

INSTITUTE FOR FISHERIES RESEARCH

The fishes of Isle Royale

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Dr. Walter Koelz presents, on pages / to 15 of this report, a paper on the fish fauna of the inland lakes of the island. It seems desirable to present also a complete list of the fishes known from the entire island,--from the streams, the coves and bays and from those portions of Lake Superior proper which are adjacent to the island.

The field work by Dr. Koelz constitutes by far the most thorough fish survey of Isle Royale. Some fishes were obtained by the University of Michigan expeditions of 1904 and 1905, published on by Dr. A. C. Ruthven in 1906 and 1909, respectively. The collecting these early parties was restricted to a few bays and coves, and a few of the inland lakes and streams. A few specimens were collected by Capt. R. E. Ellsworth when on the fish patrol in 1920,--in McCargoe's Cove on August 12, and at the mouth of Washington River (at the Washington Club), on September 14. George M. Stanley took time to make some additional fish collections, during his work on the island in the summer of 1930.

The collecting on the island as a whole has been rather thorough. The inland lakes, however, have been studied more intensively than the streams. The coves and bays and the open lake about the island have not been investigated in enough detail to give us much confidence that the list of fishes inhabiting the island is as yet completely known.

The fish fauna of these waters has partly been made known by an examination of the unpublished commercial fishery returns from the various ports, made available through the courtesy of the State Department of Conservation and the U. S. Bureau of Fisheries. The reports for 1927-1928, including the winter of 1928-1929, were the only ones which have been summarized by ports. The later reports have been summarized

for the whole Island only. Dr. John Van Oosten has supplied a few records from notes he made on a fishery survey of the island in 1927. The total fish fauna of Isle Royale, as here listed, comprises 45 species and subspecies.

Dr. Koelz has treated the problems involved in the origin and distribution of the Isle Royale fish fauna. Dr. Ruthven (1909: 329) realized, as does Dr. Koelz, the difficulties involved in the migration of the warm water or pond-loving fishes across the deep and cold channel separating the island from the main land. "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" is Dr. Koelz's very natural conclusion. But the survey of the Pleistocene geology of the island by George M. Stanley in 1930, carried out after Dr. Koelz completed his report, leaves no reason to believe that any fish could reach the island by any means other than swimming across the intervening stretch, no matter how wide, deep and cold it may be.

I have found that creek and pond fishes which find the Great Lakes waters inhospitable do nevertheless occur there occasionally and sporadically. That they should at times drift away from the shore, become lost and swim 25 miles to reach Isle Royale is hardly unthinkable. Following a flood, such pond fish as might be swept out of a mainland stream might well be expected to remain in the shelter of floating brush, and thus attain the island at rare intervals.

Some features of the local distribution of the fishes on Isle Royale supports the theory that the pondfish of the island reached it by the methods of "accidental dispersal". The occurrence of the two darters and the sunfish each only in a single connected group of lakes (see p. of Dr. Koelz's report), would suggest that these

So also is the occurrence of three minnow species in a single lake. species have moved across from the mainland at very rare intervals. Perhaps each of these six species only made the crossing once, in numbers sufficient to assure its reproduction and multiplication on the island.

In comparing the faunas of the high lakes of Isle Royale with those of the upper Huron Mountain lakes (see Hubbs, 1929, and Dr. Koelz's report), it should be borne in

mind that there are no falls or other barriers in the outlets of the Isle Royale lakes, at all comparable to those which have so effectively cut off several of the Huron Mountain lakes from faunal invasion after the origin of these lakes in post-Glacial history.

In the annotated list which follows, the nomenclature followed is that adopted in my list of Great Lakes fishes (Hubbs, 1926) and in the two supplements thereto (Hubbs and Green, 1928; Hubbs, 1930). For the Coregonidae, I follow in general Koelz's conclusions (1929 and 1931).

COREGONIDAE (whitefish family)

1. Leucichthys artedi arcturus Jordan and Evermann

Lake Superior herring

Recorded from Washington Harbor and Rock Harbor by Ruthven in 1906 and 1909, respectively, as Argyrosomus artedi.

Hankinson (unpublished notes) has identified nine young coregonids, 1 3/8 to 1 5/8 inches long, collected at the head of Tobin Harbor (Sta. IV, 7) on July 20, 1905, as Leucichthys. They probably represent L. a. arcturus.

Commercial fish returns indicate the catching of "herring" about the following Isle Royale localities: Belle Isle, Chippewa Harbor, Fishermen's Home, Hay Bay, Johnson Island, Malone Island, Rock Harbor, Siskowit Bay and Tobin Harbor. The species doubtless occurs throughout the island.

H. F. Johnson, fishing in Chippewa Harbor in 1927, told Dr. John Van Cooten in 1922 that he believed there were two kinds of shallow-water "herring" in that vicinity, one spawning near the surface over deep-water, and the other, looking like a tullibee, spawning on sand in shallow water. It is quite possible that the herring of Isle Royale belong to two subspecies. Koelz (1919: 500) indicated the presence of a deep-bodied race in the north bays of Lake Superior, which is different from the more terete form of the open waters.

2. Leucichthys artedi huronicus Koelz

Rush Lake cisco

The lake herring recorded from Lake Desor by Ruthven in 1909 as Argyrosomus artedi is doubtless the same form which Koelz in 1931 (p. 318) reported from the same lake under the identification of L. a. huronicus. That subspecies he described from Rush Lake at the base of the Huron Mountains, along the south side of Lake Superior. The only other locality to which he accredited the species, provisionally, is Chautauqua Lake, New York. The race up that lake, however, appears to be distinct from that of Rush Lake and Lake Desor.

3. Leucichthys artedi sargenti Koelz

Sargent Lake cisco

Koelz (1931: 320) described this subspecies from Sargent Lake, and referred to it with more or less doubt, ciscoes he found in Siskowit Lake and Lake Richie. The Lake Richie form appears to agree fairly well with sargenti, and may retain that identification. The "herring" from Siskowit Lake, however, appear to me to be the young of the "chub" of that lake, Leucichthys bartletti.

4. Leucichthys bartletti Koelz

Siskowit Lake cisco

This cisco is known only from Siskowit Lake, from which Koelz (1931: 363) recently described it as a distinct species.

From the same lake Koelz (1931: 321) reported a number of young ciscoes, referring them to L. a. sargenti with the reservation that "on account of their being so very small, it is impossible to determine positively the identity of these specimens." He contrasted these "herring" ("sargenti") with his "chub" ("bartletti") in the following words:

"A form of Leucichthys artedi, probably sargenti, is also found in the lake. L. bartletti is distinguishable from this by having a reduced number of gillrakers,

a much longer snout and much less body depth. It also undoubtedly lives in much deeper water and probably grows larger." The "herring" were found on the beach of floating; the "chubs" were taken in gill-nets and fish stomachs.

A close study of this material leads to the conclusion that Koelz's "herring" are merely the young of his "chubs". Some specimens it is true have more gill-rakers, 40 to 42, than any of bartletti counted, but several others counted have only 35 to 37 gill rakers, as in that species. The difference in the length of the snout is an average one only: as measured from anterior orbital rim to tip of premaxillaries, the snout length enters the head length 2.7 to 3.2 times in the young ("herring") and 2.5 to 2.8 times in the adult. Some of the larger of the young have the snout quite as long and the head quite as slender and rakish as in the types of bartletti. In the young of L. a. sargentii, the snout is only one-fifth as long as the head. In the length and form of the mandible also these young ciscoes from Siskowit Lake agree with bartletti rather than with sargentii: the mandible is slightly more instead of decidedly less than half as long as head; it is more slender, distinctly projecting and somewhat hooked upward at its tip. Many of the young are quite as slender as the adults. The differences in size and habitat are of course merely an index of age. The scale rows, counted in about a dozen of the young specimens, show a variation of 62 to 76.

I therefore conclude that there is but one form of Leucichthys in Siskowit Lake. With what Great Lakes species this form is allied can hardly be guessed at now. It is not at all impossible that it is, like most of the inland-lake forms, a relative of L. artedi.

5. Leucichthys nigripinnis cyanopterus Jordan and Evermann

Bluefin

This usually deep-water form was reported for Rock Harbor by Ruthven (1909: 330) under the name then current, Argyrosomus nigripinnis.

H. F. Johnson, who has fished commercially about Chippewa Harbor since 1904, told Dr. John Van Oosten in 1927 that blackfins were taken in abundance in 1904, but almost disappeared in 1905, few being taken from then to the present (1927).

The commercial fish statistics do not distinguish between the deep-water species of coregonids. Occasional returns or reports are given for "chubs" or "longjaws" from Chippewa Harbor and Washington Harbor. There is little reason to doubt that the ~~two~~ <sup>four</sup> other deep-water species of Lake Superior (see Koelz, 1919) all occur about Isle Royale: L. zenithicus, L. reighardi dymondi, L. k. kiyi and L. hoyi. Mr. Johnson, fishing at Chippewa Harbor told Dr. Van Oosten of sometimes taking "bloaters", probably the species last named, in his herring nets.

6. Coregonus clupeaformis clupeaformis Mitchill

Lake Superior whitefish

The whitefish has not been reported from Isle Royale as a result of the former surveys, but must be fairly common all around the island. The commercial fish reports indicate catches at Belle Isle, Chippewa Harbor, Rock Harbor, Siskowit Bay, Tobin's Harbor, Washington Harbor, Washington Island and Wright's Island.

Hankinson (unpublished notes) identified as of this species a young coregonid 1 3/4 inches long, taken on July 20, 1905, at the head of Tobin Harbor (Sta. IV, 7).

7. Coregonus clupeaformis nee-hantoniensis Prescott

Inland lake whitefish

Koelz (1931: 377) found a whitefish, which he referred to this subspecies, to be common in Lake Siskowit. It is a rather slender form, especially in the head, and superficially somewhat resembles the pilot or menominee (Prosopium). This I suppose is the basis for Ruthven's record (1909: 330) of Coregonus quadrilateralis from Siskowit Lake.

8. Coregonus clupeaformis dustini Koelz

Lake Desor whitefish

Koelz (1931: 379) described this very peculiar type of whitefish from Lake Desor. He referred to the subspecies also the whitefish of Trout Lake, northern Wisconsin, but noted some differences between the specimens from the two lakes.

9. Presopium quadrilaterale (Richardson)

Pilot or Menominee

As explained above, it seems probable that the one published record of this species from Isle Royale was based on Coregonus clupeaformis nee-hantoniensis. <sup>The pilot</sup> ~~white species~~ does occur about the island, however,--in the bays and Lake Superior. Dr. John Van Oosten in 1927 saw some that had been caught in Good Small Boat Harbor. The commercial fish records examined indicate catches about Rock Harbor, Siskowit Bay and Wright's Island.

SALMONIDAE (trout family)

10. Salmo gairdneri irideus <sup>u</sup> Gibbons

Rainbow or steelhead trout

No published records for the occurrence of the rainbow or steelhead trout about Isle Royale have been seen. The species is occasionally caught through Lake Superior, however, and probably is of general distribution around the island. Fishermen reported to Dr. John Van Oosten in 1927 that they occasionally caught this trout about Washington Harbor. The only specimen examined, a small but identifiable fingerling, was caught in this harbor, at the mouth of Washington River, by Capt. H. E. Ellsworth, on September 14, 1920.

11. Cristivomer namaycush (Walbaum)

Lake trout

The lake trout was reported for Washington Harbor and the north shore of the island and from off the east coast of the island by Ruthven (1906: 109); from Rock Harbor, by Ruthven (1909: 330), and was taken in

Siskowit Lake by Koelz. The 41 mm. fingerling from Benson Brook, identified by Ruthven as Cristivomer namaycush, proves on comparison with the better material now available to be a brook trout.

The lake trout is no doubt common around the entire island. Commercial fish returns indicate captures about Amygdaloid Channel, Belle Harbor, Belle Isle, Chippewa Harbor, Fishermen's Home, Hay Bay, Johnson Island, Little Boat Harbor, Malone Island, Rock Harbor, Siskowit Bay, Tobin's Harbor, Todd Harbor, Washington Harbor, Washington Island, and Wright's Island. Dr. John Van Oosten saw lake trout which had been caught at Chippewa Harbor and Good Little Boat Harbor.

Fishermen, as usual about the Great Lakes, make the plausible claim that there are two kinds of trout in the shoal waters about Isle Royale. An investigation of the trout races is urgently needed.

#### 12. Cristivomer namaycush siscowet (Agassiz)

##### Siscowet

Dr. John Van Oosten in 1927 saw some trout which he supposed to be siscowets, and which had been caught off Good Little Boat Harbor. H. F. Johnson reported to him that catches of siscowets were made about Chippewa Harbor. A few reports of "siskowits" are given in the statistics for Isle Royale.

#### 13. Salvelinus fontinalis (Mitchill)

##### Brook trout

The brook trout was recorded by Ruthven (1906: 108, and 1909: 330) from Washington River, Washington Harbor and Benson Brook, and was taken by Koelz (~~1932~~) in Hatchet Lake and Lake Desor and indicated as probably occurring in Siskowit Lake. Stanley took specimens in Desor Creek, just above Todd Cove. The species is known to occur in other streams of the island, and in the lake about their mouths.



CATOSTOMIDAE (sucker family)

14. Catostomus commersonii commersonii (Lacépède)

Common sucker

This sucker was reported by Ruthven (1906: 109 and 1909: 330) from Washington Harbor and Rock Harbor, and was obtained by Koelz in 15 lakes. Capt. Ellsworth collected specimens at the mouth of Washington River and in McCargoos Cove. Stanley took it in Pickerel Cove; a feeder to Lake Desor; Siskowit Lake; mouth of Little Siskowit River, and outlet of Shesheeb Lake. Commercial fish returns list "white suckers" from Washington Harbor and Washington Island. Single entries found for "mullet" and for "carp" may refer either to this sucker, or to some species of Moxostoma.

15. Catostomus catostomus (Forster)

Red-side or sturgeon sucker

The apparent absence of this species from the inland lakes of Isle Royale occasions comment by Koelz in his accompanying report. The only specimen at hand from the island was taken by Capt. Ellsworth in McCargoos Cove. Some commercial fish returns indicate the occurrence of the species at Washington Harbor. It probably occurs generally around the island, but less commonly than the other species of sucker.

CYPRINIDAE (minnow family)

16. Couesius plumbeus (Agassiz)

Lake chub

This minnow was reported for Washington Harbor by Ruthven (1906: 109). Koelz took it only in Lake Desor; Ellsworth collected it in McCargoos Cove, and Stanley got it in Washington Harbor. It probably occurs around the entire island.

17. Rhinichthys cataractae (Valenciennes)

Long-nosed dace

This species presumably occurs all around the beaches of Isle Royale, but the only specimens at hand are young seined by Stanley at the mouth of Little Siskowit River.

18. Semotilus atromaculatus atromaculatus (Mitchill)

Creek chub or horned dace

The only place where this species is known on Isle Royale is Hatchet Lake, where Koelz took very large specimens.

19. Margariscus margarita nachtriebi (Cox)

Northern dace

This dace was taken in Hatchet, Desor and Forbes lakes by Koelz.

20. Margariscus margarita koelzi Hubbs, new subspecies

Northern dace of Lake Harvey

The Margariscus of Harvey Lake, like the Pimephales and the Notropis <sup>atrocaudalis</sup> heterolepis of the same lake, is distinct in appearance from the subspecies M. m. nachtriebi as a whole, and is made a new subspecies. The type specimens are deposited in the Museum of Zoology, University of Michigan: holotype, No.                      paratypes, no.

Diagnosis.--Like M. m. nachtriebi, but head more slender and conic, lips thinner and gape less curved.

21. Pfritille neogaea (Cope)

Fine-scaled dace

The fine-scaled dace was recorded from Summer Lake by Ruthven (1909: 300), and was obtained in the same lake and adjacent marsh pool by Koelz, and also in Benson and Wallace lakes.

22. Chrosomus eos Cope

Northern red-bellied dace.

This species has been taken on Isle Royale only by Koelz, and only in Wallace Lake.

23. Notropis atrocaudalis heterolepis Eigenmann and Eigenmann

Black-nosed shiner

This shiner was taken in 21 of the Isle Royale lakes by Koelz. Stanley took one

young specimens at the mouth of Big Siskowit River. Its characters as a whole in all these lakes are similar to those shown by the subspecies throughout its range. It is noteworthy, therefore, that the form is represented in Harvey Lake by an apparently distinct subspecies:

24. Notropis atrocaudalis regalis, new subspecies

Lake Harvey shiner

This peculiar race of Notropis atrocaudalis appears to be confined to Lake Harvey, Isle Royale. The types are deposited in the Museum of Zoology of the University of Michigan: holotype, no. , and paratypes, no.

Diagnosis.--Like N. a. heterolepis, but size relatively huge (the type is 82 mm. long to caudal); head small, usually entering the standard length more than 4.0 times (3.9 to 4.3 times); eye less than one-fourth length of head; lateral band rather solidly black. The differences in head and proportions are apparent not only between specimens of maximum size, but also between those of the same size.

(regalis, in reference to the large size attained, and to the occurrence on Isle Royale).

25. Notropis volucellus volucellus Cope

Mimic shiner

This shiner apparently occurs in only one lake on Isle Royale, namely Lake Richie, where Koelz found it common.

26. Notropis hudsonius salens Jordan

Northern spot-tailed shiner

Koelz took the spot-tail shiner in ten inland lakes of Isle Royale. It probably occurs also along the Lake Superior shore.

27. Notropis atherinoides Rafinesque

Lake shiner

Siskowit Lake, where Koelz took it, is the only record for this shiner on Isle Royale. It is <sup>an</sup> abundant species around the mainland shores of Lake Superior, and may therefore be expected in the bays and coves of Isle Royale.

28. Notemigonus crysoleucas crysoleucas (Mitchill)

Golden shiner

The golden shiner was taken by Koelz in 10 of the inland lakes of Isle Royale.

29. Pimephales promelas promelas Rafinesque

Northern fat-head minnow

The first Isle Royale record of this minnow was given by Ruthven (1909: 530), for Sumner Lake. Here Koelz found it very abundant, and he took it also in Hatchet and Wallace lakes. In these lakes, the species does not show the peculiarities exhibited in Lake Harvey.

30. Pimephales promelas harveyensis, new subspecies

Lake Harvey fat-head minnow

As Koelz pointed out to me, the fat-head minnows of Lake Harvey are quite unlike those from other waters through the wide range of the species. It therefore seems worthy of subspecific separation. The type specimens are in the Museum of Zoology of the University of Michigan, where they are catalogued as nos. (holotype) and (paratypes).

Diagnosis.--Like P. p. promelas, but with finer scales (more than 50 rows); dorsal fin inserted farther forward; caudal peduncle longer, and slender; head slender and subconic; mandible not very strongly oblique; lateral line short.

ESOCIDAE (pike family)

31. Esox lucius Linnaeus

Grass pike

Ruthven (1909: 530) gave Sargent Lake as the only Isle Royale record for the pike then known. Koelz found the species in that lake, and in 27 others. It is reported to be caught in the coves around the island, one of which is named Pickerel Cove. A catch of grass pike was found entered on one of the commercial fish tallies for the island.

32. Esoc masquinongy masquinongy Mitchell

Muskellunge

Ruthven (1906: 109) recorded a muskellunge from Washington Harbor.

PERCOPSIDAE (trout-perch family)

33. Percepsis omiscomaycus Walbaum

Trout-perch

The trout-perch was reported from Tobin Harbor by Ruthven (1909: 331), as P. guttatus. Koelz collected it in six of the inland lakes, and Stanley seined one young at the mouth of Little Miskowit River.

PERCIDAE (perch family)

34. Perca fallaxiensis Mitchell

Perch

Perch were reported from Washington Harbor and from Forbes Lake by Ruthven (1906: 109 and 1909: 331). Koelz found the species in 28 of the inland lakes. Stanley caught one in Pickeral Cove. The only definite locality found on the commercial fish records was Washington Harbor, but the species is doubtless of general occurrence in the bays and coves.

35. Stizostedion vitreum (Mitchill)

Walleye; yellow pickerel

Koelz took this species from three lakes only (Chickenbone; Whittlesey and Dustin). These inland lake fish have a very peculiar appearance, and may prove to represent distinct forms when subjected to close study. The species no doubt occurs also about the shores of Isle Royale, although the only definite record I have seen is the official listing of a catch taken in Chippewa Harbor by a commercial fisherman.

36. Percina caprodes semi-fasciata (De Kay)

Northern log perch

The log perch is reported by Koelz for Miskowit, Whittlesey and Dustin lakes.

37. Pseudichthys exilis (Girard)

Iowa darter

The taking of this darter in Chickenbone and Sargent Lakes by Koelz is one of the many interesting results of his survey.

CENTRARCHIDAE (sunfish family)

38. Eupomotis gibbosus (Linnaeus)

Pumpkinseed

The occurrence of this species on Isle Royale was hardly to be expected, but Koelz took it in lakes Richie and Mason.

COTTIDAE (sculpin family)

39. Triglopsis thompsonii Girard

Deep-water sculpin

Ruthven (1909: 331) found this species in the stomachs of lake trout caught off the east coast of Isle Royale.

40. Cottus bairdii kumlieni (Hoy)

Great Lakes muddler

This sculpin was found by the 1904 and 1905 parties in Washington and Hook Harbors (Ruthven, 1906: 109, and 1909: 331; recorded as C. ictalops). Koelz took it in Chickenbone Lake, one of the very few inland lakes known to be inhabited by this subspecies. Stanley seined three at the mouth of Little Siskowit River.

41. Cottus cognatus Richardson

Slimy muddler

Ruthven (1909: 331) reported this muddler for Hook Harbor and Benson Brook, as Uranidea franklini, the name then in use. Koelz took the species in six inland lakes.

42. Cottus riesi Nelson

Horned muddler

Koelz took this interesting species in three of the inland lakes of Isle Royale, namely Siskowit, Whittlesey and Desor. It presumably also occurs along the shores of the island.

GASTEROSTEIDAE (stickleback family)

43. Megalia inconstans Kirkland

Brook stickleback

Ruthven (1909: 331) recorded this stickleback from tamarack and spruce swamps about Siskowit lake, and Koelz found it in six other inland lakes.

44. Pungitius pungitius (Linnaeus)

Nine-spined stickleback

This species of stickleback was recorded by Ruthven, (1909: 331) from Rock and Tobin harbors. Koelz took it in three inland lakes (Siskowit, Hatchet and Desor). Ellsworth seined it at the mouth of Washington River; Stanley got it at the mouth of Little Siskowit River.

GADIDAE (cod family)

45. Lota maculosa (Le Sueur)

Lawyer

The freshwater cod was reported from Tobin and Rock harbors by Ruthven (1909: 331), and Dr. Van Costen saw some which had been caught in Chippewa Harbor. It doubtless occurs entirely around the island, but apparently in few of the inland lakes. In his extensive collecting, Koelz took this fish only in Siskowit Lake.

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