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FISHES COLLECTED IN NEWFOUNDLAND DURING THE AUTUMN OF 1922

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INTRODUCTION

BEYOND the fishes of economic importance (cod, salmon, trout, etc.), little is known, and still less has been published, about the fishes inhabiting the freshwater bodies and shore-waters of Newfoundland. Much has been written about the famous cod-fishing banks off the S.E. coast of Newfoundland (The Grand Banks); and the numerous rivers and lakes of the interior of the island are well known to the enthusiastic angler or tourist as a paradise for salmon and trout, as duly recorded in various articles and books.

When, however, one takes up the question of the Newfoundland fauna, from a more scientific point of view, and asks what animals inhabit the freshwater bodies and shore waters of the island, the information we have so far is very meagre. This is partly owing to the fact that the Newfoundlanders themselves up to very recently have been content with economic investigations, in so far as the natural history of their island is concerned, treating the cod-fishery, the minerals, forests, etc. And as Newfoundland, politically, belongs neither to Canada nor the United States, it has not been included in the regular natural history surveys and field-work carried out by these two countries, though much nearer to the centres of population than Alaska and the Canadian Arctic. As is well known, Newfoundland is the oldest crown-colony in the British Empire and leans, economically and culturally, more upon Great Britain than upon Canada, though geographically it is a part of the latter. The lion's share of the economic and scientific investigations carried on in Newfoundland by outsiders, has therefore, been financed and carried out from the British Isles, and they were, until the island became a Dominion, practically the only ones. Particularly the mammals and birds, and the vegetation (both terrestrial and marine) have in later years come in for some attention by naturalists in the United States, (both museum-studies and field-work), and the deep waters surrounding the island have been investigated by scientific expeditions from France, Scandinavia, United States, etc.

It is, however, altogether proper that Newfoundland's nearest neighbour, Canada, which has resources, wealth and population far surpassing those of the island, should assist it in solving many of the problems connected with the proper utilization of its natural resources, also because these problems are largely our own. Newfoundland forms the east side of the Gulf of St. Lawrence, and deflects the enormous masses of arctic ice moving south from our shores. Its physiography, fauna and flora (both on land and in the sea) are eastern Canadian; its principal industries are the same as at our Atlantic sea-board; its population consists of English and Acadian French, with history and present relations in common with us; and the island forms the gateway to the Dominion of Canada from the sea, and is greeted in gratitude and hope both by the Canadian returning from abroad, and by the immigrant.

As is well known, sea-fishing is by far the most important industry of Newfoundland, both as to the income from it, and as to the resources and number of people engaged in it. The sea "fishing" falls into two main categories, viz.: the pelagic hunting of seals upon the ice in the spring from schooners fitted out for the purpose in St. Johns; and the fishing for cod, etc., from shore in smaller boats or in schooners upon the banks off the island. It has long been realized that a proper utilization and development of the sea-fisheries (as of every other industry) depends largely upon the gathering of scientific information and conducting of experiments; in this case, observations on the food, animals, currents, etc., of importance to the fishes, and on the life history of the latter. What has Canada then done with regard to this, in so far as Newfoundland is concerned? It is not very much, judging from the literature, but it is gratifying to know, that the last years have seen more accomplished by Canada than was done in as many centuries preceding them.

As the title to this article infers, I shall limit myself here to Canadian, scientific observations

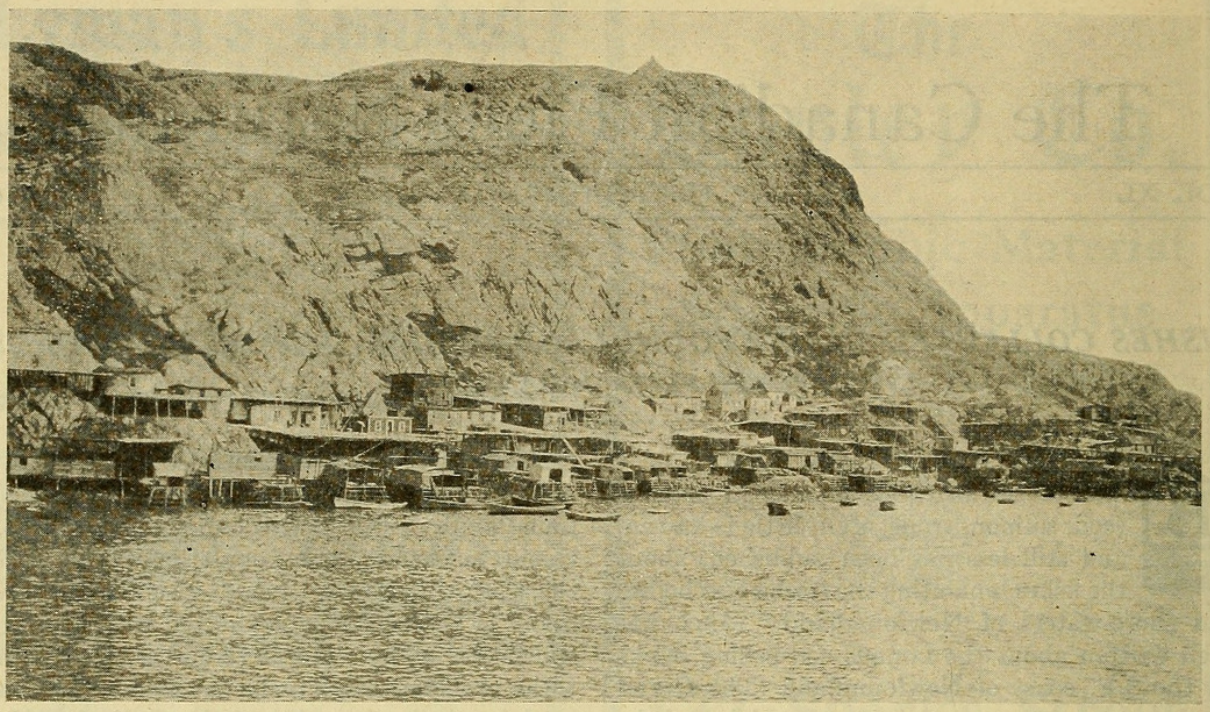

FIG. 1—*Entrance to St. Johns, Nfld., showing shacks and platforms for drying cod.*
F. Johansen photo

on the fishes inhabiting the freshwater bodies and shore waters of Newfoundland.

In the National Collections here in Ottawa is a 7 cm. long Stickleback (*Gasterosteus*) apparently collected by the *Diana* Expedition in November, 1897, at St. Johns, Nfld. (Cat. No. 40). I sent it to Prof. P. Cox, in Fredricton, N.B., who states about it: "I cannot distinguish this specimen from the usual type of the marine *G. bispinosus* of our coasts which I believe it to be." This record is now published for the first time.

The next contribution to our subject, by Canada, is apparently the investigations carried out by the Canadian Fisheries Expedition under Dr. J. Hjort, in 1915. A great amount of pelagic (plankton) material was secured by the *Acadia*, *Princess* and *33* off the south and west coasts of Newfoundland, as recorded in the report on this expedition published in Ottawa in 1919 (see *Canadian Field-Naturalist* for October, 1923, pp. 139-40.). The stations near the shores of Newfoundland are *Acadia* Nos. 36, 83, and *Princess* Nos. 18-20, 44-46 (see figs. 4-5 in the report referred to; fig. 4 should be fig. 5, and fig. 5 should be fig. 4). The drifter *33* also secured fish-eggs and larvae at the west coast of Newfoundland. The fish-eggs and larvae secured are treated by A. Dannevig on pp. 1-74, 3 plates, in the report; and the Newfoundland records will be found on pp. 5-7 (*Ctenolabrus adsperus*), 9-11 (*Scomber scombrus*), 12-14 (*Sebastes marinus*), 17 (*Glyptocephalus cynoglossus*), 18-21 (*Drepanopsetta platessoides*), 22-28 (Gadidae), 29 (*Ammodytes tobianus*), 30-32 (*Mallotus villosus*); and a discussion and lists of them on pp. 33-41, 51-73; while Newfoundland specimens are figured on Plates I, fig. 6, and III, figs. 18, 26-27. The drifter *33* also secured by seine and shrimp trawl some shore-fishes on the west coast of Newfoundland in August, 1915; but these have not yet been recorded, apart from the Long Rough Dab (*D. platessoides;* see Huntsman, 1918, frontispiece, and on pp. 7, 17, 20, 22-26), and the Cunner (*Tautogolabrus adspersus;* see Johansen, 1925. p. 427).

In the summer of 1923, the Canadian Biological Board carried on in the *Prince* and the C.G.S. *Arleux*, under Dr. A. G. Huntsman, detailed marine investigations in the strait of Belle Isle and neighboring waters, at the north-end of Newfoundland; but the fishes secured on this expedition have not yet been published, apart from some references to them (from a hydrographic point of view) by Huntsman in *Contrib. Canad. Biol.*, New Ser., Vol. II, Toronto, 1924; and my record of the occurrences of the Cunner at the Newfoundland side of the Strait (1925, p. 465).

MY EXCURSION IN 1922

After a three weeks' stay in Gaspé, during which time I collected a number of marine and freshwater specimens which will be recorded in another article, I reached Charlottetown, on Prince Edward Island, August 22. I remained only a day and a half on this island, but during this time I secured both freshwater amphipods (*Gammarus fasciatus*) in a lake nearby, as also

Sticklebacks (*Gasterosteus gladiunculus*) and plankton in the harbour, and different small invertebrates attached to the sea-weeds covering the piers here. Heavy rains prevented longer excursions.

I then left on SS. *Manoa* for St. Johns, Nfld., direct; and, after a somewhat stormy passage arrived there on August 24th. After getting ashore, I acquainted myself with the town, particularly the interesting, but neglected, Museum, and the immediate surroundings in company with my friend, Mr. Arthur English, who is much interested in natural history, and knows the island so well. The entrance to St. Johns Harbour is magnificent, with its towering, almost bare, granite coast washed by the sea, and a rather narrow channel leading to the spacious harbour, lined on both sides below with shacks and platforms for the curing and drying of cod-fish (see fig. 1). At the highest point on the north side, facing the sea, nestles the signal-station, from where one has a wonderful view of the Capital and its surroundings, and far out to sea. The city itself, covers a wide area around the harbour (basin) and up the hillsides, and the major part of it lies on the north side of the harbour (where the country is lower and more open), and encloses half a dozen ponds, the largest of which is called Quidi Vidi Lake, and has an outlet to the sea two miles north of St. Johns, where an old fishing village surrounds a protected cove, with high cliffs all around. The soil around St. Johns is very stony; but a little farming is carried on in the outskirts, and there are patches and ridges with fair-sized spruce, larch, pine, etc., even close to the city, which also contains an extensive park. The hillsides are green with verdure and a profusion of berries, and in their lower parts shrubbery of willows, alder, etc., while bogs surround the occasional ponds.

The day after my arrival, Mr. English and I spent in an excursion to Quidi Vidi village, one of the oldest settlements on Newfoundland. It contains some picturesque old houses, and the lagoon-like harbour, which communicates with the sea by a very narrow entrance, is littered with refuse from the fishing-shacks and platforms (made of spruce posts and boughs) alongside it. Of fishes only Sticklebacks (probably *Gasterosteus bispinosus*) were observed in the harbour and an adjoining freshwater pond, and I kept three specimens, $2\frac{1}{2}$-4 cm. long. Some marine algae and invertebrates were also collected in the harbour and in a pocket nearby, where the waves from the Atlantic surge to and fro, and wash up *Laminaria*, shells, etc.

In the afternoon, we visited Oxenham and Burton's Pond and the ponds at the sand pits, but no fishes were found, though I secured specimens of the (introduced) Green frog (*Rana clamitans*), and a number of invertebrates, besides insects, land-snails, etc. I also got a good impression of the havoc wrought by insect-pests to the spruce trees here, and had supper on Mr. English's farm.

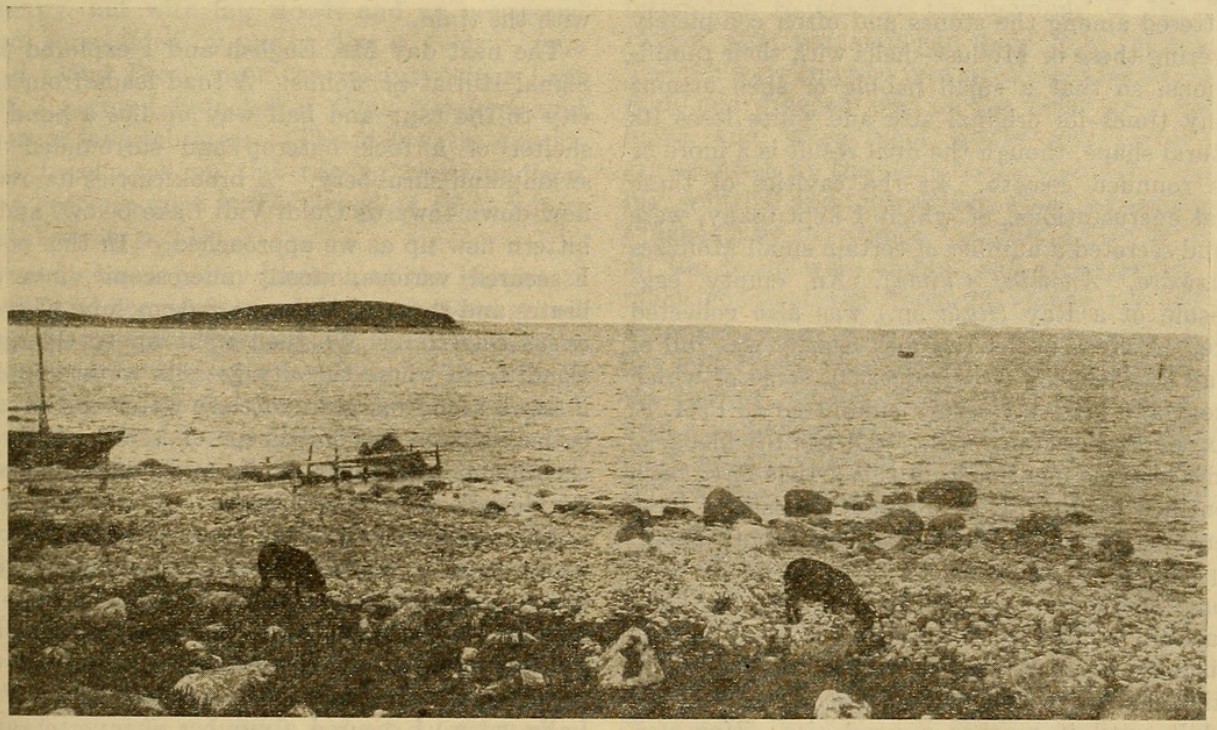

FIG. 2—*The beach at Kelligrews, Conception Bay, Nfld., looking west towards limestone-point.*
F. Johansen photo

The next day I took the train in the morning for Conception Bay, west of St. Johns, on the north side of Avalon Peninsula. After a ride of an hour and a half through the valley, I reached Kelligrews, where I got off and walked along the beach towards the bottom of the bay, where the dome-shaped Holyrood Mountain is a conspicuous landmark. The bottom of Conception Bay is entirely different from the coast of St. Johns, being a low limestone coast with extensive gravel-flats or boulder-beach. At Kelligrews lagoons and marshes gradually merge into the open country behind, but a little further south along the east coast of the bay the sea washes directly upon the land, and increases the number of boulders protecting it. The railway runs right along the beach bluffs here, and a characteristic feature of these are the tumulus-shaped, wind-swept, small spruce trees growing here and there close to the ground. The bottom of Conception Bay is very beautiful, with the rocky Bell Island (famous for its iron ore) out in the Bay, and on both sides the yellowish limestone cliffs covered with vegetation, the white gravel and green marshes, and the blue waters of the bay held in check by the boulders (see fig. 2). The villages (Topsail, Kelligrews, etc.) are therefore largely made up of summer houses owned by the people in St. Johns, who find here a more congenial climate, and a less turbulent and more accessible sea than at the Atlantic sea board.

Characteristic for the washed-up gravel-bars or flats making up the beach at Kelligrews is the large quantity of calcareous algae (*Lithothamnion*) scattered among the stones and often completely covering these or Mollusc-shells with their ramifications, so that a small pebble or shell attains many times its original size and quite loses its natural shape, though the final result is a more or less rounded growth. In the cavities of these algal encrustations, of which I kept many, were found secreted a number of certain small Molluscs (*Saxicava, Anomia, Chiton*). An empty egg-capsule of a Ray (*Raja* sp.) was also collected here. A creek-outlet (lagoon) nearby was full of small sticklebacks (*G. bispinosus*), some of which I kept and after my return submitted to Prof. P. Cox, of Fredericton, N.B. (All the Sticklebacks and *Fundulus* mentioned in this article have been identified by Prof. Cox. The other fishes I have identified myself.) Prof. Cox says about them: "Specimens of sticklebacks from 15 to 30 mm. "long, immature. In regions where the fully and "partially mailed species occur, it is often hard to "diagnose these immature stages, for the young "stickleback does not assume the armature of the "adult until it reaches a good size. However, "these specimens are neither *G. cuvieri*, nor *G. "gladiunculus*, but may be the young of *G. aculeatus*, if the species occurs in the range of which "I have no evidence, or of *G. bispinosus*. The "latter is the more probable."

A widening (freshwater pond) in a creek further down the coast also contained sticklebacks, of which I kept two 4 cm. long ones (probably *G. atkinsii*). Small brook-trout (*Salvelinus fontinalis*) were also seen jumping in the water here, but I did not succeed in catching any of them.

At this place is a small pier and a couple of fishermen's shacks, and while bathing here, I noticed a Cunner (*Tautogolabrus adspersus*) swimming around in shelter of the pier; but it refused to bite on my hook, though I secured a 13 cm. long sculpin (*Myoxocephalus scorpius groenlandicus*) this way. I did, however, find the result of a boy's more successful endeavour in the form of the head of a cunner on the pier, which I kept as this is the first record of the cunner from the east coast of Newfoundland (see Johansen, 1925, pp. 427-28). I also secured some small invertebrates secreted among the boulders at the beach here, the most interesting of which was a tiny, ball-shaped Ascidian.

Returning to Kelligrews, I paid a visit to the long limestone point forming the south (west) side of the cove at the village, and found here a small pond (cattle-pool) situated in a grassy field, where I secured various aquatic insects and Entomostraca (Ostracoda and Cladocera). A fisherman's basket-trap in the cove contained no fishes; so, after securing samples of marine plankton here, I had supper and returned to St. Johns with the train.

The next day Mr. English and I explored the Signal Hill at St. Johns. A road leads from the city to the top; and half way up lies a pond in shelter of a rock outcrop and surrounded by swamp and shrubbery. A brook carries its overflow down towards Quidi Vidi Lake below, and a bittern flew up as we approached. In this pond I secured various, mostly microscopic, invertebrates and three sticklebacks, 3-6 cm. long (*Gasterosteus cuvieri?*). We then went up to George's Pond, from where the city gets its water supply; it has a stony margin and clear water and is said to be eighteen fathoms deep. I kept samples of the filamentous algae in it, and secured also a stickleback (*G. cuvieri?*) here.

After admiring the view from the signal tower, we returned to the city by walking along the side of the mountain, where are to be seen the ruins of a stone fortification from the time an English garrison was here. Descending the slopes overgrown with shrubbery, we reached Quidi Vidi Lake, where I secured a number of invertebrates in the water and under stones and among vegetation along its margin. This lake lies on an exten-

FIG. 3—*Fishermen landing their catch at Torbay, Nfld. Note the man holding a cod aloft, and the platforms for drying fish on the slope.*

F. Johansen photo

sive plain and is thus easy of approach; the annual regatta (racing of pleasure yachts) takes place here.

The day after, I walked to Torbay, the deepest of the bays north of St. Johns. A good road runs all the way; and one gets a good impression of the inland country near St. Johns, very stony or swampy, but with fair woods and an occasional farm, surrounded by partly cleared fields. In a pond (Mud Pond) near the road at Sugar Loaf Hill, I secured tadpoles of *Rana clamitans* and different invertebrates. (The freshwater Amphipods I collected on this trip to Newfoundland have been recorded in *The Canadian Field-Naturalist*, Vol. 36, p. 178).

Torbay has a pretty location at the bottom of the bay of the same name, where a wide gravel beach forms a landing-place for the many motorboats used by the fishermen here. The village lies scattered up the surrounding hillsides; and where the latter do not fall off too steeply to the sea, are found the several stories high platforms and shacks for the curing of cod-fish, so characteristic and picturesque a feature of the settlements on the east coast of Newfoundland. Apart from its very bottom, the sides of the bay are thus everywhere formed by steep cliffs, rounded above and covered with verdure, which, with the reddish rock, white houses and blue water and sky, forms a lovely picture. I made a short cut through a gully in the cliffs down to the bottom of the bay, as the fishermen were just coming in with their catch of Cod (see fig. 3). The latter are caught by jigging, using the common squid (*Illex illicebrosus*) which is very plentiful here, as bait; and before I left in the evening, I saw all the motorboats run out to the outer part of the bay, where they anchored for "squidding". The fishing is far better here than at St. Johns, and it was interesting to observe the handling of the cod caught, after the boats had come up to the beach. The fish were emptied into small open box-sledges, each one dragged out to the boat by a small horse, and, when filled, ashore and across the gravel-beach up the slope to the shacks for cleaning, splitting and later drying upon the platforms ("flakes") by the women. This was kept up until all the boats were empty, and accompanied by much good-natured "banter" among the sturdy fishermen, all in oilskins. It was a scene I shall not soon forget, and watched with interest also by the tourists staying at the small hotel here. I kept a squid from here; and also one about 30 cm. long, female flounder (*Limanda ferruginea*) just thrown upon the beach. Specimens of the latter were also seen alive on the bottom at a depth of about two fathoms, and here I also caught a full-grown, female *Myoxocephalus groenlandicus* (not kept; bait in stomach), which species is equally common here. Lovely was it to sit in a boat and look down in the clear, blue water where millions of jelly-fish (medusae and ctenophores) of various sizes, drifted with the current and shone in all the colours of the rainbow, with the bright sun over-

head, and dozens of gulls fighting for the fish-refuse thrown overboard and drifting out to sea. I had my plankton-net out and secured, besides worms, crustacea, etc., a couple of 1-1½ mm. large fish-eggs and several tiny fish-larvae (herring?); the latter were unfortunately dissolved by the evening, as I had forgotten to bring formaldehyde with me. By wading around at low tide in the pockets among the cliffs I noticed different invertebrates attached to the large algae (*Laminaria*, etc.) growing in the water. It was too deep for wading, so I had to take off my clothes and suffer a very cold bath, but I was rewarded by getting different molluscs, crustacea and worms, and not less than sixty of the beautiful, sessile Medusae (*Lucernaria*), so difficult to distinguish in colour from the brown sea-weed to which it was attached. I then had a good supper, and enjoyed getting back to St. Johns in no time, by automobile.

Next morning I shipped off the specimens collected so far, to Ottawa, and I left with the train to explore the west side of the island. I was on the train all day and the following night and morning; and the observations, which can be made from it, are of course very limited. It was a bright, sunny day, so it was a peculiar experience when travelling along the narrow neck of land connecting the Avalon Peninsula with the rest of Newfoundland to be suddenly enveloped in a dense fog, which lasted until we got out of reach of Trinity (north side) and Placentia (south side) Bays, which almost meet here. I am told this fog is a permanent feature here, and it would gladden the heart of any Londoner to see it. After passing Bonavista Bay (which is an important fishing and whaling area), one enters the vast moorland of northern Newfoundland (The Great Barrens), practically uninhabited, except at the coast and the lumber camps up the larger rivers and lakes. Bogs, ponds and scattered growth of shrubby spruce all around, except for an occasional landmark in form of a rock outcrop as a rounded, isolated hill, sometimes dignified by being called a mountain. This used to be an eldorado for wild fowl and reindeer, but the good, old days when one could camp on the railroad track and wait for them to pass, have gone forever. After reaching the vicinity of Grand Lake (about long. 57° W.) the country became much more attractive, with good woods, plenty of shrubbery and swift-flowing streams; and from the railway one catches a glimpse of this lovely lake, the largest in Newfoundland.

At noon (on August 30) I reached Deer Lake, a widening of the famous Humber River, and went in motorboat across it to Nichol's place, which Mr. English had recommended me as a good collecting-ground. The shores of this lake are low and with close shrubbery also upon the islands it contains, but its level was at present so high, that I soon discovered I would have little success in getting any freshwater animals beyond plankton. The latter I secured, and left again in the afternoon, catching the train going east and got off at Grand Lake, where I went to Major Whitaker's bungalow hotel. He is an enthusiastic outdoor-man and amateur ornithologist, and has had great success beautifying the grounds around his premises; so it was a genuine pleasure to remain here for a day or two. That same evening I went on a reconnaissance excursion along the lake, and soon discovered it would be a very interesting and profitable place to collect.

Accordingly, Mr. Whitaker and I left the next morning for a day's trip in canoe down the lake. It was a lovely day, and I have rarely seen anything more beautiful than the wide expanse of this lake, surrounded by woods untouched by fire, lumbering and pests, right to the water's edge and up the surrounding slopes. Above them towered in the distance the more naked, rocky hilltops; and the shore was sand, gravel or boulders, and at the north end a flat bedrock floor. I am glad I have seen it, for it is now well on the way to be destroyed by the raising of the level of the lake fifteen to twenty feet in connection with the new lumber industry in the Humber valley. Mr. Whitaker told me he would soon be "drowned" out and have to move.

We crossed the lake in our canoe, and reached a place on the west side of the lake, where a creek (Rocky Brook) comes out on a sandy beach with scattered boulders (see fig. 4). In its outlet here and along the adjoining margin of the lake, I saw a number of sticklebacks and secured a dozen of them, 1¼-7 cm. long (*Gasterosteus atkinsi*). The ones more than 3 cm. long were infested in their abdominal cavity with a large Cestode (*Schistocephalus?*).

We walked up this creek until we reached a now deserted beaver-dam in it, and I secured a number of invertebrates (Molluscs, insects, Crustacea, leeches, sponges, etc.) in its different parts, attached to stones, submerged logs, etc. The lower part of this creek is surrounded by dense woods; but higher up the trees get more scattered and shrubby and the ground a swampy bog.

(*To be concluded in the February issue*)