SPECIAL REPORT NO. 7

Great Lakes Plankton Investigations:

A Bibliography

by

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INTRODUCTION

Our knowledge of the biology and limnology of large lakes remains far behind our understanding of small bodies of water. This is due primarily to the sampling problems inherent in conducting research in large lakes. The St. Lawrence Great Lakes represent one of the largest concentrations of fresh water in the world (Fig. 1). Research on the Great Lakes began in the late 19th century, but little was known concerning their ecology until the last few decades. Even the earliest workers on the Lakes realized the importance of plankton in the overall economy of the lakes. Although over four hundred papers have been published on the plankton of the St. Lawrence Great Lakes, the biology and ecology of the plankton remain poorly known. Most papers are descriptive and concentrate heavily on taxonomy and distribution of certain organisms. Experimental work on the dynamics of Great Lakes plankton is urgently needed in light of rapidly changing environmental conditions and fluctuating fish stocks.

This bibliography has been prepared to provide quick reference to papers published on Great Lakes plankton. In addition to Lakes Superior, Michigan, Huron, Erie, and Ontario, papers on Lake St. Clair, Lake Nipigon and Lake Nipissing have been included. Plankters are all the obligate drifters in the water which move about mainly under the influence of the currents. Therefore, this bibliography includes papers on: bacteria, fungi, algae, protozoa, Rotifera, Cladocera, Copepoda, and Hydracarina found in the water column. Certain organisms, such as Pontoporeia affinis, Mysis relicta, and Chaoborus sp., are essentially benthic organisms but undergo vertical migration into the water column at night. Only papers concerning the taxonomy, distribution, and presence of these organisms in the
water column have been included; papers dealing strictly with these organisms as benthos have been excluded. Papers on plankton in water quality investigations and plankton as food for fishes have also been included in the bibliography. Bibliographic style followed in this report is that recommended by: World List of Scientific Periodicals (3rd Edition (1968), as listed in Abbreviated Titles of Biological Journals compiled by P.C. Williams on behalf of The Biological Council, London); and the American Institute of Biological Sciences, Style Manual for Biological Journals (2nd Edition, AIBS, Washington, D.C., 117 p.).

I have examined and briefly annotated each of the papers listed. The main purpose of the annotations is to elaborate on the titles and to define more clearly the content of the papers. The annotations include comments on the qualitative or quantitative nature of the study, date of sampling and the level of taxonomic identification given. The appendix lists other sources of information on Great Lakes plankton. Brief geographical and subject indices are included.

Any bibliography of this scope is, unfortunately, never complete. Although not constituting publication, several mimeographed reports are listed here, as they are available in some of the libraries of the larger universities and research institutes in the Great Lakes region. Omissions, if they exist, are probably confined to early taxonomic works and to reports by municipal and state organizations. The author would be grateful if any such omissions would be brought to his attention.
GREAT LAKES PLANKTON INVESTIGATIONS:
A BIBLIOGRAPHY


13. Andrews, T. F. 1948c. Temporary changes of certain limnological conditions in western Lake Erie produced by a windstorm. Ecology, 29: 501-505. [Horizontal variations in relative abundance of Cyclops and Diaptomus before and after a windstorm were recorded.]


17. Anonymous. 1950. Lake Erie yield affected by plankton supply. Atlantic Fisherman, 31 (9): 16. [A short article on plankton investigations at Ohio State University, Stone Laboratory (Put-in-Bay, Ohio) and University of Western Ontario, Fisheries Research Laboratory (Erieau, Ontario).]


28. Baylis, J. R. 1957. Microorganisms that have caused trouble in the Chicago water system. Pure Water, 9: 47-74. [Quantitative data on filter-clogging (mainly by diatoms) and odor problems (mainly by Dinobryon).]


42. Bigelow, N. K. 1922. Representative Cladocera of south-western Ontario. Univ. Toronto Biol. Ser., No. 20: 111-125. [Species list of Cladocera including plankton collections from Georgian Bay (Lake Huron), and Point Pelee (Lake Erie). Also specimens obtained from stomachs of ciscoes (Leucichthys sp.) from Georgian Bay, Lake Ontario and Lake Erie.]


63. Carr, J. F. and J. K. Hiltunen. 1965. Changes in the bottom fauna of western Lake Erie from 1930 to 1961. Limnol. Oceanogr., 10: 551-569. [The phantom midge, Chaoborus, has been rarely reported from the Great Lakes. This paper, although on bottom fauna, has been included since Chaoborus was found in limited numbers in a few of their samples.]


69. Chandler, D. C. and O. B. Weeks. 1945. Limnological studies of western Lake Erie, V. Relation of limnological and meteorological conditions to the production of phytoplankton in 1942. Ecol. Monogr., 15: 435-457. [Standing crop of phytoplankton at surface, 5 m, and 9 m depths at intervals of 7 to 12 days throughout the year.]


75. Coyle, E. E. 1930. The algal food of Pimephales promelas (fathead minnow). Ohio J. Sci., 30: 23-35. [Species identification of algae found by gut analysis. Many of the fish used in the study were collected in bays and mouths of several rivers in western Lake Erie.]


94. Davis, C. C. 1955. Plankton and industrial pollution in Cleveland Harbor. J. Sewage & Indus. Wastes, 27: 835-850. [Phytoplankton and zooplankton in relation to industrial pollution as indicated by total iron content of the water. Part IV of "A preliminary study of industrial pollution in the Cleveland harbor area, Ohio." See Davis (1954a) and (1954b) for Parts II and III.]

95. Davis, C. C. 1958. An approach to the problem of secondary production in the western Lake Erie region. Limnol. Oceanogr. 3: 15-28. [Samples from western Lake Erie and from several ponds were analyzed for dissolved organic matter, dissolved inorganic matter, phytoplankton and zooplankton volume, volume of μ-cells (mostly bacteria), and volume of organic and inorganic tripton as an indirect approach to the problem of zooplankton nutrition.]


148. Hankinson, T. L. 1914. Young whitefish in Lake Superior. Science, N. S., 40: 239-240. [Food of eight young whitefish (4.9–9 cm TL) was examined by C. Juday. Bosmina longirostris, Diaptomus ashlandi, and Cyclops viridus were the chief species present. See Hankinson (1916) for the full report.]


232. New York Conservation Department. 1929. A biological survey of the Erie-Niagara system. Suppl. 18th Ann. Rept. (1928), 244 p. [Includes studies on bacteriology, phytoplankton and zooplankton from a biological survey of the eastern basin of Lake Erie. See also Fish (1929; 1960).]


245. Osburn, R. C. 1926b. Details regarding preliminary pollution survey of Lake Erie. Ohio Div. Fish & Game, mimeographed report, 18 p. [Station by station presentation of data. Plankton identified only to major groups. Coliform bacteria counts at surface and bottom.]


249. Pearse, A. S. 1921. The distribution and food of the fishes of three Wisconsin lakes in summer. Univ. Wisconsin Stud. Sci., No. 3, 61 p. [Includes stomach analysis of 30 species of fish from Lake Michigan; Crustacea identified only to major groups.]


255. Poppen, A. R. 1951. A bio-assay for toxicity of Ohio's Grand River near its mouth. Unpublished masters thesis, Ohio State University. [River empties into Lake Erie at Fairport, Ohio; Daphnia magna was the test organism.]


organic matter, dry weight of zooplankton (collected with a #5 mesh ½ - net vertical hauls), and dry weight of macrobenthos in the five Great Lakes during summer, 1966.]


314. Smith, S. I. 1871b. Dredging in Lake Superior under the direction of the U.S. Lake Survey. Amer. J. Sci. Arts., 3rd Ser., 2: 373-374. [See Smith (1874b) for the most complete account of this work.]


349. Tiffany, L. H. 1937. The filamentous algae of the west end of Lake Erie. Amer. Midl. Natur., 18: 911-957. [Mostly benthic forms which may occur as accidental constituents of the plankton. See Tiffany (1934) for planktonic algae of this region.]


356. Turner, C. L. 1920. Distribution, food and fish associates of young perch in the Bass Island regions of Lake Erie. Ohio J. Sci., 25: 137-152. [138 stomachs examined from 26-120 mm fish caught in less than 5 ft. of water near the shores of the islands. Zooplankton identified only to major groups.]


359. U.S. Comm. Fish. & Fisheries. 1899. Lake Superior. Rept. U. S. Comm. Fish. (1898), Pt. 24: 142-143. [Short note on the abundance of Diaptomus sp. in deep waters (100-130 fathoms) and possible correlation with abundance of blackfin cisco, _L. nigripinnis._]


391. Vorce, C. M. 1885. Remarks on Stephanodiscus niagarae. Trans. Amer. microsc. Soc., 7: 139-141. [A note on cell division in this species of diatom collected from Lake Erie at Cleveland, Ohio.]


398. Ward, H. B. 1895. The food supply of the Great Lakes; and some experiments on its amount and distribution. Trans. Amer. microsc. Soc., 17: 242-254. [General discussion including net plankton volume data for Grand Traverse Bay, Lake Michigan; see Ward (1896) for a complete account of this study.]


APPENDIX

SOURCES OF ADDITIONAL INFORMATION ON GREAT LAKES PLANKTON

I. Great Lakes Bibliography

The Great Lakes Fishery Commission, P. O. Box 640, Ann Arbor, Michigan 48107, maintains a 3x5 card file of references pertaining to all phases of research on the St. Lawrence Great Lakes. Copies of the card file are sent to many libraries and research organizations in the Great Lakes region. It is an extensive bibliography with an author index and many key words listed in the subject index. The sections on plankton are fairly complete and adequately cross-referenced. Use of the Great Lakes Bibliography is an excellent way of obtaining future references on plankton investigations in the Great Lakes. The following is a list of libraries and research organizations which are on the Great Lakes Fishery Commission Bibliography Accessions and Mailing List.

District of Columbia
- Branch of Inland Fisheries
- Bureau of Commercial Fisheries
- Fish & Wildlife Service
- Washington, D. C. 20240

Indiana
- Indiana Department of Natural Resources
- District II Headquarters
- Route #4
- Columbia City, Indiana 46725

Illinois
- Federal Water Pollution Control Administration
- Great Lakes Region
- Great Lakes—Illinois River Basins Project
- 1819 West Pershing Road
- Chicago, Illinois 60609

56
Illinois Natural History Survey Division  
Natural Resources Building  
Urbana, Illinois 61801

Michigan  
Institute for Fisheries Research  
Museums Annex  
University of Michigan  
Ann Arbor, Michigan 48104

Great Lakes Basin Commission  
2200 North Campus Boulevard  
Ann Arbor, Michigan 48105

Van Oosten Library  
Bureau of Commercial Fisheries  
Research Laboratory  
P. O. Box 640  
Ann Arbor, Michigan 48107

U. S. Lake Survey  
630 Federal Building  
Detroit, Michigan 48226

Minnesota  
Minnesota Department of Conservation  
Section of Research and Planning  
390 Centennial Building  
St. Paul, Minnesota 55101

University of Minnesota  
School of Public Health  
Minneapolis, Minnesota 55455

New York  
New York Conservation Department  
Fisheries Research Station  
P. O. Box 292  
Cape Vincent, New York 13618

Ohio  
Department of Biology  
Case-Western Reserve University  
Cleveland, Ohio 44106
Botany and Zoology Branch Library
Ohio State University
Columbus, Ohio 43210

Ohio Division of Wildlife
P. O. Box 650
Sandusky, Ohio 44870

Pennsylvania
Pennsylvania Fish Commission
State Office Building
Harrisburg, Pa. 17120

Wisconsin
Technical Library
Southern Area Headquarters
Wisconsin Conservation Department
Route 2
Madison, Wisconsin 53713

Library
University of Wisconsin-Milwaukee
Milwaukee, Wisconsin 53201

Canada
Freshwater Institute
501 University Crescent
Winnipeg, 19, Manitoba

Canada Centre for Inland Waters
867 Lakeshore Road
P. O. Box 5050
Burlington, Ontario

Department of Zoology
University of Guelph
Guelph, Ontario

Fisheries Section
Research Branch
Ontario Department of Lands & Forests
Maple, Ontario
II. Great Lakes Research Checklist

The Great Lakes Commission, 2200 North Campus Blvd., Ann Arbor, Michigan 48105, periodically distributes a checklist of papers published on all phases of Great Lakes research. In addition, the Commission distributes the Great Lakes Newsletter, which also contains information on publications concerning Great Lakes research. The checklist and newsletter are very useful in obtaining current publication information especially of state and municipal publications which are often difficult to find.

III. Other bibliographies

Hile, R. 1966. U.S. federal research on fisheries and limnology in the Great Lakes through 1964: An annotated bibliography. U.S. Fish Wildl. Serv., Spec. Sci. Rept.--Fish. No. 528, 53 p. [Includes references on plankton investigations. All pertinent papers have been incorporated into this bibliography.]

Van Oosten, J. 1957. Great Lakes fauna, flora and their environment—a bibliography. Great Lakes Comm., Ann Arbor, Mich., 86 p. [A comprehensive bibliography on all aspects of Great Lakes biology and limnology through the mid-1950's. References on plankton have been incorporated into this bibliography.]
ACKNOWLEDGEMENTS

I gratefully acknowledge the assistance of Mr. R. Ballard, librarian at the Bureau of Commercial Fisheries Research Laboratory, Ann Arbor, Michigan, and Mrs. H. Broughton of the interlibrary loan office, University of Wisconsin-Milwaukee library for their help in locating many of the papers in this bibliography. Special thanks go to Mr. R. Ristic for drafting the figure and M. Pierce for document preparation.
SUBJECT INDEX

Taxonomy: Taxonomic keys useful in the Great Lakes region and early taxonomic papers on Great Lakes biota. The numbers below refer to bibliographic entries.


Review: Comprehensive review papers on some aspect of Great Lakes plankton investigations.

102, 103, 105, 112, 201, 246.

Survey: General limnological surveys of the Great Lakes including plankton investigations.


Phytoplankton: Includes papers on primary productivity and chlorophyll determinations.

Zooplankton: Includes papers on particulate organic matter.


Water Quality: Includes papers on bacteria, fungi, and plankton in relation to water pollution and water purification investigations.


Plankton as food for fishes

GEOGRAPHICAL INDEX

Lakes and Bays

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Lake Ontario


Lake St. Clair


Lake Superior

Rivers

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Lower St. Lawrence River
222, 223.
REQUEST FOR LITERATURE EXCHANGE

This report is being sent to you in the hope that literature exchange between you or your organization and this Center will be initiated and maintained. Reports or reprints which you may wish to designate for the Center Library, or inquiries concerning publications and exchanges, should be addressed to:

Center for Great Lakes Studies
Reference Library
University of Wisconsin-Milwaukee
Milwaukee, Wisconsin 53201

Publications designated for individuals within the Center should be addressed to those persons by name.

SPECIAL REPORT SERIES

Special Reports are issued from time to time, usually to provide accounts of work in progress, or completed, which are too detailed for acceptance by professional journals. This method of publication is, for example, convenient when it is desired to record and deposit collections of data in identifiable and recoverable form, or to fulfill the terms of contracts, or to make the details of a particular technique available to other potential users. This mode of reporting does not preclude later publication—usually abbreviated and selected—in professional journals; indeed, authors are urged to regard such publication as a necessary final step in the completion of a piece of literature. The following Special Reports have been issued to date:


