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K. MIYABE

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OF THE

BOSTON SOCIETY OF NATURAL HISTORY;

VOLUME IV, NUMBER VII.

THE FLORA OF THE KURILE ISLANDS.

By K. MIYABE.

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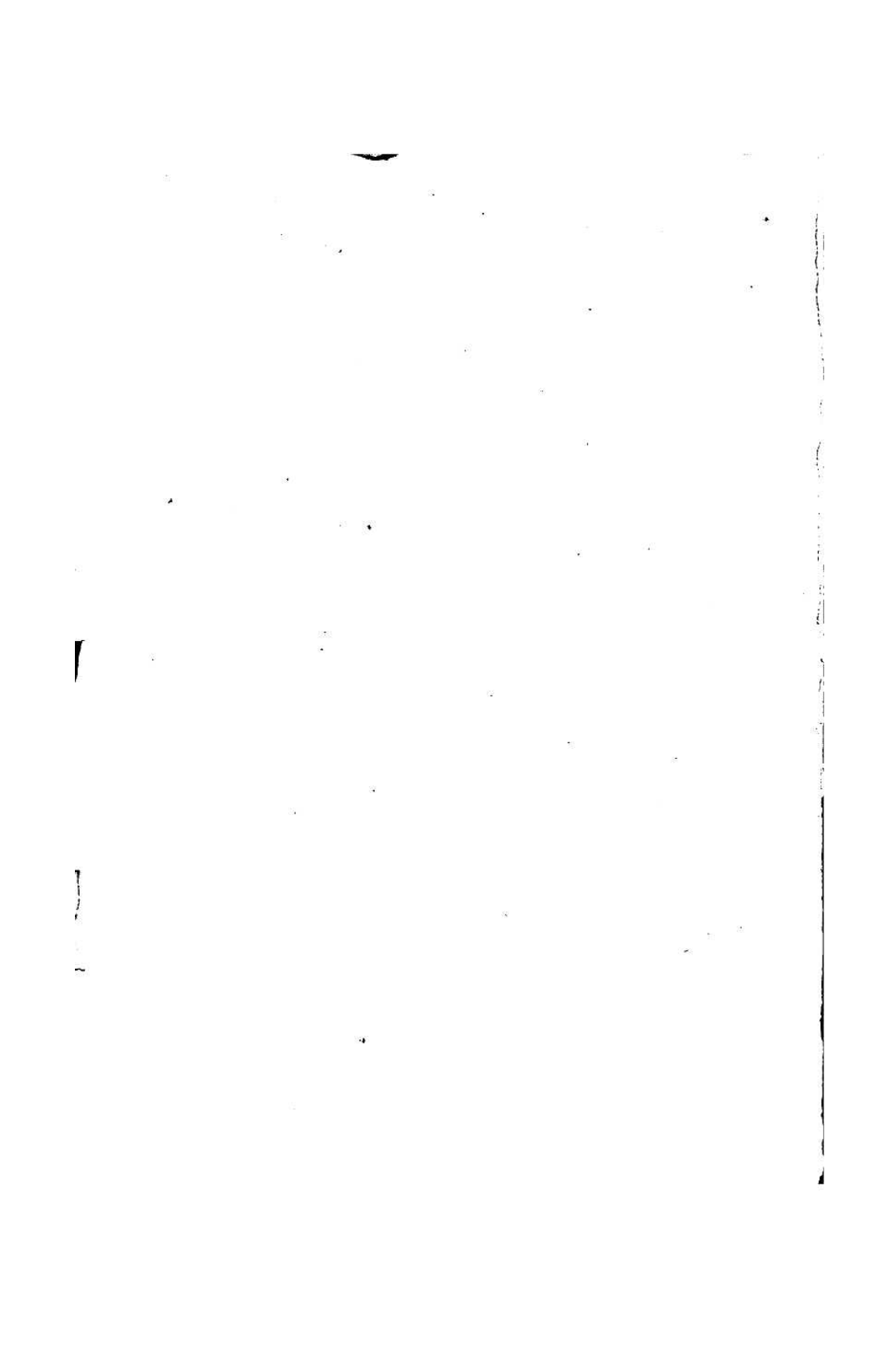
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VII. THE FLORA OF THE KURILE ISLANDS.

By K. MIYABE.

INTRODUCTION.

GENERAL REMARKS.

SO far as I am aware, no special work devoted to the flora of the Kurile Islands has ever been published. The glimpses we could get of its character have chiefly been from the scattered writings of Russian botanists. In his "Flora Rossica," Ledebour attributes about forty species to these islands. Before his time, Pallas,¹ Georgi,² Turczaninow,³ Chamisso and Schlechtendal,⁴ De Caudolle⁵ and Ruprecht,⁶ referred occasionally in their writings to the Kurile plants. Most of these plants, however, were included by Ledebour in his "Flora."

Since the appearance of that important work, many additions have been made to our knowledge of the Kurile vegetation by Regel,⁷ Maximowicz,⁸ Herder,⁹ Fr. Schmidt,¹⁰ Siebold,¹¹ Boott,¹² and others.¹³ The total number of plants of these islands known to me from the writings of these authors is 104 species.

The materials on which most of these references were based had been collected by the Russian naturalists and naval officers in the northern Kuriles, as far south as Urup, and are now incorporated chiefly in the herbaria of St. Petersburg. Prof. Maximowicz, who has noted every Kurile plant he has come across in these herbaria since 1868, most generously placed his valuable list in my hands

¹Pallas, P. S.; Neue Nordische Beiträge, Vol. iv, pp. 112-141. St. Petersburg & Leipzig, 1788. — Flora Rossica, Tom. i., pars 1, 2. Peteropol, 1784-1788. — Species Astragalorum. Lipsia, 1800.

²Georgi, J. T.; Geographisch-physikalische und naturh. Beschreibung des Russ. Reiches. 8ten Theils 4ter Band, pp. 609-1072. Königsberg, 1800. — Nachträge für dessen Geog., etc., 1802.

³Turczaninow, N.; Description de deux nouveaux genres de la famille des Gentianées. — Observations sur quelques genres et espèces de la famille de Boraginées. — Décades quator plantarum hucusque non descriptarum, Sibiriæ maxime orientalis, etc. (Bulletin de la Soc. des Natur. de Mosc., 1840.)

⁴Chamisso, Ad de, and Schlechtendal, D. d.; De plantis in expeditione speculatoris Romanzoffiana observatis. (In Linnæa, III (1828), p. 38, vi (1831), p. 574, on the plants in Herb. Willd.)

⁵In the "Systema" and "Prodromus," based mostly on the specimens in Herb. Fisch.

⁶Ruprecht, F. J.; Distributio Cryptogamarum Vascularum in Imperio Rossico (Beiträge zur Pflanzenkunde des Russ. Reiches. Dritte Lief. St. Petersburg, 1845).

⁷Regel, E.; Uebersicht der Arten der Gattung Thalictrum, welche im russischen Reiche und der Angräuzen den Ländern wachsen. Moskau, 1861. — Regel & Tiling, II.;

Flora Ajajensis. Mosquæ, 1859. — Regel; Plantae Raddeanae, Vol. I, 1861-2.

⁸Maximowicz, C. J.; Primitiæ Floræ Amurensis. St. Petersburg, 1859. — Diagnoses plantarum novarum Japonicæ et Mandchuricæ (Mélanges biologiques tirés du Bull. de l'Acad. Imp. des Sciences de St. Pétersbourg, Tom. VIII, IX, 1872-1876). — Diagnoses plantarum novarum Asiaticarum (Mém. biol., IX-XII, 1875-1888). — Rhododendreae Asiae Orientalis (Mém. de l'Acad. Imp. St. Pétersb., 7e sér., t. XVI, n. 9) 1870. — Aduotationes de Spiræacels (Acta H. Petrop. Tom. VI) 1878.

⁹Herder, F. von; Plantae Raddeanae, Vol. III, IV, 1864-1867.

¹⁰Schmidt, Fr.; Flora Sachalinensis, in Reisen im Amurlande und auf der Insel Sachalin (Mém. Acad. Imp. St. Pétersb., 7e Sér., t. XII, n. 2) 1868.

¹¹Siebold et Zuccarini; Flora Japonica. Lugd. Bot. 1835-1870.

¹²Boott, E.; Illustrations of the Genus Carex. 4 vols. 1858-1867.

¹³Many references to the Kurile plants are found in some of the recent monographs, as Haussknecht on Epilobium, Elwes on Lillium, Bunge on Oxytropis, Masters on Japanese Conifers, etc. In Turczaninow's Flora Baicalensis-Dahurica, about half a dozen references occur.

with full consent that it should be published with my own. The list contains one hundred and nine species, of which thirty-eight have not yet been recorded as growing in these islands, in any publications with which I am acquainted.

The first naturalists who visited the Kurile Islands were G. W. Steller and S. P. Krascheninnikof. They crossed over from Kamtschatka about 1740, either together or separately, and collected in the islands of Shumshu and Paramushir.¹ Of their botanical collections, the larger part was worked over and published by Pallas. Some of their sea-weed collections are mentioned in S. T. Gmelin's *Historia Fucorum*.²

In 1788, Merk, a doctor in Irkutsk, who accompanied, as naturalist, the expedition to the Northern Pacific under Comm. Billings, made collections in some of the northern Kuriles. Of his collections, a part is still preserved in the Fischer Herbarium, and also in the Willdenow Herbarium. They were made known chiefly by the labors of Pallas and Rudolph. The results of the study of the latter were published in the writings of Georgi.³

Langsdorff under Krusenstern (1803-1806), and Chamisso under Kotzebue (1815-1818) seem also to have made brief visits to some of the northern Kuriles during their cruise in the N. Pacific.⁴

Most of the later collectors were officers of the Russian surveying ships. In 1833, Baron Wrangell visited Urup and made some collections of its plants. These specimens are now in the Herbarium of the Academy in St. Petersburg. The only collector who made a prolonged tour among these islands, collecting plants on the Shumshu, Paramushir and Urup, was Vosnesenski, the late curator of the Zoological Museum of the Academy, in 1844.⁵

Orloff, a Russian naval officer, who is better known as a collector in the northeastern part of Manchuria, 1849-1850, collected also in the Kuriles.⁶

It must be borne in mind that, on account of strong currents, dense fogs and want of harbors (especially in the northern Kuriles), navigation among these islands is rendered very dangerous, and landing on their shores almost impossible, unless favored with unusually calm weather. Therefore the visits of these collectors were generally limited to a few hours, or, at most, to a day, at one place. Under such unfavorable physical conditions, it is not surprising that in spite of the zeal of many of the collectors who have visited these uninviting shores, we have after all comparatively little knowledge of the vegetation of these islands.

In the summer of 1884, while I was travelling on the northeastern coast of Yezo, an unexpected opportunity for visiting some of the southern Kuriles was offered me. When I reached the harbor of Nemuro on the 27th of July, I found a small steamer on the point of starting for Shikotan, Etorofu, and Urup. With scarcely any time for necessary preparation, I went on board the *Kyovin-maru* accompanied by Mr. N. Kindsichi, the head-gardener of the Botanic Garden of Sapporo Agricultural College, who greatly assisted me in collecting plants during the whole trip. About noon of the next day we were at the Shakotan harbor on the northern coast of the island of Shikotan. In this place we collected most assiduously for two hours and a half. The next day, a little before noon, we reached a small fishing cove on the northern coast of Etorofu, called Furubetsu. From that place we started at once on foot for Shana, another fishing station situated on the same side of the coast about twenty miles distant, and the best harbor of the whole island. The country which we passed through during

¹Krascheninnikof, S. P.; *The History of Kamtschatka and the Kurile Islands* (original in Russian, 1754-1765). English transl. by James Grieve, p. 37. Gloucester, 1764.

— Pallas; *Flora Rossica*, p. III (Introduction).

²Bongard, M. H. G.; *Historical Sketch of the Progress of Botany in Russia*. (Hooker's *Companion to the Botanical Magazine*, Vol. I, p. 177; 1835).

³Sauer, M.; *An Account of a Geographical and Astronomical Expedition to the Northern parts of Russia*, etc., under Comm. J. Billings, in 1785-1794. London, 1802.

— Linnae, VI, p. 574. — Georgi, *Beschr. Russ. Reiches*, III, 4, p. 619.

⁴Regel, *Pl. Radd.* p. 242. — Prof. Maximowicz informs me that Chamisso visited these islands.

⁵These facts I owe to Prof. Maximowicz.

⁶Herder, F. von; *Biographische Notizen über einige in den Plantae Raddesum genannte Sammler und Autoren*, (Engler, *Bot. Jahrbücher*, IX (1887) p. 443. — *Plantae Radd.* IV, I, p. 232.

this short inland trip is of the most diversified character, ranging from sheltered valleys thickly covered with deciduous trees and bamboos to exposed mountain-tops entirely clothed with the straggling *Pinus pumila*, and from sandy and rocky beaches to sphagnous bogs on marine terraces. Thus I was able to observe and collect more than two hundred species of the phanerogams and vascular cryptogams of this island, which, I believe, would fairly represent the general flora of the southern Kuriles.

On the 31st, the steamer took us from Shana to Shibetoro, a fishing station near the northern extremity of the same island. There we had only an hour and a half at our disposal to spend on its hillsides. So far the weather had been uncommonly fine and calm. But the regular Kurile weather soon set in, preventing our landing on the island of Urup.

The number of species that I collected and observed¹ in the island of Etorofu is 202; and in Shikotan, 86. All my Kurile specimens are now preserved in the Herbarium of Sapporo Agricultural College, Japan. What duplicates I had of them I have distributed, together with those of my Yezo collections, to the herbaria of the Imperial University of Tokyo, of the Botanic Garden of St. Petersburg, and of Harvard University.

The first list of my Kurile collections was made soon after my return to Sapporo from that trip in 1884. It was sent to my friend, Prof. J. Matsumura of the Imperial University of Tokyo, who read it for me before the November meeting of the Botanical Society of the same year. By the courtesy of Professor R. Yutabe, I was allowed to spend about five months, in 1885, in his laboratory in the University of Tokyo, working up my Kurile and Yezo collections. Some important corrections were there made in my former list.

But it was not until I came to Harvard University that the idea of publishing this list in the present shape was formed. I am indebted to the late Dr. Asa Gray for first suggesting the publication of such a list, which, in his opinion, would be equally interesting to American and to Japanese botanists.

This work I was able to begin in earnest during the summer of 1888 in the Gray Herbarium, where, by the kindness of Dr. Sereno Watson, I was allowed the use of its extensive collections and library. For this particular work there could be few places better suited than this Herbarium, which is especially rich in specimens from the western and northwestern portions of North America, and the islands in the Behring Sea. The vegetation of eastern and northeastern Asia is also very largely represented by the valuable collections of Charles Wright, Williams and Morrow, J. Small, Maximowicz, Albrecht, Schmidt, Oldham, Tschonoski, Wilford, Augustinowicz, Maries, Stewart and others.

Under each species I have given the range of its geographical distribution, special attention being paid to its limits in the adjoining countries. For this purpose I have availed myself largely of the labors of Ledebour, Maximowicz, Regel, Herdor, Hooker, Gray, Watson, Forbes, Hemsley, Franchet, and many others. As to its range in the rest of Japan, my report is based mainly on the collections in the Imperial University of Tokyo, and also on my own, which especially relates to the island of Yezo.

The citation of the literature under the species is not designed to be complete. As a general rule, I have always referred to some of the principal Floras of the neighboring countries, and also to one or more works of a general character, in which can be found a description of the species. A work in which any reference to the Kurile plant as such is made is usually cited under that species. In the case of a critical species, fuller references to its literature and synonymy are given.

During the preparation of this paper, I have been greatly indebted to Dr. Sereno Watson, whose judgment I have freely sought, and on whose suggestions I have acted, on many points of doubtful and critical character. I owe much also to Prof. G. L. Goeble, who has kindly suggested many valuable changes. To Prof. C. J. Maximowicz I am under very great obligations. To his generosity

¹ Want of space in my press-papers obliged me toward the end of the trip to resort to simply noting down on the

spot the occurrence of plants of whose names I was absolutely certain.

and kindness this paper largely owes any claim it may have to completeness. Prof. W. Trelease kindly supplied me with information relating to the species of *Epilobium*; and Mr. James Bisset, F. L. S., in regard to a certain plant collected by Prof. J. Milne on the northern Kuriles.

PHYSICAL GEOGRAPHY OF THE ISLANDS.

The Kurile Islands, or *Chishima* (Thousand Isles), as they are called in Japan, comprise about twenty-four principal islands, with several smaller ones scattered around them, extending in a regular chain, about 795 miles long, from the southern point of Kamschatka to the island of Yezo. They form the boundary between the Sea of Okhotsk and the Northern Pacific, which attains just south of this group the enormous depth of 27,980 feet.

Until 1875, the islands lying north of Vrica or Etorofu Strait belonged to Russia; but by the treaty of that year the whole of the Kurile Islands were placed under the rule of the Japanese Empire. The name Hokkaido—the North Sea district—is now applied to the Kuriles, Yezo, and its adjacent smaller islands collectively.

Beginning at the north, the islands which are habitable¹ are Shumshu, Paramushir, Shishkotan, Matua, Rishua, Urup, Etorofu or Itarup, Kunashiri and Shikotan. The rest of the islands, chiefly on account of their barrenness and lack of good drinking water, have been left uninhabited. They are visited for game by the inhabitants of the neighboring islands only in times of perfect calm during summer.

Speaking in a general way, the islands are precipitous and unapproachable on the southern side. The few coves and bays which they possess are situated on the northwestern or northeastern sides. These do not serve, however, as safe places of shelter for ships when the wind is unfavorable.

The whole chain of islands is washed by the strong cold currents which come down from the northern part of the Sea of Okhotsk, and also from the Behring Sea. Between the islands there are strong currents, varying in strength from time to time according to the force of the tidal swell from the Pacific. These cold currents, after quitting the Kurile Islands, descend along the eastern and southern coast of Yezo, forming a stream known in Japan as the *Oyashiro*. At times it comes even as far south as Kinkwazan and Inuboie in the main island of Japan.

Quite close to the east of this cold current, a branch of the Kuroshio or Black Stream runs north-eastward to the Behring Sea. According to Blakiston (Japan, Yezo, p. 22), these two opposing currents approach within fifteen miles of each other at Cape Erimo, Yezo, with the difference of temperature of 15° F. Whenever the easterly or southerly wind blows over the region, the whole chain of islands is enveloped in the densest fog. This continues usually for a long time, and is said to surpass even that of the far-famed coasts of Newfoundland.

There is another branch of the Kuroshio, which enters the Sea of Okhotsk through the Strait of La Pérouse, after washing the whole western coast of Japan. Its trace is lost as it approaches the northern coasts of Kunashiri and Etorofu. The effect of this warm current on the climate and vegetation of these two southern islands can hardly be overestimated.

From November till April or May, all the islands are locked up in ice. Even in the month of June navigation in these seas is sometimes made dangerous by the sudden appearance of drifting ice from the north. As to the temperature of these islands, we have no observations for any length of time, or that are of any value. That there exist great differences in the temperature between the northern and southern islands is evident even from the difference in their latitude (about 8°), and from the influence of the different ocean currents. According to the records of the navigators who

¹ Pallas; Neue Beschreibung der Kurilschen Inseln.

(Neue Nordische Beiträge, IV, p. 112-141, 1788.)

have cruised among them, all the islands lying north of Urup are perpetually capped with snow. Their vegetation also indicates decidedly their sub-arctic character.

According to Prof. J. Milne,¹ who has visited the Kurile islands twice since 1878, the whole chain is of volcanic origin. By him and by Captain Snow, fifty-two well-defined volcanic cones were recognized, of which seventeen were active. All these active volcanoes, with the exception of one or two, are confined to the northern Kuriles, where even those which are apparently extinct still preserve their symmetrical slopes, indicating that they have suffered but little from denudation since they were first built up. Professor Milne failed to discover any trace of stratified rocks in the northern group. From these observations he concludes that the formation of the northern Kuriles must be comparatively recent; and, in fact, some of them are now actively forming.

On the other hand, the volcanoes of Kunashiri and Etorofu are mostly rounded in shape and deeply cut by valleys. The neighboring island of Urup presents appearances similar to these two. Along the coasts of these islands, Professor Milne noticed the existence of stratified rocks and terrace formation. These facts show that they are older than the other members of the Kurile group, and formed "the first of a series of stepping stones, which connects Japan, by means of Kamtschatka, with the remainder of Asia." Accepting Croll's theory as true, the presence of marine terraces in the southern Kuriles forms good evidence of their existence before the Glacial Epoch.

CHARACTER OF THE KURILE FLORA AND ITS RELATIONS TO THE FLORA OF THE NEIGHBORING COUNTRIES.

According to our present knowledge, the number of orders, genera and species in the Kurile flora, under each of the greater divisions of the vegetable kingdom, is as follows:—

	Orders.	Genera.	Species.
Polypetalæ.	21	69	121
Gamopetalæ.	14	58	100
Monochlamydeæ.	6	12	19
Dicotyledons.	41	139	240
Monocotyledons.	7	33	53
Angiospermæ.	48	172	293
Gymnospermæ.	1	5	6
Phanerogamæ.	49	177	299
Cryptogamæ (Vascul.)	4	10	18
Total.	53	187	317

Among the orders, those which are comparatively rich in genera and species stand in the following sequence:—

Composite, with 15 genera.		Composite, with 30 species.	
{ Rosaceæ,	" 12 "	Rosaceæ,	" 23 "
{ Liliaceæ,	" 12 "	Graminæ,	" 17 "
Graminæ,	" 11 "	Ericaceæ,	" 16 "
{ Ranunculaceæ,	" 8 "	{ Caryophyllaceæ,	" 15 "
{ Ericaceæ,	" 8 "	{ Liliaceæ,	" 15 "
{ Crucifereæ,	" 7 "	Scrophulariaceæ,	" 14 "
{ Umbellifereæ,	" 7 "	Ranunculaceæ,	" 13 "

¹Milne, J.: A cruise among the volcanoes of the Kurile Islands (Geological Magazine, 1879, p. 387). — The Kurile Islands (Geol. Mag., 1880, p. 91). — Evidences of the Glacial Period in Japan (Trans. Asiatic Soc. of Japan,

1881, p. 53). — Notes on the Kurile Islands, which appeared in the Japan Gazette in the spring of 1885 (not seen; extracts from it in Nature, 1885, pp. 135 and 209).