ATLAS OF THE DISTRIBUTION OF ALPINE PLANTS IN HOKKAIDO

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Preface

Upto the present, the senior author has published papers[1)~6)] on the alpine plants of Northern Japan. But an atlas of the distribution of alpine plants has not yet been published. The materials of the present study were mostly based on specimens preserved in the Herbarium of the Agriculture, Hokkaido University.

This atlas should elucidate the character of the distribution of alpine plants in Hokkaido. For convenience, the scientific names of the species mostly follow OHWI's Flora of Japan, English edition.

We must express our sincere thanks to Prof. Dr. Toshio ISHIKAWA and Prof. Dr. Yoshio KATSUI in the Geological Institute of the Faculty of Science, Hokkaido University for their valuable help in supplying data concerning the geological composition of Hokkaido.

Phisiography

Hokkaido known under the name of "Yezo" from olden times, extends from Lat. 41°24′N. to 45°31′N., and from Long. 139°45′E. to 145°49′E. It

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1) TATEWAKI, M.: Taxonomical study of plants growing in the alpine belt in Yezo. I. Journ. Sapporo Agr. & Forest. **26**-(120). 1~45. (1934); II. ibid. **28**-(131). 21~48. (1936); III. ibid. **29**-(143). 1~26. (1938). (in Japanese)

2) ——————: Phytosociological study on the alpine plants in Yezo. Ecol. Rev. **13**. 101~112. (in Japanese). (1935).

3) —————— and SAMEJIMA, J.: Alpine plants of the central mountain district, Hokkaido, Japan. 1~70. (in Japanese). Bot. Inst. Fac. Agr. Hokkaido Univ. (1959).

4) ——————: Alpine plants in Hokkaido. Sci. Rep. Tohoku Univ. Ser. IV (Biol.) **29**. 165~188. (1963).

5) ——————: Distribution of alpine plants in Northern Japan. Arctic and alpine environments (H. E. WRIGHT, Jr. and W. H. OSBURN, eds.). 119~136. Indiana Univ. Press. (1967).

6) ——————: The geobotanical relationship between Beringia and Northern Japan, with special reference to the arctic-alpine flora of the latter. Journ. Fac. Agr. Hokkaido Univ. **57**-3. 340~348. (1974).

is almost rhombic in outline, with a fish tail shaped extension called the Oshima Peninsula on the southwest and two small bifurcate arms called the Shiretoko and Nemuro Peninsulae at the east end. Its maximum length from south to north and its greatest width from east to west are about 386 km in each direction, and it has an area of 77,900 square kilometers. Hokkaido, separated on the south from Honshu by the Tsugaru Strait and on the north from Sakhalin by the Sôya Strait, is surrounded by the Sea of Japan on the west, the Sea of Ochotsk on the north, and the Pacific Ocean on the south. As Hokkaido is situated at the conjunction of the elongational lines of the mainland of Japan, Sakhalin and the Kurils, the distribution of the alpine plants under consideration occupies a very important place in respect to their phytogeographical positions and their interesting relationships to the flora of the mainland.

From physiographical and geological points of view, Hokkaido may be divided into four, viz. the southwestern, the central, the northwestern and the eastern parts running parallel to the former three in a longitudinal direction (J. SUZUKI, 1952 and 1958; Geol. Surv. Japan, 1967). The northwestern and the central parts from the southwestern part are distinctly separated by a median depression, extending from the Ishikari plain to the vicinity of Tomakomai on the Pacific coast, though the eastern and central parts are not so sharply delimited. The depression zone is now deeply burided under alluvial deposits.

Southwestern Part: The whole surface of southwestern Hokkaido is mountainous, though high peaks are not numerous. It consists of the Neogene Tertiary, the basement rocks of pre-Cretaceous age, and various kinds of plutonic and volcanic rocks. The basement rocks which include the fossiliferous limestones of Carboniferous and Jurassic periods, is represented in the mountain group of the Matsumae district at the southwestern side. On the eastern side, there are, however, many active and extinct volcanoes belonging to the extension of the Nasu volcanic belt and extending from south to north, of which the following are noted: —Mt. Komagatake (1133 m); Mt. Yôtei (1893 m), Mt. Nisekoan-nupuri (1309 m), Mt. Usu (725 m), Mt. Tarumae (1024 m), and Mt. Eniwa (1320 m). The highest peak is Mt. Yôtei, otherwise known as Yezo-fuji from similarity in a graceful shape to the famous Fuji in Honshu. The alpine flora of this mountain is under the protection of the natural monument regulation.

Central Part: The Central Mountain System (the so-called Yezo Mountain System) situated in central Hokkaido, forms the backbone of the main island, trending in a south-south-east to north-north-west direction from

near Cape Erimo to Cape Sôya. It comprises the most prominent mountain ranges consisting of many high mountain chains and having a very complex construction. These mountains are made up partly of the pre-Cretaceous sediments, partly of plutonic and metamorphic, and partly of volcanic rocks. The six mountain groups are defined from south to north, viz. the Apoi Massif, the Hidaka Range, the Yûbari Range, the Central Plateau, the Uryu Massif and the Kitami Range.

The Hidaka Range occupies the southern part of the Yezo Range. Comparatively high peaks, a few of which exceed 1900 m in height, are located in this range. It is mostly composed of rocks of the Hidaka supergroup, regional metamorphic rocks, and granitic and other plutonic rocks. The summits are densely covered with straggling dwarf pine and its alpine flora is comparatively poor in species. Slight traces of glaciers were recently discovered, though there are no glaciers at present in our district. It is believed that the presence of the glacial features indicates a former glaciation probably contemporaneous with that of Pleistocene time in Hokkaido.

The Apoi Massif, a disjunctive small mountain group, is situated in the western part of the southernmost Hidaka Range. It is composed of peridotite belonging to Mesozoic time and connected to the northwest with the Yûbari Range. Only two mountains, namely Mt. Apoi (811 m) and Mt. Pinneshiri (958 m) are prominent. In spite of the rather low altitude, the Apoi Massif has a wonderful alpine flora including many endemic and rare plants. At present it is kept under the protection of the natural monument regulation.

The Yûbari Range is located on the northwestern side of the Hidaka Range and on the southwestern side of the Central Plateau, extending from south to north. It is mostly of the Mesozoic, with peaks towering to a height of 1900 m. The alpine meadows of the Yûbari Range are well known in Japan as a vast treasury of the alpine plants and have a deep significance for the phytogeographer.

The elongation of the serpentine district is seen in the western part of the central Hokkaido, namely the Uryu Massif. Mt. Shiratori (776 m) has the representative alpine flora.

The Central Plateau, the highest mountain group in northern Japan, lies near the central part of Hokkaido. There are found the highest peaks in Hokkaido, having an elevation of about 2000 m. Alpine meadows and bogs are plentiful, with many interesting boreal plants. Nowhere in northern Japan are there more extensive alpine meadows so rich in species. Volcanic rocks developed in this group are composed of liparitic, andesitic, basaltic,

and their pyrolastic rocks. The Central Plateau consists of about 20 main peaks, among which Mt. Asahi (2290 m) and Mt. Tokachi (2077 m) are the representative volcanoes.

The Central Mountain System forks and becomes gradually lower to the north in the Kitami Ranges. It is partly of Paleozoic rocks. The highest peak of the cluster, Mt. Horonupuri, has a height of 839 m and has an interesting alpine flora.

Northwestern Part: The Kabato Massif is mainly composed of the pre-Cretaceous sediments, in the southern part, while of Pleistocene andesite in the northern part. There are Mts. Matsuneshiri (1100 m) and Kumaneshiri (971 m) in the former part and Mts. Syokanbetsu (1491 m) and Hamamasu (1258 m) in the latter.

Off the northern end of Hokkaido, Rishiri and Rebun islands are isolated, and they are one of the northern treasuries of alpine and subalpine species. The former is a typical volcanic island with a peak, Mt. Rishiri (1719 m), and is made up mainly of Pleistocene basalt and andesite associated with their pyroclastics. The latter is, on the contrary, generally hill with the altitudes of 200~300 m, excepting with Mt. Rebun (490 m), and consists mainly of Neogene Tertiary rocks, partly of the Cretaceous.

Eastern Part: Eastern Hokkaido is made up of low hills or uplands of Tertiary and Mesozoic formations with subordinate amounts of the Hidaka group. In the northeastern part, there is a chain of extinct and active volcanoes, running eastward to the extremity of the Shiretoko Peninsula. It extends from northeast to southwest and is recognised as a member of the southwestern extreme of the volcanic belt of the Kurils. Mt. Iwô (1563 m), Mt. Rausu (1661 m), Mt. Syari (1545 m), Mt. Oakan (1371 m) and Mt. Meakan (1499 m) are well known, and are composed mostly of andesitic rock, Among them, the alpine flora of Mt. Oakan and Mt. Meakan in the Akan National Park has been protected. The alpine vegetation of each peak differs from the other, showing the interesting contrast between flora of extinct and active volcanoes.

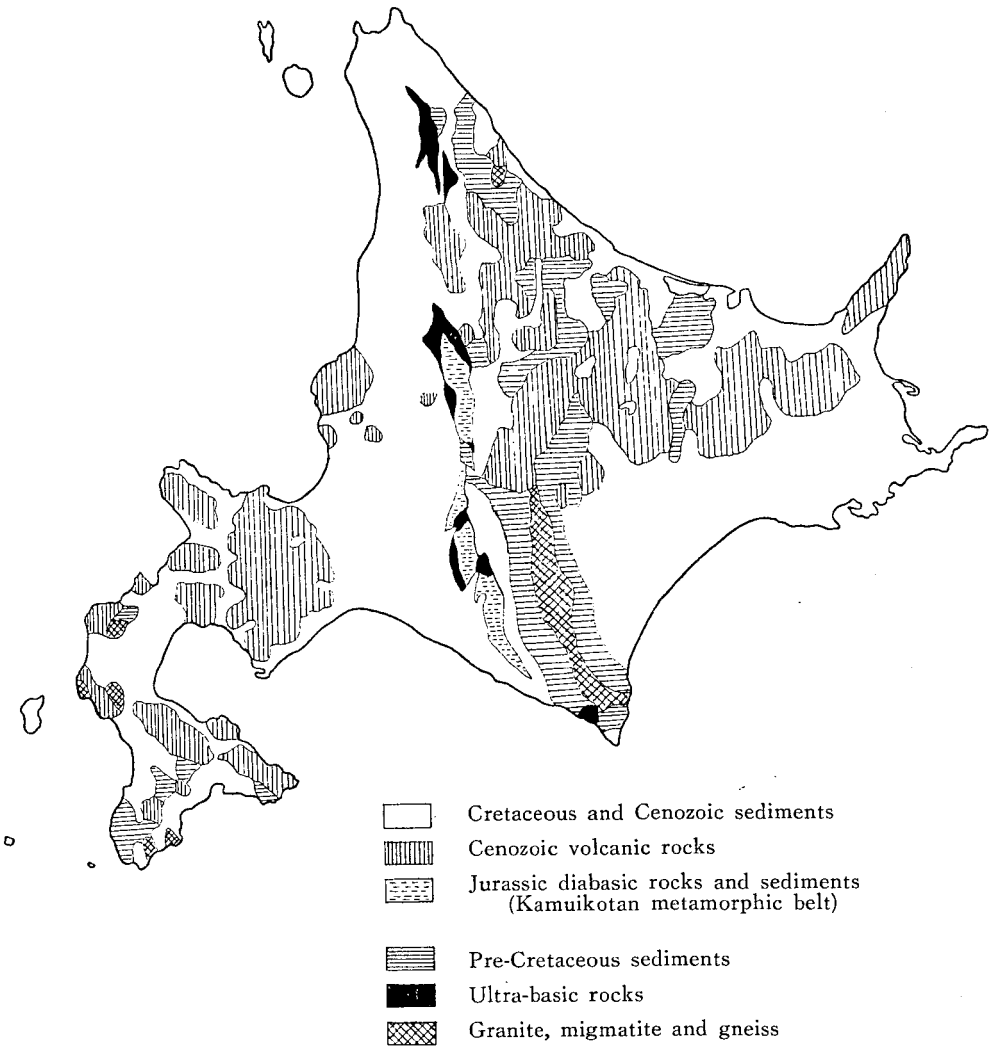
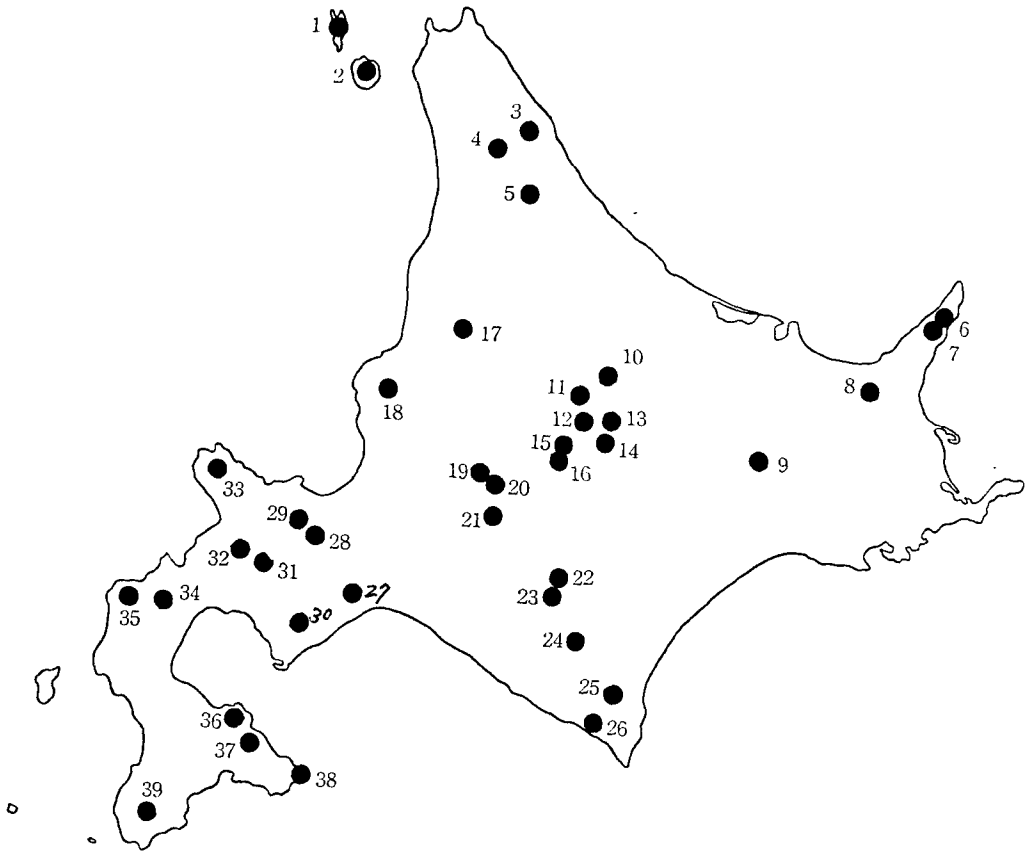


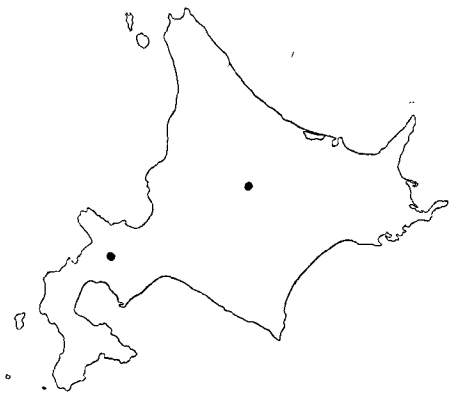
Fig. 1. Geological sketch map of Hokkaido
(simplified from Prof. Dr. J. SUZUKI, 1952*)

* SUZUKI, J.: Ultrabasic rocks and associated ore deposits of Hokkaido, Japan. Journ. Fac. Sci. Hokkaido Univ. Ser. IV. 8. 175~210. (1952).



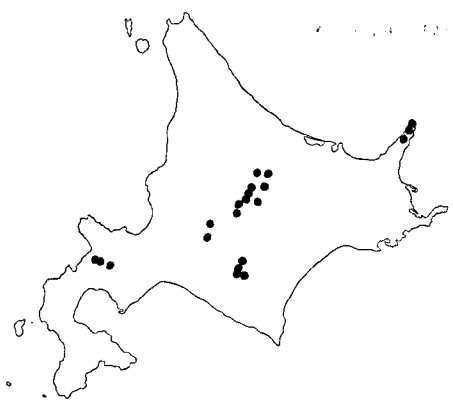
1. Mt. Rebun	(490m),	2. Mt. Rishiri	(1719m),	3. Mt. Horonupuri	(839m),
4. Mt. Panke	(632m),	5. Mt. Hakodake	(1129m),	6. Mt. Iwô	(1563m),
7. Mt. Rausu	(1661m),	8. Mt. Syari	(1545m),	9. Mt. Meakan	(1499m),
10. Mt. Niseikausyuppe	(1879m),	11. Mt. Asahi	(2290m),	12. Mt. Tomuraushi	(2141m),
13. Mt. Ishikari	(1962m),	14. Mt. Nipesotsu	(2013m),	15. Mt. Tokachi	(2077m),
16. Mt. Furano	(1912m),	17. Mt. Shiratori	(776m),	18. Mt. Syokanbetsu	(1419m),
19. Mt. Kirigishi	(1073m),	20. Mt. Ashibetsu	(1727m),	21. Mt. Yûbari	(1668m),
22. Mt. Pipairo	(1917m),	23. Mt. Poroshiri	(2052m),	24. Mt. Petegari	(1736m),
25. Mt. Rakko	(1472m),	26. Mt. Apoi	(811m),	27. Mt. Tarumae	(1024m),
28. Mt. Zyozankei-tengu	(1145m),	29. Mt. Yoichi	(1488m),	30. Mt. Orofure	(1231m),
31. Mt. Yôtei	(1893m),	32. Mt. Nisekoan-nupuri	(1309m),	33. Mt. Syakotan	(1255m),
34. Mt. Ôhira	(1191m),	35. Mt. Kariba	(1520m),	36. Mt. Komagatake	(1133m),
37. Mt. Yokotsu	(1167m),	38. Mt. Esan	(618m),	39. Mt. Daisengen	(1072m).

Fig. 2. Important mountains, Hokkaido



1. Lycopodium alpinum Linn.

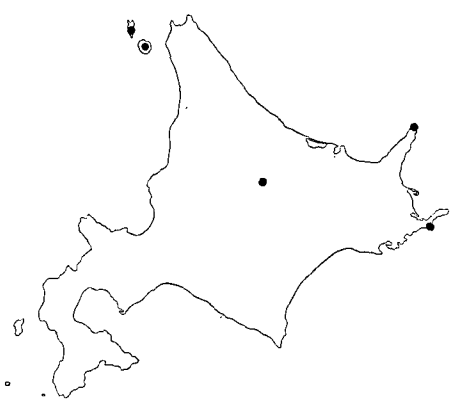
2. Lycopodium selago Linn. var. appressum Desv.



3. Lycopodium sitchense Rupr. var. nikoense Takeda

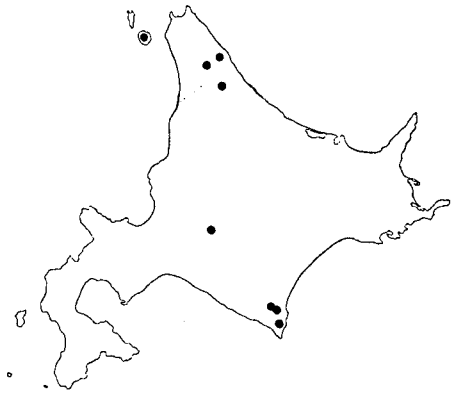
4. Selaginella selaginoides Link

5. Botrychium lanceolatum Angstr.

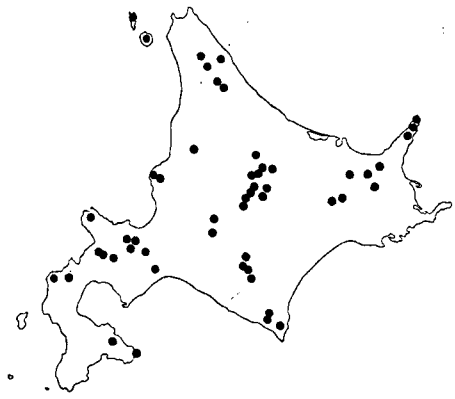


6. Botrychium lunaria Swartz

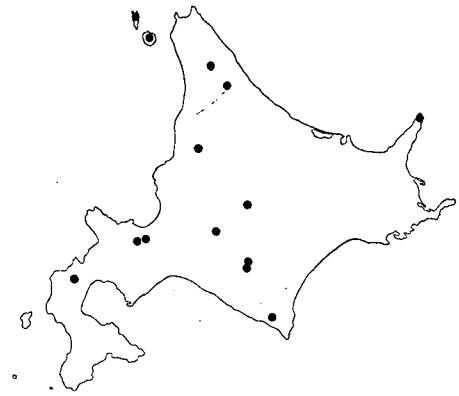
7. Athyrium alpestre Rylands



8. Cryptogramma crispa R. Br.

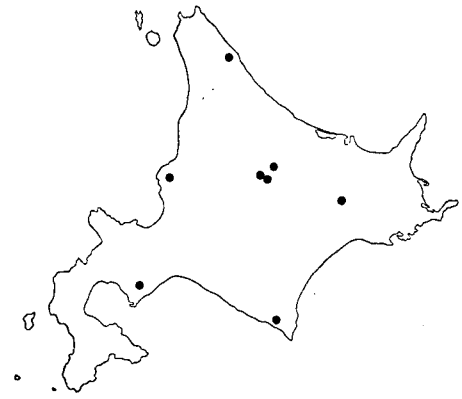


9. Pinus pumila Regel



10. Juniperus communis Linn. var. montana Ait.

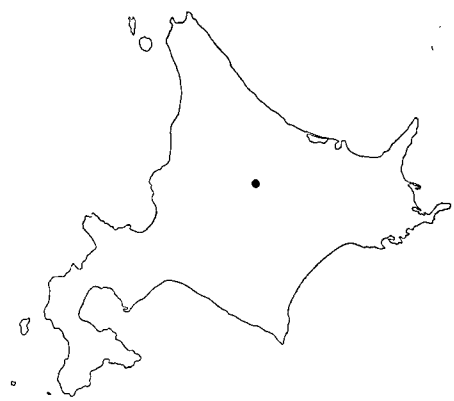
11. Salix hidaka-montana Hara



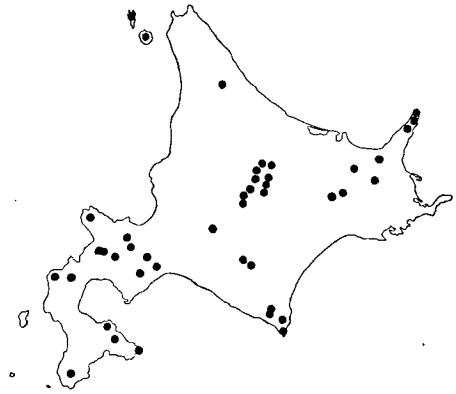
12. Salix hidewoi Koidz.

13. Salix paludicola Koidz.

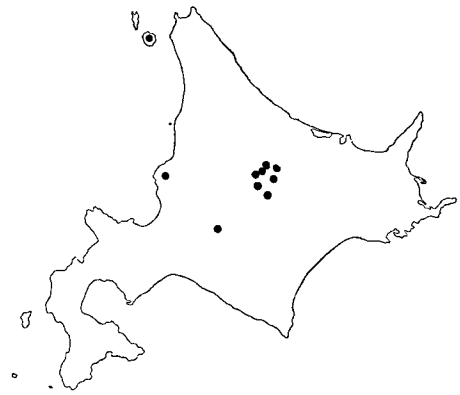
14. Salix pauciflora Koidz.



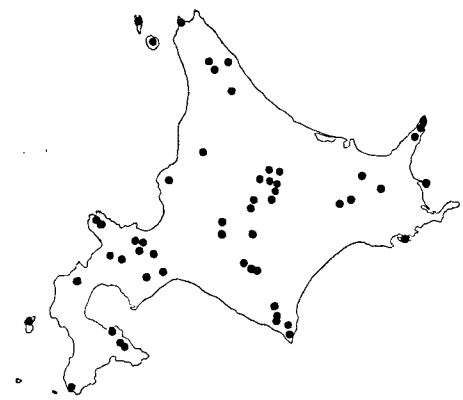
15. Salix pseudo-paludicola Kimura



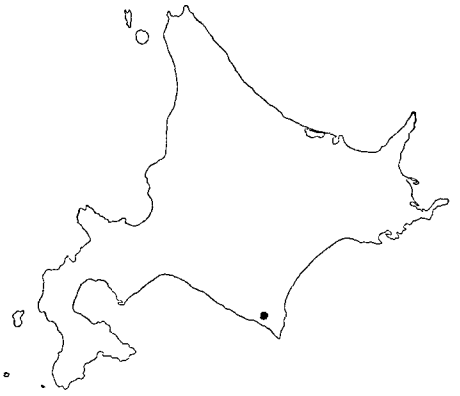
16. Salix reinii Franch. et Savat.



17. Salix yezoalpina Koidz.

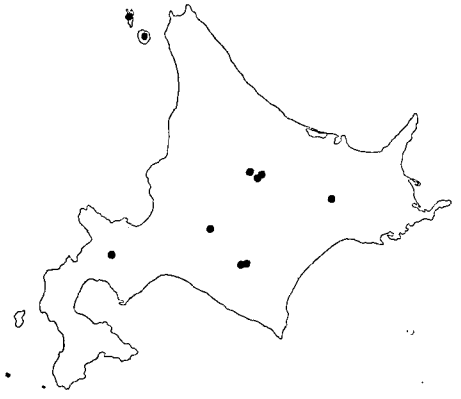


18. Alnus maximowiczii Callier

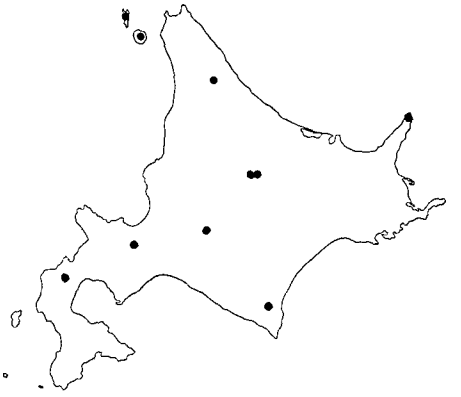


19. Betula apoiensis Nakai

20. Oxyria digyna Hill



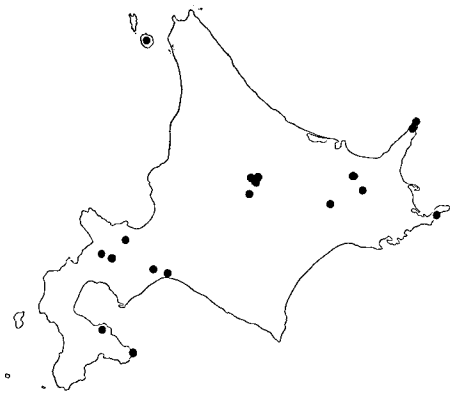
21. Polygonum ajanense Grig.



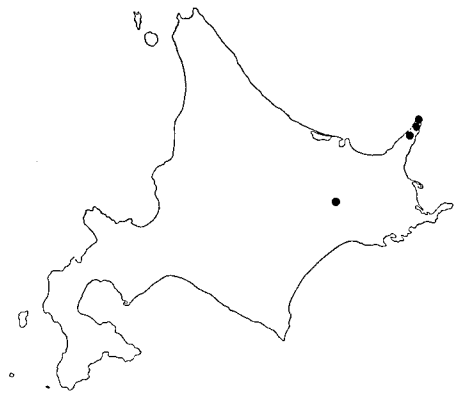
22. Polygonum bistorta Linn.

23. Polygonum nakaii Ohwi

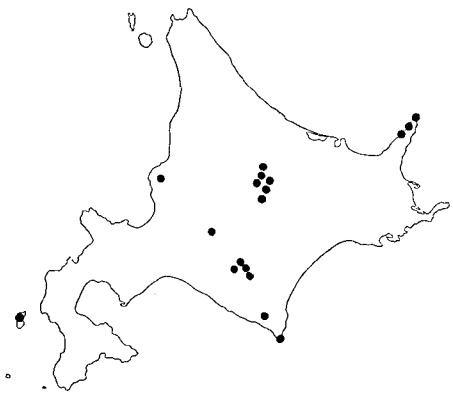
24. Polygonum viviparum Linn.



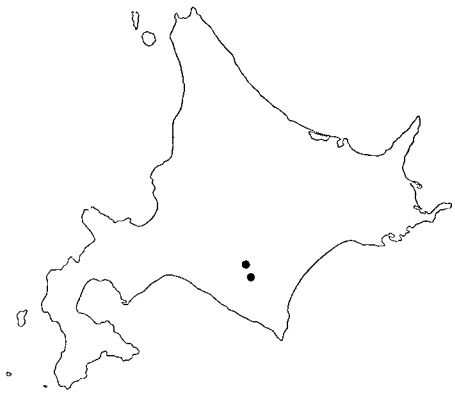
25. Polygonum weyrichii Fr. Schm.



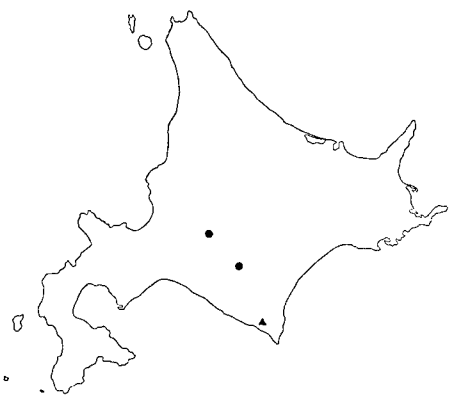
28. Arenaria merckioides Maxim.



26. Rumex montanus Desf.



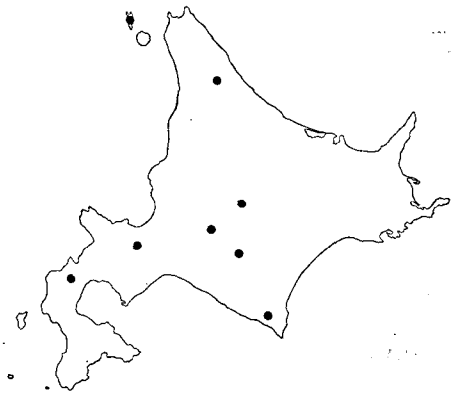
29. Melandryum hidaka-alpinum Miyabe et Tatew.



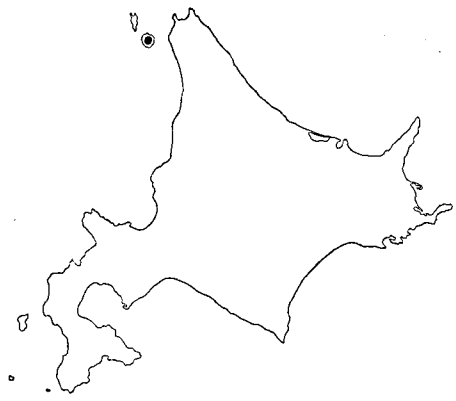
27. Arenaria katoana Makino
● var. katoana, ▲ var. lanceolata Tatew.

30. Minuartia arctica Aschers. et Graebn.

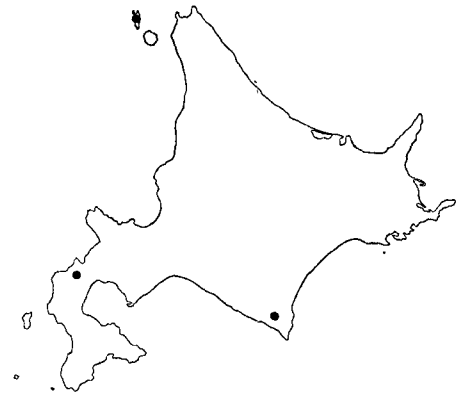
31. Minuartia macrocarpa Ostenf. var. minutiflora Hult.



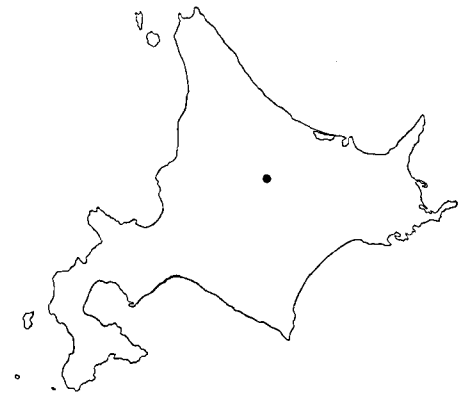
32. Minuartia verna Hiern. var. japonica Hara



33. Sagina saginoides Karsten

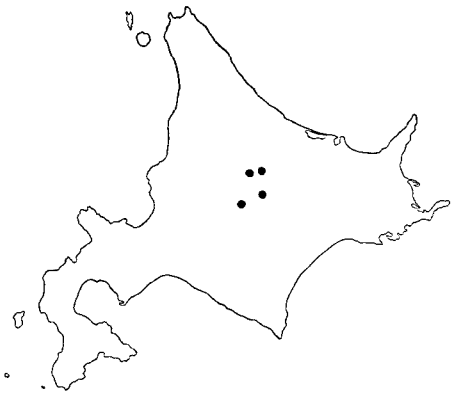


34. Silene repens Pers.

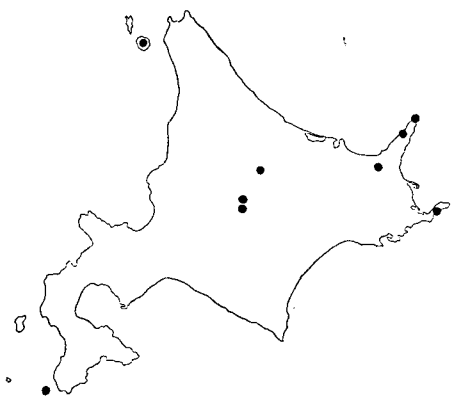


35. Stellaria calycantha Bongard

36. Stellaria nipponica Ohwi var. yezoensis Hara



37. Stellaria pterosperma Ohwi

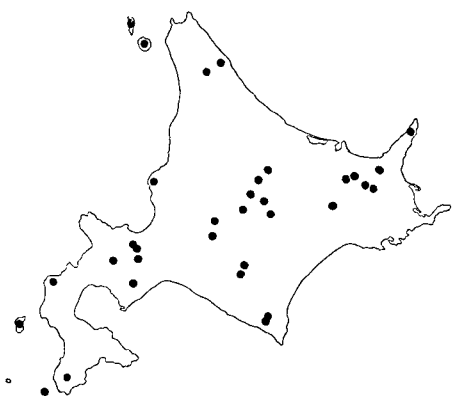


38. Stellaria ruscifolia Willd.

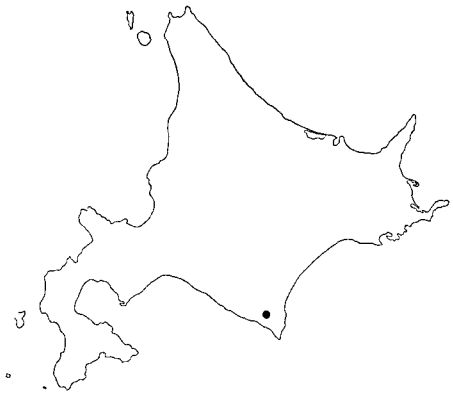
39. Aconitum yamazakii Tamura et Namba

40. Aconitum yuparense Takeda

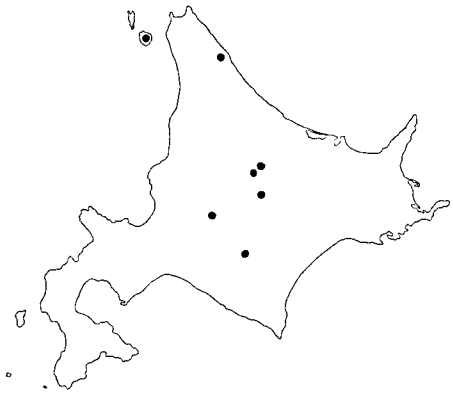
41. Anemone narcissiflora Linn.



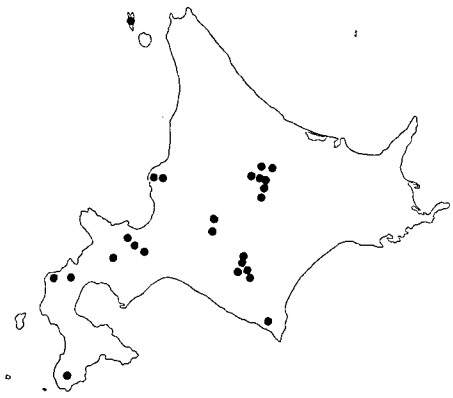
42. Aquilegia flabellata Sieb. et Zucc. var. pumila Kudo



43. Callianthemum miyabeanum Tatew.

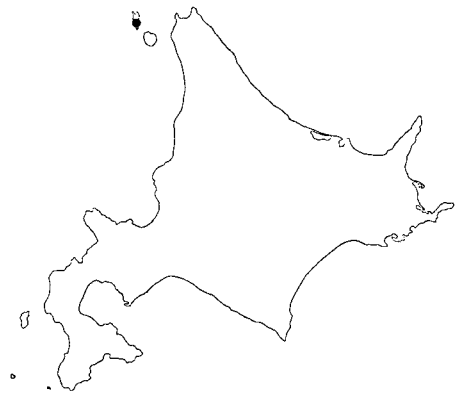


44. Pulsatilla nipponica Ohwi

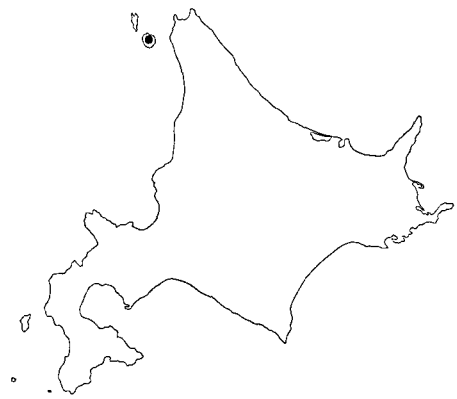


45. Ranunculus acris Linn. var. nipponicus Hara

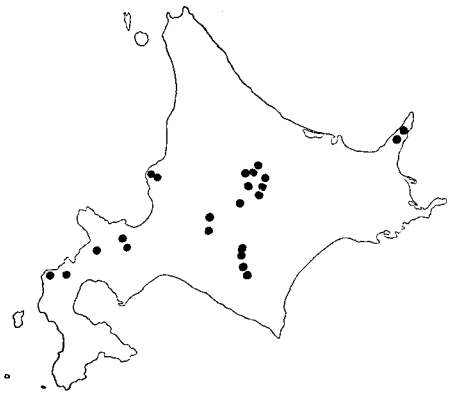
46. Trollius citrinus Miyabe



47. Trollius ledebourii Reichenb. var. polysepalus Regel



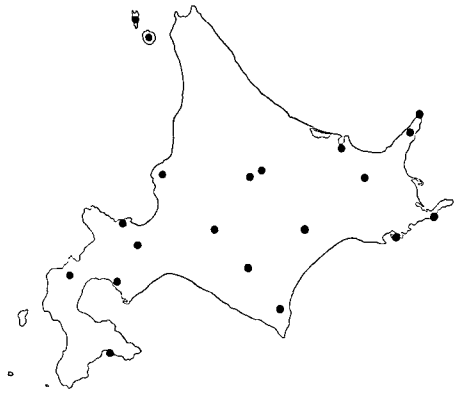
48. Trollius pulcher Makino



49. Trollius riederianus Fischer et Meyer (incl. var. japonicus Ohwi)

50. Dicentra peregrina Makino

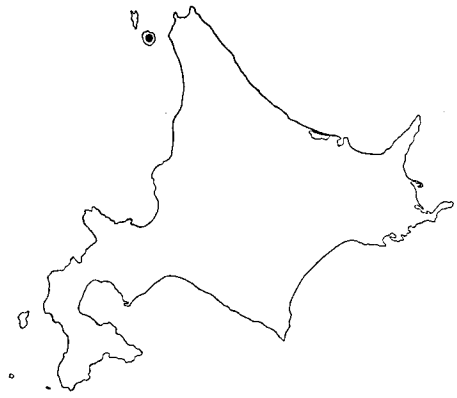
51. Papaver fauriei Fedde



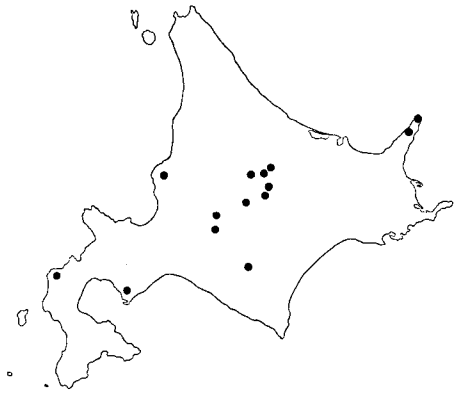
52. Arabis lyrata Linn. var. kamtschatica Fischer

53. Cardamine nipponica Franch. et Savat.

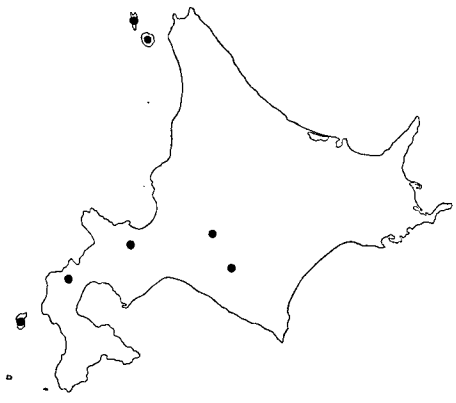
54. Draba japonica Maxim.



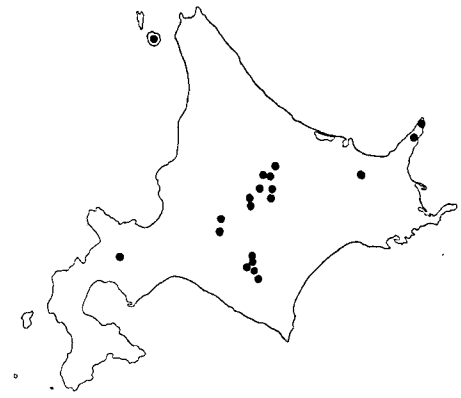
55. Draba mongolica Turcz.



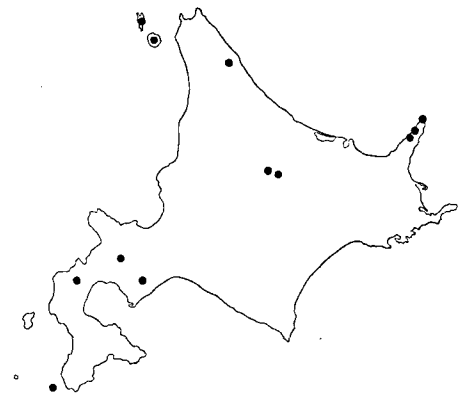
56. Macropodium pterospermum Fr. Schm.



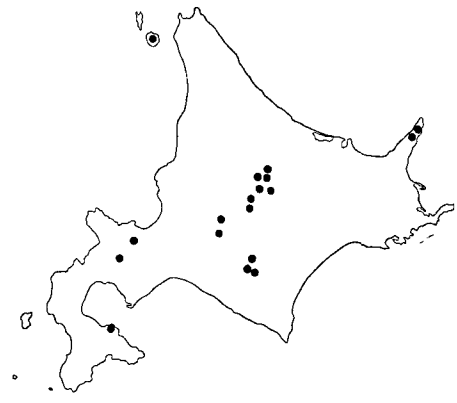
57. Thlaspi japonicum H. Boiss.



58. Sedum ishidae Miyabe et Kudo

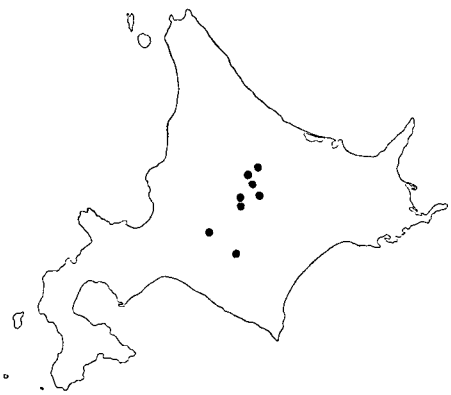


59. Sedum rosea Scop.

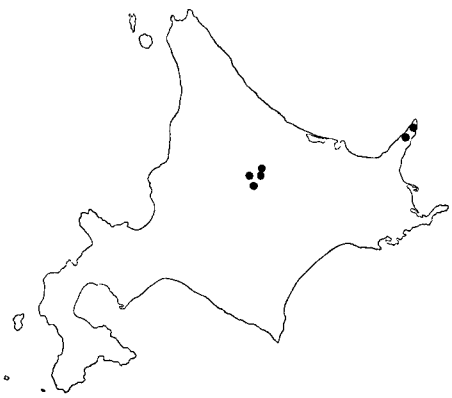


60. Boykinia lycoctonifolia Engler

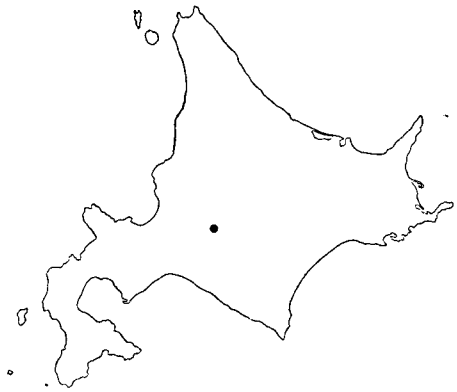
61. Saxifraga cherlerioides D. Don
●var. rebunshirensis Hara, ▲form. togakushiensis Ohwi



62. Saxifraga laciniata Nakai et Takeda

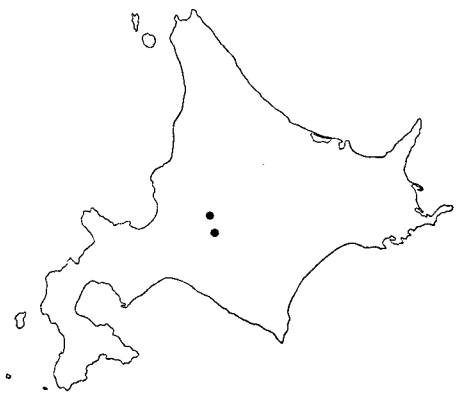


63. Saxifraga merkii Fischer var. merkii

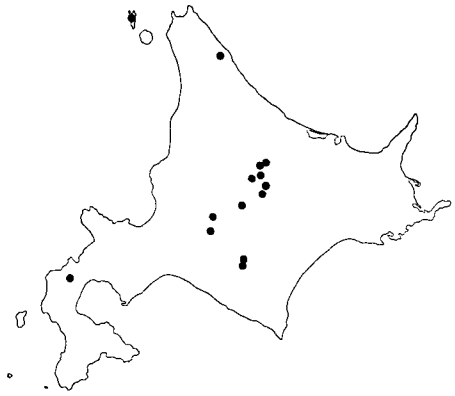


64. Saxifraga nishidae Miyabe et Kudo

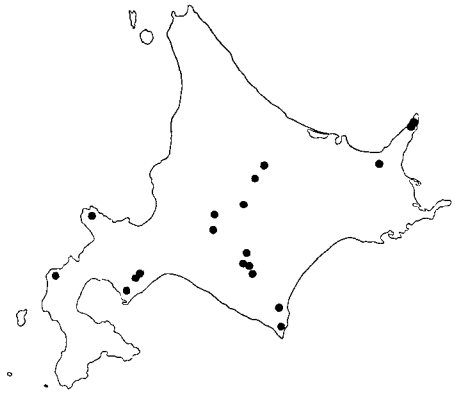
65. Saxifraga reniformis Ohwi



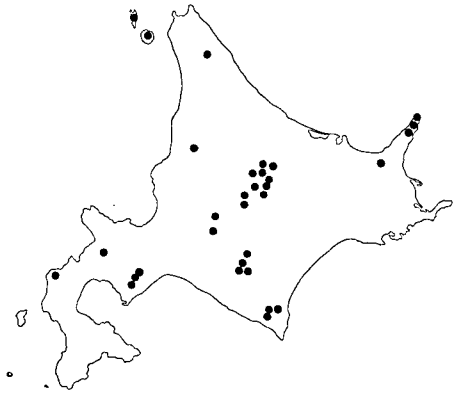
66. Alchemilla japonica Nakai et Hara



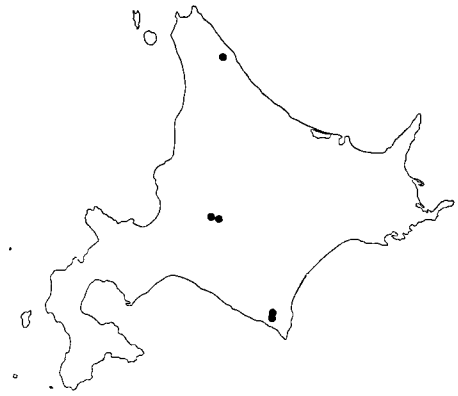
67. Dryas octopetala Linn. var. asiatica Nakai



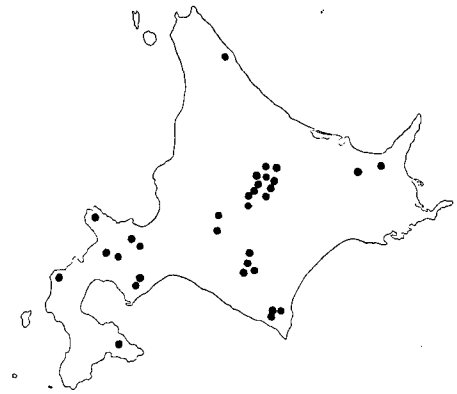
68. Geum calthaefolium Smith var. nipponicum Ohwi



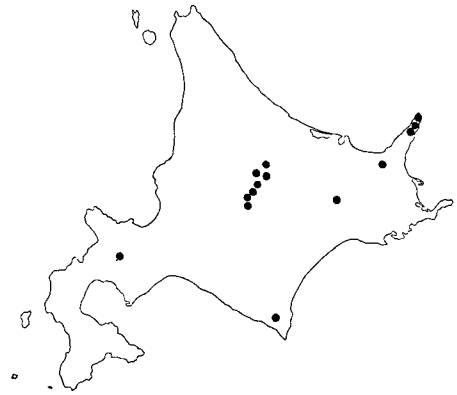
69. Geum pentapetalum Makino



70. Potentilla fruticosa Linn.

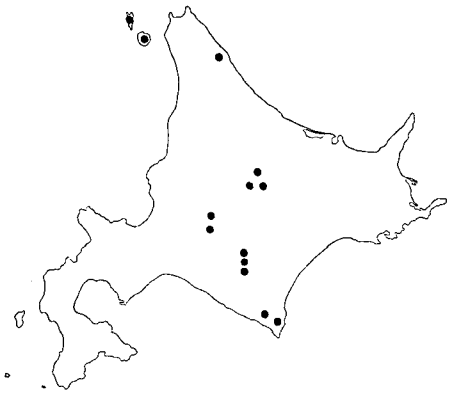


71. Potentilla matsumurae Th. Wolf



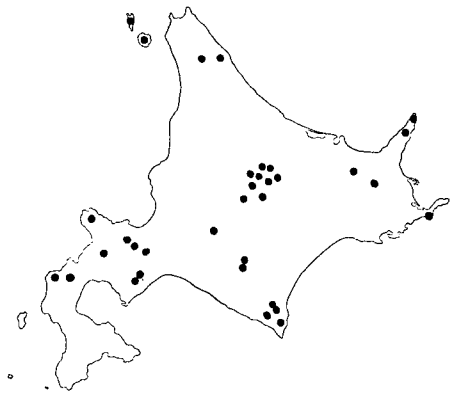
72. Potentilla miyabei Makino

73. Potentilla nivea Linn.

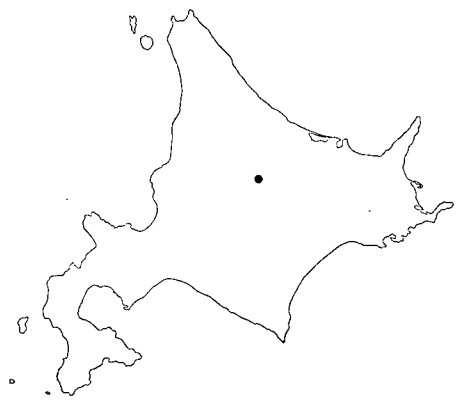


76. Sorbus pseudogracilis Koehne

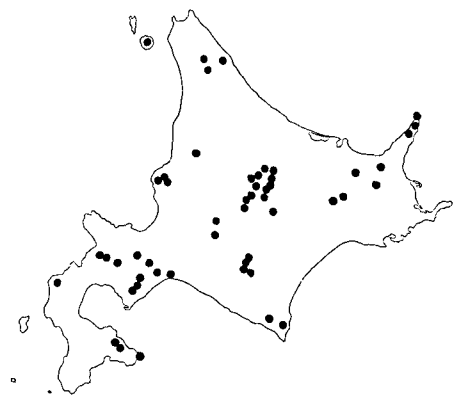
74. Sanguisorba stipulata Rafin.
● var. stipulata, ▲ var. riishirensis Hara



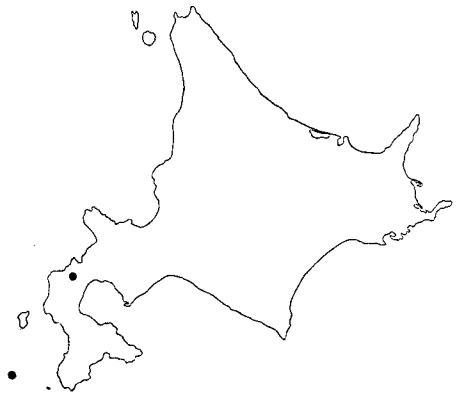
77. Sorbus sambucifolia Roem.



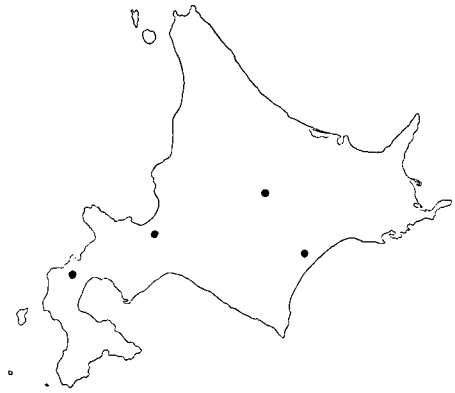
75. Sibbaldia procumbens Linn.



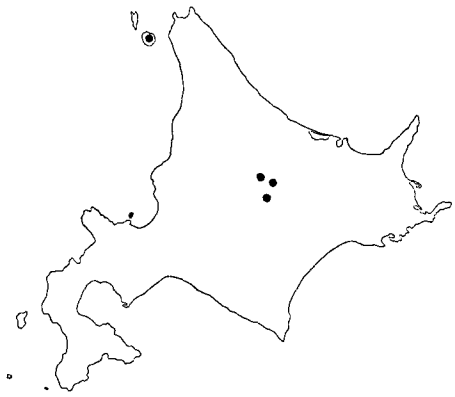
78. Spiraea betulifolia Pall. (incl. var. aemiliana Koidz.)



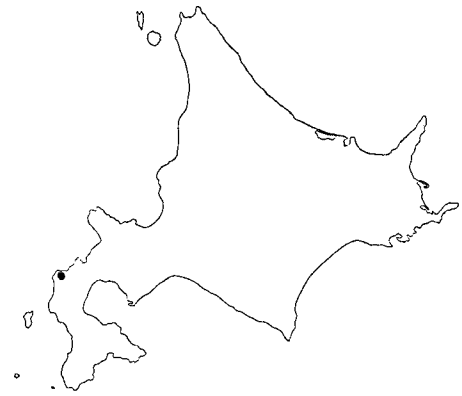
79. Astragalus adsurgens Pall.



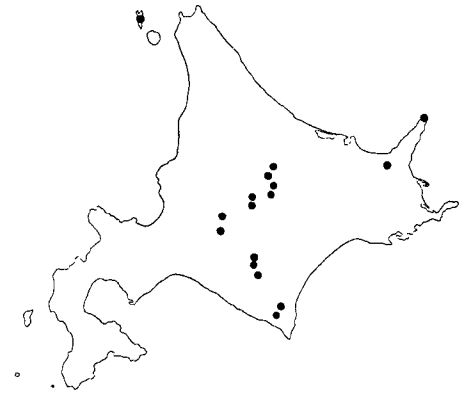
80. Astragalus membranaceus Bunge var. obtusus Makino



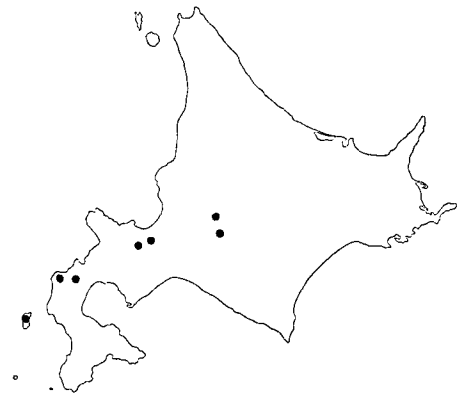
81. Astragalus secundus DC.



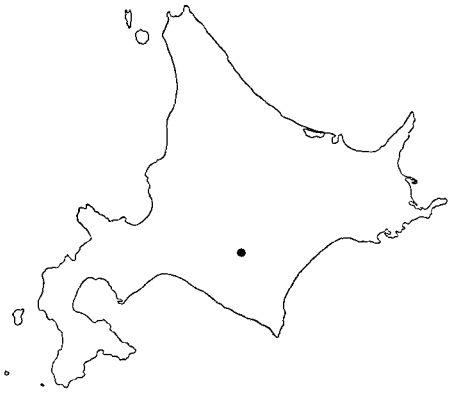
82. Astragalus yamamotoi Miyabe et Tatew.



83. Hedysarum hedysaroides Schinz et Thell.



84. Hedysarum vicioides Turcz.

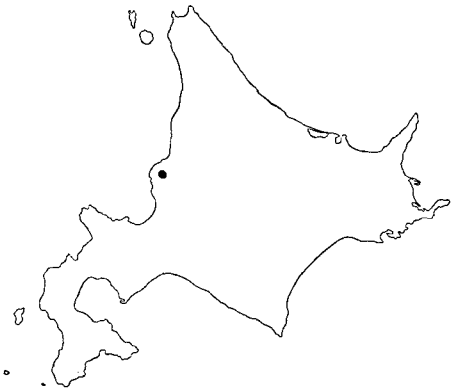


85. Oxytropis hidaka-montana Miyabe et Tatew.

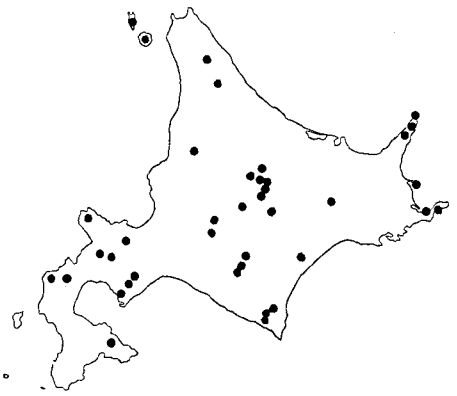
86. Oxytropis japonica Maxim. var. sericea Koidz.

87. Oxytropis kudoana Miyabe et Tatew.

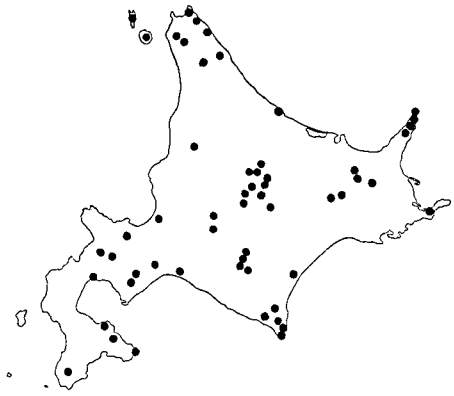
88. Oxytropis rishiriensis Matsum.



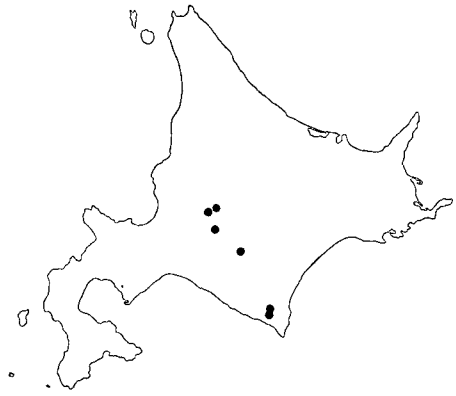
89. Oxytropis shokanbetsuensis Miyabe et Tatew.



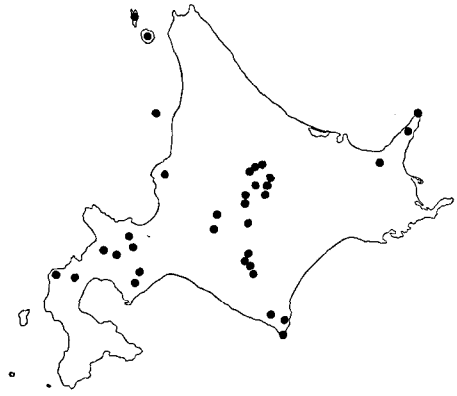
90. Geranium erianthum DC.



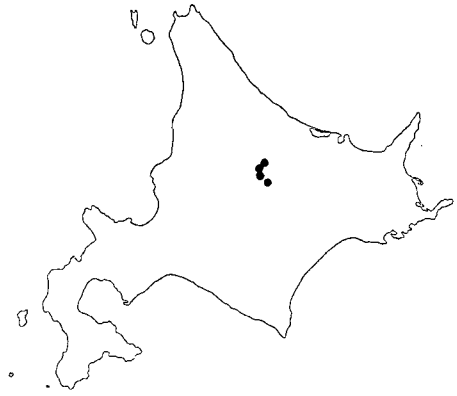
91. Empetrum nigrum Linn. var. japonicum K. Koch



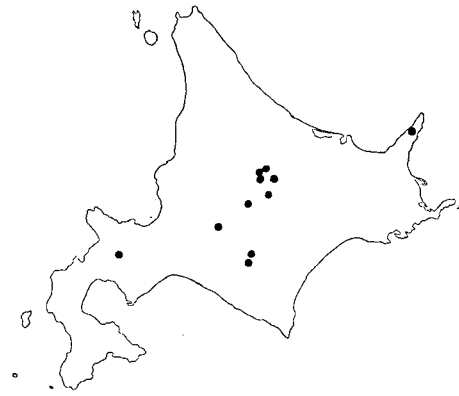
92. Rhamnus ishidae Miyabe et Kudo



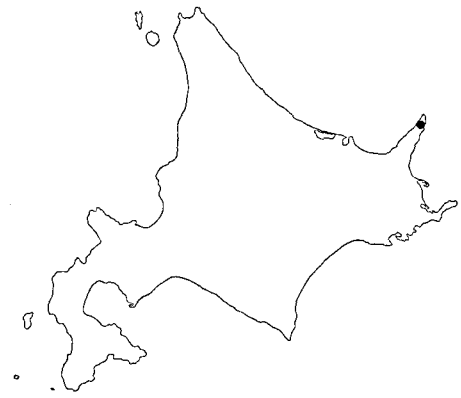
93. Hypericum kamtschaticum Ledeb.



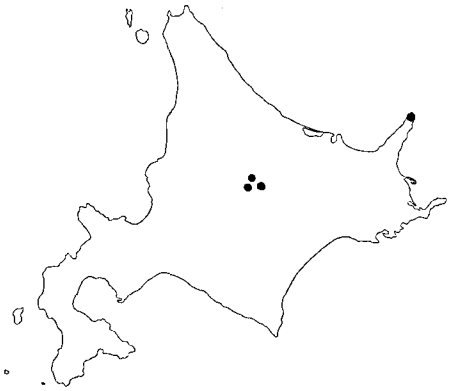
94. Viola alliariaefolia Nakai



95. Viola crassa Makino

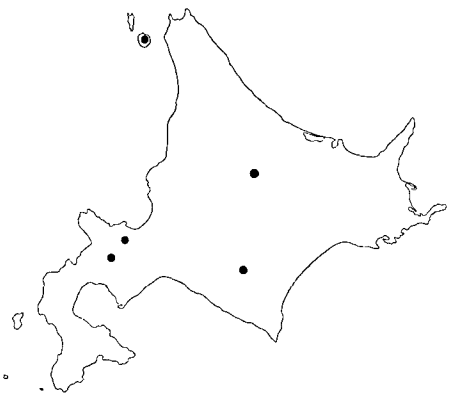


96. Viola kitamiana Nakai

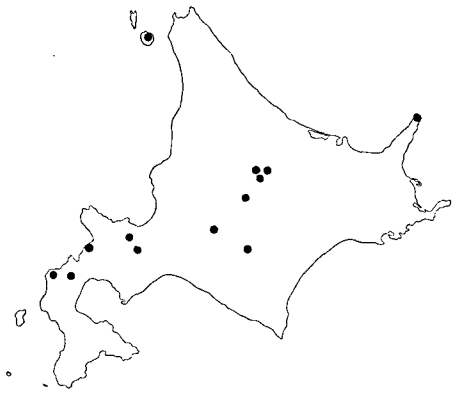


97. Viola repens Turcz.

98. Viola yubariana Nakai



99. Epilobium dielsii Léveillé

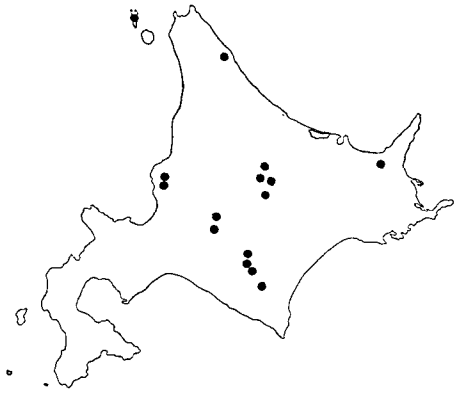


100. Epilobium foucaudianum Léveillé

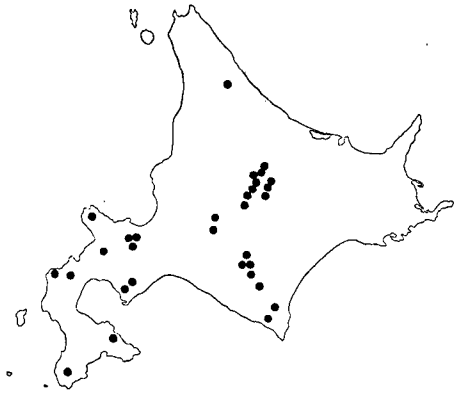
101. Epilobium shiroumense Matsum. et Nakai

102. Angelica stenoloba Kitagawa

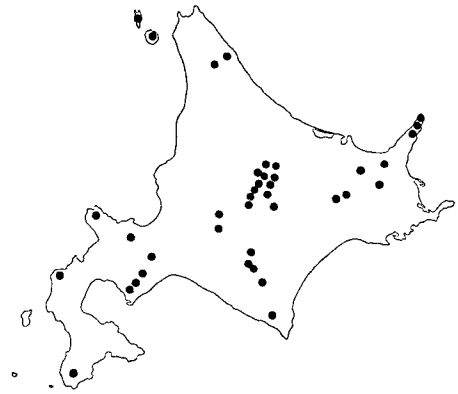
103. Bupleurum nipponicum Koso-Poliansky var. yesoense Hara



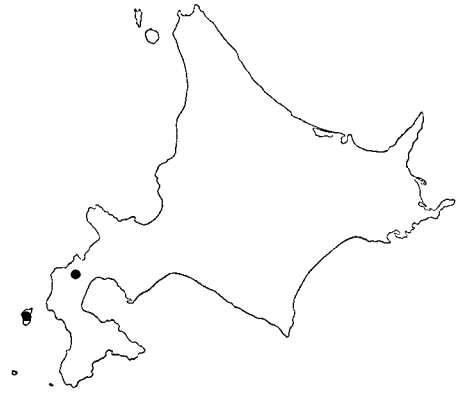
104. Bupleurum triradiatum Adams



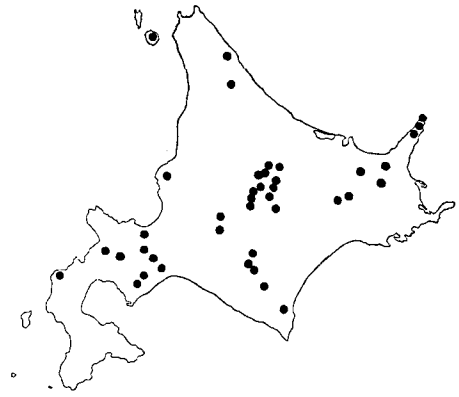
105. Peucedanum multivittatum Maxim.



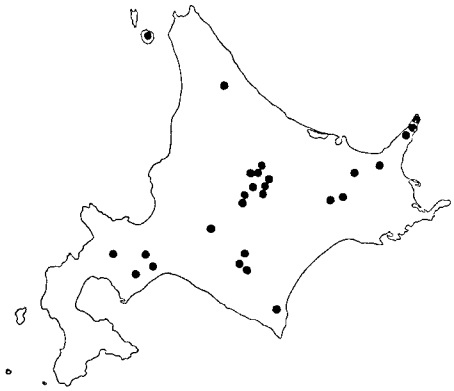
106. Tilingia ajanensis Regel



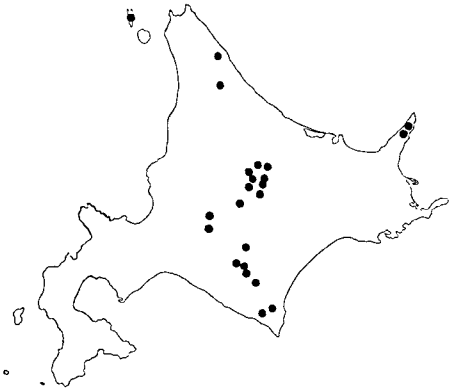
107. Tilingia tachiroei Kitagawa



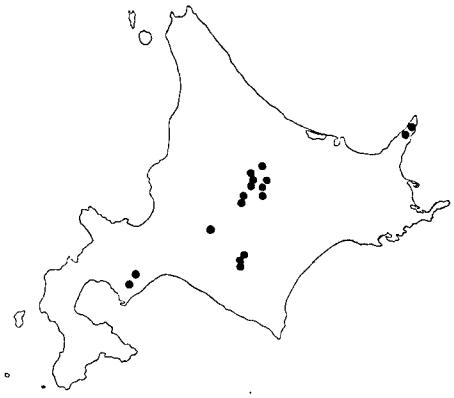
108. Diapensia lapponica Linn. var. obovata Fr. Schm.



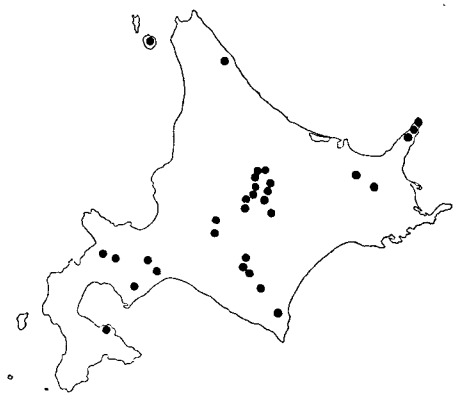
109. Arcterica nana Makino



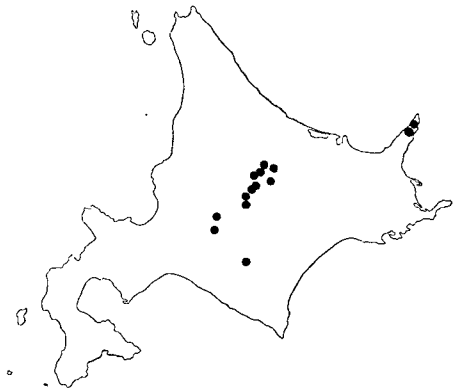
110. Arctous alpinus Niedenzu var. japonicus Ohwi



111. Bryanthus gmelinii D. Don

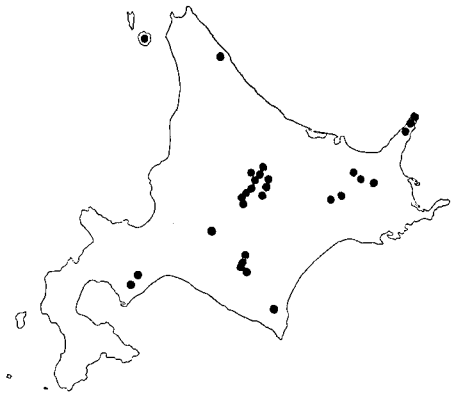


112. Cassiope lycopodioides D. Don

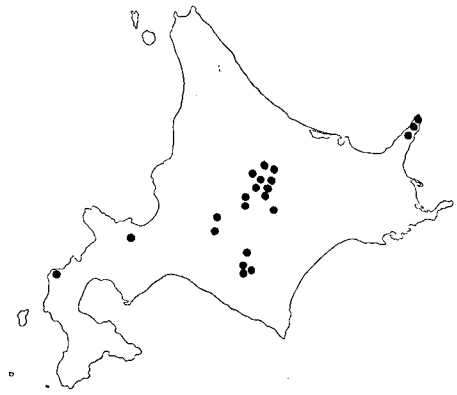


113. Harrimanella stelleriana Coville

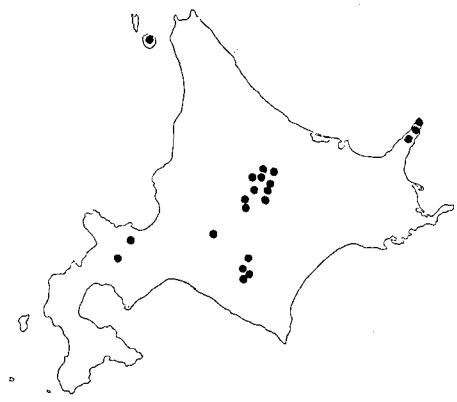
114. Ledum palustre Linn. var. decumbens Ait.



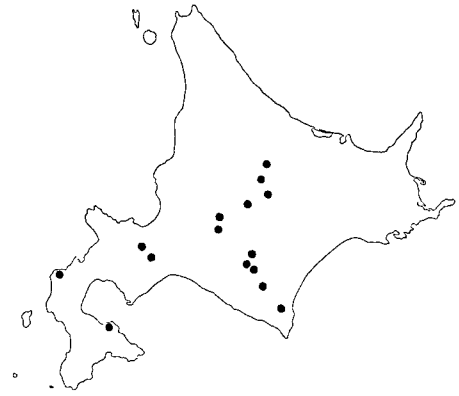
115. Loiseleuria procumbens Desv.



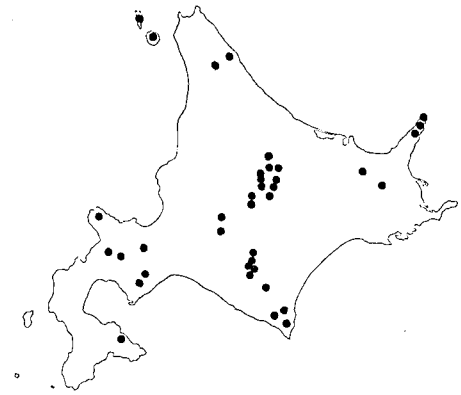
116. Phyllodoce aleutica A. Heller



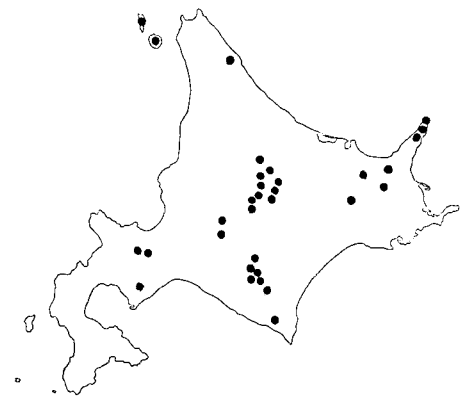
117. Phyllodoce caerulea Babington



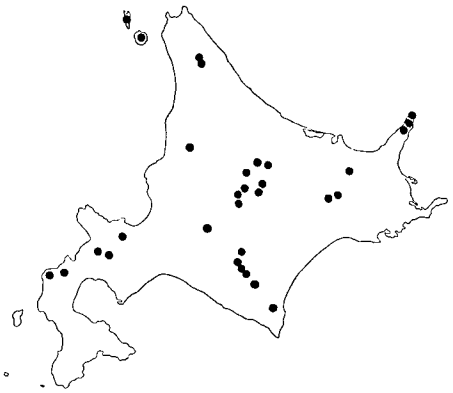
118. Phyllodoce nipponica Makino var. oblongo-ovata Toyokuni



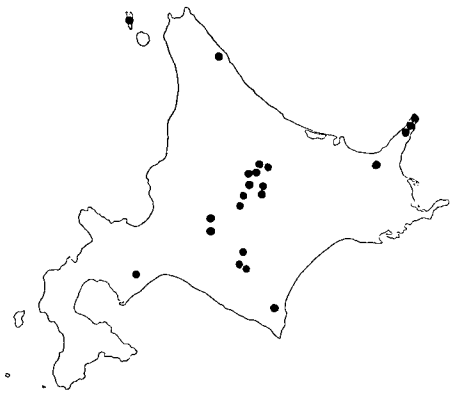
119. Rhododendron aureum Georgi



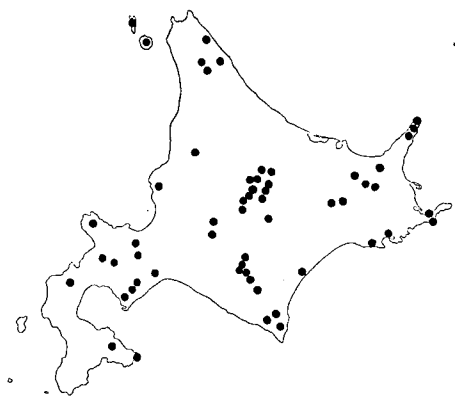
120. Rhododendron camtschaticum Pall.



121. Vaccinium ovalifolium J. E. Smith (incl. var. coriaceum H. Boiss.)

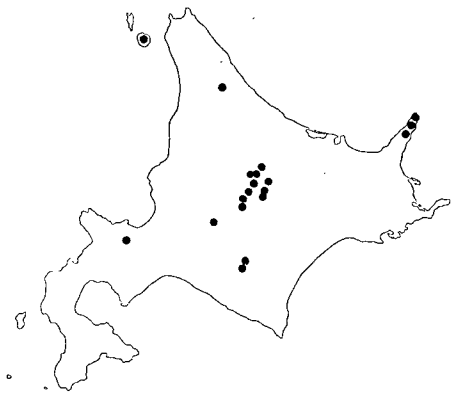


122. Vaccinium uliginosum Linn.



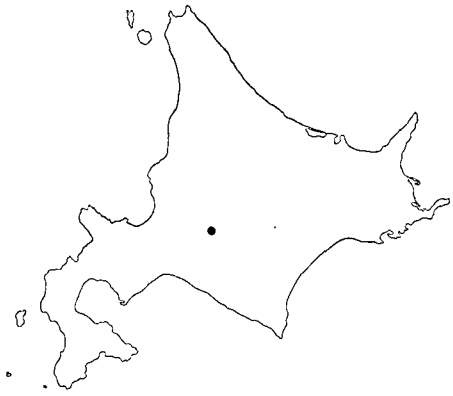
123. Vaccinium vitis-idaea Linn.

124. Androsace lehmanniana Spreng.



125. Primula cuneifolia Ledeb.

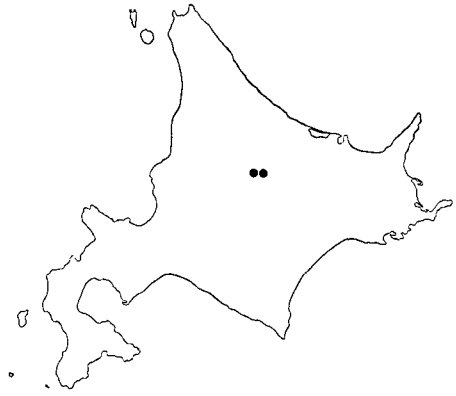
126. Primula hidakana Miyabe et Kudo
▲var. hidakana, ●var. kamuiana Hara



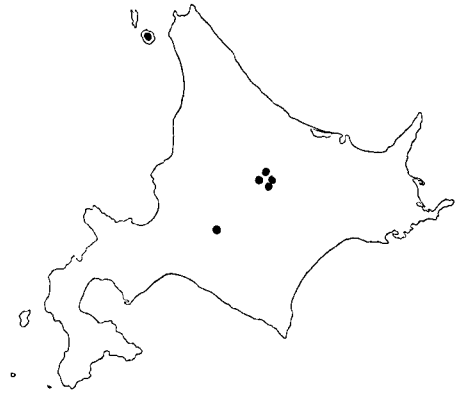
127. Primula yuparensis Takeda

128. Fauria crista-galli Makino

129. Gentiana algida Pall. var. igarashii Miyabe et Kudo



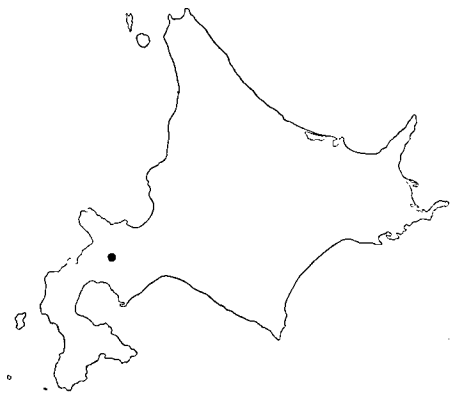
130. Gentiana glauca Pall.



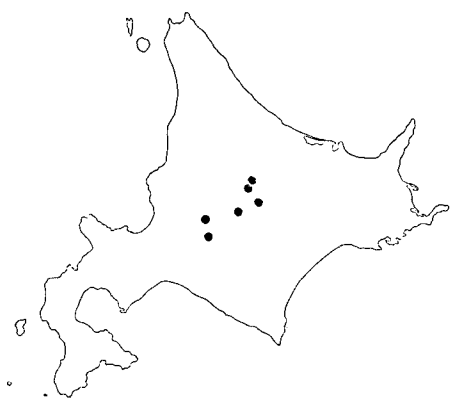
131. Gentiana jamesii Hemsl.

132. Gentiana nipponica Maxim.

133. Gentianella auriculata Gillett

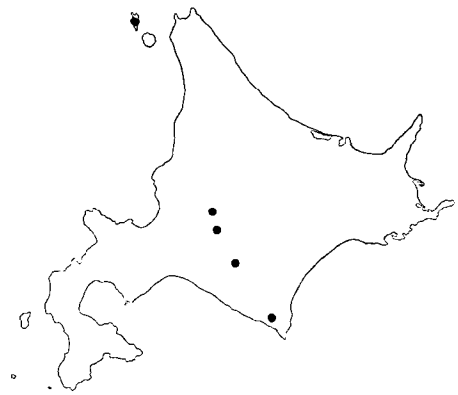


134. Gentianella takedae Satake

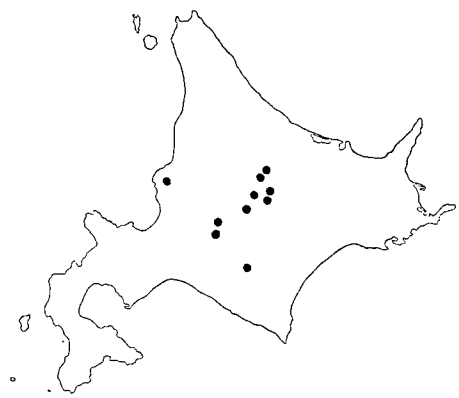


135. Gentianella yuparensis Satake

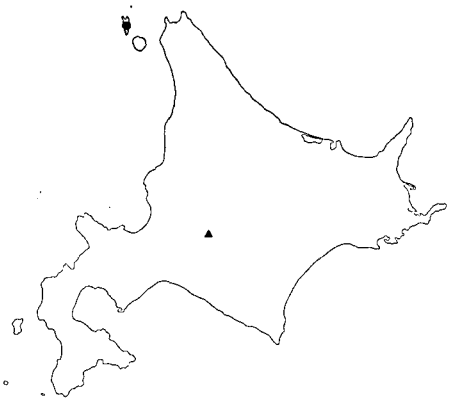
136. Swertia cuspidata Kitagawa



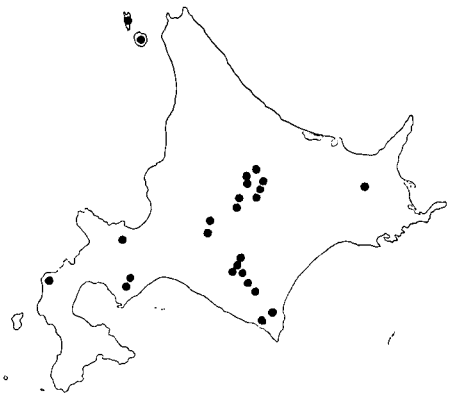
137. Eritrichium nipponicum Makino var. albiflorum Koidz.



138. Mertensia pterocarpa Tatew. et Ohwi var. yezoensis Tatew. et Ohwi



139. Lagotis glauca Gaertn.
●var. glauca, ▲var. takedana Kitamura



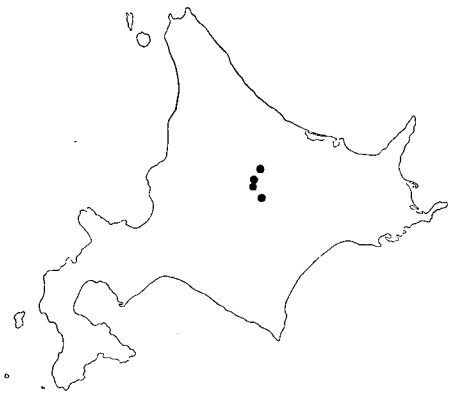
142. Pedicularis chamissonis Stev. var. japonica Maxim.

140. Lagotis stelleri Rupr. var. yesoensis Miyabe et Tatew.

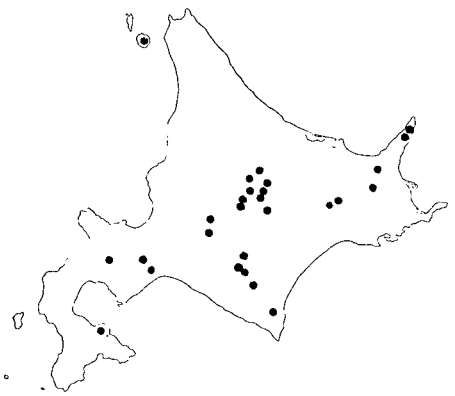
143. Pedicularis koidzumiana Tatewaki et Ohwi

141. Pedicularis apodochila Maxim.

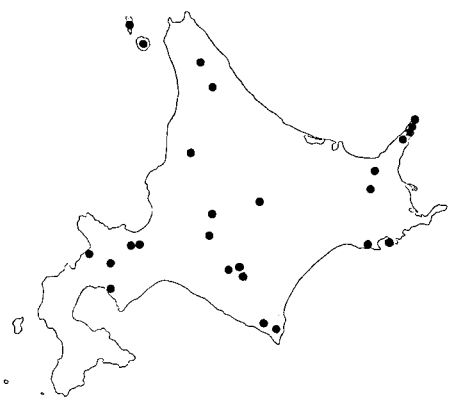
144. Pedicularis oederi Vahl



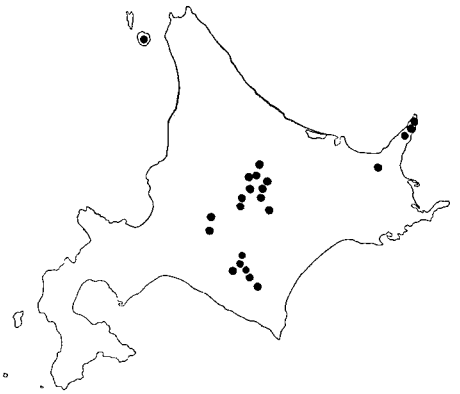
145. Pedicularis verticillata Linn.



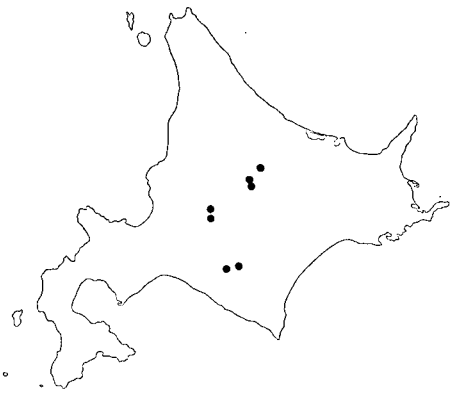
146. Pentstemon frutescens Lamb.



147. Veronica schmidtiana Regel

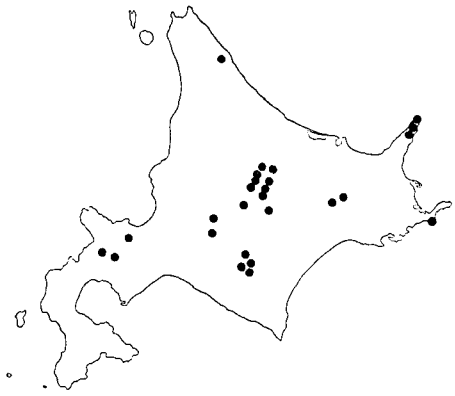


148. Veronica stelleri Pall. var. longistyla Kitagawa



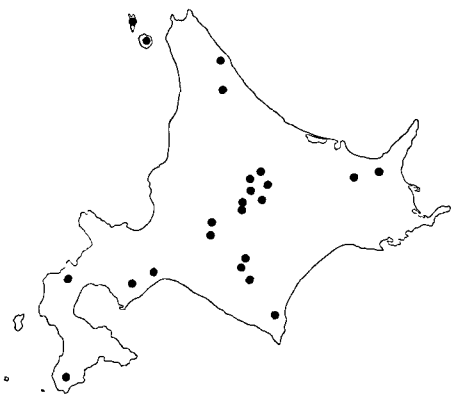
149. Boschniakia rossica Fedtsch. et Flerov

150. Pinguicula vulgaris Linn. var. macroceras Herder

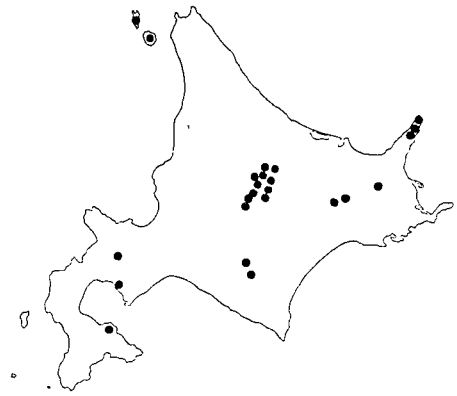


151. Linnaea borealis Linn.

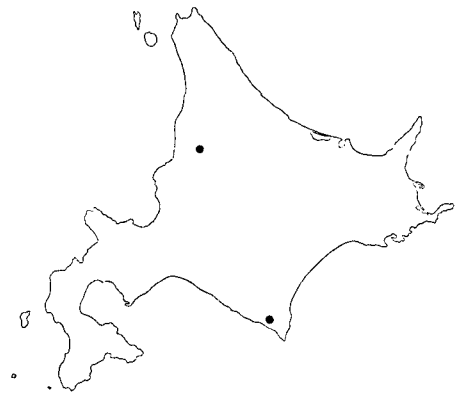
152. Patrinia sibirica Juss.



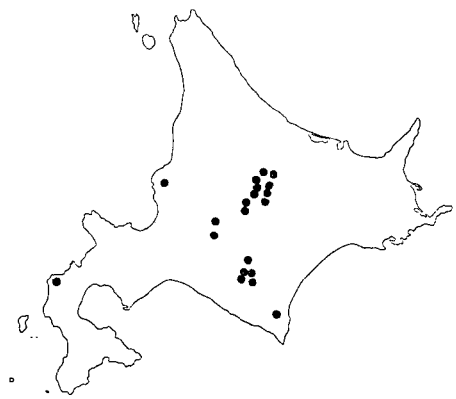
153. Campanula chamissonis Fedorov



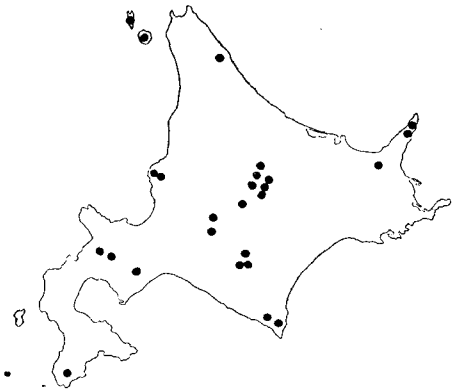
154. Campanula lasiocarpa Cham.



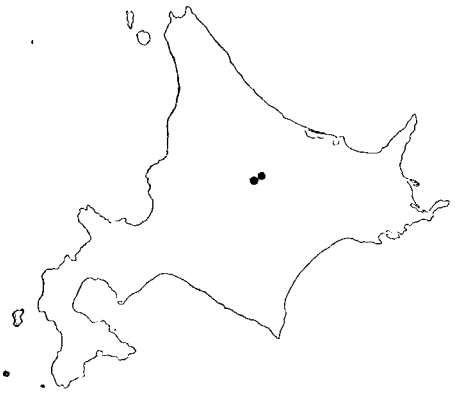
155. Anaphalis alpicola Makino



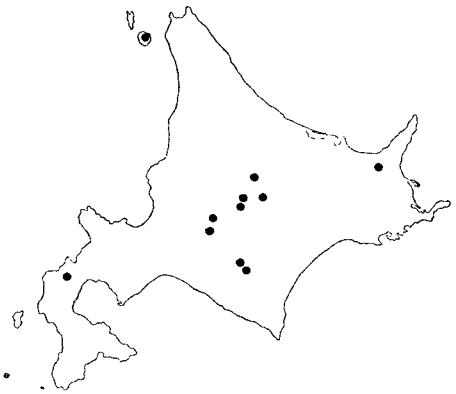
156. Arnica unalascensis Less.
(incl. var. tschonoskyi Kitam.et Hara)



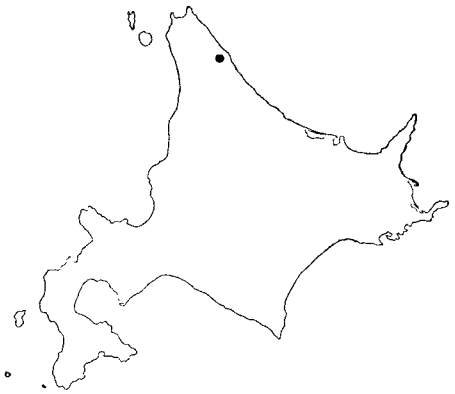
157. Artemisia arctica Less.



158. Artemisia trifurcata Steph., ex Spreng. var. pedunculosa Kitam.



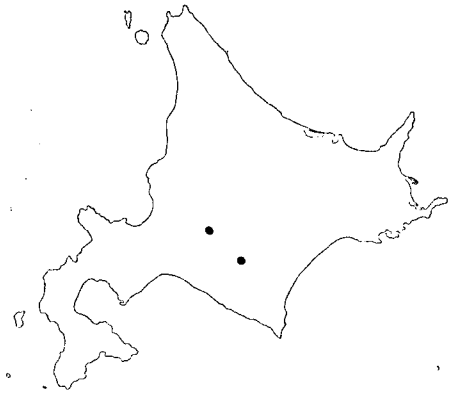
159. Crepis hokkaidoensis Babcock



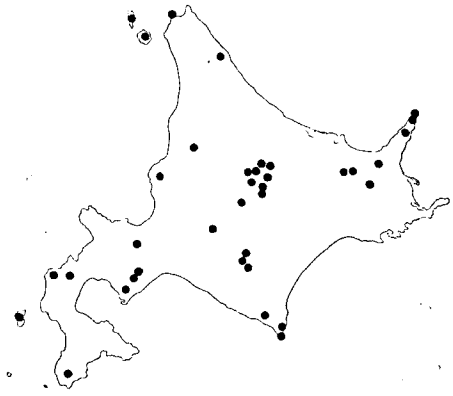
160. Erigeron miyabeanus Tatew. et Kitam.

161. Hypochoeris crepidioides Tatew. et Kitam.

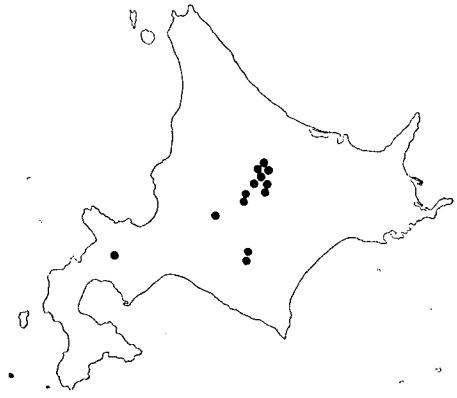
162. Leontopodium hayachinense Hara et Kitam. var. miyabeanum S. Watanabe



163. Saussurea chionophylla Takeda

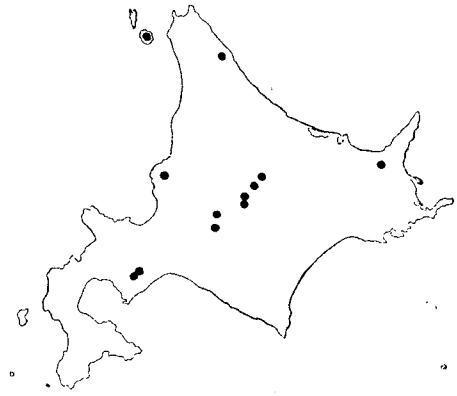


164. Saussurea riederi Herder var. yezoensis Maxim.

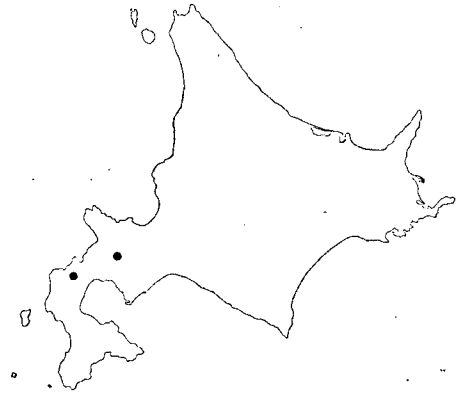


165. Saussurea yanagisawae Takeda

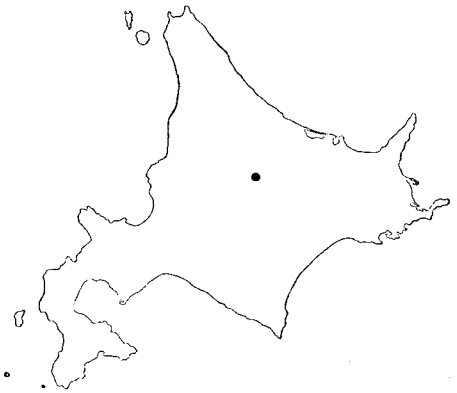
166. Scorzonera rebunensis Tatew. et Kitam.



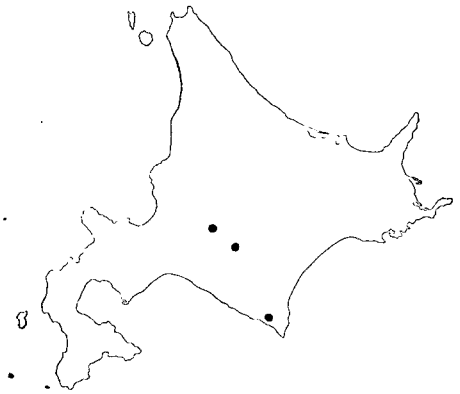
167. Senecio kawakamii Makino



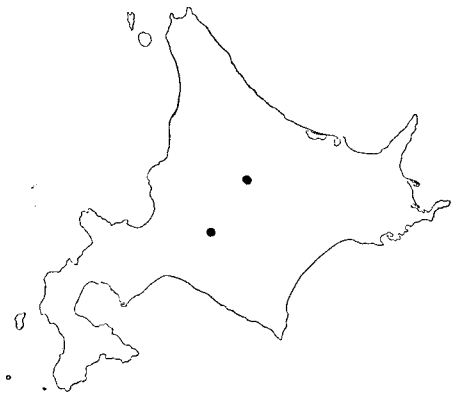
168. Taraxacum platypecidum Diels



169. Taraxacum trigonolobum Dahlst.



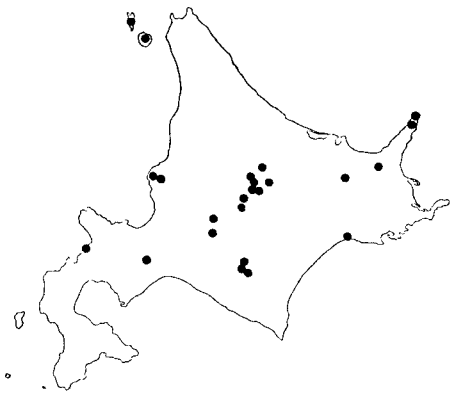
170. Taraxacum yuparense H. Koidz.



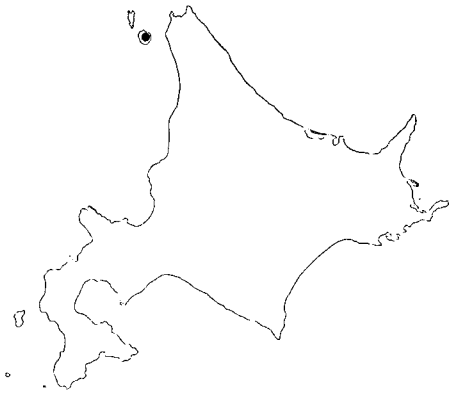
171. Sparganium angustifolium Michx.

172. Sparganium hyperboreum Laest.

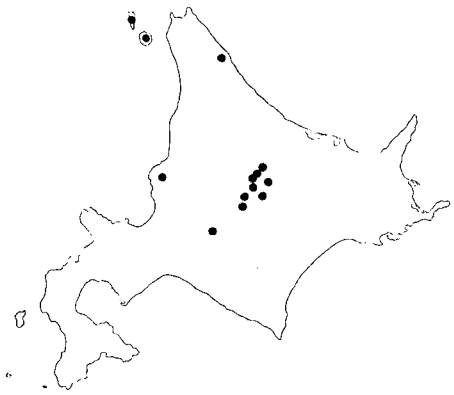
173. Agrostis borealis Hartm.



174. Agrostis flaccida Hack.

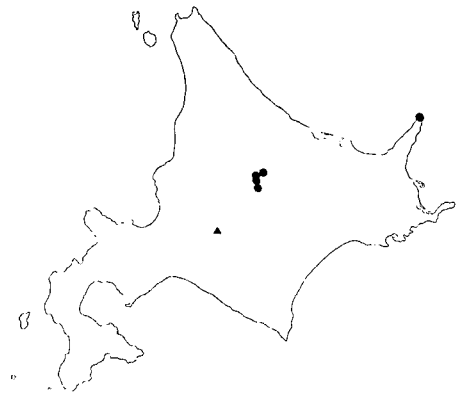


175. Anthoxanthum odoratum Linn. var. furumii Ohwi

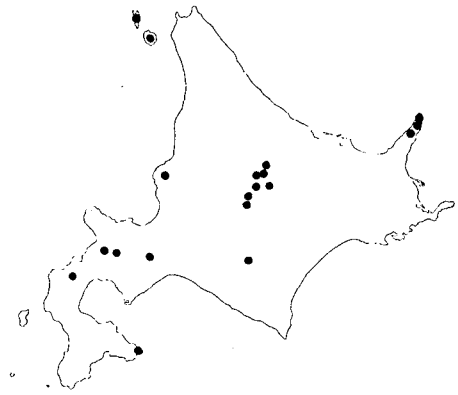


176. Calamagrostis purpurascens R. Br.

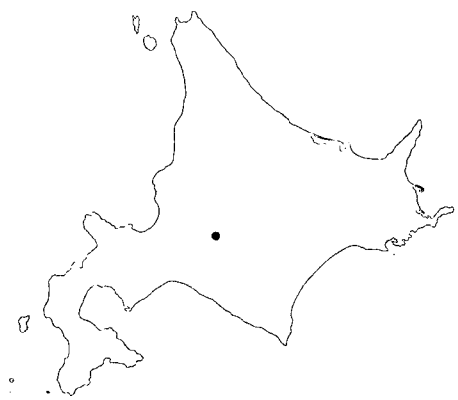
177. Deschampsia atropurpurea Wahlenb. var. paramushirensis Kudo



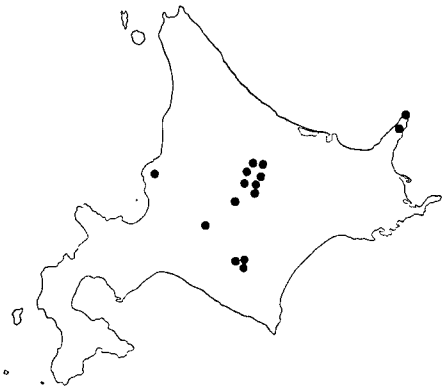
178. Deschampsia caespitosa Beauv. ●var. festucaefolia Honda, ▲var. levis Ohwi



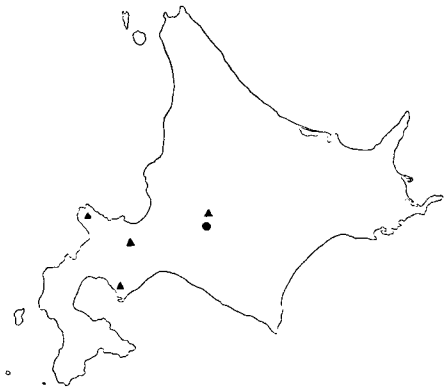
179. Deschampsia flexuosa Trin.



180. Elymus yubaridakensis Ohwi



181. Hierochloe alpina Roem. et Schult.



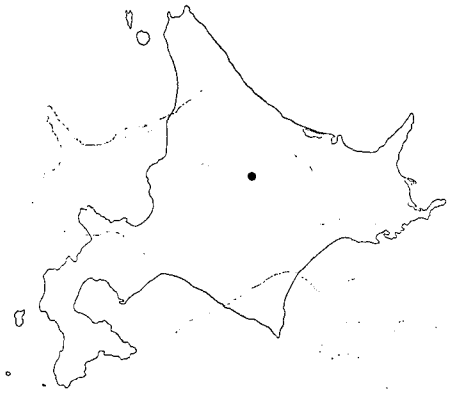
182. Hierochloe pluriflora Koidz.
●var. pluriflora, ▲var. intermedia Ohwi

183. Phleum alpinum Linn.

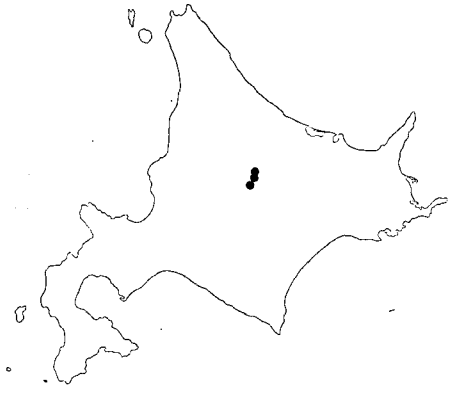
184. Poa hakusanensis Hack.

185. Poa hayachinensis Koidz.

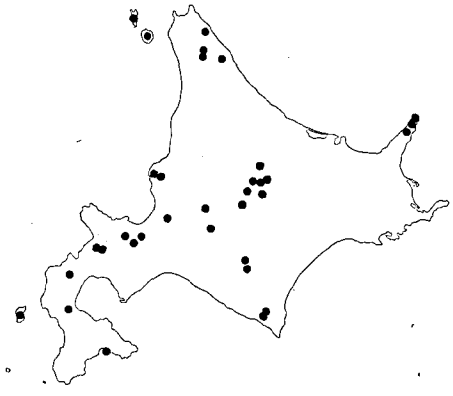
186. Trisetum spicatum Richt.



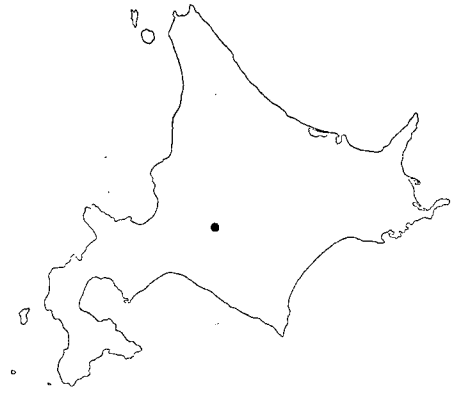
187. Carex bigelowii Torr.



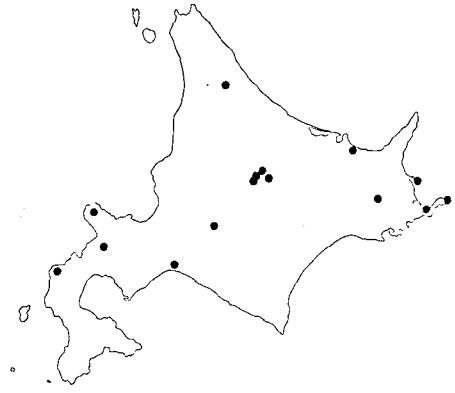
188. Carex bipartita All.



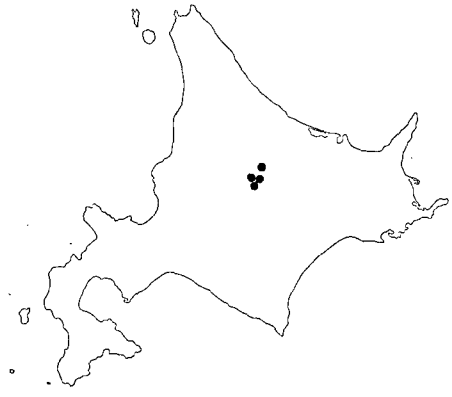
189. Carex blepharicarpa Franch.



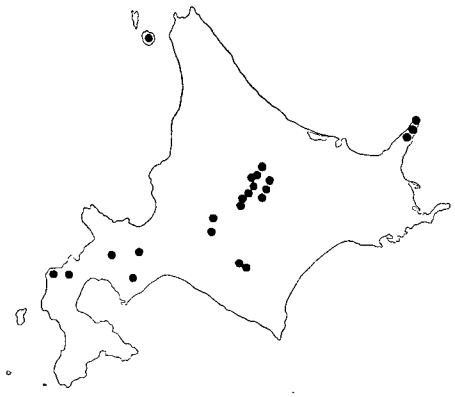
190. Carex capillaris Linn.



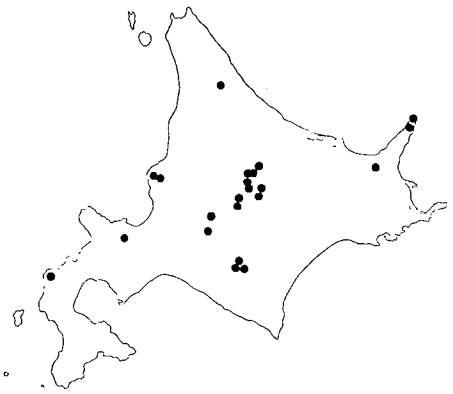
191. Carex curta Gooden.



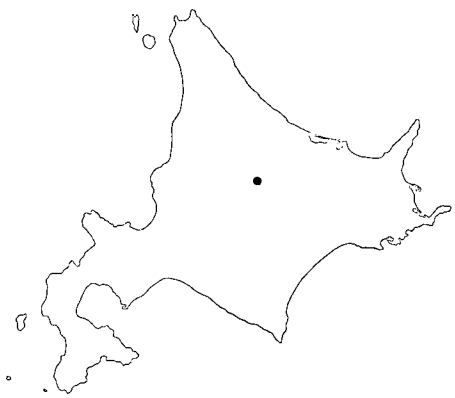
192. Carex eleusinoides Turcz.



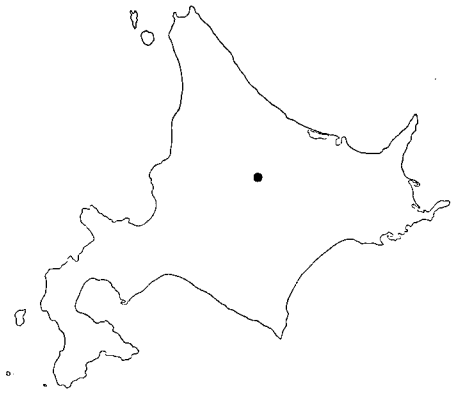
193. Carex flavocuspis Franch. et Savat.



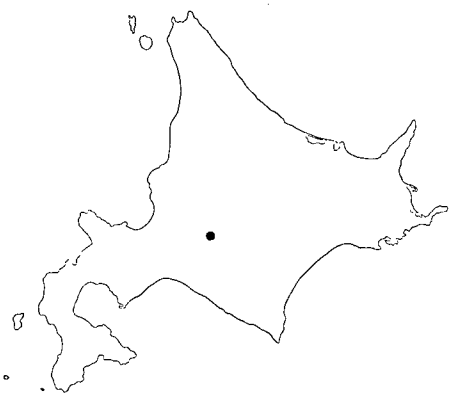
194. Carex hakkodensis Franch.



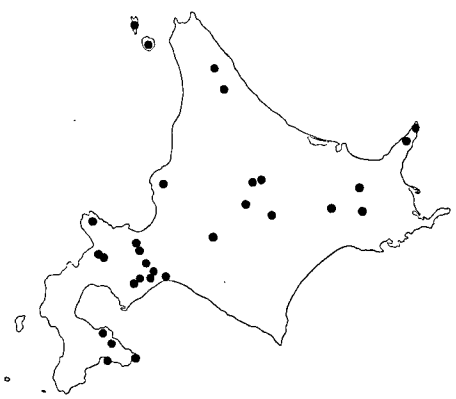
195. Carex kabanovii V. Krecz.



196. Carex livida Willd.

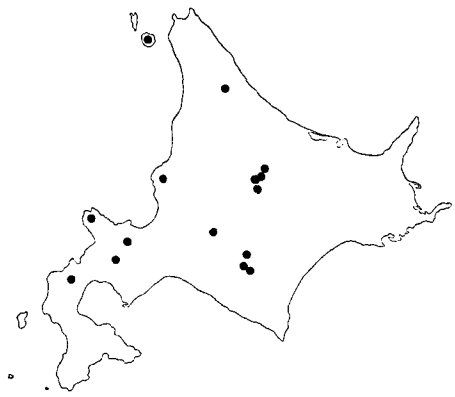


197. Carex melanocarpa Cham.

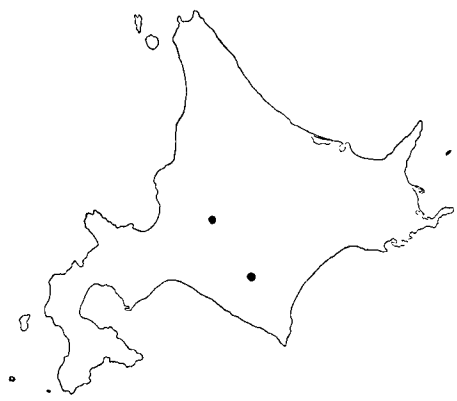


198. Carex oxyandra Kudo

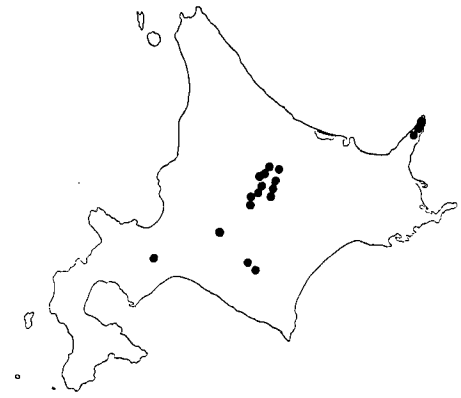
199. Carex pyrenaica Wahlenb.



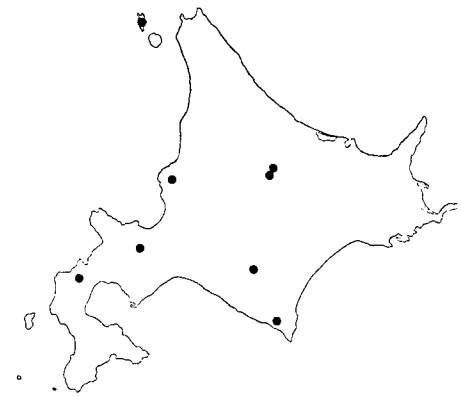
200. Carex scita Maxim. var. riishirensis Kükenth.



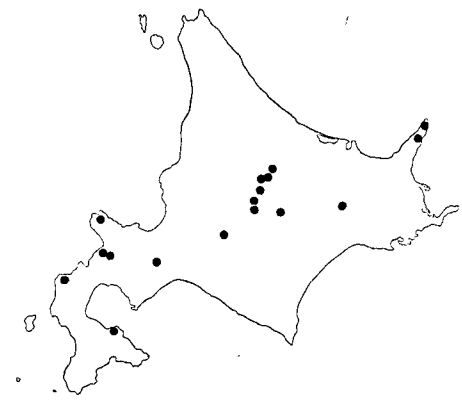
201. Carex rupestris Bell., ex All.



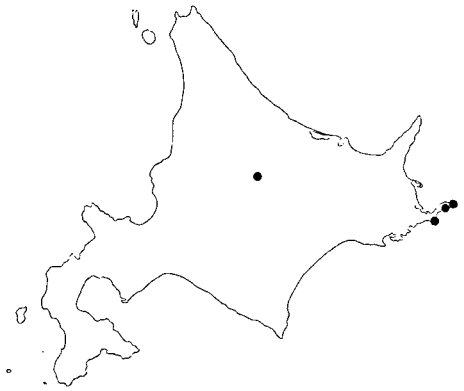
202. Carex stenantha Franch. et Savat. var. taisetsuensis Akiyama



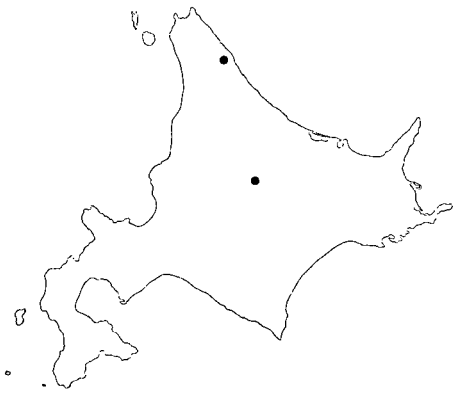
203. Carex tenuiformis Lévet. et Vant.



204. Carex mertensii Presc. var. urostachys Kükenth.

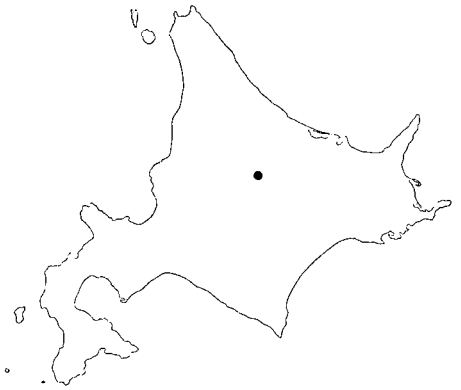


205. Carex vaginata Tausch

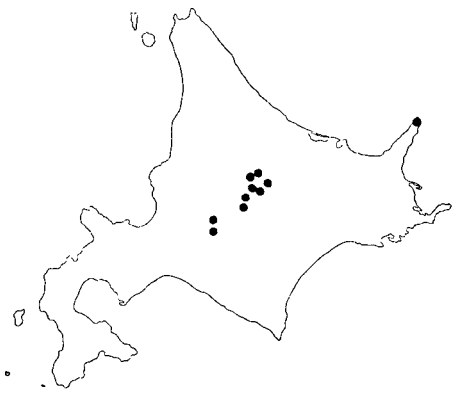


206. Carex vanheurckii Müll. Arg.

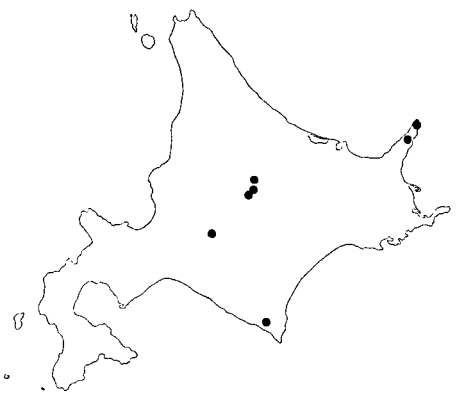
207. Eriophorum scheuchzeri Hoppe var. tenuifolium Ohwi



208. Kobresia bellardii Degland

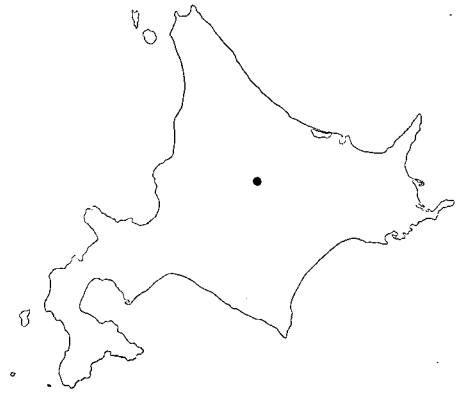


209. Scirpus caespitosus Linn.



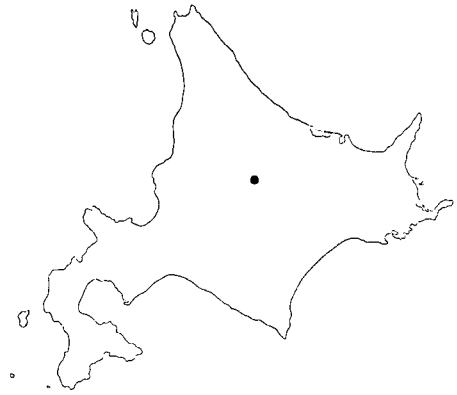
210. Scirpus maximowiczii C. B. Clarke

211. Juncus beringensis Buchen.

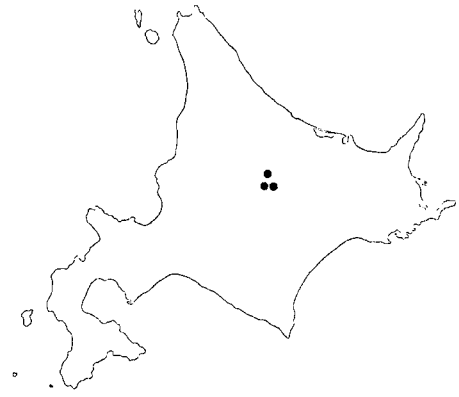


212. Juncus fauriensis Buchen.

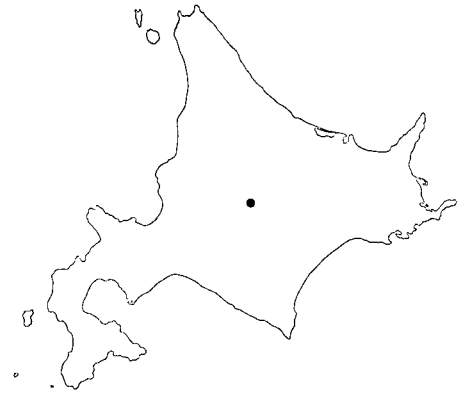
213. Juncus filiformis Linn.



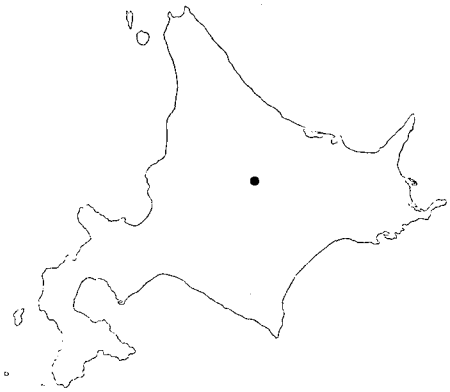
214. Juncus kamtschatcensis Kudo



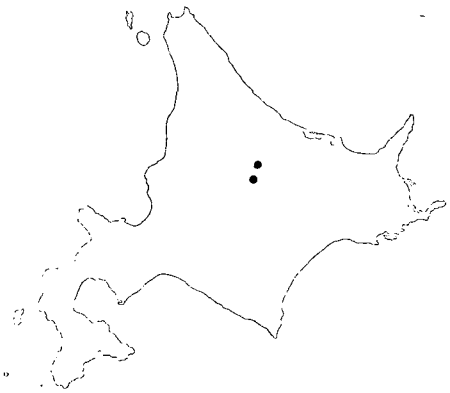
215. Juncus mertensianus Bong.



216. Juncus potaninii Buchen.

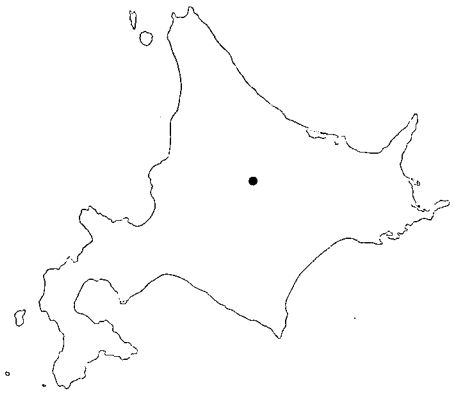


217. Juncus triceps Rostk.



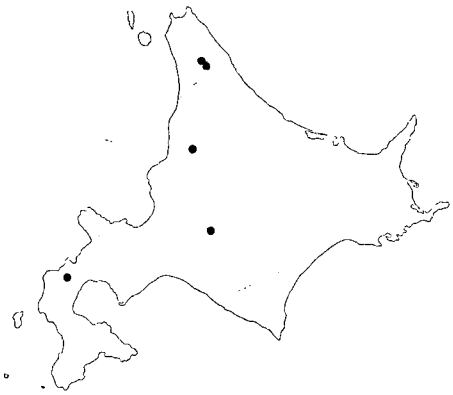
218. Juncus triglumis Linn.

219. Luzula oligantha G. Sam.

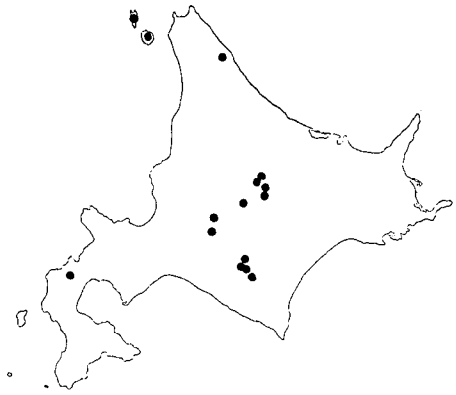


220. Luzula parviflora Desv.

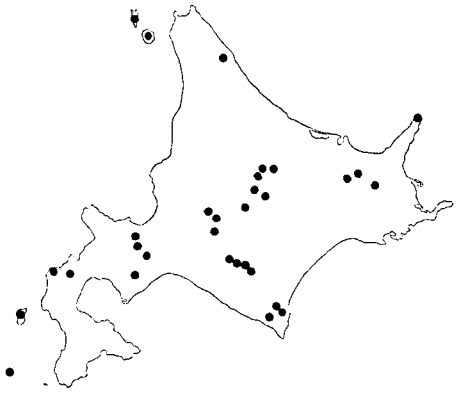
221. Luzula wahlenbergii Rupr.



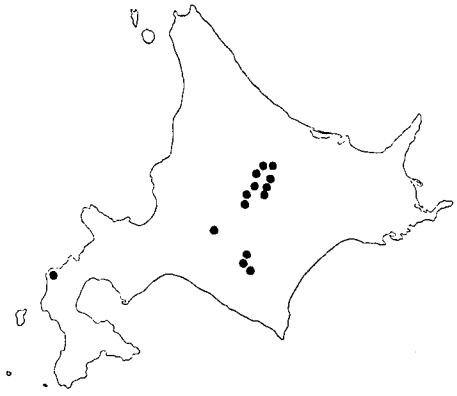
222. Allium maximowiczii Regel



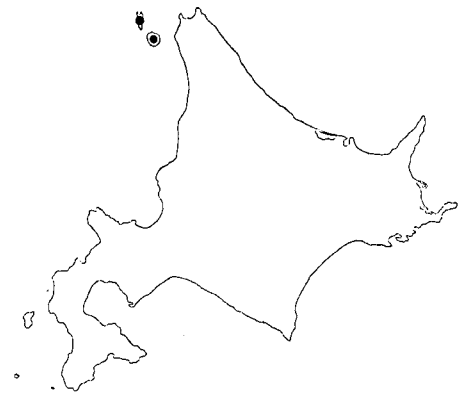
223. Lloydia serotina Reichenb.



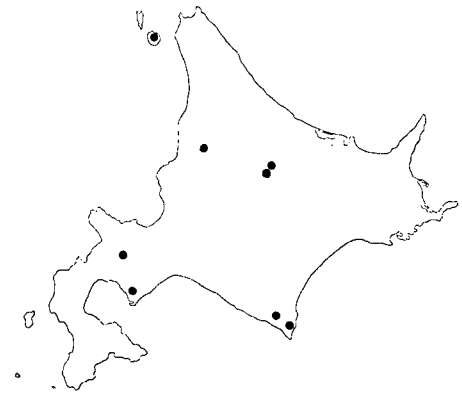
224. Tofieldia coccinea Richards.



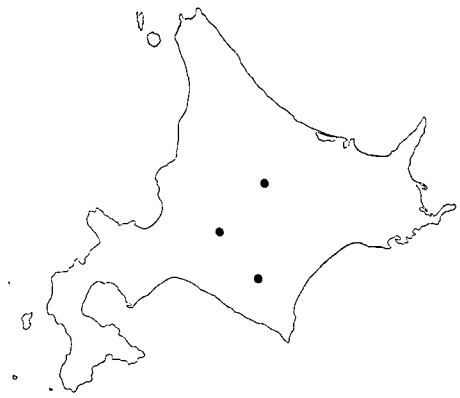
225. Tofieldia okuboi Makino



226. Zygadenus sibiricus A. Gray



227. Platanthera chorisiana Reichb. fil.



228. Platanthera hyperborea Lindl.