminal forks southward to excavate, with their swifter flow, such gorges as those of the Columbia and the Chelan. Here the landscape of the ice age was that of interior Greenland today. The burden of ice rose to a level of from six to seven thousand feet above the sea where, from peak to peak and range to range, its flood is marked by a transformation of topography. Elevated, refrigerated by the eastern and western mountain rims, unaffected by the Japanese current, the plateau ice lingered and lingered. Johnson and Uglow's intensive study suggests that the glaciers of the foothill valleys of the Cariboo district have been absent only some fifteen thousand years. So much of the recent work on the chronology and paleontology of the pleistocene has dealt with parts of the United States where actual glaciations were rare and widely-sundered epi-

sodes, that their actuality, duration, and significance in the biological history of the north has not been understood.

It is not necessary to possess the intuition of a G. M. Dawson, or to be steeped in the data of the Canadian Geological Survey in order to read one fact from the landscape of British Columbia, viz., that during the late Pleistocene the region was uninhabitable by most of its present land vertebrates. We may leave the question of a scant handful of extreme "arctic-alpine" forms open to doubt—it need not concern us here. One corollary follows—that the present inhabitants must have arrived by migration in their present guise, or varied *in situ* since the change of climate.

If we use the word *endemic* in its present accepted sense of *restricted to*, though not necessarily indigenous in, or originating in, then the lighter the endemic variations in newly available and sharply differentiated regions, the more likely they are to be indigenous and of post-Pleistocene development. It is at least unthinkable that a group of animals or birds showing a roughly corresponding degree, and, especially, a parallel *type* of variation, should as a unit, with the change of conditions, have transferred their common range to a new region which bore no resemblance to their previous habitat.

One impressive fact stands out from the accompanying map. In the British Columbian region, a sharply-defined natural unit, rich in light endemic variation, *endemism of specific degree practically does not exist*, in contrast to all surrounding areas. Only the Northwestern Crow (*Corvus caurinus*) still rated, undoubtedly wrongly, a race of the *brachyrhynchos* group by orthodox ornithology, and extending its present range to Prince William Sound, is a candidate for specific near-endemism. This bird, by a fortunate chance, happens to be the only one in North America which can be shown by paleontological evidence to have at least withdrawn its southern extension, since the later Pleistocene, from southern California to Puget Sound, and which very probably is an immigrant endemic rather than an indigenous one in its present range.

Be that as it may, in the possession of endemic forms the contrast of the British Columbian and southern Alaskan coasts with both the north and the south are obviously overwhelming and must have a reason. Today, in the United States west of the Rockies and in Lower California there exist at a minimum estimate some forty endemic species and 243 races, variously distributed. At the opposite extreme, in the

far northwest, warm *unglaciaded* western Alaska and its islands offer as sharp a contrast and a more surprising one. Here is all that is left of the faunas (for there were probably at least two rather distinct ones) of the great Tertiary landbridge, hundreds of miles in width and diverse in climate, which joined the continents, and is now the floor of the shallow Bering Sea. It is true that an undue proportion, though not all, of the fifteen endemic species are littoral or even pelagic, but of the thirty-three largely terrestrial endemic races a large number are extremely strong, relatively nearer specific rank, in contrast to those of the more southern coast or the British Columbian interior. The region is a rich pocket of relatively deep-seated endemism—an ancient, almost relict, fauna, strangely surviving in a strange retreat.

When, however, we turn to the obvious interpretation, i. e., that the explanation is historical and lies in the time factor, that the degrees of endemic variation more or less accurately represent the length of endemic habitation of the populations involved, we are faced with an apparently flat negation in the fact that the eastern glaciaded regions, from the Rockies to the Atlantic, are by no means equally deficient in endemic forms of specific rank. I believe, however, that the difficulty is less stubborn than at first appears. Dangerous as it may be to give free rein to the imagination in matters so out of reach of experience, careful consideration must lead to the conclusion that the present distribution of endemism is strikingly in accord with the probabilities, and offers extraordinary insight into the nature and rate of variation.

Over the monotonous eastern landscapes, as the ice came and went, we must imagine sweeping and unified migrations of coherent populations of animals and plants, drifting northward or southward rank by rank, each enclosed within its drifting environment. The movements were over a comparatively uniform terrain. Topography ran north and south. Change crept northward in a cycle of repetitions. Over broad steppes, along sea coasts, up the spine of the Cordillera, the footsteps of change, gradual or rapid, continuous or intermittent, followed relatively simple paths. Transitions, as between the Sierras and the Cascades, barriers, like the vanished lakes of the Pleistocene, were inconsequential or fugitive. Each zone reclaimed from the ancient frost was suitable for settlement by the life of its southern margin.

On our rocky northwestern fringe there was no duplication and reduplication, no moving up of ready-made environments. Here the old



life faced new conditions. The renaissance began at the margin of a new physiography. Major climatic and topographic boundaries had chanced to coincide. Reclamation began where coast, mountains, and interior are transfigured, at the gateway of the northwest, where the mountains turn westward to plunge their spurs and valleys into the sea, or where, in the words of Dawson, the coast system "replaces and partially overlaps" the Cascades. Nothing like the new shore line had existed elsewhere; even the inter-mountain region was strongly differentiated.

What took place over the relatively uniform east with the passing of the Late Pleistocene is seductively easy to visualize; what took place over the complex west, very difficult—so difficult that we may never extricate the history of the individual animal forms. To illustrate the distinction, we may venture, with the eye of the mind, to pierce the darkness as far as the so-called Wisconsin glaciation and to glimpse, near the ice-front in the middle west, something over twenty-five thousand years ago, some characteristic scene—perhaps a round sphagnum muskeg, bordered concentrically with grass, willow, and alder, and backed by dark conifers, beyond which rises a rolling landscape of windswept grass and evergreen scrub. A group of caribou, circling with clicking hooves and muzzles stretched high, have been roused by a shift of wind. A moose, seen in vague outline through the willows, shakes and snaps the long shoots on which it feeds. So far the setting has left its record, for those to read who can. But we may quite safely people the stage with other actors of whose presence no trace remains: the deeper forest with White-winged Crossbills and Three-toed Woodpeckers, the forest edge with Yellow-bellied Flycatchers and Canada Jays, the deciduous brush with Tennessee, Cape May, Myrtle, and Blackpoll Warblers, while the royal crimson of the sphagnum is enhanced by a dotting of Rusty Blackbirds, walking their long patrols, their bills bristling with insects. In the distant landscape there are sites, in the open grassland, for the nests of Sprague's Pipits and Smith's Longspurs, in the scrub, for those of Harris's Sparrows.

Such a picture once established, in part by the sciences which deal with the animals and plants of the lost ages, in part by inference from present association, we seem at liberty to shift the scene northward, step by step, age by age, until, time and space converging, we meet the present reality in northern Manitoba or Saskatchewan. No radical and lasting changes in topography have been passed over, no

more subtle changes, insurmountable to the animals in question, need have intervened.

It is true that we too rarely have among the smaller mammals, and practically never among birds, adequate fossil evidence of such migration by unchanged living forms. But all that we do know or guess of the rate of mutability of vertebrate species forbids us to believe that such profound modifications in the germ line as exist among Canadian endemic species east of the Rockies can have come to pass in the region of their present sojourn and in the short period since the glaciated regions became habitable. Whether such forms evolved before or during the great stretch of the Pleistocene, whether far to the south, or even farther north during some interval still warmer than the present, or whether, more probably, the more recent process of evolutionary changes were never localized but protracted through long cycles of drift, such as still continue, though too slowly to be reflected in our brief records, we may never know. But of one thing we may feel reasonably sure, that of the many *species* now endemic to regions of Pleistocene glaciation, very few, if any, can be the exclusive products of their present geographic range.

On the Pacific slope, in the same latitudes, we cannot conjure up such a scene of the diluvial drama which, actors and setting unchanged, is reproduced today on the northwestern stage. Here our mind's eye must look back upon an ancient southern fauna trapped in a disappearing, rather than a migrating, environment. The questions are rather what forms will have the vigor and tolerance to escape, the plasticity of behavior or form to undergo adaptation. The tolerance of many forms from many directions enabled them to penetrate and gain a foothold in the new regions. Hardly a single form was prepared to adopt it as an exclusive unit, to become endemic to its natural boundaries.

Then, as now, we can not doubt the existence of essentially coastal forms in the south, narrowly fenced between the Cordilleran barricades and the sea, and subjected to specialized environments. But the shadow of change, passing quietly from latitude to latitude, from level to level, produced little orderly procession of such forms. No ancient form found its environment reproduced in the virgin northwest, and indeed relatively few possessed the catholicity to include its new and singular habitat types in their adopted ranges. Many, as both deductive reasoning and avian paleontology suggest, disappeared with their surroundings. Relatively few, and these practically all from the southern seaboard, were capable of accepting the novel extremes of

the new coast. In consequence, the breeding forms of the British Columbian coast hardly number half of those which occupy almost any strip of corresponding size in the interior of the province.

The avian population of the interior of British Columbia, on the other hand, instead of being composed of scattered gleanings from a single source, as on the coast, is relatively large and the result of invasion of three great geographic groups, those of the far north, the Great Basin and Rocky Mountains, and the east. This is the no man's land of the grand strategy of distribution. Like the coast, it lacks deep-seated endemic differentiation, native or immigrant. Unlike the coast, it exhibits the most meager indications of incipient geographic variation. Over 70 per cent of the population is composed of forms which find their present centers of distribution in the far north or southward in the Great Basin. Embedded in the same mosaic is a smaller but strangely distinct component of eastern races or species, which here, just above the southern limits of glaciation, suddenly strikes through the Rockies and the intermountain region, often as far as the Coast Range. For a long time I stood somewhat in awe of this group of familiar eastern creatures in such unfamiliar surroundings, so indifferent to the tangible and intangible barriers of topography and ecology. So bold an alien vanguard, it seemed, must herald a mysterious faunal movement, be fed by hidden springs of vitality, and contain secrets of faunistic revolutions of the past. But if we regard the population as the mixed product of recent invasions and of centripetal force, it is obvious that the adjacent east would have contributed its fraction, especially of kinds of birds to which mountains and boreal forests constitute avenues rather than barriers. Such a variegated faunal complex, once we accept the historical viewpoint, needs no explanation other than recent and heterogeneous origin. It is the selective result of throwing open virgin territory to settlement on several frontiers. The mixture as a whole lacks local color, for local color is slow to appear. In the crucible of the natural environment reactions are deliberate indeed.

Inherent in such a situation lies the framework of a great experiment in the rôle of environment in organic evolution. There was waiting not only a *tabula rasa*, an empty stage, but one dissimilar to any previous and ill-adapted to carry on old themes of remote origin. The results of the re-occupation are to be read in new themes, in those incipient changes or "geographic variations" which probably differ

only in degree from more trenchant "species", and to which younger vertebrate naturalists are inclined to look as the lowest perceptible evolutionary points of departure. The time of re-occupation, also, is fixed. Because for a long period most of the north was almost empty of vertebrate life, the length of the local habitation of the present occupants can be measured. Granted the responsible agency of environment, we can, like chemists, determine the rate of certain evolutionary reactions, even if we must guess at their mechanism.

Certainly in those regions whose character and position in the present natural cycle we are trying to grasp there have developed only those hints of change, tantalizing fugitive variations, shades too delicate to endure a change of light, dimensions so confused that only long series and the subtleties of mathematics can evaluate them, which the science of vertebrate systematics has struggled to reduce to a single category, the geographic race. Of such variations no study can be too minute, for the chances are large that in them we see eternally repeated the very birth of organic evolution, but it is quite certain that no system of ponderous trinomials will ever convey a sense of their delicate and imponderable values, which we now understand to include innumerable degrees, from near-specificity down to faintly divergent behavior and physiology in groups otherwise indistinguishable, even to the change of a note in a song between colonies a few miles apart and otherwise beyond the discrimination of human sense or scientific apparatus.

I do not suggest that while "species" may have evolved elsewhere (or nowhere exclusively), "races" must have developed where they are today, or propose any equally rigid and absurd distinction between the categories. On the contrary, it is almost certain that many strongly differentiated races, as, for instance, certain of the endemics of the eastern glaciated areas, must antedate the renaissance of the regions they occupy. But the more superficial the variation appears, the greater the probability of its local development. The endemic variations of the northwest coast are uniformly light. Furthermore, their most spectacular aspect, as a group, is their parallelism. An overwhelming proportion are darker, of a more "saturated" pigmentation than surrounding races, while size is almost as regularly diminished. One or more localized modifying factors, whatever their means of operation, of common application, to which many of the native forms show strikingly parallel responses, obviously exist in the new envi-

ronment. The lightness of the differential characters, their striking parallelism, their sharply endemic grouping, and above all their occurrence in a region so recently uninhabitable and so completely without evidence of immigrant endemism in ancient and trenchant forms, *leaves little doubt of the local origin* of the variations. Such a conclusion carries in its train the establishment of a somewhat more-than-minimum period, if not yet in years at least in a very small division of the geologic column, for the development of distinct, morphologic, geographic races. Furthermore, it seems highly probable that the contrast between coast and interior in British Columbia as to prevalence of geographic variation indicates a further correlation with the relative lengths of the habitable periods in the two zones, which has already been discussed.

For many years large groups of vertebrate zoologists have blindly concentrated upon the description of geographic variation. Hardly a thought has been wasted on the rate of such change, and indeed there is little basis for speculation upon it. Yet the phenomena of widespread glaciation, when subjected to such chronological studies as those, for example, of Antevs, and knowledge of the age of certain islands which have been submerged and re-elevated, provide data which is certain to be collected and applied effectively to such problems.

On this continent Hay, interpreting the riches of mammalian paleontology, guardedly admits the possibility of differentiation into species since the *beginning* of the Pleistocene, almost certainly over a million years ago. The span of the whole Pleistocene, as compared to the recent, was immense, and if we may feel assured that Recent time, say, in the regions under discussion, following the strong consensus of modern geological opinion, something over 25,000 years, is sufficient to have produced the lesser geographic variations, such a point of view as Hay's supports what many devotees of vertebrate research believe, that there is a vast interval between the first emergence of perceptible morphologic "geographic variation" and the "specific" stage when ready interbreeding ceases to take place in nature.

In this attempt to locate, in place and time, certain starting points of potential evolutionary changes in one class of vertebrate animals, I have coupled the words environment and variation as though such coupling, as cause and effect, were a foregone conclusion and a comprehensible one. But in so doing I have followed the common working hypothesis rather than clear-cut principles, and have restricted myself to the consideration of that phase of very gradual variation based

on geographic series which has been so much emphasized in the study of the higher vertebrates but is so difficult to isolate in other fields, notably in that of botany. Its recognition does not deny other and older genetic evolutionary mechanisms which are unfamiliar in the vertebrate field.

In respect to this working hypothesis of the study of distribution, we flounder in dark waters, snatching at straws and dropping them, straining for doctrines only to revolt from their far-fetched inadequacy. The life sciences are approximately as far as ever from showing how external agencies can create heritable changes in organisms. To ask selective adaptation to account for the minute and inconsequential variations of geographic races is to reduce the theory to absurdity. To believe that such variations are "linked" to others more important, but unfortunately quite invisible, is one more step in the same direction. The vertebrate geneticist looks not at the nature of the environment but at the degree of its isolation, especially if combined with small size and reduced numbers, or to contacts of adjacent groups for the origin of strains of a mutative origin and Mendelian behavior, a doctrine which has only far-fetched answers for our increasing knowledge of the parallelism of variation in local populations, of which the northwest coast offers a fine example. The form of agnosticism which takes refuge under the name "orthogenesis" would perhaps free itself, if it could, from all environmental correlations. Because science finds no mechanism for the operation of direct environmental influence upon racial morphology, it has devoted great ingenuity to eluding the evidence of it. Yet naive acceptance of an almost universal sensitiveness to the environment *per se*, as opposed to mere isolation, of the parallel effects of parallel environments, and of the early development of differentia independently of selective value, seems the attitude most likely to lead at last to the center of the bitter problem of the origin of races, and therefore of species.

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