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## VASCULAR PLANTS COLLECTED DURING THE CANADIAN HUDSON STRAIT EXPEDITION IN 1927.

By FRITS JOHANSEN

### INTRODUCTION

**D**URING the season (July-October) of 1927, I was attached, as naturalist, to the Canadian Hudson Strait Expedition. While my main work there was zoological, as (partly) recorded in *The Canadian Field-Naturalist*, 45: 80-83, 1931, Ottawa, I also collected a number of plants, at the five localities where I was ashore for shorter or longer time. These plants have been kindly identified by the late Prof. C. H. Ostenfeld of Copenhagen who, together with the late Dr. M. O. Malte, of Ottawa, was engaged in a comprehensive study of the arctic flora. Prof. Ostenfeld informed me in a letter (dated February 3, 1930) that these plants from Hudson Strait, 1927, contained several interesting records. Owing to the death of Prof. Ostenfeld, and to the scarcity of published records for plants from Hudson Strait, I deem it advisable and of interest to make this collection known.

The five localities are: (1) *Port Burwell*, Ungava, on the south side of the eastern end of Hudson Strait, where I stayed from September 12 to October 3; (2) *Lake Harbour*, on the south coast of Baffin Island (on the north side of the middle of Hudson Strait), where I was ashore on August 23; (3) *Wokeham Bay*, Ungava, on the south side of the middle of Hudson Strait, where I stayed from

August 24 to September 10, and from October 5 to October 15; (4) *Eric Cove*, (Cape Wolstenholme), Ungava, on the south side of the western end of Hudson Strait, where I was ashore on August 1-3; (5) *Nottingham Island*, in the western end of Hudson Strait, where I stayed from August 4-17. A summary of my observations on the natural features of importance to the vegetation at each of these five localities, together with Prof. Ostenfeld's lists of the plants I collected there, follows. About 110 species in all were secured.

### I. PORT BURWELL, UNGAVA

See detail-map made by Miles and King in 1910.

This harbour lies upon the west side of Cape Chidley Island, the latter being separated by McLean Strait from the mainland of Labrador-Ungava. A smaller island, at low tide connected with the main island, forms the northside of the harbour.

The country consists of gneiss, in the form of rockbeds or higher cliffs, and as a whole it is very stony. There are no streams of any size on Cape Chidley Island, particularly not in the autumn, but only brooks, running into or from the various ponds or lakes lying in depressions among the rocks. The vegetation is mainly found on such valley stretches, around the fresh-water bodies or brackish-water lagoons; and at particularly favor-



able places it attains the form of shrubbery, composed of willows, birch, blue-berries, etc. But even the high cliffs exhibit other colours than that of stone: the lichens, mosses, a Crassulaceous plant (*Sedum*) and a fern (*Cystopteris*), etc., enlivening their vertical faces or crevices with grey, brown, red, or green colours, glittering in the sun.

The following plants were collected here, at Port Burwell, in the last half of September, 1927, a total of 52 species.

*Cystopteris fragilis* (L.) Bernh.

\**Equisetum variegatum* Schleich.

" *arvense* Linn.

*Lycopodium selago* L., var. *appressum* Desv.

\**Juncus castaneus* Sm.

*Eriophorum Scheuchz. ri* Hoppe.

" *polystachyum* Linn. (= *E. angustifolium* Roth.)

*Carex membranopacta* Bailey.

*Poa rigens* Hartm. (= *P. arctica* R.Br.)

\* " *alpina* Linn.

*Trisetum spicatum* (L.) Richt.

*Salix speciosa* Hook. & Arn. (?)

" *uva-ursi* Pursh.

" *arctica* Pall., var.

*Polygonum viviparum* Linn.

*Oxyria digyna* (L.) Hill.

*Cerastium alpinum* Linn.

*Stellaria longipes* Goldie.

" *humifusa* Rottb.

*Honckenya Halimifolius* *peplodes* (L.) Ehrh.

*Melandryum apetalum* (L.) Fenzl.

*Silene acaulis* Linn.

\**Ranunculus hyperboreus* Rottb.

\* " *eradicatus* (Laest.) (= *Batrachium paucistamineum*, Tausch., var.)

\**Arabis alpina* Linn.

*Cochlearia officinalis* L. var. *groenlandica* (L.) Gelert.

*Draba alpina* Linn.

\* " *lactea* Adams. (= *D. Wahlenbergii* Hart.)

*Eutrema edwardsii* R. Br.

\**Sedum roseum* (L.) (= *S. rhodiola* D.C.)

*Saxifraga oppositifolia* Linn.

" *aizoides* Linn.

" *cernua* Linn.

" *foliolosa* R. Br. (= *S. stellaris* L. var. *comosa* Poir.)

" *groenlandica* Linn. (= *S. caespitosa* L.)

*Potentilla alpestris* Hall. (= *P. maculata* Pourr.)

\* " (*Comarum*) *palustris* (L.) Scop.

*Dryas integrifolia* M. Vahl.

*Oxytropis terræ-novæ* Fernald.

*Epilobium (Chamaenerion) latifolium* L. (Hook)

\**Epilobium anagallidifolium* Lam. (= *E. alpinum* Linn.)

*Hippuris vulgaris* Linn.

*Pyrola grandiflora* Rad.

*Arctostaphylos alpina* (L.) Spreng.

*Vaccinium vitis-idaea* L., forma *pumilum* Horn.

" *uliginosum* L., var. *alpinum* Bigel.

*Statice armeria* L., var. *labradorica* Turcz. (= *Armeria elongata* Hoffm.)

\**Veronica alpina* L., var. *Wormskioldii* Roem. & Sch.

*Mertensia (Stenhammaria) maritima* (L.) S. F. Gray.

*Campanula rotundifolia* Linn.

*Taraxacum croceum* Dahlst.

*Erigeron unalaschkensis* (D.C.) Vierh. (= *E. uniflorus* L., var. *unalaschkensis*)

## II. LAKE HARBOUR. BAFFIN ISLAND

The place where I was ashore, at Lake Harbour, was in the outer part of the sailing-in to the post, where the "Larch" remained anchored, between a larger island (with an Eskimo camp on it) and the "Meta incognita" part of Baffin Island (also with an Eskimo camp), from 4 p.m. on August 22 to the next day's noon.

The coast of Baffin Island here consists of steep cliffs of gneiss and schists falling down to the sea; but with much vegetation, particularly around lakes and ponds, in the shelter of cliffs, and in the grassy gullies intersecting the coastal cliffs and containing the outlets from the fresh-water bodies inland. At these place, willow bushes sometimes reach almost to the knees, and a little inland shrubbery of low dwarf birches occurs. I followed a brook from the coast, up over the cliffs, to the lake it came from, at about 100 feet elevation, noticing on my way the progressing erosion, in the form of gravel debris, of the cliffs, when exposed to the air. The lake itself had a stony or gravelly bottom, and no vegetation extending out into it, though surrounded by a grassy swamp at its western end, and around its outlet at its east end.

The following plants were collected here, on "Meta incognita", on August 23, a total of 33 species.

\**Lycopodium annotinum* L., var. *pungens* Desv.

*Eriophorum Scheuchzeri* Hoppe.

" *polystachyum* Linn. (= *E. angustifolium* Roth.)

*Carex rigida* Good.

\* " *rariflora* Sm.

*Poa rigens* Hartm. (= *P. arctica* R.Br.)

*Trisetum spicatum* (L.) Richt.

*Salix arctica* Pall. x *S. glauca* L. (?)



*Salix herbacea* Linn.  
*Betula glandulosa* Michx.  
*Polygonum viviparum* Linn.  
*Oxyria digyna* (L.) Hill.  
*Stellaria longipes* Goldie.  
*Silene acaulis* Linn.  
*\*Ranunculus lapponicus* Linn.  
*Empetrum nigrum* Linn., var. *hermaphroditum*  
 (Lange) Hagerup  
*Saxifraga tricuspidata* Rottb.  
*Dryas integrifolia* M. Vahl.  
*Potentilla alpestris* Hall. (= *P. maculata* Pourr.)  
*Epilobium (Chamænerion) latifolium* (L.) Hook.  
*Hippuris vulgaris* Linn.  
*Pyrola grandiflora* Rad.  
*\*Bryanthus (Phyllodoce) cæruleus* (L.) Dippel.  
*Arctostaphylos alpina* (L.) Spreng.  
*Vaccinium vitis-idaea* L., forma *pumilum* Horn-  
 em.  
 " *uliginosum* L., var. *alpinum* Bigel.  
*Diapensia lapponica* Linn.  
*Cassiope tetragona* (L.) D. Don.  
 \* " (*Harrimanella*) *hypnoides* (L.) D. Don.  
*Ledum decumbens* Lodd. (= *L. palustre* L., var.  
*decumbens*)  
*Pedicularis lapponica* Linn.  
*Antennaria alpina* (L.) Gaertn.  
*Taraxacum russeolum* Dahlst.

### III. WAKEHAM BAY, UNGAVA

The outer part of Wakeham Bay presents high, steep gneiss cliffs on both sides, intersected by cross-gullies, and hiding longitudinal valleys containing watercourses, lakes and ponds. At the middle part of the bay, however, a wide valley, divided at its mouth by a lower rocky hill, comes down to the sea in the form of a broad, coastal plain, upon which the buildings of the trading posts of the Hudson Bay Company and Revillon Frères are situated. Behind this lower rocky hill, most of the valley is taken up by a system of half a score of lakes, mutually connected, fed from the surrounding hill slopes, and with creek outlets in the above mentioned coastal plain. This chain of lakes stretches all the way to Joy Bay (the large wide bay east of Wakeham Bay); three of the lakes draining into Wakeham Bay, and six or seven of them into Joy Bay. I covered the whole stretch of these lakes out and back, on October 10th; finding that at the bottom of Joy Bay their creek outlets spread out over extensive mud-flats, boulder stretches and marshes, an entirely different coast-nature from the higher tundra-plain in the middle of Wakeham Bay. Proceeding further up Wakeham Bay one

passes high steep cliffs, alternating with grassy slopes intersected by brooks; and finally reaches the bottom of the bay, where a river comes out among boulder- or gravel-flats, merging into marshes or higher tundra further up the wide, cliff-bordered valley here. I was here on September 1st.

The vegetation at Wakeham Bay is better than at Port Burwell and Lake Harbour; and particularly luxurious in protected cliff gullies, river banks or valley stretches, and on the ruins of old Eskimo stone-houses, situated on grassy promontories at the bay or along inland lakes. At such places a shrubbery of willows, birch, blueberries, etc., occurs; though certain species of plants (e.g. *Rubus chamaemorus*) are found only some distance inland.

The following plants were collected here, at Wakeham Bay, at the end of August, and beginning of September, a total of 70 species.

*Cystopteris fragilis* (L.) Bernh.  
*Equisetum arvense* Linn.  
*Lycopodium selago* L., var. *appressum* Desv.  
*Luzula confusa* Lindeb.  
 " *nivalis* (Laest.), var. *longifolia* Beurl.,  
 var. & typ.  
*Eriophorum polystachion* Linn. (= *E. angustifolium* Roth.)  
*Carex rigida* Good.  
 " *membranopacta* Bailey.  
*Poa rigens* Hartm.  
 \* " *glauca* Vahl.  
 " *alpigena* Lindm.  
*Alopecurus alpinus* Sm.  
*Arctagrostis latifolia* (R. Br.) Griseb.  
*Trisetum spicatum* (L.) Richt.  
*\*Puccinellia retroflexa* (Curt.) Holmb.  
*Elymus arenarius* Linn.  
*\*Tofieldia palustris* Huds.  
*Betula glandulosa* Michx.  
*Salix arctica* Pall. x *S. glauca* Linn. (?)  
 " *uva-ursi* Pursh.  
 " sp. (*S. speciosa* Hook & Arn.?)  
 " *reticulata* Linn.  
 " *herbacea* Linn.  
*Polygonum viviparum* Linn.  
*Oxyria digyna* (L.) Hill.  
*Silene acaulis* Linn.  
*Honckenya (Halianthus) peploides* (L.) Ehrh.  
*Stellaria humifusa* Rottb.  
 " *longipes* Goldie.  
*Cerastium alpinum* Linn.  
*Melandryum affine* Vahl.  
*\*Ranunculus affinis* R. Br.  
*\*Anemone Richardsonii* Hook.



*Papaver radicatum* Rottb. (= *P. nudicaule* Linn.)

*Eutrema edwardsii* R. Br.

*Draba nivalis* Liljebl.

" *alpina* Linn.

\**Cochlearia officinalis* L., var. *arctica* Schlecht.

*Empetrum nigrum* L., var. *hermaphroditum* (Lange) Hagerup.

*Saxifraga foliolosa* R. Br. (= *S. stellaris* L., var. *comosa* Poir.)

" *tricuspidata* Rottb.

" *groenlandica* Linn. (= *S. cæspitosa* Linn.)

" *hirculus* Linn.

" *aizoides* Linn.

" *cernua* Linn.

*Chrysosplenium alternifolium* L., var. *tetrandrum* Lund.

\**Parnassia Kotzebuei* Ch. & Schl.

\**Rubus chamæmorus* Linn.

*Dryas integrifolia* M. Vahl.

*Potentilla alpestris* Hall. (= *P. maculata* Pourr.)

*Astragalus alpinus* Linn.

*Oxytropis terræ-novæ* Fernald.

*Epilobium (Chamænerion) latifolium* (L.) Hook.

*Pyrola grandiflora* Rad.

*Cassiope tetragona* (L.) D. Don.

*Arctostaphylos alpina* (L.) Spreng.

*Ledum decumbens* Lodd. (= *L. palustre* L., var. *decumbens* Ait.)

\**Rhododendron lapponicum* (L.) Wg.

*Vaccinium vitis-idaea* L., var. *pumilum* Hornem.

" *uliginosum* L., var. *alpinum* Bigel.

*Statice armeria* L., var. *labradorica* Turcz. (= *Armeria elongata* Hoffm.)

*Pedicularis hirsuta* Linn.

" *lapponica* Linn.

*Mertensia (Stenhammaria) maritima* (L.) S. F. Gray.

*Campanula uniflora* Linn.

" *rotundifolia* Linn.

*Antennaria alpina* (L.) Gaertn.

*Arnica alpina* (L.) Olin.

*Taraxacum russeolum* Dahlst.

*Erigeron unalaschkensis* (D.C.) Vierh. (= *E. uniflorus* L., var. *unalaschkensis*).

#### IV. ERIC COVE, UNGAVA

The sides of Eric Cove (just east of Cape Wolstenholme) are formed by cliffs, up to 2000 feet high composed of Precambrian schists. Here and there, these cliffs are intersected by gullies by which they can be ascended; but the bottom of the cove is a wide expanse of sand and gravel, deposited by the river coming out here. The buildings of the Hudson Bay Company are situated upon this level, coastal plain, which gradually merges

into a deep valley behind. The above mentioned river receives, during its course, a couple of tributary creeks (one of which comes down the western river slope through a cliff gorge up the valley) and many similar brooks; but there is no lake at its head.

The vegetation is fairly good, particularly in the swamps and protected places (banks, etc.) of the river, or in the cliff gullies leading up from its slopes, judging from my excursions several miles up the valley through which it runs in its middle and upper course. A detail map of Eric Cove was made by Hazen in 1912.

The following plants were collected here, at Eric Cove, during the first days of August, a total of 56 species.

*Lycopodium selago* L., var. *appressum* Desv.

\**Luzula parviflora* (Ehrh.) Desv.

" *confusa* Lindeb.

" *nivalis* Laest., var. *longifolia* Beurl.

*Eriophorum Scheuchzeri* Hoppe.

" *polystachion* Linn. (= *E. angustifolium* Roth.)

*Carex rigida* Good.

" *membranopacta* Bailey.

*Poa alpigena* Lindm.

" *rigens* Hartm. (= *P. arctica* R. Br.)

*Alopecurus alpinus* Sm.

*Arctagrostis latifolia* (R. Br.) Griseb.

*Hierochloë alpina* R. & S.

\**Festuca ovina* L., var. *brevifolia* R. Br.

*Elymus arenarius* Linn.

*Salix arctica* Pall. x *S. glauca* Linn. (?)

" *herbacea* Linn.

*Polygonum viviparum* Linn.

*Oxyria digyna* (L.) Hill.

*Silene acaulis* Linn.

*Honckenya (Halimolobos) peploides* (L.) Ehrh.

*Stellaria longipes* Goldie.

*Melandryum apetalum* (L.) Fenzl.

" *affine* Vahl.

*Cerastium alpinum* Linn.

\**Ranunculus nivalis* Linn.

" *Sabinei* R. Br.

*Papaver radicatum* Rottb. (= *P. nudicaule* Linn.)

*Eutrema Edwardsii* R. Br.

\**Draba hirta* Linn. (= *D. daurica* Df.)

" *nivalis* Liljebl.

*Empetrum nigrum* Linn.

*Saxifraga foliolosa* R. Br. (= *S. stellaris* L., var. *comosa* Poir.)

\* " *nivalis* Linn.

" *groenlandica* Linn. (= *S. cæspitosa* Linn.)

" *tricuspidata* Rottb.



*Saxifraga cernua* Linn.  
*Dryas integrifolia* Vahl.  
*Potentilla alpestris* Hall. (= *P. maculata* Pourr.)  
*Astragalus alpinus* Linn.  
*\*Oxytropis Maydelliana* Trautv.  
*Epilobium (Chamænerion) latifolium* (L.) Hook.  
*Cassiope tetragona* (L.) D. Don.  
*Ledum decumbens* Lodd. (= *L. palustre* L., var. *decumbens* Ait.)  
*Diapensia lapponica* Linn.  
*Vaccinium vitis-idaea* L., var. *pumilum* Hornem.  
 " *uliginosum* L., var. *alpinum* Bigel.  
*Statice armeria* L., var. *labradorica* Turcz. (= *Armeria elongata* Hoffm.)  
*Pedicularis hirsuta* Linn.  
 " *lapponica* Linn.  
*Mertensia (Stenhammaria) maritima* (L.) S. F. Gray.  
*Campanula uniflora* Linn.  
*Antennaria alpina* (L.) Gaertn.  
*Arnica alpina* (L.) Olin.  
*Taraxacum croceum* Dahlst.  
*\*Erigeron uniflorus* Linn.

#### V. NOTTINGHAM ISLAND.

This island consists of gneiss-rocks, much glaciated, and forming island-like hummocks, surrounded by plains of boulder-clay of marine origin, stretching to an elevation of 50-100 feet inland. While R. Bell did not find any marine shells in the boulder-clay on the east side of the island, in 1884, I found, in 1927, great quantities of subfossil Mollusc shells (*Mya*, *Saxicava*, *Tellina*, etc.) on the south end of the island, in the boulder-clay, or washed out from it. The boulder-clay plains are often very extensive; and at many places come down to the sea (particularly at the head of bights or inlets) in the form of boulder strewn, sandy, gravel beaches or clay mudflats, alternating with stretches of rocky coast. The general nature of the island, as noticed by me on August 13 from one of the highest points on the south end (cairn with record built here), showed rocky ridges and outcrops intervening with, often extensive, valleys, partly filled by many lakes and ponds. There are apparently no rivers of any size upon the island; only creeks and brooks, connecting or running into or out of the various lakes and ponds. The large lakes are sometimes divided up by rocky islands or points, and have boulder-strewn margins. For botanical, entomological, and fresh-water biological collecting, it is therefore natural to follow the merging of the sea-coves into the inland valleys and

plains, the vegetation being best developed here. The remains (stone-caches, shelters, etc.) of former Eskimo inhabitants of the island, are also found along this route. The greatest variety in the vegetation is, however, found near the coast, as proven also by the more barren nature of the animal life inland, compared to that nearer the sea. The more exposed islets off Nottingham have of course, few species of vascular plants; thus I found only half a dozen of them on one islet visited on August 15 (See list below.)

The following plants were collected here, on Nottingham Island, in the middle of August, a total of 40 species.

*Lycopodium selago* L., var. *appressum* Desv.  
*Luzula confusa* Lindeb.  
*Eriophorum Scheuchzeri* Hoppe.  
*Alopecurus alpinus* Sm.  
*\*Dupontia Fischeri* R. Br.  
*\*Puccinellia tenella* (Lange) O. R. Holmb. (from an islet off Nottingham Island only.)  
*Hierochloë alpina* R. & Sch.  
*Salix arctica* Pall. x *S. glauca* Linn. (?) (also from islet off Nottingham Island.)  
 " *herbacea* Linn.  
 " *reticulata* Linn.  
*Polygonum viviparum* Linn.  
*Oxyria digyna* (L.) Hill.  
*Honckenya (Halimolobos) peploides* (L.) Ehrh. (also from islet off Nottingham Island).  
*Silene acaulis* Linn.  
*Stellaria longipes* Goldie.  
*Cerastium alpinum* Linn.  
*Melandryum apetalum* (L.) Fenzl.  
*Ranunculus pygmaeus* Wg.  
*Papaver radiculatum* Rottb. (= *P. nudicaule* Linn.)  
*Draba nivalis* Liljebl.  
 " *alpina* Linn.  
*\*Cardamine pratensis* Linn.  
*Cochlearia officinalis* L., var. *grænlantica* (L.) Gelert.  
*Empetrum nigrum* Linn.  
*Saxifraga grænlantica* Linn. (= *S. caespitosa* (Linn.) (also from islet off Nottingham Island).  
 " *tricuspidata* Rottb.  
 " *hirculus* Linn.  
 \* " *rivularis* Linn. (from islet off Nottingham Island only).  
 " *oppositifolia* Linn. (also from islet off Nottingham Island).  
*Chrysosplenium alternifolium* L., var. *tetrandrum* Lund.  
*Dryas integrifolia* M. Vahl.  
*Potentilla alpestris* Hall (= *P. maculata* Pourr.)  
*Astragalus alpinus* Linn.



*Pyrola grandiflora* Rad.

*Cassiope tetragona* (L.) D. Don.

*Vaccinium uliginosum* L., var. *alpinum* Bigel.

\**Pedicularis lanata* Cham. & Schlecht.

*Mertensia* (*Stenhammaria*) *maritima* (L.) S. F. Gray (also from islet off Nottingham Island).

\**Chrysanthemum integrifolium* Rich.

\**Matricaria inodora* L., var. *grandiflora* Hook.

#### CONCLUSION.

It will be seen from the above that not less than 40 species of plants were observed only at one locality, thus emphasizing the floral variety in Hudson Strait. These forty species are marked with an asterisk in the lists above for each locality. Eleven of these were found at Port Burwell; five at Lake Harbour; nine

at Wakeham Bay; eight at Eric Cove; and seven on Nottingham Island. Collections made by others in the same area will, of course, greatly reduce this number of species, when published. But at present, both these 40 species, and the other 70 odd species, also collected, form a working basis for future investigations of the vegetation in Hudson Strait. In this connection it is greatly to be wished that the large collections of plants made there by Canadian botanists may be published.

For photographs of the above mentioned localities, refer to: *Report of the Hudson Strait Expedition 1927-28*, Ottawa 1929, pp. 194-196, 201-203 (Port Burwell); 192-193, 198-200, 204, 207-208, 210 (Wakeham Bay); 185-191, 197-198, 206 (Nottingham Island).

## NOTES ON THE FISH FAUNA OF AN EASTERN ONTARIO SHALLOW WATER LAKE

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KNOWLEDGE of the fish fauna of eastern Ontario is largely limited to the game and commercial species. The black basses, the lake trout and the whitefish have an extended literature but very few of the smaller fishes have been studied in this part of the province. In a general way it is known that certain types of fish are present, but there is no exact knowledge of where many of the smaller kinds may be found. Dymond *et al* (1929) has written of the fishes of Lake Ontario and Bishop (1931) reported on the fishes of the Upper St. Lawrence River. Hubbs and Brown (1929) listed some collections from the eastern end of Lake Ontario and the Upper St. Lawrence. The many small lakes of the eastern counties have been almost entirely neglected.

The present paper is preliminary to further studies on the lakes in the vicinity of Kingston, Ontario. It is hoped that lakes of the first and second orders (Chapman 1929, p. 305) will be examined another season. Long Lake, which is situated three-quarters of a mile north of the village of Verona, is one of the headwater lakes of the Napanee River. It is a typical example of Chapman's third order of lakes, that is, a shallow water lake without a thermocline. Its greatest depth is about 12 metres but half of it is less than

5 metres in depth. Roughly a mile and three-quarters in greatest length, its main axis is north and south. It is separated into three large arms or bays; with swamps near the ends, indicating that in former times the lake was much larger than it is at present. Three streams enter, and one leaves, the lake. None of these have much flow except during high water. Geologically, Long Lake is in a region of metamorphic rocks overlaid to a great extent by glacial till and gravel. The deepest portion of the lake is towards the eastern shore where it is bordered by steep, rocky hills. The land on the west shore of the lake is gently sloping. Several shoal areas are present, and in times of low water two of these appear at the surface as small islands.

Shallow water and vegetation are important factors in the production of fish in a lake. This is particularly true of the type of lake that is under review. The literature shows that these factors are recognized as important by the aquatic biologists. Adams and Hankinson (1926) found that shallow waters have the most varied conditions, because here are the greatest changes in temperature and in light, the greatest variety of vegetation and the feeding and breeding grounds of most of the fish and the main habitat of the young fish. Bensley (1915) says that the environ-





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