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THE ISLAND OF SAKHALIN.*

By Professor von KRASNOW.

By its geological structure, this, the northernmost island of the Japanese group, forms a part rather of Siberia than of Japan. The volcanoes which are such a characteristic feature of Japan are here entirely wanting, and the three parallel chains of mountains which form the skeleton of the island are similar in formation to those of Eastern Siberia. They are composed of Jurassic slate, Cretaceous strata, and Tertiary sandstones, and clothed with thick forests seldom visited even by the native hunters. Inasmuch as the mountains reach in the interior an average elevation of 6000 to 7000 feet, it is evident that the vegetation of the island must be very varied. Still greater differences, however, are caused by the abnormal climatic conditions of the island; for although Sakhalin lies between the latitudes of Trieste and Hamburg, its conditions of life are almost polar. Bathed by two cold marine currents, it is exposed without protection in winter to the cold north-west winds of the East Siberian anticyclone, and an abnormally cold winter is associated with an abnormally cold summer. Even in May snow lies at the sea-level in open sunny spots, whilst in the thick forest it often remains on the ground until June, and in crevices until July. Snowfalls occur down to the end of May, and frosts to the middle of June, the latter beginning again as early as September, at the end of which month snow again falls. On account of the cold currents which bathe the island, distance from the coasts plays an important part in relation to the vegetable covering, giving rise to anomalies perhaps observable on no other portion of the Earth's surface. In Siberia, and even in Central Europe, it has many times been noticed that during the winter cold the mountain summits are much warmer than the plains. There is a saying in the Tirol, "Steigt man im Winter um einen Stock, so wird es wärmer um einen Rock." The same holds good in Sakhalin. The cold and heavy winter's air collects in the lower regions, whilst above the mountain heights enjoy the warmer sea-breeze. But since even in summer the cold comes from the surface of the sea, the mountains display all the year through different temperature conditions to those we are accustomed to in Europe. Thus while an arctic vegetation prevails on the sea-shore, forests with sub-tropical Japanese species occur at a certain elevation, and only on the highest summits does the forest again give place to arctic plants.

The principal component element of the forest consists of pines, firs, and Siberian larches—*Pinus ajanensis*, *Picea Sakhalensis*, and *Larix dahurica*. The young trees grow thickly together, so that in the struggle for existence they kill one another, and but few individuals of a larger size survive. For this reason all the intermediate spaces are filled up with standing or lying skeletons of trees, which make these forests impassable for man. The flora resembles that of North Lapland. On the west side of the island the woods have a more mixed character, especially in the south-west, where the milder climate permits the association of the maple (*Acer spicatum*), *Betula Ermanni*, and large numbers of *Sorbus aucuparia*, with the coniferous trees. At a certain height, especially in the interior of the island, these woods lose their hyperborean character, and quite suddenly sub-tropical forms of the sunny south make their appearance. Beneath the evergreen foliage of the *Taxus baccata* rise high bushes of the Japanese *Flex crenata*, and stems of bamboo as high as a man—true Indian jungle beneath the conifers of the far north—bush-like *Vaccinium*, fine Hydrangeas, which, as in the evergreen forests of the Himalayas, grace the woods with their blue flowers, whilst colossal leaves of *Araliaceæ* and

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Petasites cover the banks of streams. Only on the highest summits does the forest disappear, and is replaced by dwarf firs—*Cembra pumila*—and evergreen stretches of *Empetrum nigrum*.

Where the sea-shore is flat and exposed to the winds, a regular arctic tundra vegetation prevails. Trees are entirely wanting, or at most form stunted growths, spreading horizontally only, under the shelter of sand-hills. The true tundra region, however, is not on the sea-shore, but in the great longitudinal valleys connected with the structure of the island, especially in those of the Poronai and Tym. With the exception of a few swampy meadows, covered with *Spiræa salicifolia*, these plains form a polar tundra with frozen soil, peat-bogs, and arctic vegetation. In no other part of the world does the tundra-formation extend so far to the south as in Sakhalin, where it occurs under the latitude of Trieste, and where reindeer also are met with in large numbers.

The tundras of these valleys owe their existence, not to the cold winds, but to the unfavourable drainage of the soil. On well-drained soil and on steep mountain slopes no arctic flora grows, but only on the level plains. The nearer we approach such plains from the direction of the mountains, the more does the habit of the woods change. The pines and firs have a stunted appearance, and by degrees disappear altogether, only larches taking their place. The vegetation of the larch woods differ fundamentally from that of the pine forest. It consists of a variety of tundra plants, and possesses much scientific interest from the point of view of the history of the development of the plant world. It is well known that the east coast of Asia, with its chain of islands, has had no glacial epoch: from the equator to the polar regions it enjoys a moist climate, corresponding in the south to that of Tertiary times, and in the north to that of the pre-Glacial epoch. Under the influence of the gradual cooling, the elements of the sub-tropical vegetation which formerly prevailed were but slowly extinguished. Like "living fossils," representatives of this flora, such as *Juglans majurica* and *Vitis Thunbergi*, still remain in particularly favourable spots in Sakhalin. But side by side with the extinction of the more southern flora, a gradual conversion of sub-tropical into arctic forms may be observed. In the region of the East Asiatic islands, almost the same evergreen species, belonging to the same families, occur on the high summits of the mountains (e.g. on the Javanese volcanoes) and on the border of the polar region; and in this way the plants of the Sakhalin peat-bogs are biologically near allies of the trees of the tropical moist forests. Nothing similar is to be observed in Europe, because here the original vegetation was destroyed by glaciation, and we have now to do only with the subsequently introduced forms.

The peat-formation on the tundras of Sakhalin reaches in many places a thickness of 50 feet, and beneath it upright fossil larch-stems, which have been buried *in situ*, can often be seen. The destruction of these woods might be ascribed to a change of climate, but another explanation may also be found. As was mentioned above, the snow, owing to the cold and gloomy summer, lies as late as July under the shelter of the forest on badly drained clayey soil. The surface, constantly damp, becomes covered with a growth of swamp vegetation, which more and more prevents the access of the summer air and the thawing of the soil. Thus the conditions become more and more unfavourable to the growth of the forest, till even the moisture-loving larch gives place to the bare tundra. All the wide plains of Sakhalin have therefore been transformed into tundras and half-frozen peat-bogs, and a true polar landscape prevails wherever mountains or hills are absent.

A single exception is formed by the banks of streams, which show the sharpest contrast to the tundras, being clothed with the most luxuriant vegetation to be seen anywhere in the island. The appearance of the landscape corresponds to that

of desert regions, where also the courses of streams are fringed with forest. At a distance of a quarter to half a mile, the peat-bog gives place to a charming meadow of *Calamagrostis* grasses, with park-like groups of birches, poplars, willows, *Fraxinus excelsior*, *Ulmus*, etc. But the most striking is the bush vegetation. *Polygonum Sakhalinense*, *Senecio palmatum*, and other plants, with stems 6 feet or more in height, overtop the traveller, making the use of a hatchet as indispensable as in the tropical forest; and he can scarcely believe, as he sees around him fine tropical butterflies, that he is in the immediate neighbourhood of herds of reindeer and the ever-frozen tundra.

Before the advent of the Russians and Japanese, Sakhalin already possessed four distinct races which had entered the country from the south or west. The most interesting of these are the Gilyaks, who are not becoming extinct like most of the primitive races of North-East Asia, but thrive and maintain their customs and religion. Physically they are true Mongolians, and wear clothes of the Manchu style, with long pigtails like the Chinese, from whom they are distinguished, however, by their more robust physique and darker colour. Their religion consists in a reverence for the unseen spirits of the sea, the woods, and the mountains, to whom offerings of food and the most prized possession of the Gilyaks, tobacco, are made. The bodies of the dead are burnt, and the ashes preserved in special small huts. The women of a clan are the common property of all the men, and, on this account, all the members thereof consider each other as brothers and sisters, fathers and sons. Each family has a summer dwelling to itself, built without a window, of piles and pine logs, and covered with birch bark. The winter dwellings are of the same type, only much larger, and in them all the members of the clan live together. They have no villages, and, beside dogs, they possess no domestic animals. They are a true tribe of fishermen, in contrast to the Tunguses, who live by the rearing of reindeer on the tundras. On the mountains lives the dwindling tribe of hunters called Orochones. Both are nominally Christian, and are few in numbers. There are still Ainos living in the south of the island. Their dress is Japanese, only they wear, like the peasants of Great Russia, shoes of bast. In their customs they are sharply separated from the Ainos of Yesso, the women, e.g., never painting themselves blue mustachios.

In addition to these indigenous races, there are also the Russian exiles, who number about 17,000. Those newly arrived begin by working several years in the coal-mines or in the forests, where they make roads and cut timber. Afterwards they are made to live five years in villages, practising agriculture and cattle-rearing. But as the climatic conditions are very unfavourable to agriculture (in the south only rye, vegetables, and potatoes will grow, oats and fruit-trees flourishing nowhere; while in the north nothing but potatoes and the most northern cereals can be cultivated on exceptionally favourable spots), this village life is still more wretched than that during the period of penal servitude in the mountains. After this the exile becomes free, and is permitted to settle in East Siberia. Every one takes the earliest opportunity of leaving the inhospitable island, and, as a rule, settles in the neighbourhood of Vladivostok. On this account the inhabitants of the villages change every five years, and the advance of cultivation is but slow. Coal-mines, petroleum, and fisheries (as yet in the hands of the Japanese) form the natural riches of the island, which should acquire great importance when the Siberian railway is completed.