

## REFERENCES

- ALLIN, A. E. 1940. Two rare orchids in Thunder Bay District. *Can. Field Nat.* 54:59.
- BALDWIN, W. K. W. 1958. Plants of the Clay Belt of northern Ontario and Quebec. *Bull. nat. Mus. Canada* 156.
- CLAPHAM, A. R., T. G. TUTIN and E. F. WARBURG. 1952. *Flora of the British Isles*. Cambridge, University Press.
- CORRELL, D. S. 1950. Native orchids of North America. Waltham, Mass., *Chronica Botanica*.
- HULTÉN, E. 1942. *Flora of Alaska and Yukon*. Pt. 2. *Lunds Univ. Arsskr.*
- . 1958. *The amphi-atlantic plants*. Stockholm, Almqvist & Wiksel.
- MORRIS, F., and E. A. EAMES. 1929. *Our wild orchids*. New York, Scribners.
- MOSS, E. H. 1959. *Flora of Alberta*. Toronto, University of Toronto Press.
- RYDBERG, P. A. 1932. *Flora of the Prairies and Plains of Central North America*. New York, New York Botanical Garden.
- SJÖRS, H. 1959. Bogs and fens in the Hudson Bay Lowlands. *Arctic* 12:2-19.
- SZCZAWINSKI, A. F. 1959. The orchids of British Columbia. *Handb. B.C. prov. Mus.* 16.
- VICTORIN, MARIE. 1935. *Flore Laurentienne*. Montreal, Imprimerie de la Salle.

Received for publication 26 April 1960



## A COLLECTION OF PLANTS FROM THE HORN PLATEAU, DISTRICT OF MACKENZIE, NORTHWEST TERRITORIES

JOHN W. THIERET

Chicago Natural History Museum, Chicago, Illinois

DURING the 1959 Northern Great Plains Botanical Field Trip sponsored by Chicago Natural History Museum, a brief time (July 31 - August 2) was spent on the Horn Plateau in southwestern District of Mackenzie. The observations and collections made there are the subject of this report. These collections are the first ever taken from the plateau and are, so far as I have been able to determine, the first from the area bounded by Great Slave Lake on the east and the Mackenzie River on the south and west (with the exception of some of my collections from the Mackenzie River—Fort Rae Highway northeast of Fort Providence).

Horn Plateau, called also Horn Mountain(s), rises from the Mackenzie Lowlands to an altitude of 2300 to 2600 feet. The summit is about 1600 to 1900 feet above the surrounding terrain. The plateau extends about 75 miles in an east-west direction. Its greatest north-south extent is about 35 miles. The eastern tip of the plateau is some 48 miles north of Mills Lake; the western tip, some 32 miles east-northeast of Fort Simpson.

Horn Plateau and several similar plateaus to the south and east (including the Cameron Hills and Caribou Mountains) are thought to have been formed through long-continued dissection of the uplifted strata of Cretaceous age that covered the whole region (Raup, 1935). These strata underlie the plateau and on the scarp are exposed along several small streams as "dark grey, fissile shales slightly rusty weathering and sulphur stained, with scattered selenite



crystals" (Douglas, 1959). The plateau is heavily drift covered (Whittaker, 1922). Surface soil atop the plateau is gray, slightly calcareous, and clayey, presumably derived from boulder till.

Geological parties visited the western and eastern tips of the plateau in 1921 and 1922. The accounts of the ascents are well worth repeating here. Of the western end, Whittaker (1923) wrote:

Horn mountain in this area rises rather abruptly from this level plain [Mackenzie Lowlands] to a height of about 1500 feet. This ascent is made in a gentle slope of about 300 feet in half a mile and an abrupt rise of 1200 feet in about 300 yards. From the crest the land rises very slowly for about a mile, then merges into the plateau which forms the top of the mountain. The plateau at this point is covered with stunted spruce and, more rarely, poplar.

Whittaker's (1922) account of the eastern end of the plateau is as follows:

Rising to a height of 2000 feet from the monotonous plain of muskeg and lake, Horn Mountain range roughly parallels the Mackenzie and disappears opposite Simpson. These hills rise gradually to a height of about 1200 feet above the plain in a distance of about 6 miles. At this height the slope is truncated by a level strip averaging  $1\frac{1}{2}$  miles wide, and then follows an abrupt rise of 400 to 500 feet to the top of the range, which is a plateau . . . , almost treeless, covered with caribou moss, and dotted with small ponds. One of these ponds is worthy of being called a lake, being about  $1\frac{1}{2}$  miles long by  $\frac{3}{4}$  mile wide. . . . The trees on the bare plateau of the range show plainly the effects of the prevailing winds. The limbs all point to the southeast, and the northwest sides of the trees are scarred and limbless.

Our visit to the plateau was to its eastern tip in the vicinity of Lake-on-the-Mountain ( $62^{\circ} 08' N$   $118^{\circ} 07' W$ ), the pond that Whittaker considered worthy of being called a lake. Our reconnaissance was carried out from the southeast shore of the lake to the edges of the plateau south and east of the lake.

Lake-on-the-Mountain is at an elevation of about 2330 feet and is one mile long and half a mile wide (slightly smaller than Whittaker's estimate). Its bank, at least on the southeast shore, is five to six feet high, steep, and bouldery. Boulders line the shore and also cover the bottom as far out (two to three feet) as we could see in the rather turbid water. The depth of the water increases quite rapidly. Our float-equipped plane was able to approach within one or two feet from the shore before striking submerged boulders.

The steep, bouldery southeast bank of the lake is covered with a thicket made up of *Salix glauca*, *Alnus crispa*, *Betula glandulosa*, and *B. occidentalis*. Similar thickets are found along the streams flowing down the south slope of the plateau. Undergrowth in these thickets is very scanty and includes *Artemisia tilesii*, *Chrysosplenium tetrandrum*, *Galium trifidum*, *Ledum groenlandicum*, *Lycopodium annotinum*, *Peltigera aphthosa*, and *Petasites frigidus palmatus*. *Ledum groenlandicum* becomes especially abundant at the upper edge of the thicket along the southeast shore of the lake, forming, in many places, a distinct zone between the thicket and the tundra on the level land above the lake.

Except for some floating fragments of a broad-leaved *Potamogeton*, no submerged aquatics were seen along the southeast shore. The bouldery bottom and the depth of the water here are unfavorable for such plants. Among boulders at the water's edge are occasional clumps of *Calamagrostis canadensis*, *Carex aquatilis*, and *Potentilla palustris*.



Much of the summit of the plateau in the vicinity of Lake-on-the-Mountain is covered with lichen tundra in which common or frequent lichens are *Alectaria ochroleuca*, *Cetraria cucullata*, *C. nivalis*, *Cladonia alpestris*, *C. amaurocraea*, *C. cornuta*, and *C. rangiferina*. The lichens form a more or less continuous cover in which other plants are rather scattered. The most common flowering plants in the tundra are *Ledum decumbens* and *Vaccinium vitis-idaea*. *Rubus chamaemorus* is frequent. Less common shrubs are *Andromeda polifolia*, *Betula glandulosa*, *Empetrum nigrum*, and *Salix glauca*. None of the shrubs is over two feet tall. Herbaceous flowering plants are few. Of these, *Arctagrostis latifolia* and *Pedicularis labradorica* are the most frequently seen.

Here and there in the tundra are small areas of stony, frost-disturbed soil that are bare of vegetation except for *Juncus castaneus*, *Luzula multiflora frigida contracta*, and *Stellaria longipes*, and scattered lichens, including *Cladonia alpicola*, *C. coccifera*, *Coriscium viride*, and *Icmadophila ericetorum*.

Lines of drainage and small moist depressions in the tundra are characterized by the local abundance of *Sphagnum*. *Sphagnum capillaceum*, *S. lindbergii microphyllum*, *S. squarrosum*, and *S. teres* were collected in these situations. Larger moist areas, which might be called "marshy," usually have a basic ground cover of mosses, the most apparent of which are *Aulacomnium palustre* and *Sphagnum*. The grasses and sedges *Arctophila fulva*, *Calamagrostis canadensis*, *C. neglecta*, *Eriophorum angustifolium*, and a rhizomatous *Carex*, unfortunately sterile at the time of our visit, may be frequent to abundant locally. The only trees in these marshy areas are a few scattered black spruces. Shrubs observed are *Andromeda polifolia*, *Arctostaphylos rubra*, *Betula glandulosa*, *Empetrum nigrum*, *Potentilla fruticosa*, *Rubus chamaemorus*, *Salix reticulata*, *Vaccinium vitis-idaea*, and *V. uliginosum*. Herbs include *Castilleja raupii*, *Parnassia multiseta*, *Pedicularis labradorica*, *Potentilla palustris*, *Senecio lugens*, and *Tofieldia pusilla*.

In depressions above the southeast shore of the lake are found picturesque, stunted black spruces. Maximum height of these trees is about 15 feet, but most of them are smaller, and some are even prostrate. Their branches typically point toward the southeast, away from the direction of prevailing winds.

On higher ground about half a mile east of the lake is a fairly typical forest of black spruce and feather moss (*Hylocomium splendens* — *Ptilium crista-castrense*) with a rather sparse shrubby and herbaceous flora including *Anemone parviflora*, *Corallorhiza trifida*, *Habenaria obtusata*, *Kalmia polifolia*, *Potentilla fruticosa*, *Salix myrtillifolia*, and *Tofieldia pusilla*. A few white spruces were seen in this forest.

South- and east-facing slopes just below the summit of the plateau show clearly the results of fire. Numerous blackened dead trees are to be seen. The east-facing slope is dominated by young black spruces, *Betula glandulosa*, *Alnus crispa*, and *Salix glauca*. A few young white spruces also occur. Most of the shrubs are less than six feet tall, but the trees reach 15 or 20 feet. *Hylocomium splendens* is the most common ground cover; it occurs in scattered patches between which is rocky soil with but a few other plants, including *Arctostaphylos rubra*, *Arnica lonchophylla*, *Epilobium angustifolium*, *Em-*



*petrum nigrum*, *Geocaulon lividum*, *Ledum decumbens*, *L. groenlandicum*, *Potentilla fruticosa*, *Rhododendron lapponicum*, *Pyrola grandiflora*, *Senecio lugens*, *Solidago multiradiata*, *Tofieldia pusilla*, and *Vaccinium vitis-idaea*. The south-facing slope has similar plant cover except that white spruce replaces black spruce almost entirely and *Hylocomium splendens* is much less common.

#### CATALOGUE OF PLANTS

In the following catalogue of plant specimens collected at Lake-on-the-Mountain, entries are arranged in three major groups, as follows: Lichenes, 14 species; Bryophyta, 15 species; and Tracheophyta, 78 species. Lichenes are arranged alphabetically by genus and species; and Bryophyta, alphabetically by class, genus, and species. The families of Tracheophyta are arranged according to the Englerian system, but the genera and species within the families appear in alphabetical order.

To conserve space, five terms are used to define localities from which many specimens were collected. The terms and their meanings are as follows:

tundra — lichen tundra atop plateau south of lake;

bank thicket — thicket dominated by *Alnus*, *Betula*, and *Salix*, on steep, bouldery bank above southeast shore of lake;

east slope — east-facing slope dominated by *Picea*, *Alnus*, *Betula*, and *Salix*, below summit of plateau east of lake;

south slope — south-facing slope dominated by *Picea*, *Alnus*, and *Betula*, just below summit of plateau south of lake;

marsh — marshy areas southeast of lake.

All specimens cited here are in the herbarium of Chicago Natural History Museum (F). Collection numbers are those of the author and his field assistant, Robert J. Reich.

#### LICHENES

*Alectaria ochroleuca* (Ehrh.) Ach. Frequent, tundra, 5910.

*Cetraria cucullata* (Bell.) Ach. Common, tundra, 5912, 6299.

*Cetraria nivalis* (L.) Ach. Frequent, tundra, 5917.

*Cetraria pinastri* (Scop.) Hoffm. On branches of black spruce near southeast shore of lake, 6300.

*Cladonia alpestris* (L.) Rabh. Common, tundra, 5911.

*Cladonia alpicola* (Fw.) Vainio. Infrequent in stony, frost-disturbed soil, tundra, 5916c.

*Cladonia amaurocraea* (Flk.) Schaer. Frequent, tundra, 5913.

*Cladonia coccifera* (L.) Willd. Frequent in stony, frost-disturbed soil, tundra, 5916b, 6298.

*Cladonia cornuta* (L.) Schaer. Frequent, tundra, 5918.

*Cladonia deformis* (L.) Hoffm. Frequent, tundra, 5916.

*Cladonia rangiferina* (L.) Web. Common, tundra, 5914.

*Coriscium viride* (Ach.) Vainio. Rare in stony, frost-disturbed soil, tundra, 6297.

*Icmadophila ericetorum* (L.) Zahlbr. Infrequent in stony, frost-disturbed soil, tundra, 6301.

*Peltigera aphthosa* (L.) Willd. Infrequent, bank thicket, 5915.

#### BRYOPHYTA

##### HEPATICAEE

*Cladopodiella fluitans* (Nees) Buch. Common in shallow pool, tundra, 6289.

##### MUSCI

*Aulacomnium palustre* (Hedw.) Schwaegr. Common marsh, 5894.

*Ceratodon purpureus* (Hedw.) Brid. Among boulders at southeast shore of lake, 6290.

*Dicranum bergeri* Bland. Infrequent, tundra, 6291.

*Dicranum elongatum* Schleich. Rare, tundra, 6296.



*Drepanocladus uncinatus* (Hedw.) Warnst. Infrequent among boulders at southeast shore of lake, 5901; infrequent, bank thicket, 6295.

*Hylocomium splendens* (Hedw.) Bry. Eur. Frequent, east slope, 5832.

*Leptobryum pyriforme* (Hedw.) Schimp. Among boulders at southeast shore of lake, 6292.

*Polytrichum strictum* Banks. Infrequent, tundra, 5931.

*Ptilium crista-castrense* (Hedw.) Nees. Rare, tundra, 6293; rare among boulders at southeast shore of lake, 6294.

*Sphagnum capillaceum* (Weiss) Schrank. Infrequent, marsh, 5895.

*Sphagnum lindbergii* Schimp. var. *microphyllum* Warnst. Occasional to common, wetter areas, tundra, 5854.

*Sphagnum squarrosum* Crome. Edge of small pool, tundra, 5922.

*Sphagnum teres* Angstr. Frequent, marsh, 5902.

*Splachnum luteum* Hedw. Rare, tundra, 5933.

## TRACHEOPHYTA

### EQUISETACEAE

*Equisetum arvense* L. Infrequent, south slope, 5883a.

*Equisetum pratense* Ehrh. Infrequent, south slope, 5883.

*Equisetum scirpoides* Michx. Rare, east slope, 5834.

*Equisetum sylvaticum* L. Frequent in *Sphagnum* among black spruce above southeast shore of lake, 5855.

### LYCOPODIACEAE

*Lycopodium annotinum* L. Rare, bank thicket, 5899.

*Lycopodium complanatum* L. Rare, south slope, 5873.

### PINACEAE

*Juniperus communis* L. var. *depressa* Pursh. Rare, east slope, 5837.

*Picea glauca* (Moench) Voss. Infrequent, east slope, 5819a.

*Picea mariana* (Mill.) BSP. Common in depressions at southeast shore of lake, 5860.

### GRAMINEAE

*Agrostis scabra* Willd. forma *tuckermanii* Fern. Infrequent, south slope, 5878.

*Arctagrostis latifolia* (R. Br.) Griseb. Infrequent, tundra, 5920; infrequent, marsh, 5890; infrequent, east slope, 5830.

*Arctophila fulva* (Trin.) Rupr. Locally common, marsh, 5904.

*Calamagrostis canadensis* (Michx.) Nutt. (approaching var. *robusta* Vasey) Infrequent, marsh, 5891, 5905; infrequent, bank thicket, 5900.

*Calamagrostis neglecta* (Ehrh.) Gaertn., Mey., et Scherb. Rare, tundra, 5857, 5921.

*Poa pratensis* L. s.l. Infrequent, south slope, 5866; rare, tundra, 5934.

*Trisetum spicatum* (L.) Richt. var. *maidenii* (Gand.) Fern. Rare, south slope, 5863.

### CYPERACEAE

*Carex aquatilis* Wahl. Infrequent in mud among boulders, southeast shore of lake, 5907.

*Carex capitata* L. Infrequent, east slope, 5842.

*Carex limosa* L. Infrequent, marsh, 5852.

*Carex media* R. Br. Infrequent, marsh, 5889.

*Carex scirpoidea* Michx. Infrequent, east slope, 5817.

*Eriophorum angustifolium* Honck. Infrequent to common, marsh, 5906.

*Eriophorum vaginatum* L. ssp. *spissum* (Fern.) Hult. Infrequent, tundra, 5908.

### JUNCACEAE

*Juncus castaneus* Smith. Rare in stony, frost-disturbed soil, tundra, 5856.

*Luzula multiflora* (Retz.) Lej. ssp. *frigida* (Buch.) Krecz. var. *contracta* Sam. Rare in stony, frost-disturbed soil, tundra, 5858; rare, east slope, 5843.

### LILIACEAE

*Tofieldia pusilla* (Michx.) Pers. Rare, east slope, 5831.

### ORCHIDACEAE

*Corallorhiza trifida* Chat. Rare, black spruce forest east of lake, 5807.

*Habenaria obtusata* (Pursh) Rich. Infrequent, black spruce forest east of lake, 5804.

### SALICACEAE

*Populus balsamifera* L. Infrequent, south slope, 5880.

*Populus tremuloides* Michx. Infrequent, south slope, 5881.

*Salix glauca* L. Common, bank thicket, 5927; infrequent, marsh, 5802; infrequent, tundra, 5859, 5932; common, east slope, 5810; infrequent, south slope, 5867.

*Salix myrtilifolia* Anders. Infrequent, black spruce forest east of lake, 5806.

*Salix reticulata* L. Infrequent, marsh, 5801; rare, east slope, 5818.



## BETULACEAE

*Alnus crispa* (Ait.) Pursh. Common, east slope, 5815; common, south slope, 5876; common, bank thicket, 5926.

*Betula glandulosa* Michx. Common, east slope, 5811; common, south slope, 5868; scattered, tundra, 5845; common, bank thicket, 5928.

*Betula occidentalis* Hook. Common, bank thicket, 5930.

## SANTALACEAE

*Geocaulon lividum* (Rich.) Fern. Rare, east slope, 5834.

## POLYGONACEAE

*Polygonum viviparum* L. Infrequent, east slope, 5841; rare, marsh, 5893.

## CARYOPHYLLACEAE

*Arenaria lateriflora* L. Rare, south slope, 5882.

*Stellaria longipes* Goldie. Rare in stony, frost-disturbed soil, tundra, 5935.

## SAXIFRAGACEAE

*Chrysosplenium tetrandrum* (Lund) Fries. Rare, bank thicket, 5897.

*Mitella nuda* L. Rare, east slope, 5825.

*Parnassia multiseta* (Ledeb.) Fern. Rare, east slope, 5809.

## ROSACEAE

*Potentilla fruticosa* L. Infrequent, east slope, 5812.

*Potentilla palustris* (L.) Scop. Rare, marsh, 5903; rare among boulders, southeast shore of lake, 5923.

*Rosa acicularis* Lindl. Rare, south slope, 5874; rare, tundra, 5861.

*Rubus chamaemorus* L. Scattered to frequent, tundra, 5847.

*Rubus idaeus* L. var. *strigosus* (Michx.) Maxim. Rare, *Alnus-Betula-Salix* thicket along creek on south slope of plateau just below summit, south of lake, 5886.

## EMPETRACEAE

*Empetrum nigrum* L. Infrequent, east slope, 5819; rare, south slope, 5871; infrequent, tundra, 5844.

## ELAEAGNACEAE

*Shepherdia canadensis* (L.) Nutt. Infrequent, east slope, 5836.

## ONAGRACEAE

*Epilobium angustifolium* L. Infrequent, east slope, 5829; rare, south slope, 5887.

*Epilobium palustre* L. var. *oliganthum* (Michx.) Fern. Rare, marsh, 5800.

## CORNACEAE

*Cornus canadensis* L. Infrequent, south slope, 5872.

## PYROLACEAE

*Pyrola grandiflora* Radius. Rare, east slope, 5826.

## ERICACEAE

*Andromeda polifolia* L. Infrequent, tundra, 5850; rare, east slope, 5840.

*Arctostaphylos rubra* (Rehd. et Wils.) Fern. Infrequent, east slope, 5817.

*Kalmia polifolia* Wang. Rare, spruce forest east of lake, 5805.

*Ledum decumbens* (Ait.) Lodd. Common, tundra, 5846; infrequent, east slope, 5813.

*Ledum groenlandicum* Oeder. Infrequent, east slope, 5814; rare, marsh, 5896; frequent to common, bank thicket, 5924.

*Rhododendron lapponicum* (L.) Wahl. Infrequent, east slope, 5827; rare, sedge-dominated area southeast of lake, 5803.

*Vaccinium oxycoccos* L. Infrequent on *Sphagnum* among black spruce above south-east shore of lake, 5853.

*Vaccinium uliginosum* L. Rare, bank thicket, 5925; infrequent, tundra, 5919; infrequent, east slope, 5822.

*Vaccinium vitis-idaea* L. var. *minus* Lodd. Common, tundra, 5848; infrequent, east slope, 5824; infrequent, south slope, 5879.

## GENTIANACEAE

*Gentianella amarella* (L.) Börn. ssp. *acuta* (Michx.) Gillett. Infrequent, east slope, 5808.

## SCROPHULARIACEAE

*Castilleja raupii* Penn. Infrequent, east slope, 5838; infrequent, south slope, 5875.

*Pedicularis labradorica* Wirsing. Infrequent, east slope, 5821; infrequent, south slope, 5869; infrequent, tundra, 5849.

## LENTIBULARIACEAE

*Pinguicula villosa* L. Rare on *Sphagnum*, marsh, 5851.

## RUBIACEAE

*Galium trifidum* L. Rare, bank thicket, 5898.

## CAPRIFOLIACEAE

*Linnaea borealis* L. var. *americana* (Forbes) Rehd. Rare, east slope, 5835.

*Viburnum edule* (Michx.) Raf. Rare, east slope, 5820.

## COMPOSITAE

*Arnica lonchophylla* Greene. Rare, east slope, 5833.

*Artemisia tilesii* Ledeb. Infrequent, *Alnus-Betula-Salix* thicket along stream on south slope of plateau just below summit, south of lake, 5884.



*Petasites frigidus* (L.) Fries var. *palmatus* (Ait.) Cronq. Rare, *Alnus-Betula-Salix* thicket along stream on south slope of plateau just below summit, south of lake, 5885.

*Petasites sagittatus* (Pursh) Gray. Infrequent, marsh, 5888.

*Senecio indecorus* Greene. Rare, south slope, 5864.

*Senecio lugens* Rich. Rare, east slope, 5823, 5828; rare, south slope, 5877.

*Solidago multiradiata* Ait. Rare, east slope, 5839; rare, south slope, 5870.

#### ACKNOWLEDGMENTS

For determinations of some collections I am indebted to the following specialists: John W. Thomson, Lichenes; William C. Steere, Bryophyta (except *Sphagnum*); H. L. Blomquist, *Sphagnum*; T. M. Barkley, *Senecio indecorus*; and George W. Argus, *Salix*.

#### REFERENCES

DOUGLAS, R. J. W. 1959. Great Slave and Trout River map-areas, Northwest Territories. Geol. Surv. Canada Pap. 58-11.

RAUP, H. M. 1935. Botanical investigations in Wood Buffalo Park. Bull. nat. Mus. Canada 74.

WHITTAKER, E. J. 1922. Mackenzie River district between Great Slave Lake and Simpson. Summ. Rep. geol. Surv. Canada 1921, Part B: 45-55.

———. 1923. Mackenzie River district between Providence and Simpson. Summ. Rep. geol. Surv. Canada 1922, Part B: 88-100.

Received for publication 26 July 1960



The attention of readers is directed to to the announcement of the Canadian Audubon Society on the outside of the back cover of this issue.



Thieret, John W. 1961. "A Collection of Plants from the Horn Plateau, District of Mackenzie, Northwest Territories." *The Canadian field-naturalist* 75(2), 77–83. <https://doi.org/10.5962/p.341930>.

**View This Item Online:** <https://www.biodiversitylibrary.org/item/89075>

**DOI:** <https://doi.org/10.5962/p.341930>

**Permalink:** <https://www.biodiversitylibrary.org/partpdf/341930>

#### **Holding Institution**

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

#### **Sponsored by**

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

#### **Copyright & Reuse**

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Ottawa Field-Naturalists' Club

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.