

Report 136

A SURVEY OF THE LAKES OF ISLE ROYALE,
WITH AN ACCOUNT OF THE FISHES OCCURRING IN THEM.

by Walter Koelz

FOREWORD

Pursuant to the provision of the Fifty-fifth Legislature of the State of Michigan for a Survey of Isle Royale, the exploration of the lakes of the Island was assigned to me. The investigation had as its primary purpose the ascertaining of the kinds of fish occurring in these water-bodies. Incidentally much information was collected on the hydrography of the lake basins, and some observations were made on the abundance of the fish and on their food. To the assistance of John Brumm and George Stanley, students in the University of Michigan, I am entirely indebted for the accumulation of the data here presented.

The party landed on the Island August 7, 1929, and left on October 2, 1929. Thirty-eight lakes were examined in this period. The number includes all but four or five small ponds shown on the maps, and also three, one of them of considerable size, not charted. A map of the Island, Plate I, shows all the known water-bodies. A few obvious errors of mapping, all referred to in the proper places in the text, have been corrected on it.

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The equipment included a 17-foot canoe, several thousand feet of linen gillnets of $2\frac{1}{2}$, 2, and $1\frac{1}{2}$ inch (stretched) mesh, common sense minnow seines, a 50-foot seine of $\frac{3}{8}$ inch mesh, and a nickel-encased Negretti-Zambra deep sea thermometer.

Each lake was sounded with the view of ascertaining the general features of the topography of the lake basin. Usually series of depth readings were made across the lake, the number of such series depending on the degree of regularity of the contour lines. A total of more than 3600 soundings ^{was} ~~were~~ recorded. In collecting, the shores were always explored around the entire lake and seines were drawn wherever possible. The best shoals were usually explored with the seine again after dark. Gillnets of the three meshes, usually in lengths of about 200 feet for each mesh, were set in virtually all the lakes. The number of the sets made was largely determined by the hydrography of the lake basin.

Specimens of fish were preserved from each locality and all collections have been deposited in the Museum of Zoology at Ann Arbor. Only the coregonids have been critically studied. These have been reported on in a paper entitled "The coregonid fishes of north-eastern America", which appeared in the Papers of the Michigan Academy of Science, Arts and Letters for 1930.

In the pages that follow the lakes are described in the order in which they were explored.

The Fish Fauna of the Lake.

1. The number of species of fish found on the island in the 38 examined lakes is 30[↓].

2. The log perch, sunfish, fathead, horned dace and the mimic shiner are very near the known northern limits of their range. Dymond 1926 did not find the sunfish and horned dace in his survey of the Lake Wipigon area.

3. Lake Siskowit, the largest lake, has 16 or 17 species (the brook trout undoubtedly occurs, at least sparingly, but was not taken). Lakes Desor and Richie have 11 each. None of the others have more than 9, and many, including some of the larger ones, have only 2 or 3. One of the smallest^x has 6. It appears thus that size alone is not the important factor that determines the number of species one of the lakes may contain.

4. The lakes may be classified according to stage of development with those that harbor Coregonidae in class I, those with bog borders and chiefly less than 5 feet and not over 10 feet deep in class III and the rest (not boggy and chiefly 8 feet or more deep) in class II.

Class I has the four deepest lakes and excepting Lake Feldtmann the largest lakes on the island: Siskowit, Richie, Desor and Sargent. In class II are most of the lakes. These are all 10 feet or more in depth, and vary in size from Feldtmann (one of the 5 largest) to the little pond Wagejo. Class III contains 7 small bog lakes: Ahmeek, Wallace, Sumner, Theresa, Sholts, Mud, Stickleback. In such a classification we see that the largest and deepest lakes (class I) have the most species (9-16). Those in class II have from 1 to 8 and in class III, 1 to 6.

[↓]35 counting subspecies, including the three confined to Lake Harvey. - Carl L. Hubbs.

5. Excluding Newt and Stickleback Lake that are clearly not suited to any but bog-tolerant species, the pike and perch occur in all but 8, or 28, of the lakes. The stripnose is found in 22² lakes and the sucker in 15. The rest of the species run as follows: spot-tail and golden shiner, 10 each;² trout perch, Cottus cognatus and brook stickleback, 5 each; Margariscus, herring³ and fathead, 4 each; walleye, finescaled dace, ninepined

² Corrections made for the few additional shiner records obtained on resorting the collection; no account of subspecies is taken in this tabulation.- Carl L. Hubbs.

³ According to my ^{identifications} classifications, the "herring" occurs in only 3 lakes.- Carl L. Hubbs.

stickleback, log perch and Cottus ricei, 3 each; sunfish, brook trout, darter and whitefish, 2 each; lawyer, chub, lake trout, horned dace, Chrosomus, mimic shiner, lake shiner, Couesius and Cottus bairdii kumlieni, 1 each.

6. It is not easy to explain the unequal distribution of the various species. We do not know enough about the life history of any of our fish to say that a given species is absent in a given body of water because conditions are unsuited. In the case of the pike, a very adaptable fish thruout its range, some comments appear permissible.

The pike does not occur in Harvey, Hatchet, Desor, Benson, Forbes, Wallace, Sumner or Theresa. The last three are bog lakes and conditions may not be suitable. The rest, together with Angleworm, Lesage, Livermore and Wagejo are the highest lakes on the island and hence were probably the first to be exposed by the recession of the Great Lake that once covered the island.

7. The fauna of these high lakes may give some clue to the population of this ancestor of Lake Superior. In table 2 is given the approximate altitude of these lakes, together with a list of species known to occur in them.

All these high lakes, except Desor and Hatchet have perch. Livermore, Lesage, Angleworm and Wagejo are the only ones that have pike. Of the remaining 16 species 9 are now common inhabitants of the shores of Lake Superior and the other 7 are pond or stream dwellers. If we assume that the 9 Great Lakes dwellers constituted the original population of the ancestor of Lake Superior, we may easily account for the 7 pond and stream forms by assuming that they ^{have} access to high waters thru ponds and streams now extinct.

If the pike is to be left out of this list of early-settlers it must be explained how it got into part of the lakes. The pike could have got into Angleworm from Lesage. Suckers are known to ascend the outlet of Lesage from Richie and it is possible that pike

can do likewise. It remains only then to account for their presence in W^eagejo and Livermore. The stream connecting the former with Sargent and that connecting the latter with Chickenbone have both a steep gradient. It is possible, however, that fish can still ascend both, tho offhand it would seem as great an undertaking as the ascent of some of the streams that join the other high lakes with Lake Superior. Pike of course are decidedly positively rheotropic in spring and the concentration of pike around the mouth of the creeks opening into Chickenbone and Sargent would undoubtedly be greater than that around the mouth of the streams opening into the deep cold bays of Lake Superior, so that the chances of penetration are more favorable in the inland streams.

It would not be worth while to discuss the absence of pike in such detail if it were not known that pike are absent from certain high lakes near the south shore of Lake Superior: in the Huron Mountain and Porcupine Mountain areas. In rather thorough collecting in the lakes of the Huron Mountain region by Doctor Carl L. Hubbs and me (see Hubbs: The Fishes in Book of Huron Mountain), no pike were found in Trout, Canyon, Ives, Mountain, Anne and Cliff Lakes, lying at elevations of 153 feet for Ives and 233 to 315 feet above Lake Superior for the rest. The population of these lakes was found to consist of 9 species: Leucichthys (2 species), re-sided sucker, brook and lake trout, blunt-nosed minnow, brook stickleback, Couesius, and perch. All but two are Great Lakes shore forms. The perch occurred in two and may not have found congenial conditions in the rest.

Ruthven gives the fish fauna of Carp Lakes in the Porcupine Mountains (altitude about 500 feet) as sucker, horned dace, spottail, trout perch and perch (see Ruthven, A. G.: An Ecological Survey in Northern Michigan, 1906).

There is thus in these high lakes a relatively low number of species and most of those found belong to the open shore fauna of the Great Lakes. The pike is absent from most of them though it occurs in lower lakes offering apparently no more favorable conditions. It is probable then that the pike has been late in entering the Great Lakes basin.

8. There are other points of distribution worthy of mention:

(a). The Iowa darter occurs only in Chickenbone and Sargent Lakes, the sunfish only in Richie and Mason Lakes and the log-perch only in Siskowit, Whittlesey and Dustin.

The lakes of each of the three groups are close together and the connection between them undoubtedly has been rather intimate.

(b). Cottus bairdii kumlieni has been found only in Chickenbone to which it probably has been able to ascend from the Great Lake.

(c). The spot-tailed shiner does not occur in the high lakes nor in Feldtmann and Halloran, altho conditions in many of these lakes seem to be favorable. The absence of many forms where they might be expected is striking, as for example, the absence of Couesius and walleyes in Lake Siskowit, and of all minnows in Lake Feldtmann.

(d). It is noteworthy that the reidsided sucker does not occur in the lakes of the Island. It is found in Lake Superior and in some of the high lakes of the Huron Mountain region. In the latter lakes the common sucker which is the usual one on the Island is absent.

9. Most of the lakes are rather poor places for fish. Even where the number of species is rather high, the number of individuals is low. In many lakes with only 2 or 3 species there are relatively few fish. The exceptions are in the main summarized below:

(a). Perch grow large (1 lb.) in Chickenbone, Otter, Beaver, and Benson. They appear to be abundant in some other lakes: Forbes, Angleworm, Feldtmann, Livermore, Harvey, but they do not grow large in these, and in most appear to be exceedingly dwarfed.

(b). Siskowit Lake seems to offer favorable conditions for most salmonoids. The trout and whitefish appear to be rather common and to attain a size comparable with that reached by Great Lakes individuals.

(c). In Lake Harvey¹ occur the largest examples of stripenosed shiners on record. Margariscus is abundant and suckers and perch are exceedingly common - so abundant in fact that individuals taken are generally much emaciated.

(d). In Hatchet Lake are found numbers of large brook trout and horned dace¹ of approximately maximum size for the species. The temperature of the lake becomes rather high.

¹The "Stripenosed" shiner and the Margariscus and the Pimephales of Lake Harvey were found by Koelz to be very different from those of other waters, and are referred by me to distinct subspecies. - Carl L. Hubbs.

(e). Desor Lake supports a very large population of whitefish. Suckers are also common.

(f). Wagejo Lake supports a large number of pike, the only fish found in it.

(g). In Lake Summer fatheaded minnows are very abundant. Thirty-five hundred individuals were caught with one dip of an improvised cheesecloth dip net.

10. Eradication by the moose of the higher aquatic plants has undoubtedly had serious consequences for the fish. These plants are important in affording them food and shelter.

11. It appears that food is generally scarce for the larger fish. In virtually every lake except Siskowit, Wagejo and Shesheeb, the pike were thin, often extraordinarily emaciated, with no infestation of parasites to account for loss of flesh. Stomachs in all pike were found with little food except those of Wagejo which were feeding almost exclusively on Crustaceans and aquatic insect larvae.

Stomachs of perch and walleyes were generally found with little food.

been

The whitefish of Lake Desor have apparently ^{been} driven by absence of Crustaceans and molluscs to a predatory habit and many stomachs contained only fish, principally the nine-spined stickleback.

12. The fish fauna of the Island's lakes has been seen to be relatively large and to be constituted of a rather high number of warm water or pond-loving fish. Geologists do not know that the Island has been connected with the mainland since it emerged from the depths of Lake Algonquin and the Island's biota, according to this view, has been transported by water. It seems improbable that many of the species of fish could have traversed the stretch that separates Isle Royale from the nearest mainland. A journey of 25 miles across a depth largely over 600 feet deep, in water that for most of the year is near freezing is hardly to be expected from fish that do not regularly grow larger than 3 inches and prefer to live on warm shoals.

Appendix

Scientific names of fishes referred to in the
text by common names or generic names

Bluntnosed Minnow	<u>Hyborhynchus notatus</u> (Rafinesque)
Chrosomus	<u>Chrosomus eos</u> Cope
Chub	<u>Leucichthys bartletti</u> Koelz
Couesius	<u>Couesius plumbeus</u> (Agassiz)
Darter, Iowa	<u>Poecilichthys exilis</u> (Girard)
Dace, Fine-scaled	<u>Pfrille neogaea</u> (Cope)
Dace, Horned	<u>Semotilus atromaculatus atromaculatus</u> (Mitchill)
Fathead Minnow	<u>Pimephales promelas promelas</u> Rafinesque ¹
Herring	<u>Leucichthys artedi sargentii</u> Koelz in Sargent, Richie and Siskowitz lakes. <u>Leucichthys artedi huronicus</u> Koelz in Lake Desor.
Lawyer	<u>Lota maculosa</u> (Le Sueur)
Log Perch	<u>Percina caprodes semifasciata</u> (De Kay)
Margariscus	<u>Margariscus margarita nachtriebi</u> (Cox) ²
Miller's Thumb	<u>Cottus cognatus</u> Richardson <u>Cottus bairdii humlieni</u> (Hoy) <u>Cottus ricei</u> Nelson
Perch	<u>Perca flavescens</u> Mitchill
Pike	<u>Esox lucius</u> Linnaeus

¹ The Lake Harvey race I separate as P.p. harveyensis. - Carl L. Hubbs.

² The "herring" of Siskowit which Koelz doubtfully identifies as L. a. sargentii I regard as the young of L. bartletti. - Carl L. Hubbs.

³ The Lake Harvey race I separate as M. m. koelzi. - Carl L. Hubbs.

Shiner, Lake	<u>Notropis atherinoides</u> Rafinesque
Shiner, Golden	<u>Notemigonus crysoleucas crysoleucas</u> (Mitchill)
Shiner, Mimic	<u>Notropis volucellus volucellus</u> (Cope)
Shiner Spottailed	<u>Notropis hudsonius selene</u> (Jordan)
Shiner, Stripenosed	<u>Notropis atrocaudalis heterolepis</u> Eigenmann and Eigenmann ⁴
Stickleback, Brook	<u>Eucalia inconstans</u> (Kirtland)
Stickleback, Nine- spined	<u>Pungitius pungitius</u> (Linnaeus)
Sucker, Common	<u>Catostomus commersonnii</u> (Lacépède)
Sucker, Redsided	<u>Catostomus catostomus</u> (Forster)
Sunfish	<u>Eupomotis gibbosus</u> (Linnaeus)
Trout, Brook	<u>Salvelinus fontinalis fontinalis</u> (Mitchill)
Trout, Lake	<u>Cristivomer namaycush</u> (Walbaum)
Trout Perch	<u>Percopsis omiscomaycus</u> (Walbaum)
Walleyed Pike	<u>Stizostedion vitreum</u> (Mitchill)
Whitefish	<u>Coregonus clupeaformis dustini</u> Koelz in Lake Desor
	<u>Coregonus clupeaformis neo-hantoniensis</u> Prescott in Lake Siskowit

⁴The Lake Harvey race I separate as N. a. regalis. - Carl L. Hubbs.

Table 1. DISTRIBUTION OF FISH IN LAKES OF ISLE ROYALE

	Pike	Perch	Stripenose shiner	Sucker	Spot tail shiner	Golden shiner	Brook stickle-back	Trout perch	Cottus cognatus	Herring	Fathead minnow	Margariscus	Pine-scaled dace	Walleye	Log perch	C. ricei	9-spined stickle-back	Sunfish	Iowa Darter	Brook trout	Whitefish	Chub	Lake trout	G. b. kumlieni	Couesine	Horned dace	Lawyer	Carasomus	Lake shiner	Mimic shiner	Number of species in each lake
1 Chickenbone	X	X		X	X				X					X					X											8	
2 Livermore	X	X	X																											3	
3 Lesave	X	X																												2	
4 Richie	X	X	X	X	X	X		X	X	X								X										X	11		
5 Intermediate	X	X	X	X	X	X		X																					7		
6 Siskowit	X	X	X	X	X			X	X	X				X	X	X				?	X	X	X			X	X		16		
7 Whittlesey	X	X		X	X			X					X	X	X														8		
8 Mason	X	X	X		X			X										X											6		
9 Otter	X	X	X		X	X																							5		
0 Beaver	X	X	X		X	X																							5		
1 Harvey		X	X	X							X	X																	5		
2 Hatchet				X		X	X	X			X	X					X			X					X				8		
3 Desor				X		X	X	X	X		X				X	X				X	X			X					11		
4 Amygdaloid	X	X		X																									3		
5 Patterson	X	X																											2		
6 Ahmeek	X	X																											2		
7 Eva	X		X		X	X																							4		
8 McDonald	X	X																											2		
9 Shesheeb	X	X	X		X																								4		
0 Linklater	X	X	X		X																								4		
1 Sargent	X	X	X	X	X	X		X	X										X										9		
2 Warejo	X																												1		
3 Angleworm	X	X																											2		
4 Benson		X	X										X																3		
5 Forbes		X	X									X																	3		
6 Wallace			X	X		X					X	X														X			6		
7 Sumner			X		X						X	X																	4		
8 Newt																													0		
9 John	X	X	X	X																									4		
0 Theresa			X			X																							2		
1 Epidote	X	X																											2		
2 George	X	X																											2		
3 Dustin	X	X	X	X									X	X															6		
4 Sholts	X	X	X	X																									4		
5 Mud	X		X	X																									3		
6 Halloran	X	X	X		X																								4		
7 Stickleback						X																							1		
8 Feldtmann	X	X	X																										3		
o. of lakes in- habited by each species 1	25	25	22	15	10	10	6	6	6	4	4	4	3	3	3	3	3	3	2	2	2	2	1	1	1	1	1	1	1	1	

Corrections made for the few additional shiner records obtained on resorting the collection; no account of sub-species is taken in this tabulation.—Carl F. Hubbs.

Table 2. Distribution of fishes in certain lakes at high elevations on Isle Royale and on the South shore of Lake Superior.

Altitude		Species																						
		Brook trout	Lake trout	Whitefish	Herring	Leucichthys hubbsi	Sucker	Red-sided sucker	9-spined stickleback	Brook stickleback	Trout perch	Couesius	Horned dace	Margariscus	Fine-scaled dace	Flathead	Bluntnose	Stripenose	Spottail	Cottus ricei	C. cognatus	Pike	Perch	
<u>Isle Royale</u>																								
235	Desor	X	X	X			X	X	X	X	X	X	X	X						X	X			
191	Hatchet	X					X	X	X	X		X	X		X									
190	Livermore																					X	X	
About 190	Lesage																					X	X	
About 190	Angleworm																					X	X	
About 190	Wagejo																					X		
About 190	Forbes													X				X						X
About 190	Benson														X			X						
168	Harvey						X							X	X	X								X
<u>Huron Mountains</u>																								
153	Ives		X	X	X		X					X												X
233	Canon											X												
234	Trout	X	X						X	X							X							
240	Mountain	X		X			X										X							X
243	Anne			X			X																	
<u>Porcupine Mountains</u>																								
500	Carp						X		X	X									X					X

Plate I.

Map of Isle Royale (after Lane).

The maximum known depth is given in parenthesis after each lake.

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- 2—Be sure to enter complete information in spaces provided. Report is of less value if incomplete.
- 3—Under "Remarks" note ideas as to changing conditions and changes needed, and any other items which may make the record of greater value
- 4—Mail or deliver reports to Conservation Officers or to Department of Conservation at Lansing at frequent intervals for tabulations. Do not hold in possession as cards may be overlooked and become lost.
- 5—Each person will appreciate the benefit rendered Michigan authorities by placing this information in their hands. Do your part and fill out your cards please!

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